

HDPE

HIGH DENSITY POLYETHYLENE
PRODUCT GUIDE

TABLE OF CONTENTS

Vision and Mission	5
1. Introduction	6
2. Leading the Polyethylene Market with High Technologies	7
3. Product Features and Benefits	8
4. Eco Friendly	9
5. Applicable Standards	9
6. Product Range – Technical Information	11
7. Manufacturing Process	12
8. HDPE Pipe Dimension	14
9. Joining Methods of PE-HD Pipes	16
10. Control Testing	18
11. Handling, Storage and Transportation	19
12. Installation	21



IPF

A market **leader**

VISION

Leading the pipe industry by discovering the new, reinventing the old, while preserving the culture of pipe technology and its tradition, guarantying our client around the world the ultimate experience by upholding our commitments and maintain the highest standards in design, manufacturing, quality, services and trust worthy business practices.



MISSION

- ▲ Offer the highest quality products through monitoring every stage of the process leading to complete customer satisfaction.
- ▲ Commitment to uphold the strictest quality assurance standards on all product in all aspects of production.
- ▲ Optimize the researched techniques to continually improve the efficiency of the facility and the productivity of the staff.
- ▲ Maintain reasonable profitability to support the mission and to expand the experience to customer around the globe.

1. INTRODUCTION

High density polyethylene (HDPE) is today considered the most suited piping material. Looking at the outstanding performance of pipes made from this versatile thermoplastic for most rigorous applications, it is no wonder HDPE pipes attained the highest popularity worldwide.

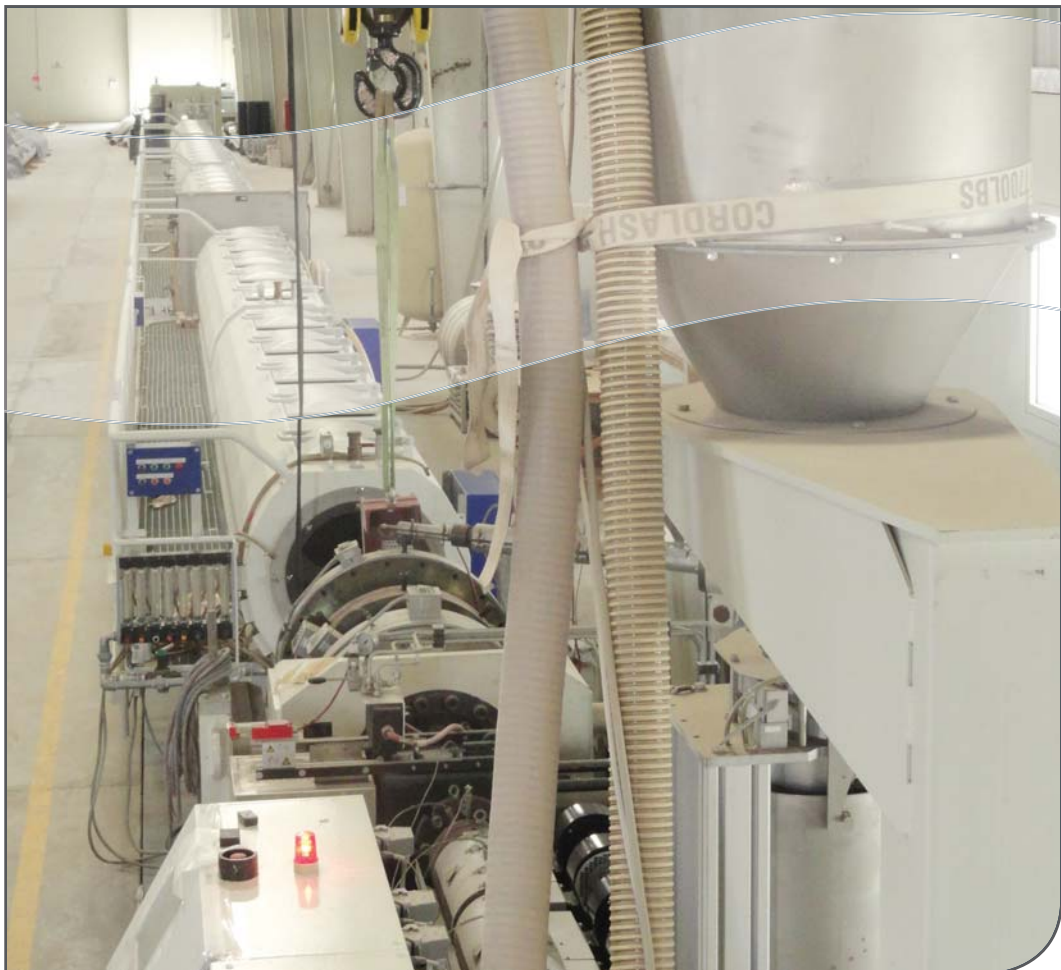
Since polyethylene was discovered in 1933, and was first polymerized to be high density polyethylene in 1954, the superior properties of HDPE material were discovered in use of many products around the world. Discovery of HDPE raw material is the most fruitful development which laid a new milestone in field of piping engineers. MRS (Minimum Required Strength) based on performance of the material @ 20°C, for 50 years, will classify HDPE compound to its designation.

Inter Pipe Factory®(High Density Polyethylene Pipes)

Inter Pipe Factory® is accredited with ISO 9001:2008,ISO 14001:2004, OHSAS 18001:2007, WARS (Water Regulation Advisory Scheme), etc ... and also approvals from ministries and municipalities all over U.A.E.

Inter Pipe Factory® manufactures High Density Polyethylene (HDPE) pipes using the extrusion technology guaranteeing a consistently homogeneous product meter to meter. A HDPE pipe system manufactured by **Inter Pipe Factory®** is the ultimate pipe selection for water supply systems as it has proven its resistance to galvanic and electrolytic corrosion.

Moreover, HDPE pipe systems are used in sewer and storm applications since it has verified its resistance to the acidic environment and other corrosive fluids. HDPE pipes have been recognized internationally as the safest, most practical and adaptable product for Gas and Water distribution. HDPE is flexible, leak-tight and highly resistant to chemical attack.



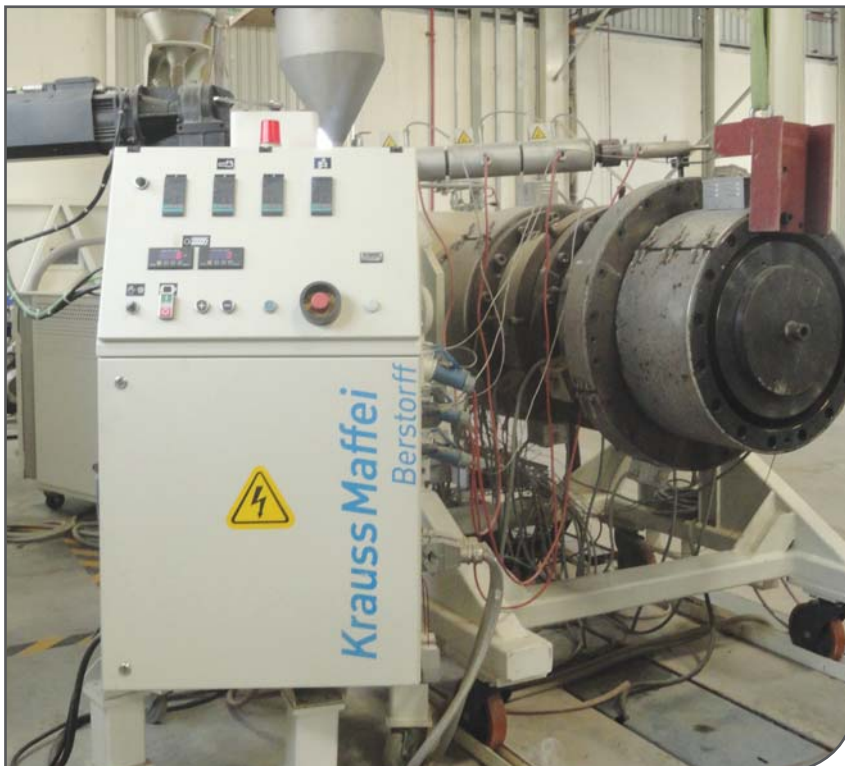
2. LEADING THE POLYETHYLENE MARKET WITH HIGH TECHNOLOGIES

Corrosion resistant, Lightweight and manufactured under stringent quality standards, **Inter Pipe Factory®**. Based on the international standard HDPE pipes are available in all pressure classes, with diameters range from 90mm up to 500mm and it is necessary for lengths of pipes to be supplied by agreement between purchaser & manufacturer. The increasing knowledge of the operational cost savings and superior corrosion resistance offered by polyethylene pipe by **Inter Pipe Factory®** operations has resulted in its widespread application for the following:

- ▲ Sewer pipelines both pumping & gravity
- ▲ Storm water and drainage
- ▲ Water Transmission and distribution (Potable & Raw Water)
- ▲ Gas distribution piping
- ▲ Chilled water pipelines & District cooling piping
- ▲ Pipe line Rehabilitation
- ▲ Crude oil flow lines
- ▲ Power & Desalination
- ▲ Irrigation & Fire Fighting
- ▲ Dredging pipeline & Slurry pipelines
- ▲ Industrial & Mining
- ▲ Ducting pipelines & plumbing
- ▲ Under water piping
- ▲ Geothermal Heating & Cooling

Inter Pipe Factory® Polyethylene pipe material delivers long, effective service life with lower operating and maintenance costs compared to other piping materials.

Inter Pipe Factory® High Density Polyethylene (HDPE) pipes are produced by using the highest levels of technology and quality in manufacturing by extrusion technology.



3. PRODUCT FEATURES & BENEFITS

Inter Pipe Factory® brings a product to market that can provide low cost, long – term pipe solutions to client around the globe. The multiple advantages of HDPE pipes systems and add up to provide effective design life and cost effective system.

Features	Benefits
Corrosion resistant material	<ul style="list-style-type: none"> ▲ Extensive, effective service life ▲ No need for coatings, lining, cathodic protection, wraps or other forms of corrosion protection ▲ Hydraulic characteristics effectively constant over time ▲ Low maintenance costs ▲ Ideal pipe for the rehabilitation of corroded sewer lines
Design life time is more than 50 years	<ul style="list-style-type: none"> ▲ Maximum economical optimization
Light weight	<ul style="list-style-type: none"> ▲ Low Transportation Cost ▲ Eliminates need for expensive pipe handling equipment
Long standard lengths	<ul style="list-style-type: none"> ▲ Fewer joints reduce installation time ▲ More Pipe per Transport Vehicle results in lower delivery cost
Extremely smooth bore	<ul style="list-style-type: none"> ▲ Low friction loss means less pumping energy needed and lower operating cost ▲ Minimum slime build up helps in lowering cleaning costs
Low cost of installation	<ul style="list-style-type: none"> ▲ Tight efficient joints designed to eliminated infiltration and exfiltration. ▲ Ease of joining, reducing installation time ▲ Leak - free joints and reduced maintenance costs
High technology pipe design	<ul style="list-style-type: none"> ▲ Flexible material; internal pressure design only. ▲ Internal Pressure Rating: Stress due to working pressure cannot exceed the HDB (1,600psi) ÷ 2.0 safety factor (Hydrostatic Design Stress = 800psi) for PE 100 ▲ Surge pressures are allowed to compromise the “design factor” which results in a reduction in the safety factor below 2.0
Environment friendly	<ul style="list-style-type: none"> ▲ Perfect material for drainage systems from an ecological point of view. It is a simple compound of carbon & hydrogen atoms-harmless to man, animals & plants. It consumes less energy during manufacture and transport than steel, cast iron or copper pipes.
High Technology pipe manufacturing system producing pipe that strictly complies with stringent performance international standards (ISO, AWWA, BS, EN, etc.)	<ul style="list-style-type: none"> ▲ High and consistent product quality worldwide which ensures reliable product performance

Table 3.1

4. ECO FRIENDLY

HDPE compound contains molecules of carbon and hydrogen. HDPE is not considered hazardous material. Material will burn if ignited. Result of HDPE combustion in an excess of O₂ is CO₂ and H₂O. Some CO is produced if insufficient O₂. Inhalation of dust can cost irritation problem to the respiratory system. HDPE pipe should not be installed in the ground polluted by hydrocarbon base such as hydrogen sulfide or gasoline that may cause odor to water in the pipe.

HDPE pipe is considered environmental conservative product, being the best pipe material when being designed with proper condition. **Inter Pipe Factory®** using granule form raw material it is not added any additive for production of the pipes. Raw material is used absolutely in its original composition. For long term development and research, HDPE pipe is superior to any other pipes in terms of:

- ▲ Long life usage at least 50 years or more
- ▲ Save erection and reinstallation cost
- ▲ Save energy consumption to deliver the same volume of water from place to place.
- ▲ Carry clean water inside for people
- ▲ Can be used after earthquakes or change the location
- ▲ No contamination to soil and earth
- ▲ Keep and delivery sewage water inside to proper place
- ▲ No harm to animal life in both above and under water
- ▲ Economic sufficient in long term for next generation



5. APPLICABLE STANDARDS

High Density Polyethylene Pipes produced by **Inter Pipe Factory®** are manufactured and tested according to International Organization of Standardization (ISO), American Standards (ASTM/AWWA) and European Standards (EN).

5.1. ISO Standards

ISO 4427 is one of the most widespread product standards in existence for HDPE pipe. This standard is for water supply piping systems, concentrating on quality control and prototype qualification testing. In addition to being a water supply piping standard, ISO has also published one of the most comprehensive design methods for supply of Gaseous fuels.

ISO 4437, HDPE Pipe Design, provides complete criteria for hydrostatic strengths, elongation at break, longitudinal reversion, oxidation index time, melt flow index, carbon black content etc....

Standard	Application
ISO 4427	Plastic piping systems - Polyethylene (PE) pipes and fittings for water supply
ISO 4437	Buried polyethylene (PE) pipes for the supply of gaseous fuels – Metric series – specifications

5.2. AWWA Standards

AWWA C 906 is another most widespread product standard in existence for HDPE pipe. This standard is for water distribution and transmission application, concentrating on quality control and prototype qualification testing. AWWA C906 is also considered to be a product performance standard.

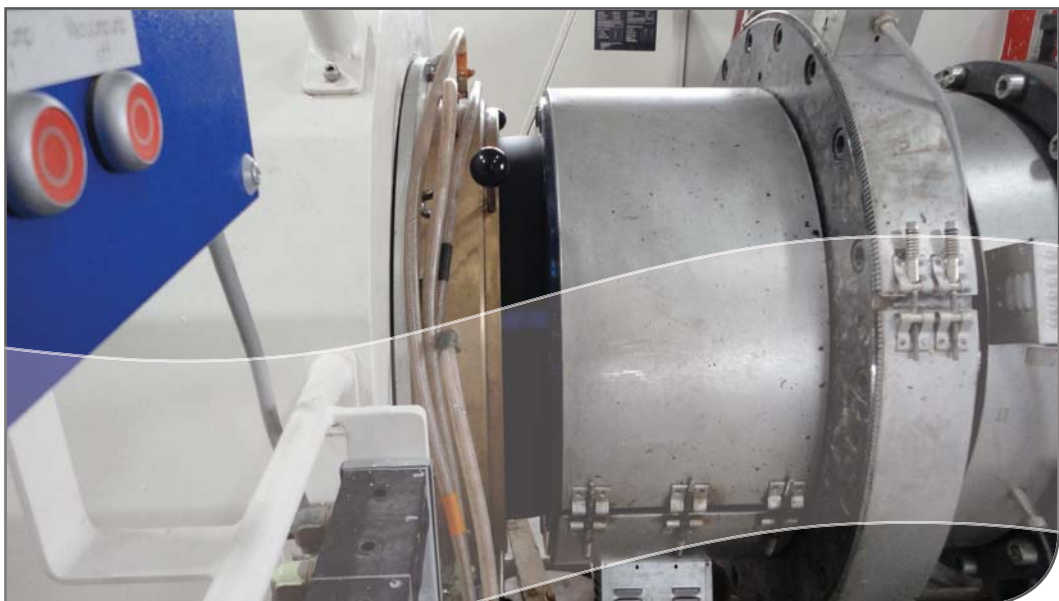
This pipe design provides complete criteria for quick burst test, bend back test, elongation at break test, melt index, density etc....

Standard	Application
AWWA C – 906	Polyethylene (PE) pressure pipe and fittings, for water distribution and transmission

5.3. EN & British Standards

Inter Pipe Factory® manufacture HDPE pipes ensuring that the performance requirements qualification and control testing, and design to meet the following European & British Standards:

Standard	Application
EN 12201-2:2003	Plastics Piping Systems for water supply – Polyethylene (PE)



6. PRODUCT RANGE – TECHNICAL INFORMATION

6.1. Diameter Range

Inter Pipe Factory® are supplied in the following Nominal Diameters* ND (mm)

Nominal Diameter ND (mm)	
90	250
110	280
125	315
140	355
160	400
180	450
200	500
225	

*for other pipe diameter range, consult Inter Pipe Factory®
Table 7.1

6.2. Pressure Class

Inter Pipe Factory® offers the pressure classes (PN) as indicated in below table 6.2-1 & 6.2-2
SDR= Standard Dimension Ratio, S= Series

SDR	S (Series)	Nominal Pressure for Material Class	
		PE 80	PE 100
17	8	8	10
13.6	6.3	10	12.5
11	5	12.5	16
9	4	16	-

Table 6.2-1 -Medium - Water

SDR	S (Series)	Nominal Pressure for Material Class	
		PE 80	PE 100
17.6	8.3	2	6
11	5	4	10

Table 6.2-2 - Medium Gaseous Fuel

6.3. Other Characteristics & Properties

Design Stress		PE 80 6.3 N/mm ²	PE 100 8.0 N/mm ²
Density	Kg/m ³	945 – 960	950 – 960
Melt Index (5kg)	g/10 min	0.4 – 0.7	0.2 – 1.4
Tensile Strength at yield	N/mm ²	20	23
Elongation at break	%	>600	>600
Brittleness temperature	°C	<-70	<-70
Durometer hardness	Shore D	60 – 65	59
Charpy impact strength	kJ/m ²	No Failure	No Failure

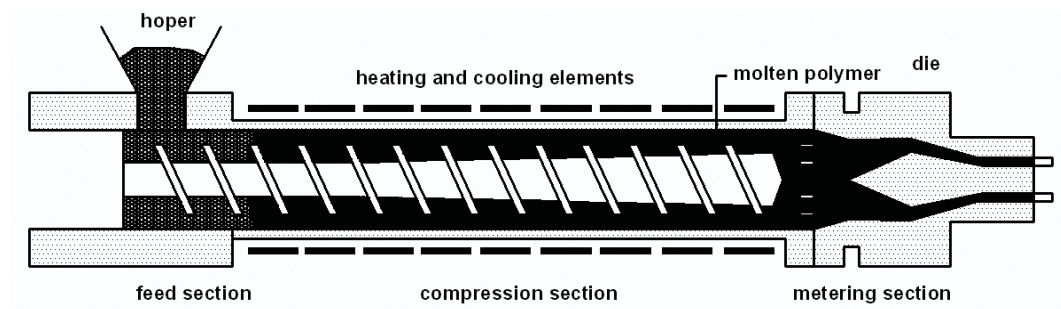
Table 7.3.1

7. MANUFACTURING PROCESS

HDPE pipe is manufactured by Extrusion process. (The process of extrusion consists of converting a suitable raw material into a product of specific cross section by forcing the material through an orifice or die under controlled condition. There are certain requirements which must be satisfied concerning both the Equipment and the Raw material. The equipment must be capable for providing sufficient pressure continuously and uniformly on to the material.

The material must be such that, when suitably conditioned it will flow under pressure and will solidify when these condition are removed.) Single screw extruder designs are used for extruding HDPE raw material. The extruder mainly consists of a barrel and screw specialty designed to ensure proper plasticization of the material. While the barrel is fixed, the screw rotate counter-clock wise direction by use of variable DC drive motor through reduction and distribution gears.

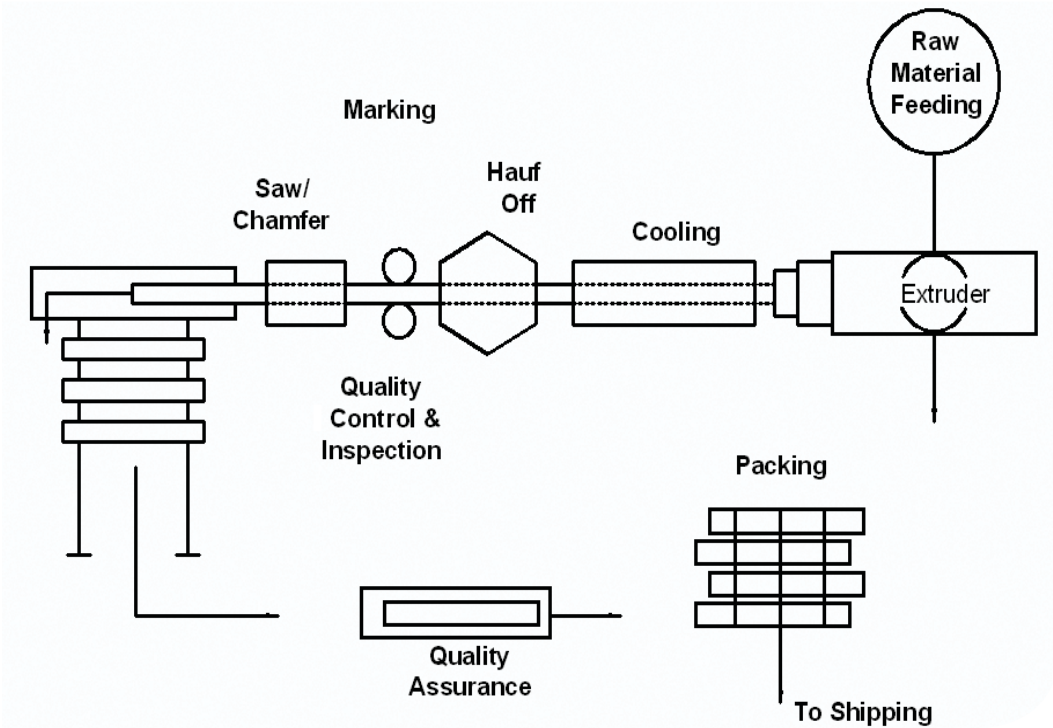
Single Screw extruder parts



Depending on the size to be produced a suitable die head is selected and assembled with the die set and then mounted on to the barrel through an adapter. The barrel, the die head and the die set are heated by a set of heater bands and the temperature is controlled through pyrometers.

Once the required temperature is attained, the extruder hopper is fed with HDPE raw material and the main motor is started. The plasticized material gradually comes out of the pipe opening and once the flow is uniform the extrudate is cooled and sized into a pipe. The OD of the pipe is controlled by a cooling jacket attached in the vacuum tank. The pipe is cooled by a haul-off machine at a set constant speed to insure the wall thickness is uniform throughout the length of the pipe. As the pipe passes through a saw machine, the pipe is cut to required length to the help of limit switches. The cut length of the pipe is then transferred.

Process Flow Diagram



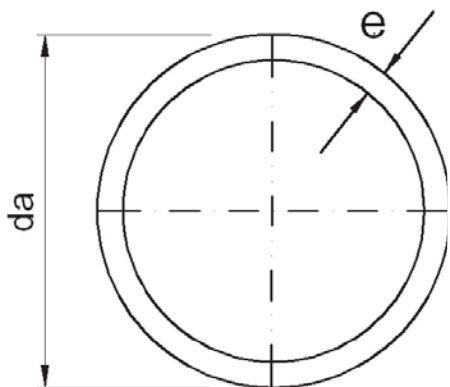
8. HDPE PIPE DIMENSION

For Water

PE-HD pipe PE 100 is produced according to ISO 4427 & EN 12201-2

Pipe Diameter	Wall Thickness	
	SDR 17 (S - 8)	SDR 11 (S - 5)
	Nominal Pressures	
	PN 10 (Bar)	PN 16 (Bar)
90	5.4	8.2
110	6.6	10.0
125	7.4	11.4
140	8.3	12.7
160	9.5	14.6
180	10.7	16.4
200	11.9	18.2
225	13.4	20.5
250	14.8	22.7
280	16.6	25.4
315	18.7	28.6
355	21.1	32.2
400	23.7	36.3
450	26.7	40.9
500	29.7	45.4

Note: - Please contact Inter Pipe Factory® for other diameters which are not included in the above table



SDR – Diameter – Wall Thickness Relation
SDR – Diameter – Wall Thickness Relation

da – Outside diameter (mm)
e – Wall thickness

PN – Nominal Pressure Rating (bar)

$$SDR = \frac{da}{e} \quad S = \text{Series} \quad S = \frac{SDR - 1}{2}$$



For Gaseous fuels

Generally the gas industry uses PE80 materials for low pressure gas distribution up to 4 bar because of their superior flexibility and ease of jointing and installation. For higher pressures, PE100 with higher strength are used.

PE-HD pipe PE 100 is produced according to ISO 4437 (Medium – Gaseous fuels)

Pipe Diameter	Wall Thickness	
	SDR 17.6 (S – 8.3)	SDR 11 (S - 5)
	Nominal Pressures	
	PN 6 (Bar)	PN 10 (Bar)
90	5.4	8.2
110	6.6	10.0
125	7.4	11.4
140	8.3	12.7
160	9.5	14.6
180	10.7	16.4
200	11.4	18.2
225	12.8	20.5
250	14.2	22.7
280	15.9	25.4
315	17.9	28.6
355	20.2	32.3
400	22.8	36.4
450	25.6	40.9
500	28.4	45.5

Note: Please contact Inter Pipe Factory for other Diameters which are not included in the above Table

*for PE 80 please refer the above table – only read the pressures PN 6 & PN 10 as PN 2 & PN 4

9. CONTROL TESTING

Quality Control testing includes scrupulous checks for all incoming raw materials and finished pipe products against **Inter Pipe Factory®** strict written standards.

9.1. Raw Materials

Raw materials are only delivered with vendor certification indicating their conformity with **Inter Pipe Factory®** quality requirements. Prior to their use, all raw materials are sample tested so as to guarantee that pipe materials do comply with the declared technical specifications

Raw Material Tests

1. Melt Mass-Flow Rate



2. Oxidation Induction Time



3. Carbon Black Content



9.2. Physical Properties

Elongation at Break and Longitudinal capacities is checked on a regular basis HDPE Pipes. Moreover, pipe composition and construction are confirmed. The following control checks are carried out:

1. Hydrostatic Strength of HDPE Pipes
2. Elongation at Break of HDPE Pipes
3. Longitudinal Reversion of HDPE Pipes

Inter Pipe Factory® has demonstrated its products compliance with the performance requirements of international standards. The performance requirements are divided in to two parts:

- ▲ Short-term requirements



▲ Long-term requirements



Inter Pipe Factory® has been rigorously tested to verify conformance to ISO 4427, ISA 1167, ISO 6259, ISO 2505, ISO 3126 and all other international standards.

9.3. Finished Pipe

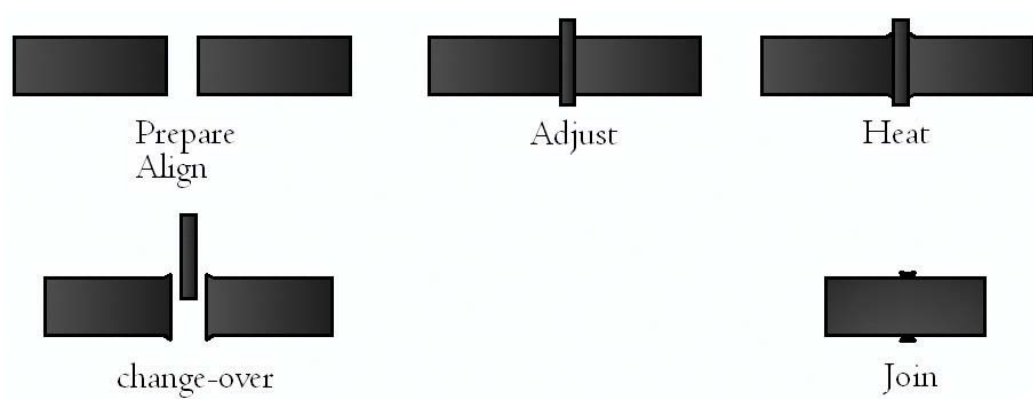
HDPE pipe products produced by Inter Pipe Factory® are subject to the following control checks:

1. Wall Thickness
2. Diameter
3. Section length
4. Visual Inspection

10. JOINING METHODS OF PE-HD PIPES

10.1. Butt Welding

Butt Welding (or buff fusion) is a simple and quick jointing method to connect pipes and fittings of PE-HD or PE-MD. The process starts by cutting the pipe ends straight and cleaning them carefully. Heated plate is then placed in between, and the ends are heated under pressure and temperatures. The polyethylene becomes soft and a so called beaded is formed between the pipe ends. The heater plate is then removed and the pipe ends are pressed unto each other and allowed to cool under pressure. This will form a welded joint that is water tight and homogeneous.



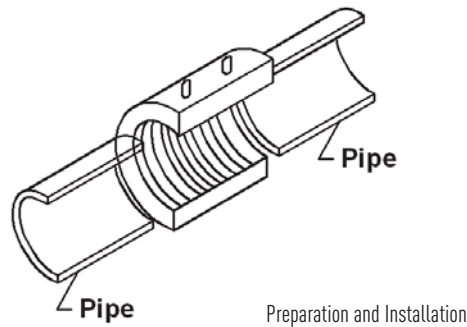
Process Description

10.2. Electro Fusion Jointing

This is an easy system where preinstalled resistance wires on the inside of the fittings are slightly coated with PE. When these wires are connected to a welding unit, they become warm and the polyethylene consequently melts.

Having the ends of the pipes in the connection of fitting (Socket), bend etc, the polyethylene then melts into each other and forms a rigid and durable

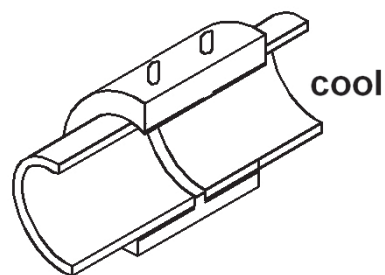
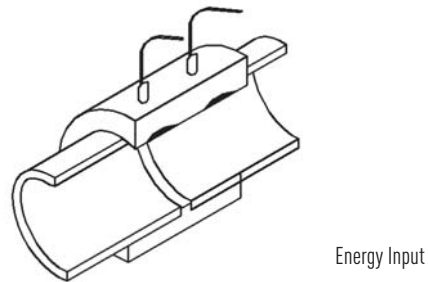
joint. The joining method is very common for gas pipes & potable water pipes



10.3. Flange Joints

To be able to make a flange joint, a stub-end has to be welded on each pipe. These are then connected to each other by loose flanges, nuts & bolts.

Usually, flanges are used in connections which are to be disassembled at a later stage, or, in submarine pipe systems. The environment is very important for the choice of loose flange material, which could be made of steel, aluminum or plastic.



Joint is stress able cooling time

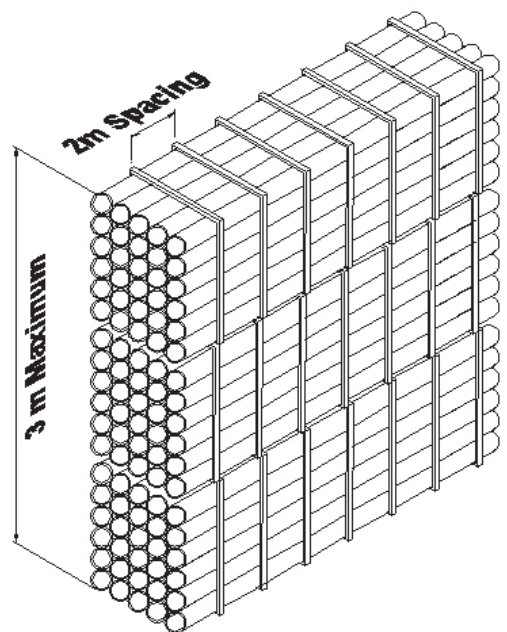
11. HANDLING, STORAGE AND TRANSPORTATION

Handling

High Density Polyethylene Pipe being a tough resilient material, light weight and easy to handle. However, because it is softer than metals it is more prone to damage by abrasion and by objects with a cutting edge.

HDPE pipe contains pigment to provide excellent protection against degradation due to UV-radiation. If due to unsatisfactory storage or handling, a pipe is damaged or 'kinked', the damaged portion should be cut out completely.

The material is not affected by low temperature as much as are some other plastic materials and there is no need for more cautions handling during cold weather. **Inter Pipe Factory®** supplies the pipes in standard lengths for easy handling. We also supply bigger lengths however, the care should be taken by the customer while handling.



Ground Level

Storage

- ▲ Black Polyethylene Pipe may be stored either under cover or in the open. It is suitably protected from ageing due to sunlight by the addition of the appropriate quantity and type of Carbon Black. Natural Polyethylene Pipe, however, should be stored under cover and protected from direct sunlight.
- ▲ Store pipes on flat/firm ground.
- ▲ Keep pipes away from sharp edges.
- ▲ Use wide non – metallic slings for lifting.
- ▲ Keep pipes away from intense heat.
- ▲ Allow for some bending deflection while lifting.
- ▲ Pipes should not be stored alongside fertilizers, pesticides, insecticides and chemical compositions such as these, as otherwise, those pipes are liable to develop cracks.
- ▲ The ends of the pipes shall be plugged or covered.
- ▲ Never throw, drag and drop from heavy vehicles.

Transportation

HDPE Pipes are 'LIGHT WEIGHT AND TRANSPORTABILITY'. High Density Polyethylene Pipes are light in weight (Density 0.955 gms/cm²), so they are easy to handle. **Inter Pipe Factory®** supplies the pipes in length – packed with wooden bundles for easy to carry and handling. Whenever loading & unloading is carried out, it is recommended to use cotton or nylon (synthetic) belts to avoid damage to the pipes. If at all metal slings are used, the pipe should be protected against scratches.

It is preferable to cover the pipes while transporting them over long distance involving exposure to the sun especially in the Arabian Gulf Cooperation Countries. Because irregular heat distribution on the pipe circumference may result in kinking or distortion.



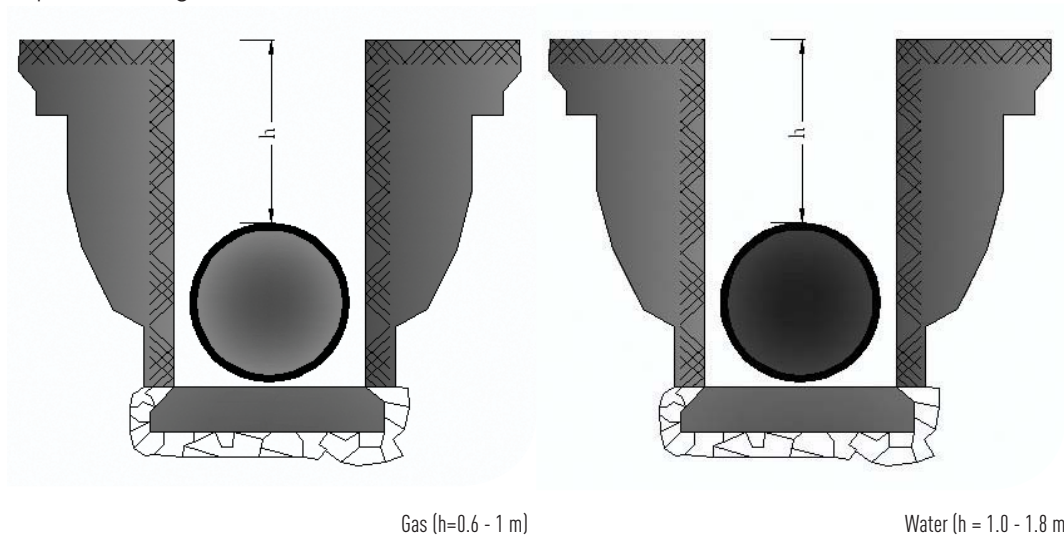
12. INSTALLATION

HDPE Pipes can be installed using the same methods, the same equipments as for any other rigid plastic pipes. But HDPE, though rigid, is flexible enough to facilitate laying of the pipelines easily and economically.

Trench Preparation

The width of the trench at the crown of the pipe shall be as narrow as possible but not less than the outside diameter of the pipe plus 300mm to allow proper compaction of the side fills material. Provided that the excavated trench bottom is reasonably even and free from sharp stones etc., which could cause abrasion to the pipe surface, on special bedding material is necessary for the laying of HDPE pipes. If due to sunlight the temperature of the pipe is significantly higher than the trench temperature, the pipe must be lightly covered before backfilling.

Pipe Coverage



Pipe Laying

HDPE pipes can be welded or joined by compression fittings on the ground and then can be snaked in to the trench easily. While on anchoring for buried HDPE pipelines, it is advisable to anchor at valves, Blank ends etc. All temporary pipe supports leveling pegs etc., must be removed from beneath the pipe prior to back filling.

Distance to underground systems

with parallel laying or at crossings with conductors or cables that emit heat, the HDPE pipes must be protected by a sufficient distance, suitable heat protection or other appropriate measures.

Distance to conductors & cables up to 1KV

When laying pipes in open ditches without special protective measures, a distance of at least 0.10m must be kept at crossings. With parallel laying, the minimum distance corresponds to half of the nominal width of the pipe with larger diameter and may not be less than 0.20m without special protective measures.

Distance to cable above 1KV

At crossings, a minimum distance of at least 0.20m must be observed. With parallel laying, the minimum distance required is 0.40m. At bottle necks the distance may not be less than 0.20m without special protective measures. If this distance cannot be observed appropriate measures such as interleaving heat-regulating jackets or plates must be implemented to protect the gas pipes.

Before Laying :

- ▲ Check delivered pipes
- ▲ Check the manufactures details
- ▲ Transport and storage damage
- ▲ Dimensional accuracy
- ▲ Assemble pipe joints stress-free
- ▲ Gas pipe network parts with operating pressures of more than 100m bar must be block able within certain areas.

Side Filling

In order to develop reaction from the side-fill, which is necessary for, a flexible pipe to sustain top load, some deformation of the pipes cross section must occur. It is generally considered that the maximum vertical deflection of the pipe should be within 5% of the pipes outside diameter, but considering the flexibility and toughness of HDPE pipe a higher deflection will not affect the long-term performance of the pipeline.

Back Filling

The material used in the back filling of trenches for HDPE pipes need not be a special grade and selected excavated material may be used, which is suitable for normal compaction. Fill up to 30cm above the top of pipe with suitable materials, e.g. sand-gravel mixture with maximum 20mm grit size.

Depth of Cover

It is generally considered that the minimum depths of cover for HDPE pipes are:

- ▲ 500mm for location with no wheel load.
- ▲ 600mm for location with light vehicle load.
- ▲ 800mm for location with heavy vehicle load.

DISCLAIMER :

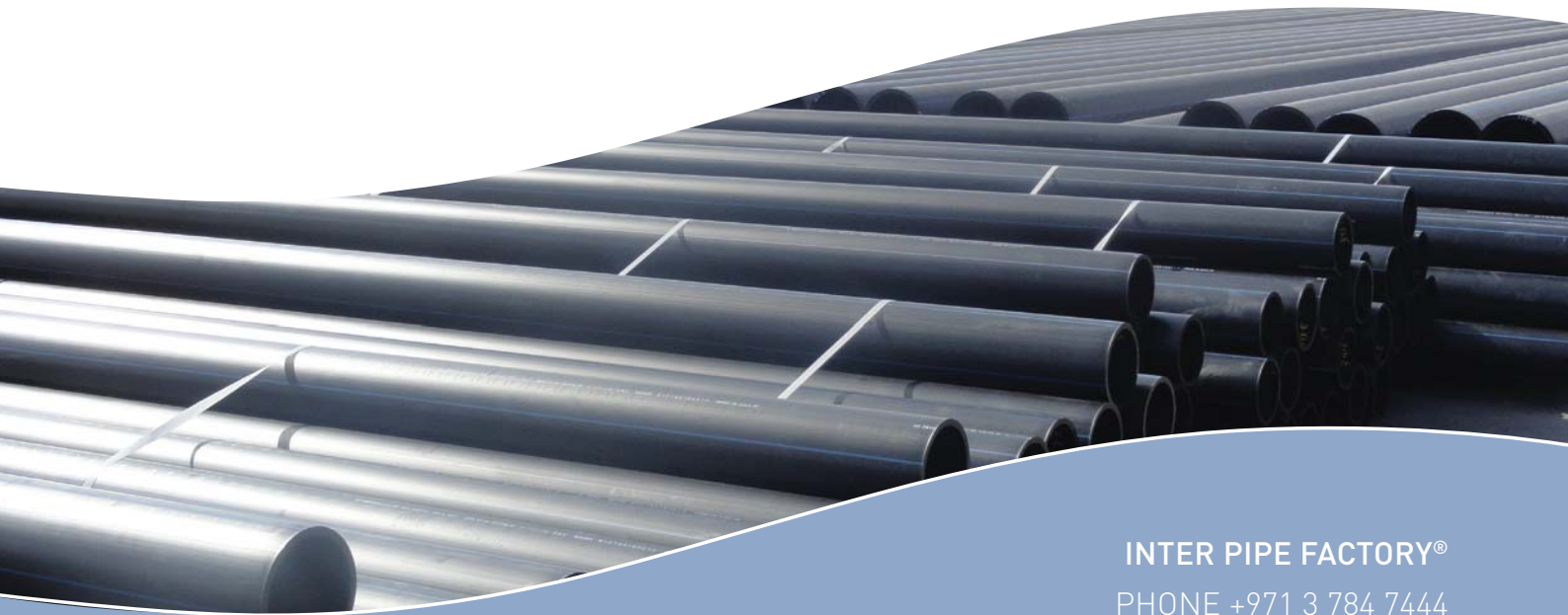
All information was accurate at the time of going to press. However, we reserve the right to alter, amend and update any product, information and service described in this catalog. No part of this catalog may be reproduced in any form, by printing, photo print, microfilm, photocopies or any other means without the written authorization of Inter Pipe Factory®. ©2009 by Inter Pipe Factory®.

OUTLINE :

Inter Pipe Factory® is a branch of Nael & Bin Harmal Hydro Export Est. Inter Pipe Factory® was established in 2009 and look forward to be a leading supplier of composite thermosetting pipe systems and technologies in GCC, Middle East, Africa, Asia and Europe.

ACCREDITATIONS :

Inter Pipe Factory® is accredited for the Quality Management Systems ISO 9001:2008, Environmental Management Systems ISO 14001:2004 & OHSAS 18001:2007. In addition, certificates of the suitability to convey potable water from the Water Regulation Advisory Scheme (WARS) from UK, Kitemark from UK and the National Sanitation Foundation (NSF International) from USA.



INTER PIPE FACTORY®

PHONE +971 3 784 7444

FAX +971 3 784 7447

P.O. BOX 68932

AL AIN - UNITED ARAB EMIRATES

EMAIL : INFO@INTER-PIPE.AE

WWW.INTER-PIPE.AE