

**FIRAT**

# TRIPLEX

SEWAGE AND  
DRAINAGE PIPES

**FIRAT**

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## FIRAT

FIRAT was established to carry out production in the field of plastic building materials in the year 1972. FIRAT, which always sets out with the principles of **“Quality Production”** and **“Quality Products Diversity”**, has succeeded in becoming both the leading establishment of the sector and the export leader of the sector as a result of significant enterprises that have taken years.

In its production FIRAT targets various sectors such as construction, agriculture, automotive, medical, domestic appliances sectors with its plastic-based products. It realizes its production targeting those sectors in its modern factories in Büyükçekmece-İstanbul and Sincan-Ankara.

FIRAT owns one of the three biggest plastic production complexes in Europe.

As of 2016 the number of personnel working in the constitution of FIRAT is 1850. Firat which believes that the most valuable element is human always organizes in-service trainings with the aim of enhancing work experience of its employees and building up their corporate knowledge.

### Product Diversity and Groups

FIRAT has a product range of over 5500 products. In order to ensure that our customers get the most beneficial and satisfactory service, Firat products are manufactured as integrated systems (parts complementing each other).

Thousands of FIRAT products, such as PVC window and door frames, PVC gutters, PVC drainpipes and attachments, PVC hose assemblies, rubber and PE-based hoses, PPRC indoor installation pipes and attachments, PP composite pipes and attachments, HDPE pipes and attachments, PP&PE sheets, LDPE pipes and attachments, EF attachments, PE attachments, PE 80 natural gas pipes, PVC and PE drainage pipes, FKS sewage pipes, FCS pipe systems, tunnel type drainage pipes, double-walled cable protection pipes, EPDM gaskets, TPE gaskets, metal injection products (hinges and window fittings), PEX mobile piping system and floor heating pipes, PEX pipes and metal attachments, PEX-AL-PEX pipes, sprinkler irrigation pipes and drip irrigation pipes are at the service of customers in Turkey and many other points in the world.





FIRAT manufactures FKS canalisation pipe, the testable operating life of which is 100 years. These pipes which can be manufactured up to 2400 mm diameter from HDPE (high density polyethylene) raw material are resistant against ground motion, gnawing animals, plant roots and chemical wastes. FKS pipes are manufactured with German company Krauh technology and licence.

Triplex pipes again manufactured in FIRAT facilities are used in out door installations and grounds as well as domestic connections, predominantly in sewer line, rain water drainage lines, industrial waste water installations, water conveying pipes and drainage systems. Triplex pipe has big advantages like high flow performance, external load resistance, long operating life, transport and storage convenience, its becoming economic, endurance against chemical substances, price and maintenance convenience, imperviousness and filter-free operation choice.

FIRAT is capable of conducting welding, heavy rain and wind resistance, blow and milled blow resistance,

compression, shear and break-off strength ring rigidity (strength of FKS and Triplex pipes against soil load) tests in its the state-of-the-art test and analysis laboratories. Our products are offered to the service of our customers only after they are confirmed by the Quality Assurance Group related to their conformity to production, sale and outlet.

After all the quality control tests are completed, FIRAT products are offered to the market with Firat Quality Assurance Confirmation". Firat is the only company of the sector which holds international quality certificates such as RAL, GOST, SKZ, BDS, SABS, EMI, DVGW, TSE as well as ISO/IEC 17025 accreditation and all of the system certificates, which are ISO 14001, OHSAS 18001, ISO 10002 and ISO 9001. As an environmentally friendly manufacturer, Firat holds an ISO 14000 Environment Management System Certificate.

To develop, grow, struggle to achieve perfection through advanced technology and utilize all its resources in order to ensure long lasting customer satisfaction are the objectives of FIRAT.



## Pipe Of The Century, Firat; Project Of The Century, Cyprus

### Cyprus is supplied with water by FIRAT.

Cyprus island is not very rich when it comes to water. Almost the entire need for water of the island is supplied with the underground water. Because of the reasons such as the fact that the scrapheaps are very close the water sources and the fact that the table water is mixed with the underground water, the quality of water in Cyprus is constantly decreasing and the water potential is dropping every day. Ministry of Forestry and Water Affairs has developed many projects such as carrying water in balloons to supply TRNC with water. It is noticed that most convenient way to solve the water problem in TRNC for a long-term is water transmission. In this context, TRNC Drinking Water Supply Project which is going to solve the water problem concerning TRNC for a long-term, has been implemented. The water taken from Alaköprü Dam which has been built in the context of this project is transferred from the sea to Geçitköy Dam which was built in TRNC.

This enormous project has 3 branches including Turkey branch, sea transmission and TRNC branch. The most critical points of the TRNC Drinking Water Supply Project are the pipes carrying the water through the sea. Thanks to the professional engineering knowledge, experience, speed of production and the successes, which has been entered in the world plastic literature, of Firat, it has been preferred for this project. In this project, Firat with 100% Turkish Capital is the only company that has capacity to manufacture 160 HDPE pipes manufactured as one piece each of which have a length of 500 meters by itself alone in such a short term as one year in the whole world. The Norwegian company offered that it can produce only 15 kilometers of pipes in a year. Unless Firat had manufactured these pipes in one year, Northern Cyprus would have suffered from lack of water and as TRNC Prime Minister Mr. Mustafa Akıncı says, they would have continued to brush their teeth with the sea water for 5 more years. With our experiences in engineering and plastic manufacturing, we succeeded this project by having its cost \$ 50 million less and we had the equity capital of our country stayed in. Manufacturing PE 100 Pipes in one piece of 500

meters for water treatment projects in two different cities Firat has benefited its experience in this project.

Imagine that each of the 500-meter-pipes have a weight of 180 cars or have a length of 5 football fields; or this project of 80.000 meters have a length of 43 Bosphorus Bridges.

Firat has rented an area of 85.000 square meters in Mersin-Taşucu Seka Harbour and built a factory composing of a closed area of 4400 square meters to implement this project. In the facility, 3 large extrusion areas have been built for PE 100 pipe manufacturing. Sea Transmission has characteristics of 80 kilometers 151 meters of length, depth of 250 meters and hung PE 100 pipe line and being a first in the world. Firat has manufactured a total of 160 pipes which have diameters of 1600 mms, lengths of 500 meters solid, and pressures of PN 8 and PN 6,4 bars. 25.000 tons of raw material have been used in the project. Production of 160 pipes have been completed on January 14, 2014.

75 million cubic meters of water is going to be delivered to TRNC with this enormous project. When the project is run, TRNC will have a source to be supplied with water in a perspective of 50 years. The water delivered can be used for drinking, usage, industry and watering and there will be a significant contribution to the economic development of the region with the area of 4.824 hectares to be watered by the project. Sharing all of its sources with Northern Cyprus until today, Turkey will now share its water with Northern Cyprus.

Thanks to this Project, our country has broken the full scale monopoly in the one piece pipe market in the whole world and now have a voice in the global projects. Indeed, not only Firat but also our country has gained accredit with this project. Firat is proud to have participated in the most critical point of this project. This project is not a tender for us, it is our responsibility to our nation. We dedicate this honor to the Turkish nation.



## Bosphorus Crossing Project

### We Broke a World Record at the Bosphorus!

Produced specially by FIRAT as the first time in the world, PE 100 pipes with 16 bar operating pressure resistance and 1200 mm diameter were installed crossing the Bosphorus with the project implemented by İSKİ in 2007 summer to prevent water shortage and to meet the water demand on Asian - European sides in a balanced way. Potable water conveyed to Ömerli Dam from Melen river by İSKİ were conveyed through world's thickest PE pipes manufactured by FIRAT with a diameter of 1200 mm between Salacak-Sarayburnu on the sea bottom. PE pipes with 1200 mm diameter and 16 bar operating pressure resistance were manufactured from 3rd generation LS Class Polyethylene 100 raw material developed specially for "Bosphorus Crossing Project" which is directed to İSKİ's Yenikapı Facilities from here and pumps 300,000 cubic meters additional water daily to European side. Wall thickness of the pipes is 109.1 millimeter as the highest wall thickness produced in the world for such diameter.

### We Manufactured the Thickest PE Pipe in the World!

In this project; pipes were anchored to the sea bottom with concrete blocks installed on the piping. Each of the pipes used in the project is 13 meters long and weighs 5 tons. With a total project length of 4,000 meters, PE pipes were manufactured in Büyükçekmece Facilities of Firat by the experienced engineers and workers. PE pipes were shipped to İSKİ - Sarayburnu worksite by land and they were joined with "butt welding" method by engineers and technicians of Firat at the worksite. Pipes were laid on the bottom of Bosphorus as two lines between Sarayburnu - Salacak. Laying of pipes to the Bosphorus was realized with "sea bottom laying method" carried out with vessels. PE 100 Pipes were anchored to the bottom of the Bosphorus with concrete rings. With the thickest PE pipes in the world major savings were realized in terms of time and cost for İSKİ's "the Bosphorus Crossing Project".



## Libya Sea Water Treatment Project

### Firat Broke Down the World Monopoly!

Firat Plastik broke new grounds in its country and manufactured 500 meters long single piece polyethylene pipe. PE 100 pipes used for supplying potable water to the city network from sea water treatment facilities in Libya have a diameter of 1400 mm and wall thickness of 55 mm. Each pipe which is resistant to 6.4 bar operating pressure is 500 meters long and weigh 110 tons. Total length of 3000 meters was achieved with pipes which are manufactured in quantity of 6.

Thanks to single piece PE 100 pipes which have a length of 500 meters preferred for minimizing the hydraulic pressure loss and requiring less joints; lines are installed in a lot shorter time.

### 500 meters long PE 100 Pipe is manufactured!

Since the pipes manufactured for this project are required to be shipped by floating on the sea, we established a mobile production plant on Büyükçekmece coast in a short time as low as 15 days with challenging efforts of our engineers and workers. PE pipes which we were manufactured in 30 days were delivered to the sea with the conveyor wheels developed by our R&D department for this task. Çanakkale Strait Crossing.

### Çanakkale Strait Crossing

6 pieces of 500 meters long PE pipes were shipped to Libya from Büyükçekmece coast by floating. Dardanelles Strait was closed to marine traffic for safety purposes.



# Raw Material

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## Polyethylene

Polyethylene is a thermoplastic used in many various products. Its name derives from the ethylene in monomer state. In the plastics industry, it is generally called PE. The ethylene molecule (C<sub>2</sub>H<sub>4</sub>), is made up of two CH<sub>2</sub>'s tied with double bonds. (CH<sub>2</sub>=CH<sub>2</sub>) Polyethylene is produced by the polymerization of ethylene. Polymerization is the reaction that leads to acquiring polymer units starting from the monomer units.

## HDPE

HDPE is a high density polyethylene material that derived from petroleum. Its name comes from the abbreviation of English equivalent of the words "High Density Polyethylene". Generally this name is used in the industry and manufacturing sector.

## Raw Material and Quality Tests



Viscosity and K Value Test



Partical Size Distribution Test



Humidity Determination Test



### Specifications

High density class of the polyethylene is called HDPE. HDPE is highly resistant to water and chemical materials. Its mechanical features are very well, particularly it has high impact and tensile strengths. It is convenient for many molding methods such as injection, extrusion, powder coating, film shooting, rotary molding etc.

### Area of use

Having a wide range of usage area, HDPE is used in pressure and non pressure type pipe use, gas distribution systems, manufacturing of electrical and electronic goods. As it is waterproof, HDPE is also used in building boats and buoys.

**FIRAT has the most developed quality and control test laboratories in its sector.**



Impact Strength Test



Density Test



Melt Flow Rate Test

# Our Notion of Quality

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Quality Control Process employed in Firat laboratories consist of three phases:

1. Input Quality Control
2. Process Quality Control
3. Output-Final Quality Control

## Input Quality Control

All types of raw materials and auxiliary materials from our suppliers are subjected to Input Quality Control tests according to the quality-production standarts set out by FIRAT. Samples randomly chosen from each lot of raw materials and auxiliary materials supplied in lots by our suppliers have to pass through Appearance Marking Compliance, Physical Compliance, Chemical Compliance and Functional Compliance tests in GKK Laboratories and obtain **“Suitable for Production”** approval.

## Process Quality Control

In the production process implemented with raw materials and auxiliary materials bearing “Suitable for Production” approval, samples taken on production lines during or soon after production are passed through Process Quality tests in Firat laboratories determined by national (TSE) and international (DVGW, SKZ, EN, DIN, etc.) standard institutions and recorded regularly. Main Process Quality Control tests are as follows:

- Melt Flow Rate
- Impact Resistance
- Ring Stiffness
- Density Test
- Tensile Strength
- Oven Test
- Heat Reversion
- Water Tightness



Water Tightness Test



Tensile Strength Test

At the phase of Process Quality Control; diameter, thickness and ovality measurements are conducted by ultrasonic measurement devices on all production lines in fully automated manner simultaneously with the production process and faulty production is not allowed upon activation of sound and light warning system under out of standard cases. Our products have to pass through all tests conducted in accordance with the control frequency and numbers set out in the standards and obtain **“Suitable for Sale”** approval.

### Final Quality Control

Our products which obtained **“Suitable for Sale”** approval also have to get **“Suitable for Output”** approval passing through Packaging Compliance, Pack Compliance, Description and Label Compliance checks soon after automatic packaging and wrapping processes.

In addition to the quality control tests conducted in FIRAT laboratories, all our products are sampled from our production lines regularly twice a year and subjected to quality and sanitary compliance tests by international test and certification institutions such as DVGW, SKZ, SKZ, SABS.

Our products which passed through all these tests and met the required quality conditions are offered to our customers.



Ring Stiffness Test



Ring Stiffness Test

## Tests that are applied to Triplex Pipes

Test Name	Testing Standard	Description
<b>MFI Test</b>	ISO 1133	This test is performed before the material is processed in order to analyze its behavior under heat. The test is applied on a MFI device at 190°C under constant load of 5 kg for 10 minutes. The result is the values acquired through weighing of the samples taken out of the test by an analytical balance.
<b>Density Test</b>	ISO 1183	This is performed to determine the weight of the material in unit volume. With the calculation method that mentioned within the Standard, density is calculated by weighing the material first in air then in a liquid with a foreknown density.
<b>Elongation at Breaking</b>	ISO 527	This is the test which the amount of elongation at breaking of the material is determined by the percentage value (%). It is applied by implanting the bow (spoon) samples prepared from the material, and pulling at a constant speed.
<b>Thermal Behaviour</b>	ISO 12091	This is the test which the behavior of the material is analyzed under heat. A sample piece is taken from the pipe , and is kept waiting in the drying oven at 110°C for 30 minutes. When the surface of the piece is examined after it is taken out, there should not be any surface distortion/lap, melting or delamination.
<b>Longitudinal Reversion Test</b>	ISO 2505	This is the test where the expansion behavior of the material is analyzed under heat. A distance of 100mm is determined on the sample piece taken from the pipe. This sample is kept waiting in the drying oven at 110°C for 30 minutes. For the result of this test , the sample is kept waiting until it cools down to the laboratory ambient temperature.
<b>Ring Stiffness</b>	ISO 9969	Ring Stiffness value , is calculated by using a 30 cm sample taken from the pipe, and held under a compression process of %3. This value should be equal to or higher than the ring stiffness class.
<b>Impact Test</b>	EN 744	A 20 cm sample is taken from the pipe , lines are drawn on top of it ( the number of lines is mentioned in the test Standard and corresponding to its diameter ) and this sample is kept waiting under the temperature of 0C for an hour . The impact strength of the material is tested by dropping a certain amount of weight ( which is mentioned in the test Standards ) from 2 meters high.
<b>Water Tightness Testi</b>	EN 1053	Caps are fitted or a sheet of PE is welded on the open parts of the pipe , which is joined by a gasket and a socket. Having filled with water it is exposed to 0.5 bars of hydrostatic pressure for 15 minutes. Then it is checked whether there is a leakage at the joined section or not.

## Our Quality Certificates

Triplex Pipe and Fittings have quality certificates which are valid both on national and international scales.

- TSE ISO 9001
- TSE ISO 10002
- TS EN 13476 - 3 + A1
- ISO 14001
- OHSAS 18001
- GOST



## Corporate Training

Relying on the understanding of “**Human comes first**”, FIRAT invests in human. FIRAT provides its employees with miscellaneous regular intra-company training programs and offers them opportunities to join necessary training, seminar and congress events both within the country and abroad for the purpose of enhancing both their own corporate know-how and business performance.

FIRAT is the leading organization of its sector also in the area of corporate training through clearly and precisely conveying targeted results to its employees, ensuring its employees to enjoy and efficiently implement their assignments and become more participative in the processes, offering them all types of business, training and organization facilities and acting as a “**team**” with all its employees.

Primarily emphasizing the fact of knowledge-based progress in its training programs, FIRAT adopted the principles of utilizing knowledge and technology in its production processes and aftersale services through researcher and problem-solving, result-oriented employees and ensuring continuous customer satisfaction through regular personnel and dealer training programs.



FIRAT, ISO Standart hazırlama toplantısı, Brüksel-Belçika.



## Çevre Dostu FIRAT

Producing by the use of “**Environmental Friendly Production Technologies**” since its foundation, FIRAT proves its sensitivity toward environmental health through its **Environmental Management System** established in 2002 and considers this area as a “**Window of Management**”.

Upon obtaining TS EN ISO 14001 2004 “**Environment Management System**” certificate from SGS in 2003, FIRAT had its sensitivity toward environmental health confirmed in national and international setting.

FIRAT not only retains its established environmental consciousness within its organization but also transforms this consciousness into an environmental policy and shares it with its neighbors, suppliers and customers. Especially during domestic and foreign seminars held for its end-users, FIRAT shares its efforts made toward environmental problems and importance that should be attached to the environmental health primarily with its business partners.

95% of the products of FIRAT consists of re-cycled re-processable materials. It sends its non-household wastes and non-recyclable waste products to “**Disposal Facilities**” licensed by the Rep. of Turkey, Ministry of Environment and Forests and implements recycling process in these facilities.

**Environment Management Programs and Projects oriented to Environmental Health Protection** drawn up by the **Environmental Group** consisting of our environmental engineers are being realized within FIRAT organization.

Committing its compliance with all national and international Environmental Legislative Directives and Environmental Regulations, FIRAT fulfills all its legal liabilities and declares statutory assessment reports to the relevant Ministry.

FIRAT, awarded by ISO (Istanbul Chamber of Industry) with “**Environment Incentive Reward**” with its environmental project drawn up in 2006, always gives precedence to the importance of environmental health and shows necessary sensitivity in all its investments.

## General Information

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Polyethylene pipes have first emerged as a result of petro-chemistry studies which gained speed together with the Second World War and were started to be used in infrastructural systems of modern cities. In the beginning, polyethylene pipes wall thickness were kept thick for high stiffness values, and had a high cost .

As a result of positive engineering solutions that attained in the construction and section structures in time, costs have been reduced and competition opportunity has increased , compared to other systems that are used for the same purposes.

Thanks to these studies in construction and section structures; Firat Triplex pipes that enable higher strength become an essential solution for today's modern infrastructure systems though less raw material is used.

Firat HDPE Triplex Pipe and fittings are manufactured from high density polyethylene (HDPE) raw material by using extrusion corrugator molding technology up to 1000 mm diameter. Firat Triplex Pipes that have a very high value of ring stiffness are not only used in sewage removal systems but in many different kind of flow systems without problem , because of its high strength, flexible structure ( which is not effected from earthquakes, tremors etc... ) , its superior resistance to chemical substances , compatibility to environmental protection and with its 50 years of working life.





### Relevant Standards and Test Methods

First Triplex Pipe and Fittings that are manufactured from high density polyethylene (HDPE) as double wall layered products, are being produced in accordance with the TS EN 13476 - 3 Standard.

- Triplex pipe gaskets that are used in the system are appropriate according to EN 681 standard.
- As Triplex sewer pipes are designed in accordance with the ATV A 127 standard with flexible features, deformation tolerances are tested within the scope of this Standard.
- Water tightness tests of the laid pipe system are performed in accordance with the EN 1610 standard.

### Areas of Usage

- In the sewer water removal lines
- In the rain waters removal lines
- In the drainage and ground waters transportation lines
- In industrial waste water removal lines
- In the domestic waste water removal lines



# Specifications of Triplex Pipes and Fittings

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## High Ring Stiffness Values and External Load Resistance

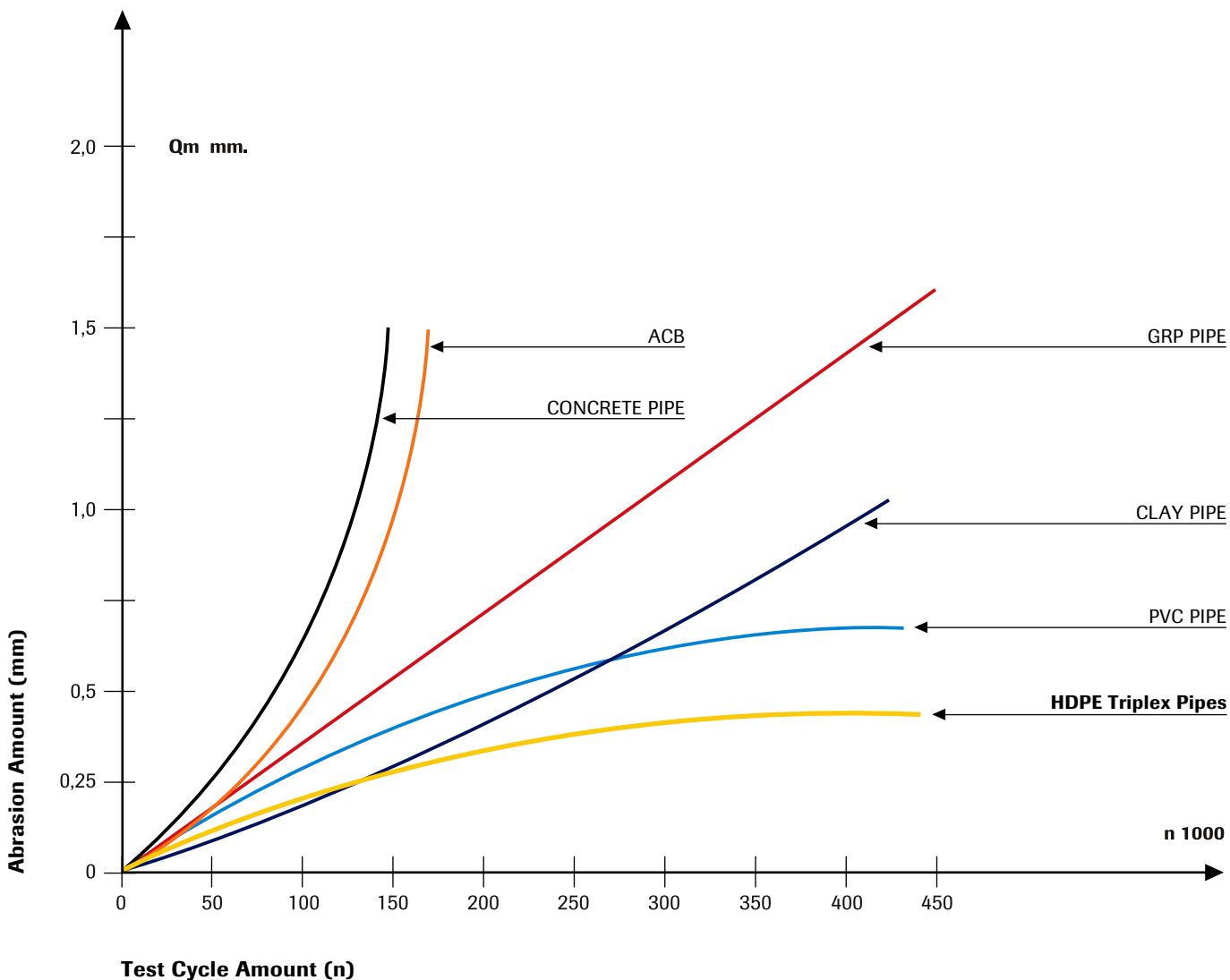
Generally the point in question in the sewer systems are is the non pressure gravity (free) flow. Therefore the effect of the external loads such as earth/ground or traffic load is important. Firat Triplex Pipes are highly resistant to heavy ground and traffic loads with their specifically designed ribbed body structures. Due to the molecule structure of the polyethylene raw material, the flexibility of the Triplex pipes is quite high. They are not affected by seismic ground motions such as earthquakes. They absorb the loads by undergoing a flexible deformation against instant load shocks and changes back to its former state. Permanent deformation limit can be up to %7.5. Within those values Firat Triplex Pipes carry on their functions without a problem while breaking and deformations happen in many different kinds of pipe systems.



**High Abrasion Resistance**

HDPE is the material which has the highest resistance to abrasion among the known plastic based raw materials. HDPE's high resistance performance to abrasion is certified in consequence of the research tests that performed by Germany Darmstadt University. As a result of approximately 100.000 test cycles it is evident that abrasion in the HDPE samples are at its lowest level when compared to other materials.

**Abrasion Resistance of Different Materials**



## Specifications of Triplex Pipes and Fittings

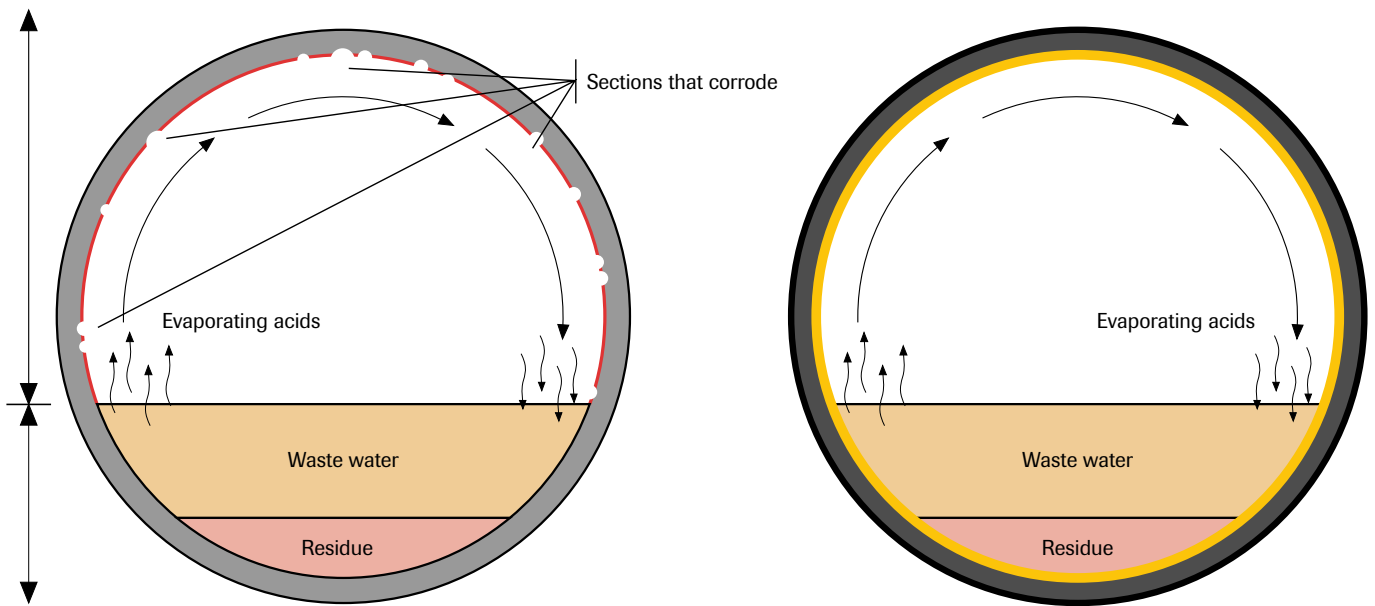
### Long Working Life

The working life of a Firat Triplex Pipe is 50 years as it is not affected by corrosion, it is highly resistant to abrasion and chemicals, it is flexible and not effected by ground motions, can deal up to heat values up to 60°C and features a system structure that does not require maintenance.

### High Chemical Resistance

Firat Triplex Pipes are manufactured from Polyethylene raw material featuring very high resistance to chemicals. Usually the pipe isn't full, and there is a non-pressured gravity flow occurring in the sewage pipe lines. Acid vapor steaming from solid and liquid wastes such as acid content liquids, highly concentrated salts etc. causes corrosion at the pipe wall directly affecting the working life of the pipe in a negative way; causing abrasion and dissolutions and leads to serious deformations on the structure of pipes.

In Firat Triplex Pipes abrasion and corrosion problems do not occur, because of its perfect resistance to chemicals.



Abrasions occur on concrete pipes that are vulnerable to chemical corrosion

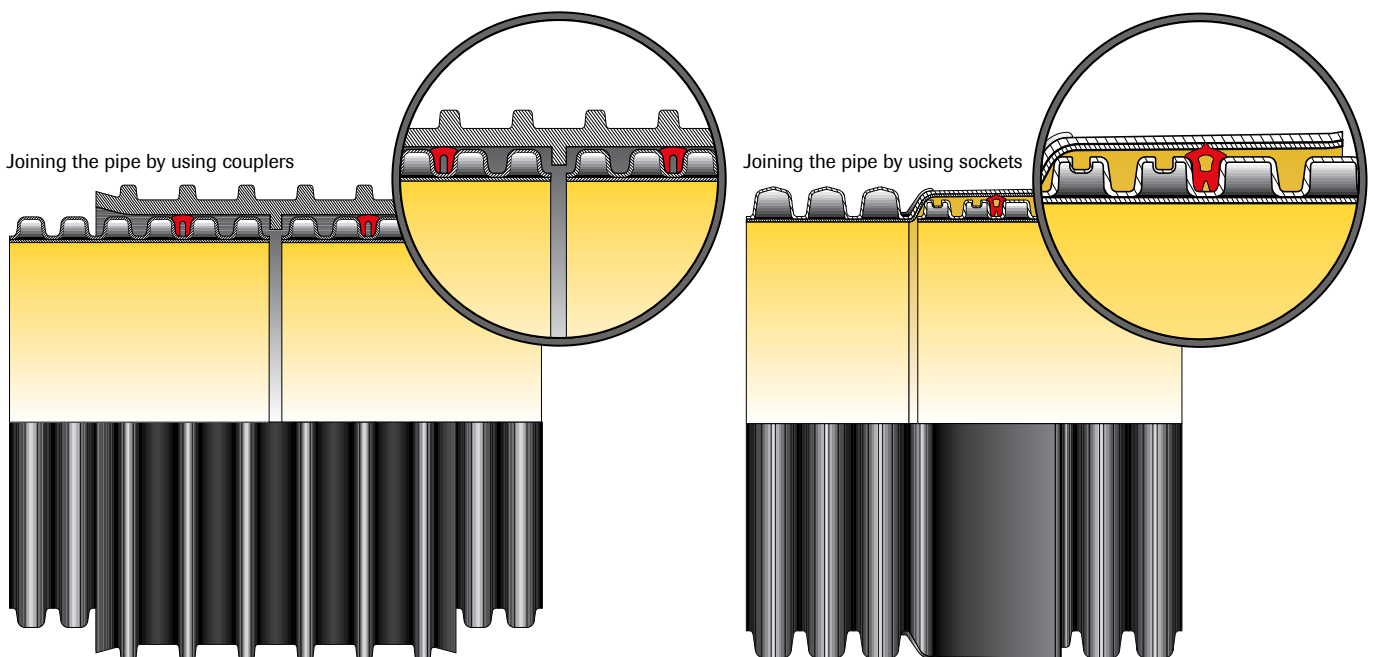
Abrasion and corrosion problems against chemicals do not occur in the Triplex Pipes.

**High Flow Performance**

Firat Triplex Pipes enable high liquidity speed because of its low coefficient of friction and smooth inner surface. Thanks to the smooth inner surface of the triplex pipes (they resemble a glass surface), solid particles don't stick and don't compose residue or accumulation ; thus the inner wall of the pipe will remain open continuously. Even for pipes with lower diameters, smooth and controlled flow can be acquired ; as in Firat HDPE Triplex Pipes at very high flow rate, a good flow performance is maintained.

**% 100 Water Tightness**

Firat Triplex Pipe and Fittings are designed and manufactured so that they can satisfy any need within the application field. Triplex pipe and fittings are joined by the gasket type insert method. The triplex pipe gaskets , that are designed according to any risk , and manufactured in accordance with the EN 681 standarts , make sure there is no leakage throughout the working life of the pipe and it prevents the waste water from flowing into the underground water and the soil.



Triplex Pipe gaskets are specifically designed so that there will be no leakage during their life span. Thanks to high strength of the polyethylene raw material, deformation will not occur at the point where gasket presses.

## Specifications of Triplex Pipes and Fittings

### System Structure without Loss

Firat Triplex Pipe and fittings offer working opportunity without any loss during assembly application as the shortest pieces of the pipes can be easily used , thanks to the rich variety of fittings of the infrastructure systems. As triplex pipe and fittings are light , and featuring high impact strength, there will be no loss arising from impacts ( caused by blows or by the dropping of the pipe ) that may happen in the stock and working area.

### Economical Solution

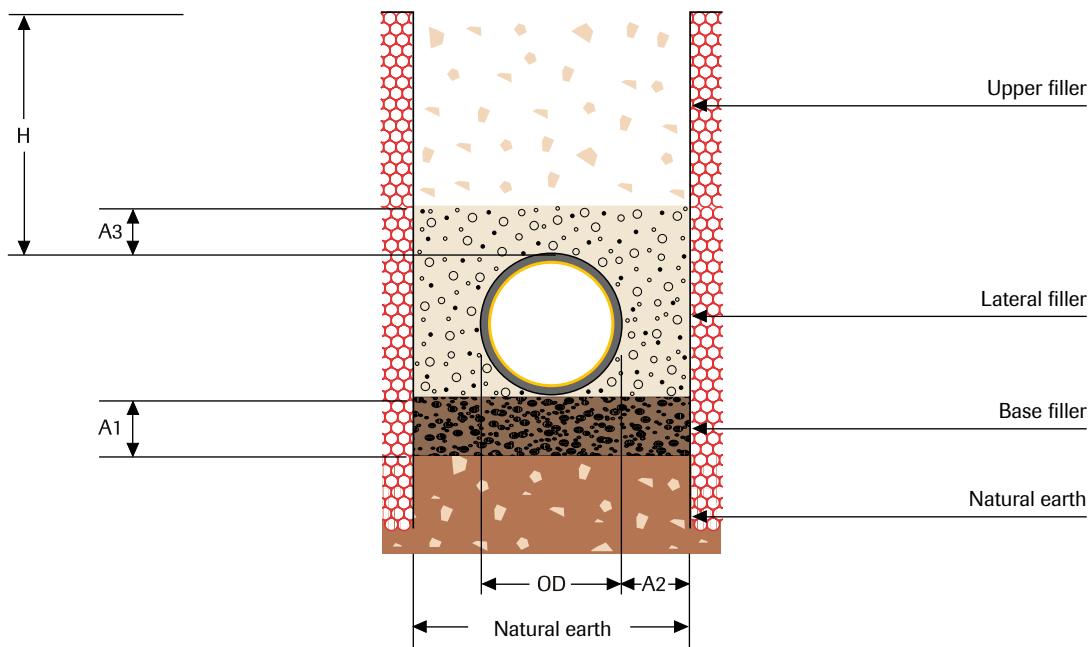
Firat Triplex Pipe and fittings; with its 50 years of working life, easily applicable system structure without loss, with its sealing guarantee, cost advantages in handling and stocking (telescopic stacking), with its availability to be laid without any need for machines (at small diameters) is inevitably the most economical and permanent solution for today's infrastructure systems.



**Laying down the triplex pipe, and the bedding**

In the sewer systems, a non pressure gravity (free) flow occurs. However as they are laid under the ground they are exposed to external loads. Therefore the effect of the external loads such as earth/ground or traffic load becomes more of an issue. Yet the Triplex pipes are designed so that they can handle these kinds of loads. For the waste water sewage systems, there are some rules that should be obeyed while laying down the pipe under the ground.

In order for the Triplex pipe and fittings to serve for long years without any problems, compression should be performed layer after layer so as not to leave a weak region around the pipe when channels are being filled up for the underground applications. Particularly it is very important to fill bottom of the pipe with filling material. In case that filling process is performed in accordance with the specifications by firmly compressing, the traffic and earth load from the pipe is transferred partially to the filling material, therefore the pipe functions for its working life without causing any problems. In case that compression is not performed properly, spaces will form in the soil, and as the pipe will be unable to transfer the load to other forces, the breakdown risk will appear.



Base filler: It should be 15 cm and compression should be performed at a minimum rate of % 95.

Lateral filler width: It should be  $A2=50$  cm.

Lateral filler: It should be at every 30 cm. and compression should be performed at a minimum rate of % 95.

Upper filler: Minimum 30 cm and normal compression should be performed.

Material: They should be of 0- 20 mm diameter, grained and fit fort he compression process containing a humidity rate of % 20.

Pipe head height: It should be minimum 50 cm.

## Specifications of Triplex Pipes and Fittings

### Manhole and Chimney Applications

Triplex Pipes are non pressure gravity flow system pipes that work according to the maximum fullness rate of %85. However, if the pipes are laid in an inclined field , the fullness rate of the pipe can increase up to 100% from place to place. This causes pressure and vacuum formation in the system. In order to prevent such problems manhole applications are used.

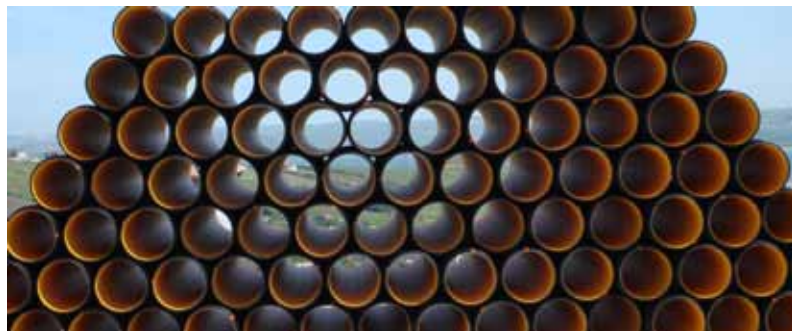
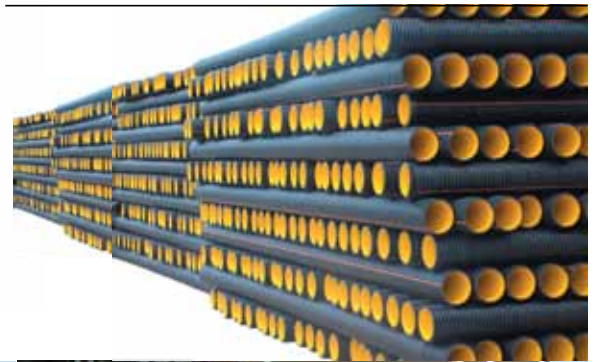
Concrete manhole and chimney applications should be performed by using manhole adaptors appropriate for the diameter of the used pipe. After the adaptor is placed in the concrete molding considering the depth level and direction, concrete should be poured. The adapter is designed such a way that , at the exterior part of the adaptor water tightening is secured by the concrete set and at the inner part of the adaptor normal socket joining can be done.





### Ease of Transport and Stocking

First Triplex Pipes can be transported and stocked by using the telescopic (or nesting) method or by stacking on top of each other, as these pipes are light and highly resistant to impact. As the Triplex pipes can be put into each other telescopically from big diameter to the small one, significant cost advantages can be obtained in terms of space, time, transport and stocking. For the pipes with small diameters transport and stocking is easily performed without using any heavy machinery.



## Specifications of Triplex Pipes and Fittings

### Joining Pipes and Fittings

Firat Triplex Pipe and Fittings are designed so that they can be easily joined by the socket type method. The variety of the fittings are designed according to different applications and different types of joinings. EPDM gaskets that enable %100 water tightness are specifically designed and manufactured by Firat for system integrity..

Pipes can be cut at the Groove points by tools ( like saw or jigsaw ) for the desired lengths . EPDM gaskets should be placed in the second groove starting from the cutting point. Before the gasketed pipe part is inserted into the socket part, lubricants (such as soap or silicone ) should be used for convenience.

In case that a pipe which is damaged by any reason should be repaired, only the part to be repaired is opened and damaged part can be repaired by using a sliding socket. In order to connect different plastic pipes to the triplex pipe system, Triplex fitting adaptors which are developed by Firat should be used.



### Fitting the Gasket

- The gasket which is suitable for the pipes diameter is placed on the end part , the other side is stretched by hand ( or by using a crowbar) and fitted on the second bulge of the pipe.
- The final form of the gasket after it is fitted should be so that domed part stays out.
- Before assembling, lubricans such as soap or silicone should be used at the parts with gasket or socket for convenience. Mineral oils should not be used.
- Before assembling, make sure that pipes are on an even axis and angular differences should be corrected if any.
- Pipes should be at a flat angle, small diameter should be fitted by pushing with a crow bar, big diameters with the help of a working machine.



## Specifications of Triplex Pipes and Fittings

### The advantages of Triplex Pipe and Fittings

- As they are manufactured from HDPE (high density polyethylene), they are highly resistant to any kind of corrosion.
- They have high resistance to chemical effects.
- The pipes working life against external influences is minimum 50 years guaranteed, and they do not require maintenance for long years.
- They don't get holes, as their abrasion resistance is high, and the underground waters and soil is prevented from contamination.
- Thanks to their light and flexible structure, the necessity of a business machine is at a minimum level as they can be easily laid by manpower in the application field.
- For critical and hard places, thank to its specific structure they can be easily curved as desired.
- As they are assembled by the gasket type joining method, different kinds of equipments such as electrical welding machine, adhesives etc. are not required.
- If necessary , they can be cleaned by high pressure water spray method.
- If renewal and repair has to be made, they can be easily repaired by opening just the concerned part, and using the necessary fitting.
- During the application product loss or casualty issues will be out of the question.
- As it has a smooth inner surface it has a very little resistance to fluids and the fluids will flow with more fullness rate. Therefore this enables selecting a smaller diameter group , thus reducing the Project costs.
- For extreme loads, breaking will not happen due to flexion/ stretching of the concerned section.
- Roots and rodents can not harm the system.

- Thanks to the different connection parts, they have a system structure which is fit for specific Project applications.
- Due to their flexibility they are not affected by the seismic activities such as earthquakes , and as they are able to change back to their original states, they continue to function properly .
- They are convenient for river, lake, sea transition uses.
- They can be used in discharging the treated water to the sea.
- They are completely hygienic and do not contain toxic substances.
- They are resistant up to 60°C.
- They are convenient for telescopic stacking.

**Points to consider**

- Should the pipes to be transported are lifted by crane or such, grippers that are not hard and sharp should be used and the grasping, should be made from the center of the pipe.
- Pipes, fittings and gaskets not be exposed to extreme temperatures and left at the opened stores for a long time. They shouldu't be exposed from direct and prolonged UV rays and sun light.
- During the transportation of the pipes, frictions and impacts that may cause harm should be avoided.



## Specifications of Triplex Pipes and Fittings

## The Resisatance of Triplex Pipes and Fittings to Chemical Substanced

### The Resisatance of Triplex Pipes and Fittings against Chemical Substanced

Material	Concentrationon%	T (°C)	Durability
Adipic Acid	sat.sol % 1.4	20/60	R
Allyl Alcohol	ts-s	20/60	R
Aluminium Hydroxide	susp	20/60	R
Ammonia, dry gas	ts-g	20/60	R
Ammonia, diluted	sat.sol	20/60	R
Ammonia, liquid	ts-s	20/60	R
Ammonium Chloride	sat.sol	20/60	R
Ammonium Sulphate	sat.sol	20/60	R
Aniline	sat.sol	20/60	NR
Acetic Acid	50	20/60	R
Acetic Acid, freezes	> 96	20/60	R/LR
Acetone	ts-s	20/60	LR
Copper (II) Sulphate	sat.sol	20/60	R
Benzene	ts-s	20/60	LR
Gasoline (fuel)	o.sol	20/60	R/LR
Beer	o.sol	20/60	R
Vegatable Oils	ts-s	20/60	
Butane, gas	ts-g	20/60	R
Mercury	ts-s	20/60	R
Iron (II) and (III) Chloride	sat.sol	20/60	R
Etanol	40	20/60	R/LR
Ethylene Glycol	ts-s	20/60	R
Phenol	sol	20/60	R
Formaldehyde	Up to 40	20/60	R
Glycerin	ts-s	20/60	R
Air	ts-g	20/60	R
Hydrogen	ts-g	20/60	R
Hydrogen Peroxyde	Up to 30	20/60	R
Hydrochloric Acid	Up to 30	20/60	R
Urine		20/60	R
Iodine (in Alcohol)	o.sol	20/60	NR
Calcium Carbonate	susp	20/60	R
Calcium Chloride	sat.sol	20/60	R
Carbon Dioxide Moisted Gas	ts-g	20/60	R
Carbon Monoxide, gas	ts-g	20/60	R
Carbon Tetrachloride	ts-s	20/60	LR/NR
Chlorine, dry gas	ts-g	20/60	LR/NR
Chloric water	sat.sol	20/60	LR/NR
Chloroform	ts-s	20/60	NR
Lead Acetate	sat.sol	20/60	R
Sulphur Dioxide, dry gas		20/60	R
Methyl Alcohol	ts-s	20/60	R

Material	Concentrationon%	T (°C)	Durability
Nitric Acid 25		20/60	R
with Fumed Nitrogen Oxide		20/60	NR
Oxigene, gas	ts-g	20/60	R/LR
Potassium Hydroxide	sol	20/60	R
Cyclohexenone	ts-s	20/60	R
Sodium Bicarbonate	sat.sol	20/60	R
Vinegar	o.sol	20/60	R
Sodium Hydroxide	sol	20/60	R
Sodium Carbonate	sat.sol	20/60	R
Sodium Chloride	sat.sol	20/60	R
Sodium Sulphate	sat.sol	20/60	R
Water Distilled Sea		20/60	R
Water, Usage, Mineral (mine)	o.sol	20/60	R
Sulfuric Acid	Up to 50	20/60	R
Milk	o.sol	20/60	R
Wine	o.sol	20/60	R
Toluene	ts-s	20/60	LR/NR
Trichloroethylen	ts-s	20/60	NR
Urea	sol	20/60	R
Oils (vegetable and animal)	ts-s	20/60	R/LR

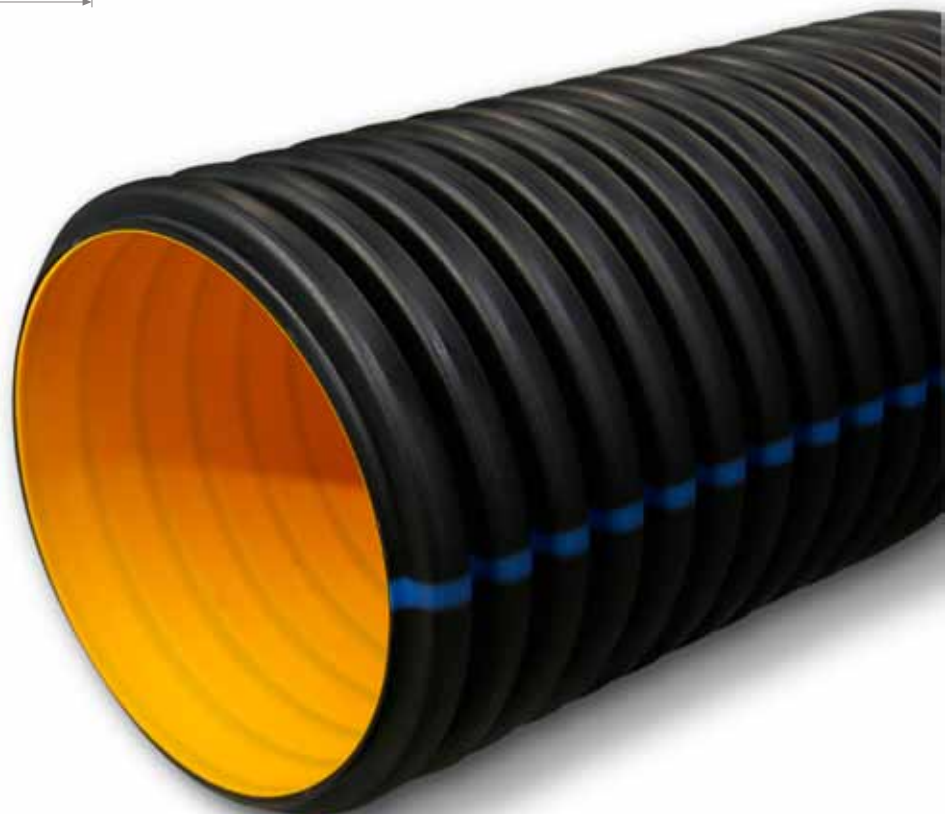
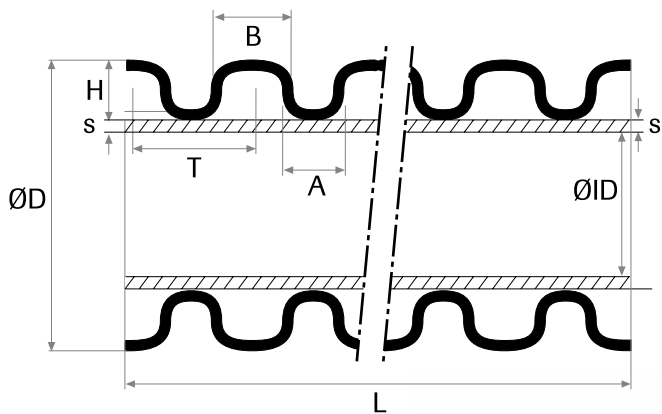
**R** Resistance  
**LR** Limited Resistance, corrosion may occur  
**NR** Non Resistance

# Triplex Pipe and Fittings



**TRIPLEX PIPES**

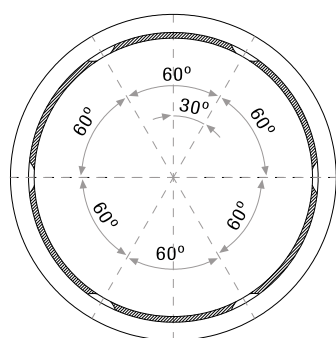
Code	OUTER DIAMETER ØD mm	INNER DIAMETER ØID mm	L mm	H mm	A mm	B mm	T mm
<b>7584000100</b>	118	100	6-12	7.7	4.1	6.8	11.0
<b>7584000125</b>	139	125	6-12	6.5	4.3	8.5	14.7
<b>7584000150</b>	174	150	6-12	9.2	4.6	11.0	18.8
<b>7584000200</b>	233	200	6-12	13.0	5.9	15.7	26.2
<b>7584000250</b>	291	250	6-12	15.7	7.1	18.8	31.5
<b>7584000300</b>	353	300	6-12	20.0	8.2	24.0	36.3
<b>7584000400</b>	468	400	6-12	26.0	11.2	32.0	52.4
<b>7584000500</b>	580	500	6-12	36.0	14.0	42.0	66.0
<b>7584000600</b>	700	600	6-12	44.0	15.0	48.0	75.0
<b>7584000800</b>	904	800	6-12	45.0	31.0	64.0	106
<b>7584021000</b>	1140	1000	6-12	61.2	39.5	78.0	132



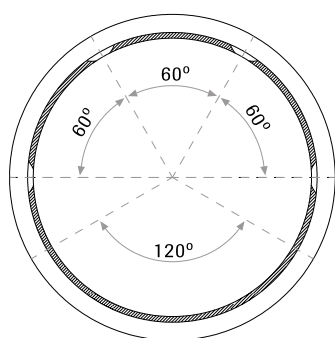


**TRIPLEX PERFORATED DRAINAGE PIPES DIN 4262-1 TYPE R2**

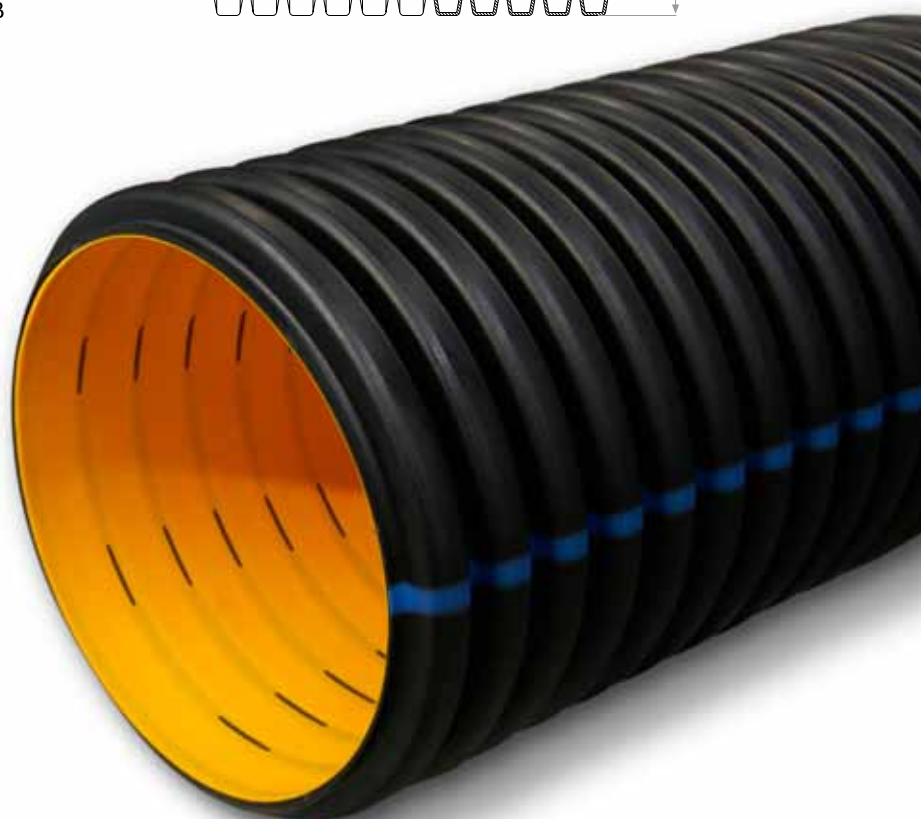
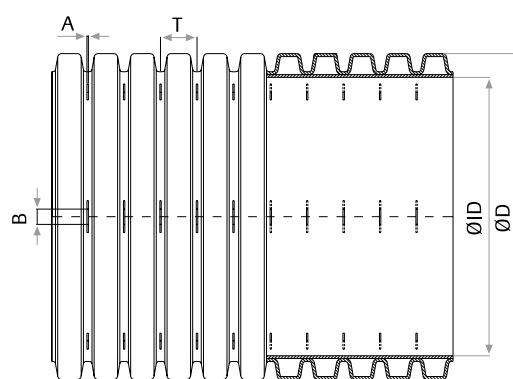
Code	OUTER DIAMETER ØD mm	INNER DIAMETER ØID mm	A mm	B mm	T mm	Cross Section cm <sup>2</sup> /m
<b>7584P00200</b>	233	200	2	11	26	> 50
<b>7584P00250</b>	291	250	2	14	31	> 50
<b>7584P00300</b>	353	300	2	17	39	> 50
<b>7584P00400</b>	468	400	2	22	52	> 50
<b>7584P00500</b>	580	500	Ø12	4adet	66	> 50
<b>7584P00600</b>	700	600	Ø12	4adet	75	> 50
<b>7584P00800</b>	904	800	Ø16	4adet	106	> 50
<b>7584P01000</b>	1140	1000	Ø16	4adet	132	> 50



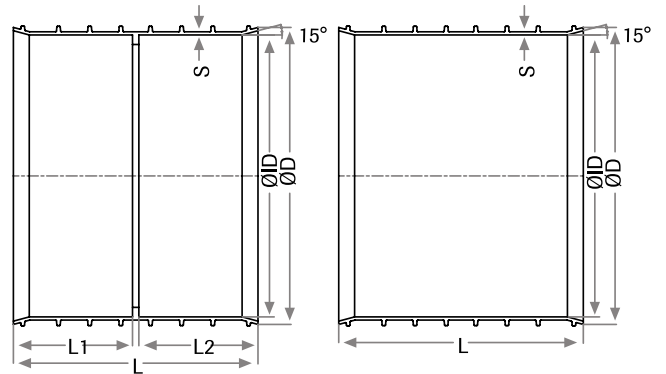
TIP A



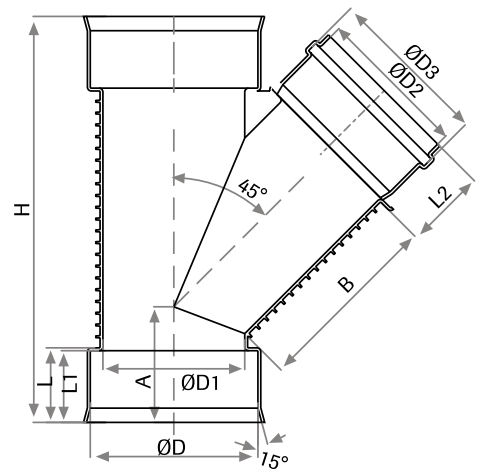
TIP B



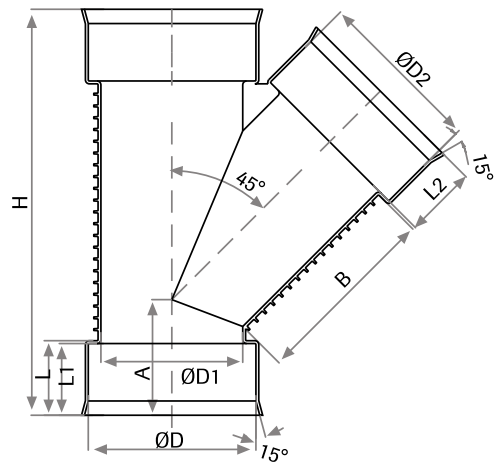
**SOCKET & SLIDING SOCKET**



**C PIECE WITH BRANCH FOR PVC PIPE**



**C PIECE WITH BRANCH FOR TRIPLEX PIPE**

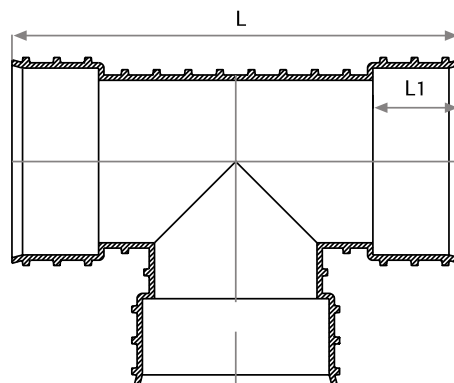


<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>L</b> mm	<b>L1</b> mm	<b>L2</b> mm
<b>7517000120</b>	100	129.6	119	250	123	123
<b>7588001125</b>	125	158.5	140.5	122	60	60
<b>7588001150</b>	150	189.6	176	169	82	82
<b>7588001200</b>	200	254	235	206	100.5	100.5
<b>7588001250</b>	250	312	293	248	121.5	121.5
<b>7588001300</b>	300	374	355	308	151.5	151.5
<b>7588001400</b>	400	489	470	412	203.5	203.5

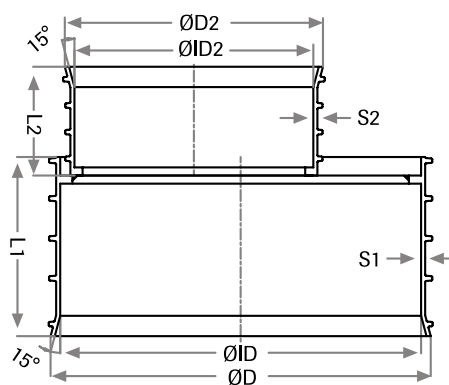
<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>H</b> mm	<b>L</b> mm	<b>L1</b> mm	<b>L2</b> mm	<b>ØD</b> mm	<b>ØD1</b> mm	<b>ØD2</b> mm	<b>ØD3</b> mm	<b>A</b> mm	<b>B</b> mm
<b>7588200111</b>	Ø200/Ø110	420.0	100.0	80.0	69.0	235.0	195.0	110.4	120.6	142.0	132.0
<b>7588200201</b>	Ø200/Ø200	569.0	104.5	100.5	104.5	235.0	198.8	200.6	216.2	162.0	267.2
<b>7588250201</b>	Ø250/Ø200	611.0	125.5	121.5	104.5	293.0	248.6	200.6	216.2	152.9	267.9
<b>7588300201</b>	Ø300/Ø200	671.0	155.5	151.5	104.5	355.0	299.8	200.6	216.2	172.3	275.5
<b>7588400201</b>	Ø400/Ø200	775.0	207.5	203.5	104.5	470.0	399.8	200.6	216.2	173.0	290.4

<b>Code</b>	<b>NOMINAL DIAMETER</b>	<b>H</b> mm	<b>L</b> mm	<b>L1</b> mm	<b>L2</b> mm	<b>ØD</b> mm	<b>ØD1</b> mm	<b>ØD2</b> mm	<b>A</b> mm	<b>B</b> mm
<b>7588200110</b>	Ø200/Ø100	420.0	100.0	80.0	65	235.0	195.0	119	162.0	151.0
<b>7588200200</b>	Ø200/Ø200	569.0	104.5	100.5	100.5	235.0	198.8	235	162.0	267.2
<b>7588250200</b>	Ø250/Ø200	611.0	125.5	121.5	100.5	293.0	248.6	235	152.9	267.9
<b>7588300200</b>	Ø300/Ø200	671.0	155.5	151.5	100.5	355.0	299.8	235	172.3	275.5
<b>7588400200</b>	Ø400/Ø200	775.0	207.5	203.5	100.5	470.0	399.8	235	173.0	290.4

**TRIPLEX TEE PIECE**



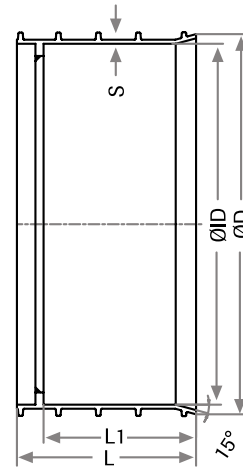
**REDUCTION**



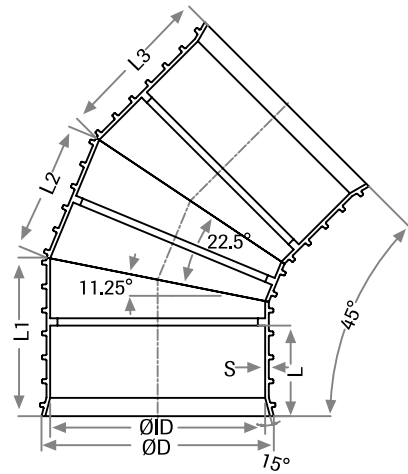
<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>L</b> mm	<b>L1</b> mm
<b>7588009110</b>	100	129.6	119	410	123
<b>7588009125</b>	125	158.5	140.5	450	60
<b>7588009150</b>	150	189.6	176	480	82
<b>7588009200</b>	200	254	235	750	100.5
<b>7588009250</b>	250	312	293	780	121.5
<b>7588009300</b>	300	374	355	960	151.5
<b>7588009400</b>	400	489	470	1050	203.5

<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>L1</b> mm	<b>ØD2</b> mm	<b>ØID2</b> mm	<b>L2</b> mm
<b>7588011125</b>	125-100	129.6	119	101	129.5	119	128
<b>7588011150</b>	150-100	189.6	176	101	129.5	119	128
<b>7588011152</b>	150-125	189.6	176	101	158.5	140.5	85
<b>7588011201</b>	200-100	254	235	119	129.5	119	128
<b>7588011202</b>	200-125	254	235	119	158.5	140.5	85
<b>7588011200</b>	200-150	254	235	119	189.6	176	87
<b>7588011252</b>	250-100	312	293	142.5	129.5	119	128
<b>7588011253</b>	250-125	312	293	142.5	158.5	140.5	85
<b>7588011251</b>	250-150	312	293	142.5	189.6	176	87
<b>7588011250</b>	250-200	312	293	142.5	254	234	107
<b>7588011303</b>	300-100	374	355	176.2	129.5	119	128
<b>7588011304</b>	300-125	374	355	176.2	158.5	140.5	85
<b>7588011302</b>	300-150	374	355	176.2	189.6	176	87
<b>7588011301</b>	300-200	374	355	176.2	254	235	107
<b>7588011300</b>	300-250	374	355	176.2	312	193	128
<b>7588011403</b>	400-125	489	470	234.4	129.5	119	128
<b>7588011404</b>	400-150	489	470	234.4	189.6	176	87
<b>7588011401</b>	400-200	489	470	234.4	254	235	107
<b>7588011402</b>	400-250	489	470	234.4	312	293	128
<b>7588011400</b>	400-300	489	470	234.4	374	355	158

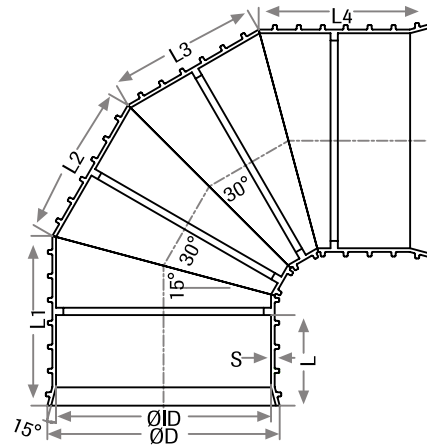
**END CAP**



**ELBOW 45°**



**ELBOW 90°**

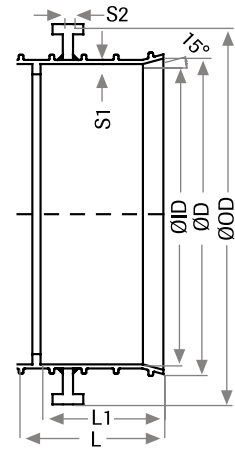


<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>L</b> mm	<b>L1</b> mm
<b>7588012110</b>	100	129.6	119	130	123
<b>7588012125</b>	125	158.5	140.5	120	119
<b>7588012150</b>	150	189.6	176	101	82
<b>7588012200</b>	200	254	235	119	100.5
<b>7588012250</b>	250	312	293	142.5	121.5
<b>7588012300</b>	300	374	355	176.2	151.5
<b>7588012400</b>	400	489	470	234.4	203.5

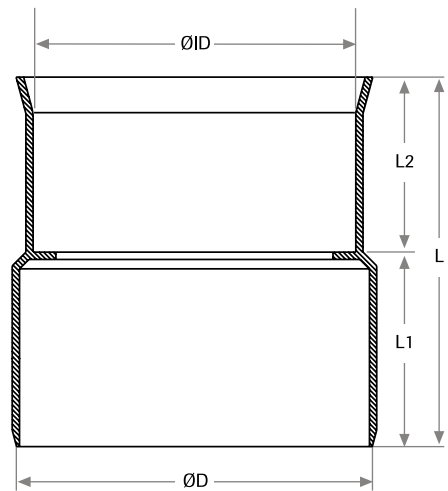
<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>L</b> mm	<b>L1</b> mm	<b>L2</b> mm	<b>L3</b> mm
<b>7588007110</b>	100	129.6	119	123	87.6	71.6	87.6
<b>7588007125</b>	125	158.5	140.5	120	89	89	92
<b>7588007150</b>	150	189.6	176	82	129.5	106	129.5
<b>7588007200</b>	200	254	235	100.5	173	141.5	173
<b>7588007250</b>	250	312	293	121.5	203.9	164.75	205.9
<b>7588007300</b>	300	374	355	151.5	254.75	189.4	189.4
<b>7588007400</b>	400	489	470	203.5	330	250	250

<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>L</b> mm	<b>L1</b> mm	<b>L2</b> mm	<b>L3</b> mm	<b>L4</b> mm
<b>7588008110</b>	100	129.6	119	123	94	85.5	85.5	94
<b>7588008125</b>	125	158.5	140.5	120	89	89	92	92
<b>7588008150</b>	150	189.6	176	82	139	123.5	123.5	139
<b>7588008200</b>	200	254	235	100.5	185.5	165	165	185.5
<b>7588008250</b>	250	312	293	121.5	225.6	201.3	201.3	225.6
<b>7588008300</b>	300	374	355	151.5	277.3	239.5	239.5	277.3
<b>7588008400</b>	400	489	470	203.5	363	316	363	316

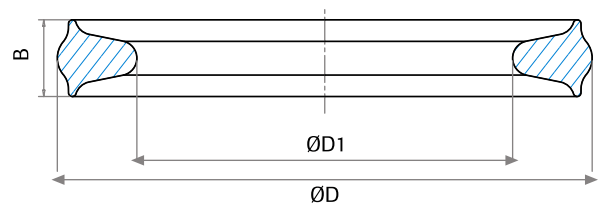
**CONCRETE PASSAGE PIECE**



**PIPE ADAPTOR PIECE**



**TRIPLEX and PERFORATED PIPE GASKET**





<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>ØOD</b> mm	<b>L</b> mm	<b>L1</b> mm
<b>7588500100</b>	100	129.6	119	224	130	123
<b>7588500125</b>	125	158.5	140.5	268	120	119
<b>7588500150</b>	150	189.6	176	304	101	82
<b>7588500200</b>	200	254	235	363	119	100.5
<b>7588500250</b>	250	312	293	441	142.5	121.5
<b>7588500300</b>	300	374	355	523	176.2	151.5
<b>7588500400</b>	400	489	470	678	234.4	203.5

<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>L</b> mm	<b>L1</b> mm	<b>L2</b> mm
<b>7588200152</b>	200-150	200	177	203	99	96

<b>Code</b>	<b>NOMINAL DIAMETER</b> ØD mm	<b>OUTER DIAMETER</b> ØD mm	<b>INNER DIAMETER</b> ØID mm	<b>ØOD</b> mm
<b>2001002300</b>	100	107	89	8.5
<b>7819990125</b>	125	138	125	9.4
<b>7819990150</b>	150	174.3	150	9.5
<b>7819990200</b>	200	232.5	200	16
<b>7819990250</b>	250	287.7	250	18
<b>7819990300</b>	300	346.4	300	21.6
<b>7819990400</b>	400	461.8	400	28.4
<b>7819990500</b>	500	525.6	461.2	33.2
<b>7819990601</b>	600	594.5	519.5	37.5
<b>7819990801</b>	800	718.7	605.3	39
<b>7819991000</b>	1000	925.6	771.6	44.3

## FIRAT sells to a lot of Countries in Europe, America, Asia and Africa

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### Countries to which FIRAT Exports:

Afghanistan  
Algeria  
Armenia  
Azerbaijan  
Bahrain  
belarus  
Belgium  
Bosnia  
Brazil  
Britain  
Bulgaria  
China  
Croatia  
Cyprus  
Egypt  
Ethiopia  
Finland  
France  
Gabon  
Gambia  
Georgia  
Germany  
Ghana  
Greece  
Hungary  
Iceland  
India  
Iranian  
Iraq  
Italy  
Jordan  
Kazakhstan  
Kenya  
Kirghizistan  
Kosovo  
Kuwait  
Latvia  
Lebanon  
Libya  
Macedonia  
Moldova  
Mongolia  
Montenegro  
Morocco  
Netherlands  
New Zeland  
Nigeria  
Pakistan  
Poland  
Portugal  
Romania  
Russia  
Saudi Arabia  
Serbia  
Slovenia  
South Africa  
Spain  
Sri Lanka  
Sudan  
Surinam  
Swedish  
Syria  
Tajikistan  
Train  
Tunisian  
Turkmenistan  
Ukraine  
United Arab Emirates  
Uzbekistan  
Venezuelan  
Yemen