

PLASCO LTD

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LIFELINES FOR THE NATION

An ISO 9001:2015 Certified Company

Manufacturers of
HDPE and PVC-U pipes

PLASCO LTD



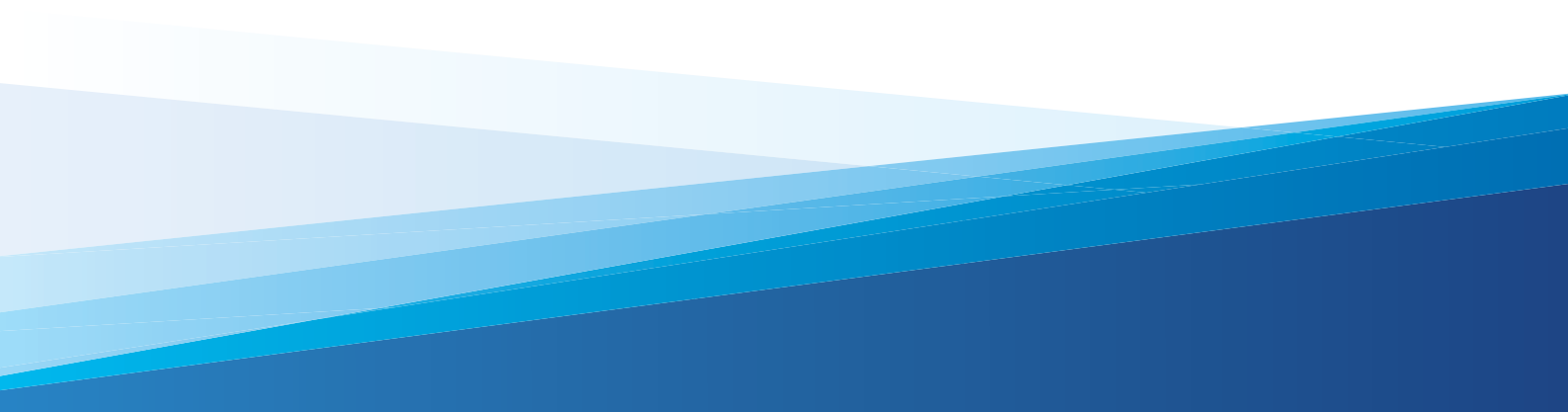

WEHOLITE

WEHOLITE MANUAL



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MESSAGE FROM COMPANY CEO



Jürg Flühmann

Plasco Ltd. is committed to deliver sustainable results and solutions to its stakeholders by supplying reliable plastic piping systems within Tanzania and neighboring countries.

We fully recognize the impact and opportunities that the adherence to quality principles affords us in supplying Quality Products and Service to our Customers, while achieving our objectives and results of the Company. Therefore, Plasco Ltd. will ensure that the Quality Management System is communicated, implemented and maintained by all personnel and will continually focus upon the improvement of the effectiveness of the system for the ongoing benefit of the Company and its Customers.

Plasco Ltd. is investing continuously in its people, equipment and quality assurance assuring our customers that world class plastic piping solutions are implemented in their projects for long-lasting, successful and sustainable results. We differentiate ourselves from our competitors in being a true partner for reliable plastic piping systems, caring for our customers well beyond the supply of our products and services.

Being the leading company for plastic piping solutions within East Africa, Plasco Ltd. contributes substantially to the growth of the industrial sector, building a strong basis for implementing the policy and objectives of "Local Content" put in place by East African governments. We strongly believe in the power of developing local people for the benefit of the East African countries for sustainable economic and social growth. We are here today thanks to the confidence and trust our customers have in us. Our objective is to become a company that every customer can be proud of. That is a commitment we solemnly pledge to all of you.

Thank you.

01. ABOUT US



PLASCO LIMITED

Founded in 1992 by four Tanzanian businessmen, Plasco Ltd. officially commenced operations in 1993 from its site on Nyerere Road in the key industrial area of Dar es Salaam, Tanzania. The first of its products, drinking straws, were produced with a single refurbished extruder, and through steady growth over the course of a decade the company was able to move to a larger site at its current location on Mbozi Road.

In 2007 the company upgraded its production capacity at its factory in Dar es Salaam via the purchase of several state-of-the-art equipment. The equipment included three brand new Italian extrusion lines, new PVC mixing equipment, a new high capacity water chiller, an extensive range of laboratory pressure testing equipment, new borehole casing manufacturing equipment, and a new PVC pipe extruder.

Over the next few years, Plasco continued its expansion via the addition of new equipment to meet the growing demand for quality pipes. By early 2010 a new PVC extruder had been installed and brought into operation, with the objective of further enhancing the production capacity, and enabling Plasco to produce up to 315mm diameter in PVC. Three years later, a new PE extruder was installed to further enhance production capability and to expand Plasco Ltd.'s pipe market, enabling it to produce PE pipes of up to 630mm diameter.

Today, in contrast to that single extruder it started with in 1993, Plasco Ltd.'s current extrusion capability is underpinned by the running of nine extruders (five Polyethylene and four PVC) as well as other modern plastics processing equipment. Plasco Ltd.'s business process includes manufacturing of HDPE & PVC pipes, and trading of related fittings. In addition to this, Plasco Ltd., also specializes in site welding of HDPE Pipes using highly skilled, trained and certified welders and supports a multitude of sectors including Gas, Mining, Water supply, Agriculture, Beverage, Telecoms and Construction.

Plasco Ltd.'s name is synonymous with high quality plastic pipes and fittings, earning it a top spot in plastics manufacturing in Tanzania and East Africa.

Plasco Ltd.'s quality stamp is not only assigned through its extensive experience locally, but also by its adherence to the highest global standards. The company obtained its ISO 9001:2000 Compliance Certification in 2004 and upgraded to ISO 9001:2008 Certification in 2010; this certification was further upgraded to ISO 9001:2015 in 2016; these being universal quality management standards that ensure we meet statutory and regulatory requirements. Plasco Ltd. produces HDPE pipes to the ISO 4427 and ISO 4437 Standards and PVC pipes to ISO 1452 Standard respectively.



The HDPE Gas Pipes manufactured by Plasco are also certified by Kiwa Gastec Laboratories in The Netherlands. Plasco products are also tested and certified by the Tanzania Bureau of Standards (TBS).

Plasco Ltd. has now made a further investment of over 4million US Dollars to introduce WEHOLITE Structured Wall HDPE Pipe Technology to the East African region under license from Uponor Infra Oy of Finland. Plasco Ltd. has combined new production techniques with the latest raw materials technology to produce a durable pipe system with superior load-bearing properties, making Weholite the preferred solution for many municipal and industrial applications including storm water management, sewage treatment systems, culverts, marine pipelines and irrigation water distribution. Weholite pipes are manufactured in accordance with Uponor Infra and Plasco internal Standards which are in accordance with the EN 13476 and ISO 21138 Standard. This investment has resulted in the conversion capacity of Plasco Ltd. to reach 28,000MT per annum.

Plasco Ltd. is a member of the Confederation of Tanzania Industries (CTI) and the Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA). Plasco Ltd.'s commitment to excellence is exhibited across its operations; in all facets of its manufacturing, purchasing, and customer service processes. Plasco's management team constantly works to stay abreast with the latest technology within the industry by attending regular training courses ensuring that they remain informed and qualified in the latest Industrial developments & innovations. Plasco remuneration policy is based on merit, which contributes extensively towards creating a driven, motivated, and highly skilled workforce with excellent prospects for advancement. It is this philosophy that is at the heart of Plasco's operations; it is what keeps Plasco Ltd. in pole position in its sector and industry.





02. INTRODUCTION TO PLASCO WEHOLITE

Weholite from Plasco Limited, is a flexible, light weight and durable structured wall pipe made from high density polyethylene (HDPE) resin. Plasco Limited manufactures Weholite HDPE pipe at their Manufacturing facility, equipped with the latest Technology, in Dar es Salaam, Tanzania, under license from Uponor Infra **Oy** of Finland.

Plasco Weholite pipe does not rot, rust or corrode due to any chemical or electrolytic reaction in the soil. Plasco Weholite pipes are highly abrasion resistant, tolerant of ground movement and will not corrode or deteriorate in contact with a wide range of destructive substances.

The excellent abrasion resistance and flexibility of the PE-material make Plasco Weholite, a truly multifunctional pipe; quick and easy to install thanks to its design and light construction.

Plasco Weholite provides all the technical advantages of polyethylene solid wall pipes, but substantial savings in weight and ease of installation often offers lower overall installed costs than traditional materials. Plasco Weholite pipe systems are manufactured using prime quality HDPE (high density polyethylene) – the same material used for high pressure water and gas mains.



03. APPLICATIONS OF PLASCO WEHOLITE PIPES



n o i t a c i l p p a e g a n i a r D / e g a r e w e t S a l p t n



Rail culverts



Road culverts



Special construction for industrial requirements



Manholes



Mine Drainage



Attenuation Application



Marine Pipeline Application



Fittings/Specials

04. DESIGN, INSTALLATION

Material properties

Chemical resistance

For all practical purposes, PE is chemically inert within normal use. In other words, PE does not rot, rust or corrode as a result of chemical or electrical reactions in any soil type, nor does it release or dissolve anything into the soil. More information on the chemical behavior of PE is given in ISO 10358.

Typical physical properties for Weholite pipe and resin

Property	Value	Unit	Standard
E-modulus, short term	≥ 800	MPa	ISO 527
Density	≈940	kg/m ³	ISO 1183
Linear expansion coeff.	≈17·10 ⁻⁵	K ⁻¹	
Thermal conductivity	≈ 0.36–0.50	W/(K · m)	
Specific heat capacity	≈ 2300–2900	J/(kg · K)	
Surface resistance	>10 ¹³	Ω	
Poisson ratio	0.45	(-)	
Tensile strength	> 15	MPa	ISO 6259
Elongation at break	> 350	%	ISO 6259

Temperature range

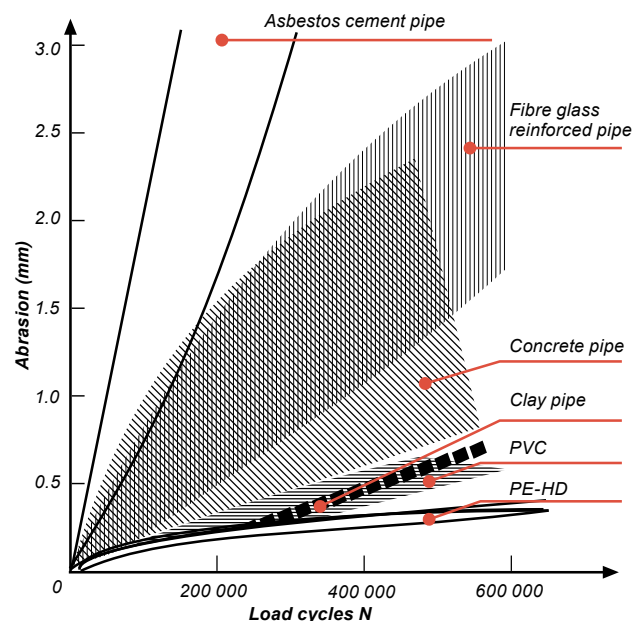
The maximum allowable temperature of the pipe medium:

Material	Short term temperature	Long term temperature
PE	+80°C	+45°C
PP	+95°C	+50°C

Please contact Plasco Limited for more detailed information on allowable operating temperature.

Abrasion resistance

In the so-called Darmstadt abrasion test (DIN 19534, part 2), pipe samples are filled with a mixture of sand and water and then subjected to a specified number of rocking cycles. The amount of abraded material is measured at regular intervals. Results indicate a very high abrasion resistance for PE pipe materials.

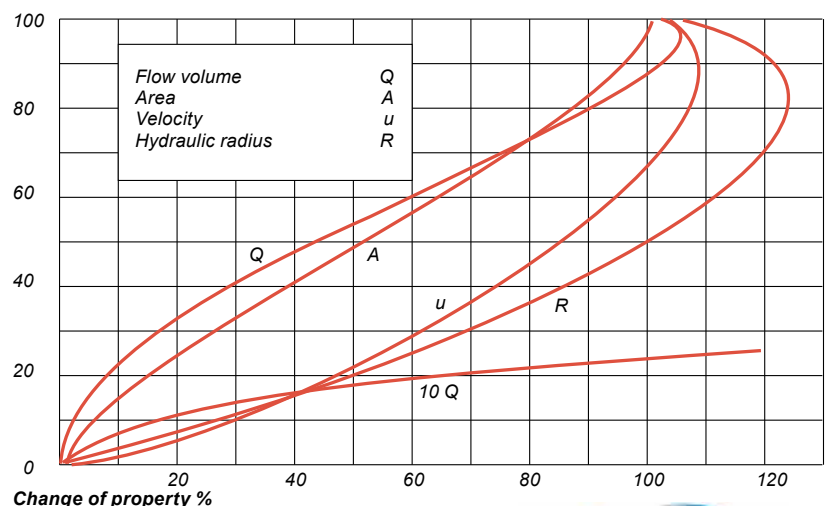


Hydraulic design

Partially water-filled pipes

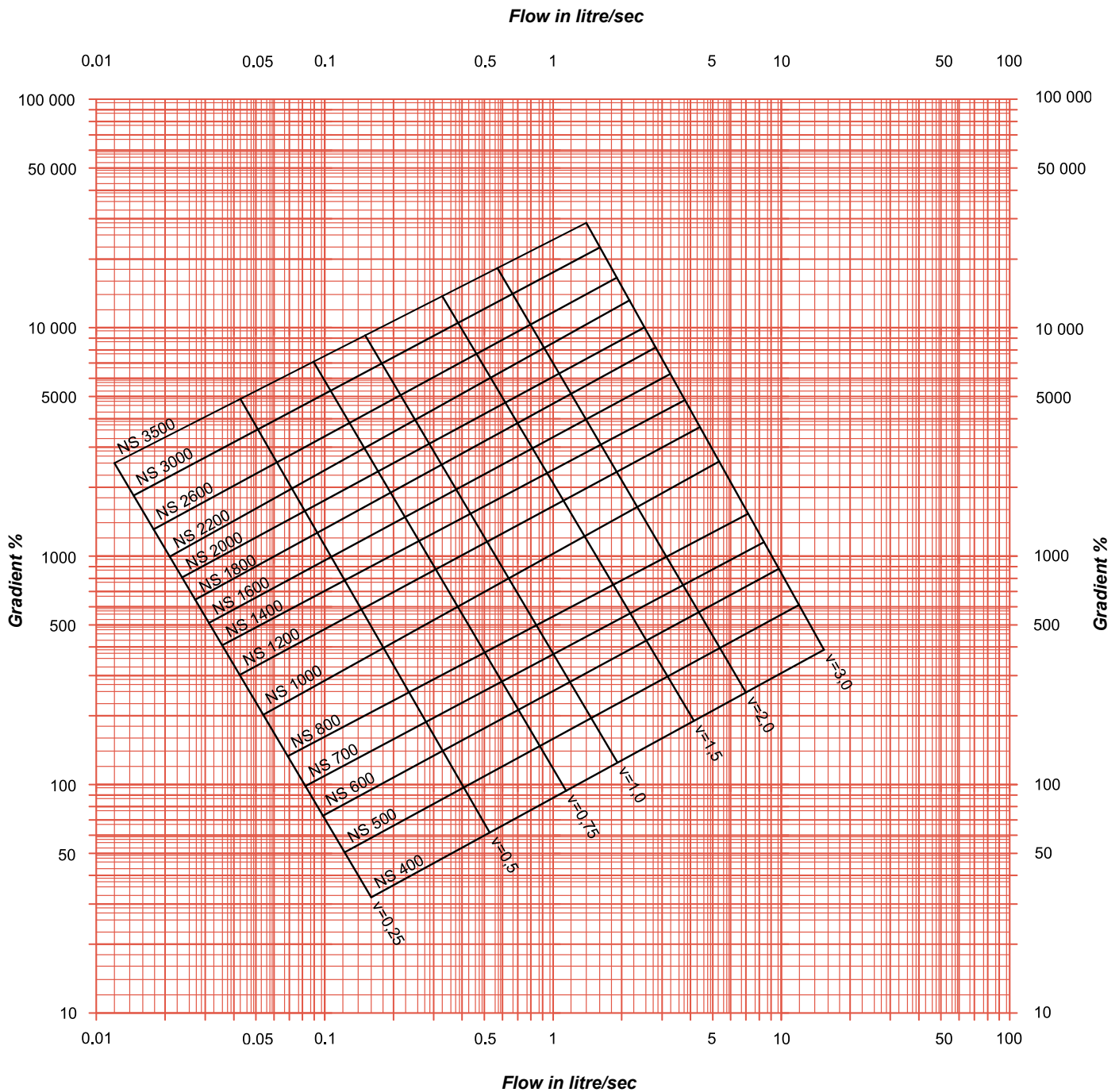
Diagram giving the change of water flow volume filled area, flow velocity and hydraulic radius as functions of the filling level in the pipe. The 10Q curve illustrates an enlargement of the Q curve between 0 and 12% on the horizontal axis.

Filling level %



Discharge nomogram for pipes flowing full

The pipe roughness coefficient is 0.03. In this nomogram, a system roughness coefficient of 0.25 is assumed.



Structural design

Flexible buried pipelines

A flexible pipe like Weholite is by definition a pipe which will deflect when subjected to external loads (traffic, ground water changes, frost actions, soil settlement etc.) – as opposed to a rigid pipe which carries all external loads by itself. The degree of deflection of a flexible pipe will depend on the pipe stiffness, support from the surrounding soil, and on external loads.

There are several methods for calculating the deflection in buried flexible pipelines. Most of them are based on the so-called

Spangler formula:

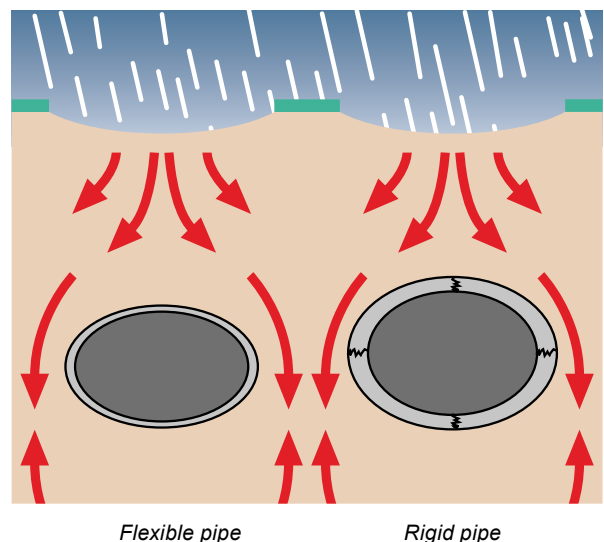
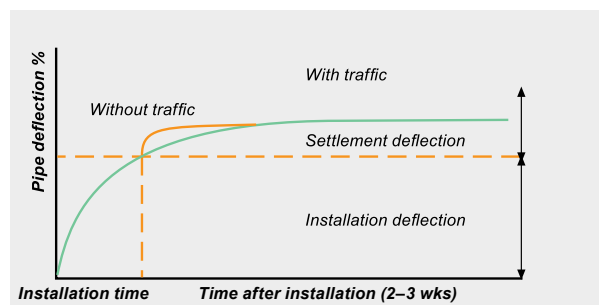
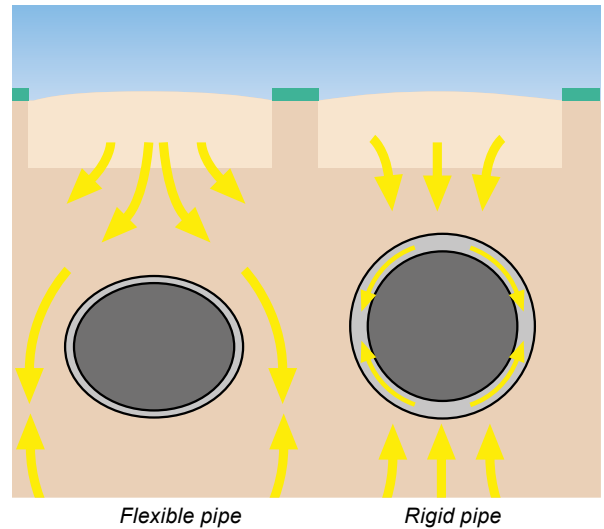
$$\text{deflection (\%)} = \frac{\text{vertical load on the pipe}}{\text{pipe stiffness} + \text{soil stiffness}}$$

The bulk of the deformation is caused during backfilling of the trench. After installation, further compaction of the surrounding soil develops with time due to external loading and soil settlement.

Experience shows that the maximum deflection will be achieved within 1 – 3 years after installation, depending on backfill material, quality of backfill compaction work and on external loads. The maximum allowable deflection is 5 – 10% depending on national regulations.

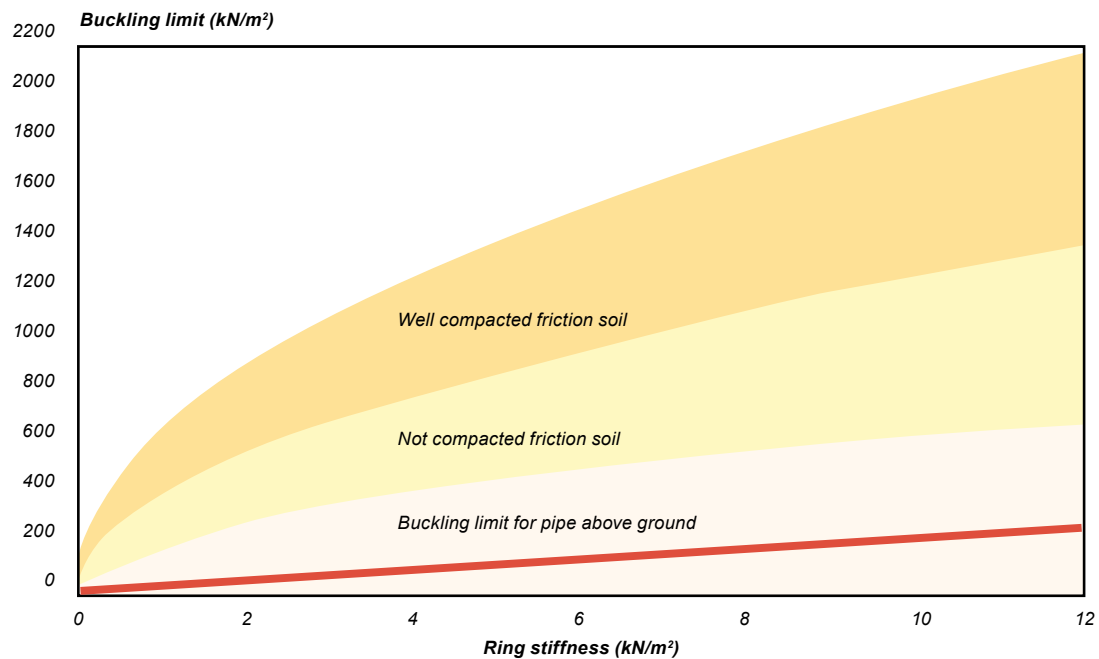
Field experience and investigations show that installation varies along the pipeline. This variation reflects differences in support and external loading on the pipe. The installation variability results in variations in deflection for flexible pipes and variations in bending moments for rigid pipes.

A flexible pipe absorbs external loads and deforms to a certain extent. A rigid pipe, on the other hand, by definition cannot deform. When external loads increase sufficiently, the rigid pipe will finally crack and lose its stiffness.



Buckling resistance

The main type of failure which could occur in a thermoplastic pipe is collapse (buckling) due to overloading. This design criterion should therefore be checked even though rarely this will determine the choice of pipe ring stiffness.



For a pipe with ring stiffness at least 4 kN/m² (SN4), the buckling risk needs to be checked only if the installation depth is more than 6m.

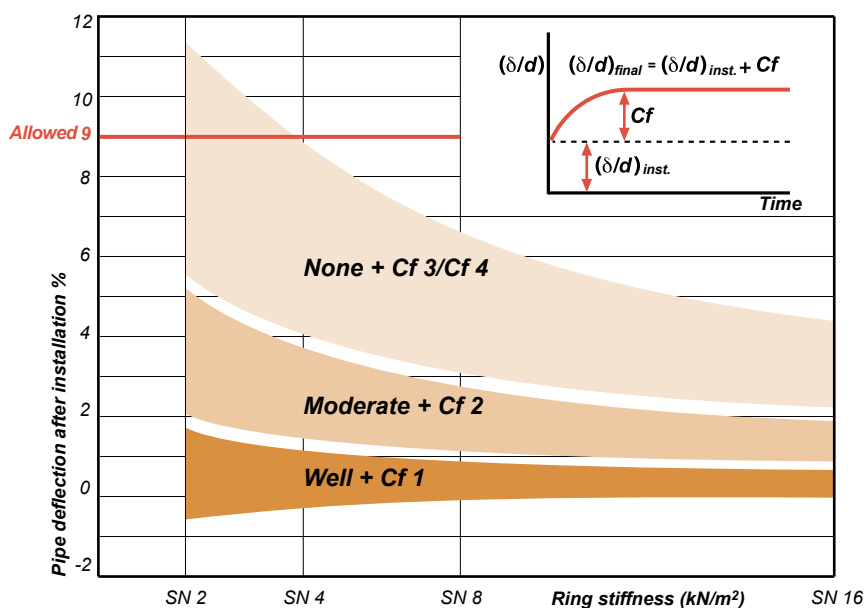
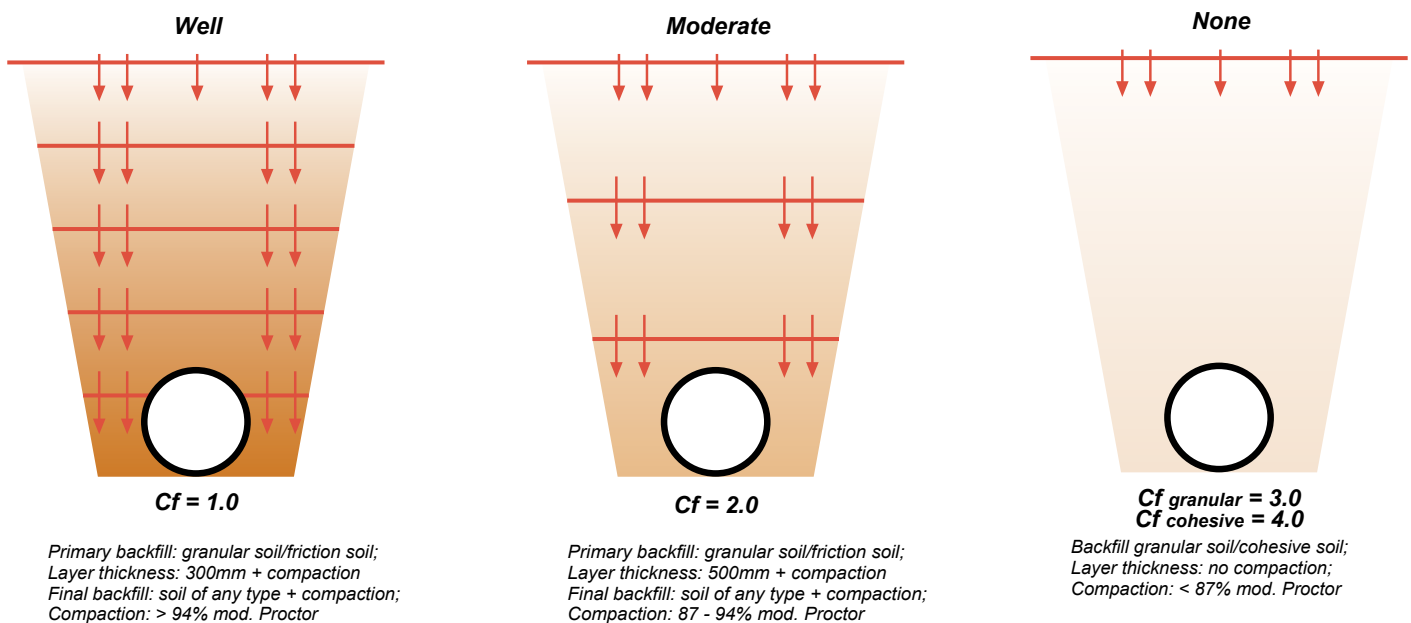
Design graph for pipe selection

Based on a study by Teppfa (Design of Buried Thermoplastics Pipes; 1999), several design approaches can be proposed. Designs can be kept simple thanks to the strainability of thermoplastics pipes. It was concluded that the most focus should be put into the installation/backfilling of the pipe. It is also important to remember that flexible pipes follow the soil settlement. Under the scope of the investigation, load is therefore not an issue for flexible pipes. Based on the results of this work, the design approach using a simple graph is strongly recommended.

In the design, graph areas are given for each installation group.

The lower boundary of each group represents the average deflection expected after installation and the upper boundary the maximum.

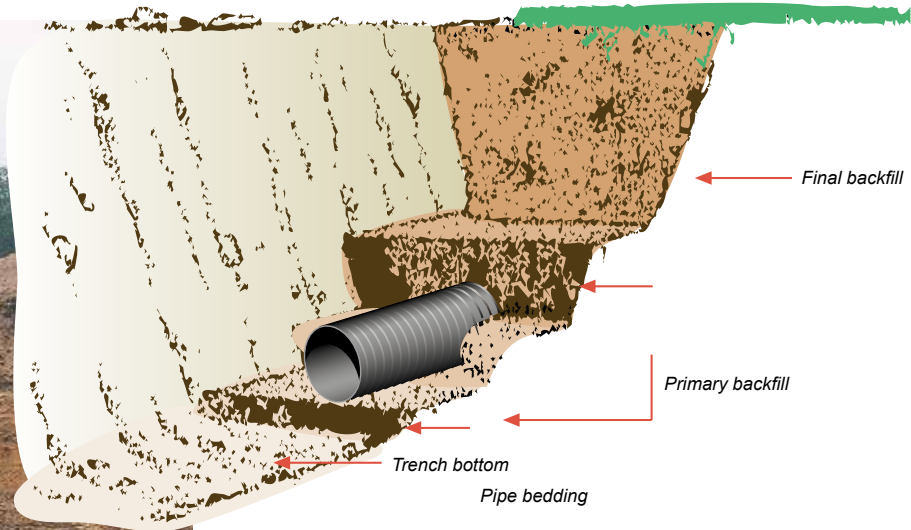
The design graph contains three installation groups. Consolidation factors (Cf) have to be added to the initial deflection values, obtained from the graph.



Note:

- installation depth 0.8 - 6 m
- pipes fulfill relevant EN or ISO product standard requirements
- heavy traffic load
- allowed deflection for PE pipes is 8 - 10%

Cf = consolidation factor
 δ/d = deformation
Source: TEPPFA (1999),
Design of Buried
Thermoplastics Pipes



Please refer to national codes of practice for installation of plastic pipes wherever applicable.

Pipe bedding

The bedding soil shall be free from stones within the width of the pipe trench. On the trench bottom, a 100-150mm thick bedding layer is prepared and well compacted mechanically.

The bedding shall be at least 400mm wider than the pipe outside diameter. For installations in soft/wet soil, a geotextile is placed under the bedding to keep bedding and native materials separate.

Primary backfill

The primary backfill material shall be a friction soil or macadam. Backfilling shall be made over the whole width of the trench. Compaction of the backfill material shall be made in layers of 150-300mm. The final layer of the primary backfill shall extend 300mm above the pipe crown.

The primary backfill material is carefully spread from a low height. The haunch area compaction is to be made with special care, making sure the pipe does not move. The primary backfill is made in even layers on both sides and in the lengthwise direction of the trench. Frozen soil material shall not be used.

Note: No compaction is to be done directly above the pipe until the backfill has reached 300mm above the pipe crown.



Final backfill

Requirements for the final backfill material are different for traffic load areas and non-traffic load areas. Compaction is carried out in several layers. The final backfill material shall be compactable as dug materials or better. The material must, however, be free from stones.

Bending

Changes in the alignment of sewer pipelines are normally done in manholes or using bends. Small alignment changes can be accommodated by bending the pipe itself. When bending socketed pipes, the bending may not be at the socket. The minimum permissible permanent bending radius for Weholite pipes under normal installation conditions is $R = 100 \times d_e$ (outside diameter).

During installation, smaller bending radius values are acceptable, down to $50 \times d_e$. An acceptable bending radius can be maintained by lateral supports against the side of the trench. For practical reasons, bending pipe with DN/ID > 1500mm in field conditions can be difficult. Special care should be taken when bending pipes at low temperatures. Plasco representatives will be happy to assist with any questions regarding bending.

Support spacing, m

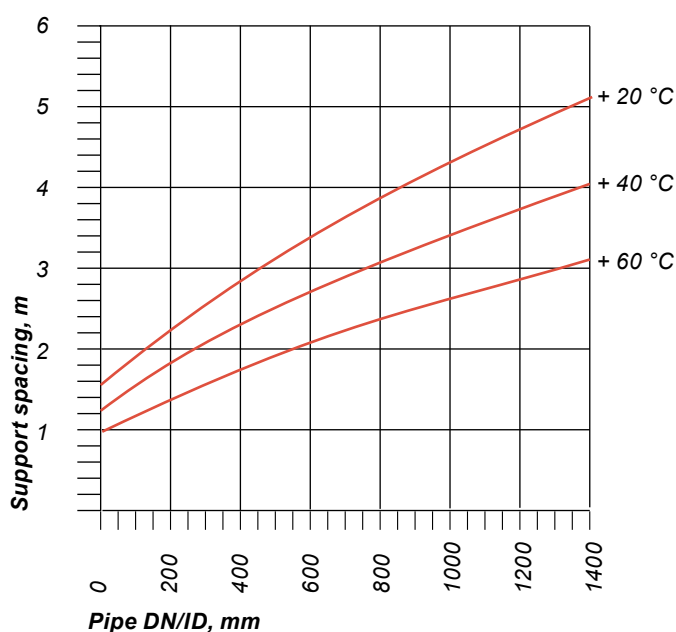
- sag 10mm/10 years
- liquid density 1000kg/m³

Support spacing

For above ground installations, the maximum support spacing can be determined according to the figure on the right.

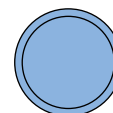
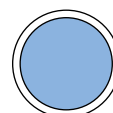
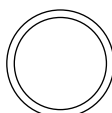
Buoyancy

When installing pipes under the ground water level, the buoyancy of the pipe shall be taken into consideration. When needed, the natural uplift of the pipe should be counteracted. This can be designed case by case. Please do not hesitate to contact us for more technical information

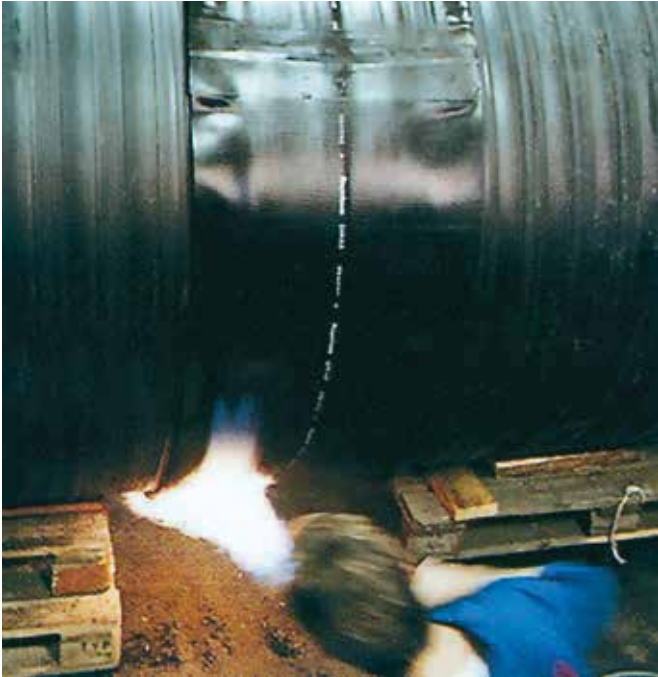


Buoyancy of Weholite pipes

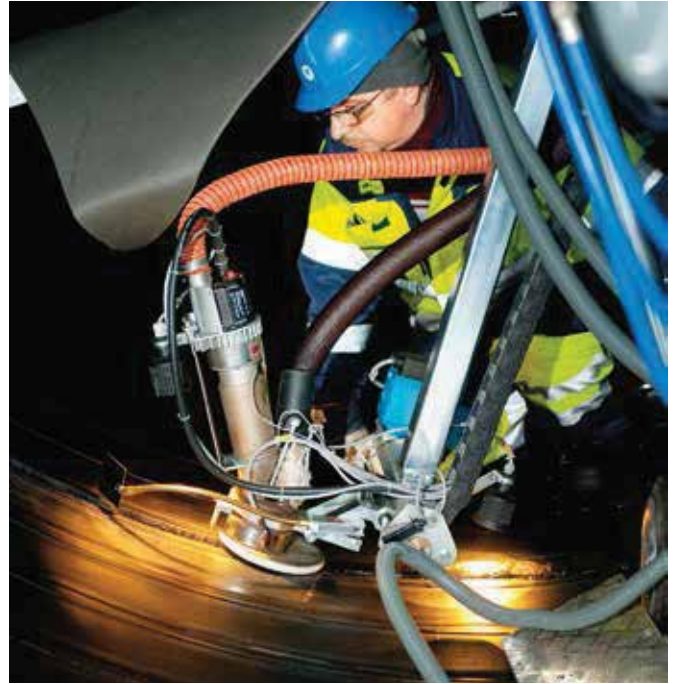
DN/ID mm	D _n mm	Pipe empty Profile empty kN/m	Pipe full Profile empty kN/m	Pipe full Profile full N/m
360	400	1.23	0.24	10
400	450	1.52	0.29	10
500	560	2.38	0.45	10
600	675	3.43	0.65	10
700	790	4.66	0.89	20
800	900	6.09	1.16	20
1000	1125	8.97	1.27	30
1200	1350	13.70	2.61	40
1400	1575	18.65	3.55	50
1500	1680	21.41	4.08	60
1600	1792	24.36	4.64	70
1800	2016	30.83	5.87	90
2000	2240	38.06	7.25	110
2200	2464	46.05	8.78	130



05. JOINTING TECHNIQUES



Heat shrink sleeve installation



Internal extrusion welding machine. All works are to be carried out by experienced personnel.



Welding seam covering the full profile height



Hand-held extrusion machine. Hand extrusion is especially suited for waterproofing thread joints



External welding machine.



Sleeve joints.

06. LOW PRESSURE (LP) COUPLINGS

The Couplings are designed and manufactured specifically for use with Weholite pipes. It is suited for low pressure, large diameter applications such as sewer, gravity or storm water pipelines. It is made from Stainless Steel with a Vulcanised Rubber Seal. Due to high-quality Rubber Seal and Stainless Steel construction components, Couplings have a design life of over 50 years, if installed correctly.

Fitting Instructions for Coupling



Advantages

- Extended life expectancy
- Proven technology ensures the stability against ground movements
- Cost-effective
- Easy to install
- Light weight
- Leak tight
- Corrosion resistant

Step 1:

Pipe surface to be checked for damage.
If the pipe end is in a suitable condition, it should be cleaned and marked with a line 150mm from the end.
The pipe end must be liberally greased to assist the rubber sleeve to slide over the pipe end.



Step 2:

The entire rubber sleeve must be pushed onto one pipe end. The two pipe ends must be positioned with a setting gap of 20mm.
The rubber sleeve must be slid back over the 20mm gap between the two pipe ends. The gasket must be located centrally between the marks made on each pipe end.



Step 3:

The first outer strap must be positioned and finger tightened in an outer groove of the rubber sleeve.



Step 4:

The second outer strap must be positioned and finger tightened in the other outer groove of the rubber sleeve.



Step 5:

The required size of socket (24mm) and the required torque rating (45Nm) is specified on the sticker by the fastening arrangement on the coupling.



Step 6:

Tighten the outer bolts to the recommended torque rating of 45Nm. Tighten the inner-sleeve bolts to the recommended torque rating of 45Nm.



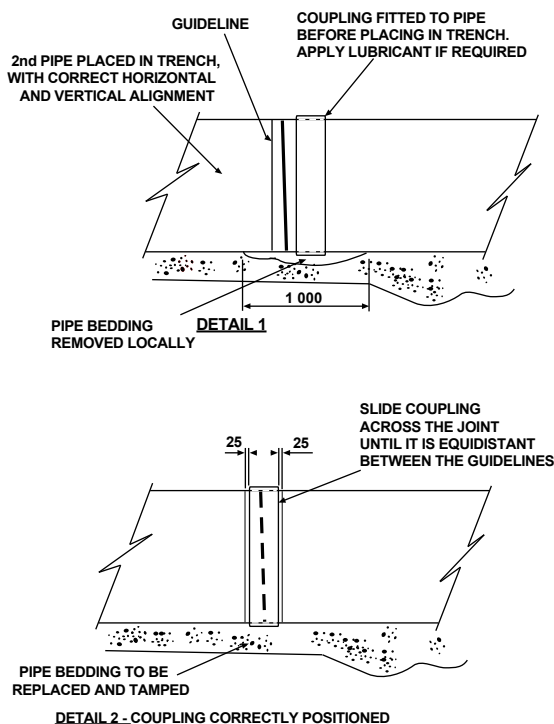
Step 7:

Re-visit each nut to ensure the correct torque rating is achieved.



Step 8:

The correctly assembled coupling should sit neat and straight, centrally located over the 20mm gap between the two pipe ends.



Deviation from straightness

It is normal practice in sewerage and drainage that pipes are installed in straight lines. However, as Weholite pipes are longitudinally flexible, it is possible to bend them if required during the installation. In such cases, minor misalignments of the pipeline can be accommodated in the pipe itself by bending. The minimum permissible bending radius for Weholite pipes under normal installation conditions = $100 (50) * D_e$ (outside diameter). There may not be any bending at the joint. An acceptable bending radius can be maintained by lateral supports against the side of the trench. Special care should be taken when bending pipes at low temperatures, and the joint must be protected against any extra stress. The largest permitted angular deflection in the elastomer ring seal joint (the design angle) is

$$\begin{aligned} 2^\circ & \text{ for } d_e < 315 \text{ mm} \\ 1.5^\circ & \text{ for } 315 \leq d_e \leq 630 \\ 1^\circ & \text{ for } d_e > 630 \end{aligned}$$

Large angular deflections are permitted in the case of joints specifically designed to accommodate such deflections. The manufacturer of the coupling will specify the permitted angular deflection.

07. CONNECTION TO EXISTING PIPES

Weholite pipelines can be connected to existing pipelines or to structured wall pipelines of a different design in a way similar to a repair (see Repairs) by using an appropriate fitting. For saddle connections, follow the saddle manufacturer's instructions.

Connection to Rigid Structures

A structure may be a wall of a building, an inspection hole, other pipelines, fittings such as valves or the like.

The connection of a Weholite pipe to a structure depends on the pipe size as well as on the structure at the connection point. Connections must be made in such a way that the joint is tight and that no damage is done to the pipe.

If a Weholite pipe is connected to a structure that may settle differently than the pipe, a flexible connection beneath the pipe in the vicinity of the structure must be used, or a transition zone permitting pipe movement, or a strengthening construction.

Special fittings for this purpose are available and must be fitted in accordance with the manufacturer's instructions (short length double-socketed pipe).

Repairs

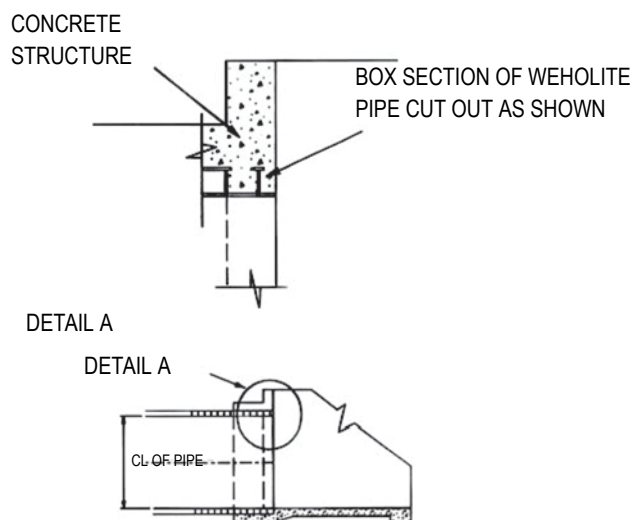
Slip couplers or purpose-designed fittings are available for effecting repairs. It is recommended that the following general points should all be adopted, where applicable:

- The full extent of the damaged or failed section must be identified and removed.
- The cut pipe ends should be square and prepared for push-fit jointing.
- LP repair couplings should be placed in position on the exposed pipeline ends.
- The replacement pipe length should then be laid on the suitably prepared bed and the LP couplings moved into their final positions.
- Ensure that the bedding does not interfere with the couplings and that the pipe ends are clean.

- Pull the couplings over the joint so that they are centrally located over the joints.
- Check the line and level of the newly installed pipe.
- Tighten all bolt tensioners evenly so that all the slack is taken up before tightening fully to 20-25Nm.
- The embedment should then be replaced to give compaction values approximately equal to those immediately adjacent to the repair.
- Prior to completing the backfill of the pipe, the bolts must be retensioned. Ideally, LP couplings should be retensioned on the morning after the repair has been carried out.



Wall Passings / Repairs



08. HANDLING, TRANSPORTATION AND STORAGE

General

Handling should be done carefully and dragging of pipes, fittings and manholes must be avoided. Weholite pipes and fittings become slippery in wet or in cold weather. It is not recommended to handle pipes and fittings at temperatures below -20°C. Pipes, fittings and manholes must be transported and stored in their own packages.

Protective packaging shall be removed immediately before installation.

Loading

Never drop the pipes, fittings or manholes. Lifting points shall be well spread and evenly spaced. Use proper lifting slings. Chains or end hooks shall not be used.

Transport

Delivery vehicles shall be provided with a clean, flat bed, free from sharp objects. Care shall be taken to prevent slippage or bending of the pipes. Tie the load well to prevent rubbing. Use nylon straps or slings, not chains or ropes. Pipes or fittings must not rest on their sockets. Avoid contamination from diesel oil and similar substances.

Storage

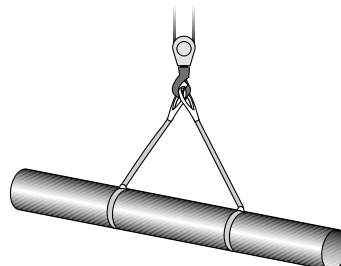
All materials shall be carefully inspected at the time of delivery and any defects should be notified and reported immediately.

All pipe stacks shall be made on firm, flat ground to support the weight of the pipes and lifting equipment.

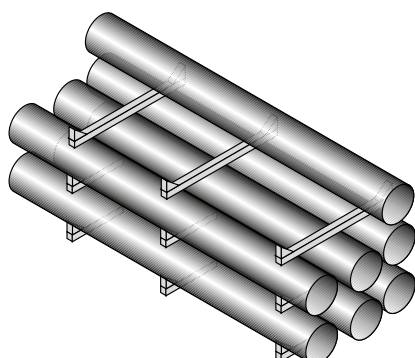
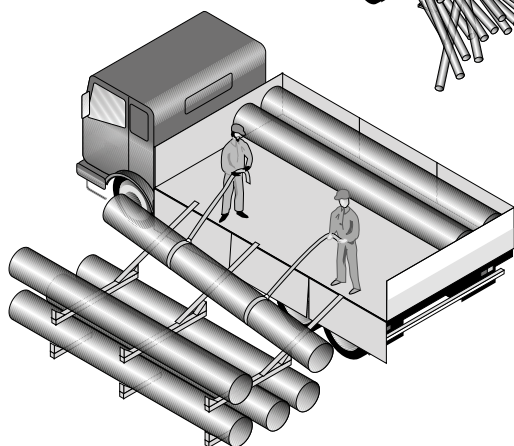
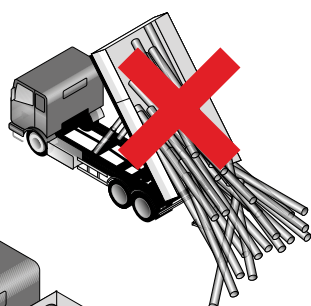
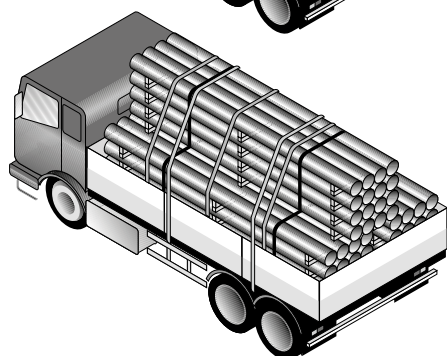
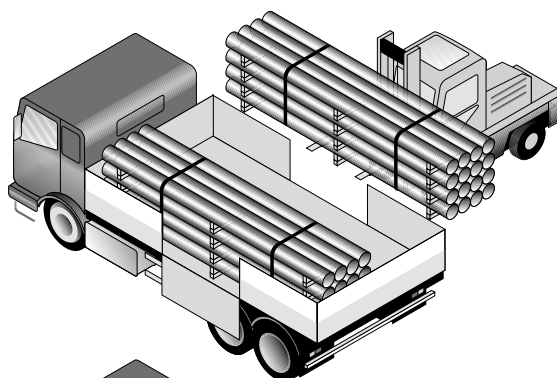
For safety and convenience of handling, the stacking height for pipes shall be limited to five units, not more than 3 metres, and adequately wedged to prevent movement.

Pipes with integral socket shall be stacked with the sockets free at alternate ends. Pipes and fittings shall be stored away from heat sources. When Weholite pipes are exposed to sunlight for a prolonged time, pipes shall be covered.

Protect all materials and equipment from theft, vandalism, accidental damage or contamination.



Off-loading on site may be made easier by using skid timbers and strap slings.

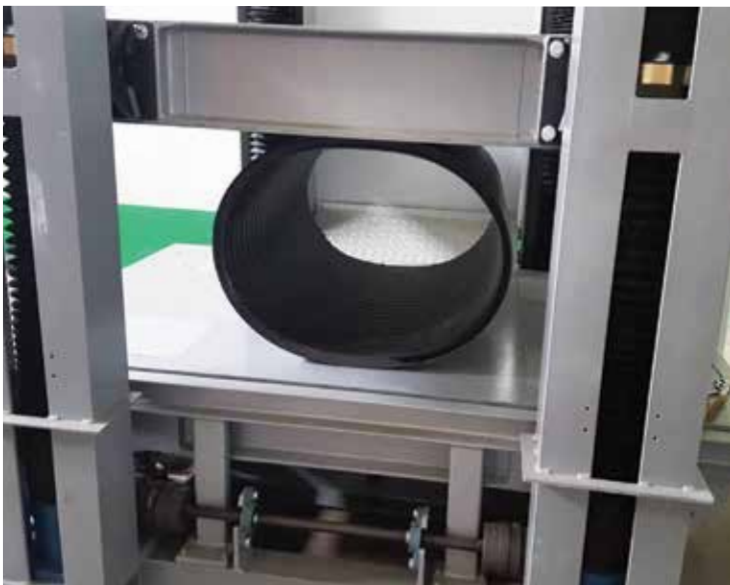


09.QUALITY ASSURANCE

Plasco Limited maintains a complete quality control regime from raw material to finished pipe product by establishing strict manufacturing specifications. The characteristics of Weholite pipes are determined by EN 13476 and ISO 21138.

The Quality assurance tests for Plasco Weholite pipes consists of :

1. Raw-material tests
2. Product geometry and tolerances
3. Product properties



Ring Stiffness Testing of Plasco Weholite Pipes according to ISO 9969 Standard



Lengthwise stiffness test for a DN/ID 600mm, SN4 pipe. Load 29kN, deflection 30mm, pipe deformation 54mm.

Weholite pipe has national approvals in Finland, Sweden, the United Kingdom, Poland and Canada.

Marking

Plasco Weholite pipes are marked in accordance with standard requirements in a clear and durable way, to maintain legibility for the life of the pipe under normal storage, weather conditions, and use.

The pipe marking will consist of:

- Manufacturer or product name
- Ring stiffness
- Material
- Nominal dimension ID
- Production code
- Approval mark if pipe has national or international approval

10. ENVIRONMENTAL ASPECTS

Plasco Limited considers Environmental, Health and Safety aspects as an important and integral part of its business. Plasco Limited strives to save energy and prevent waste; and recycles wherever waste cannot be avoided.

11. DISCLAIMER

This Structured Wall Pipe (Weholite) Manual has been produced as a guide for engineers, purchasing officers and contractors to cover the application and use of Weholite pipes and fittings. This document will be reviewed from time to time in order to keep it fully relevant to modern water and wastewater industry practice. Any comments and suggestions regarding its content will be appreciated.

The information contained herein is intended as a guide, and its accuracy and applicability is not guaranteed. Plasco Limited assumes no obligation or liability in respect of this information. All tables and statements may be considered as recommendations, but do not constitute a warranty.

Users of our products should carry out their own tests to determine the suitability of each product for their particular purposes. Plasco Ltd.'s liability for defective products is limited to the replacement, without charge, of any product found to be defective in line with their standard condition of tender and sale. In no circumstances shall it be responsible for any damages beyond the price of the products, and in no event shall it be liable for consequential damages.

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PLASCO LTD

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LIFELINES FOR THE NATION
An ISO 9001:2015 Certified Company

Manufacturers of
HDPE and PVC-U pipes



