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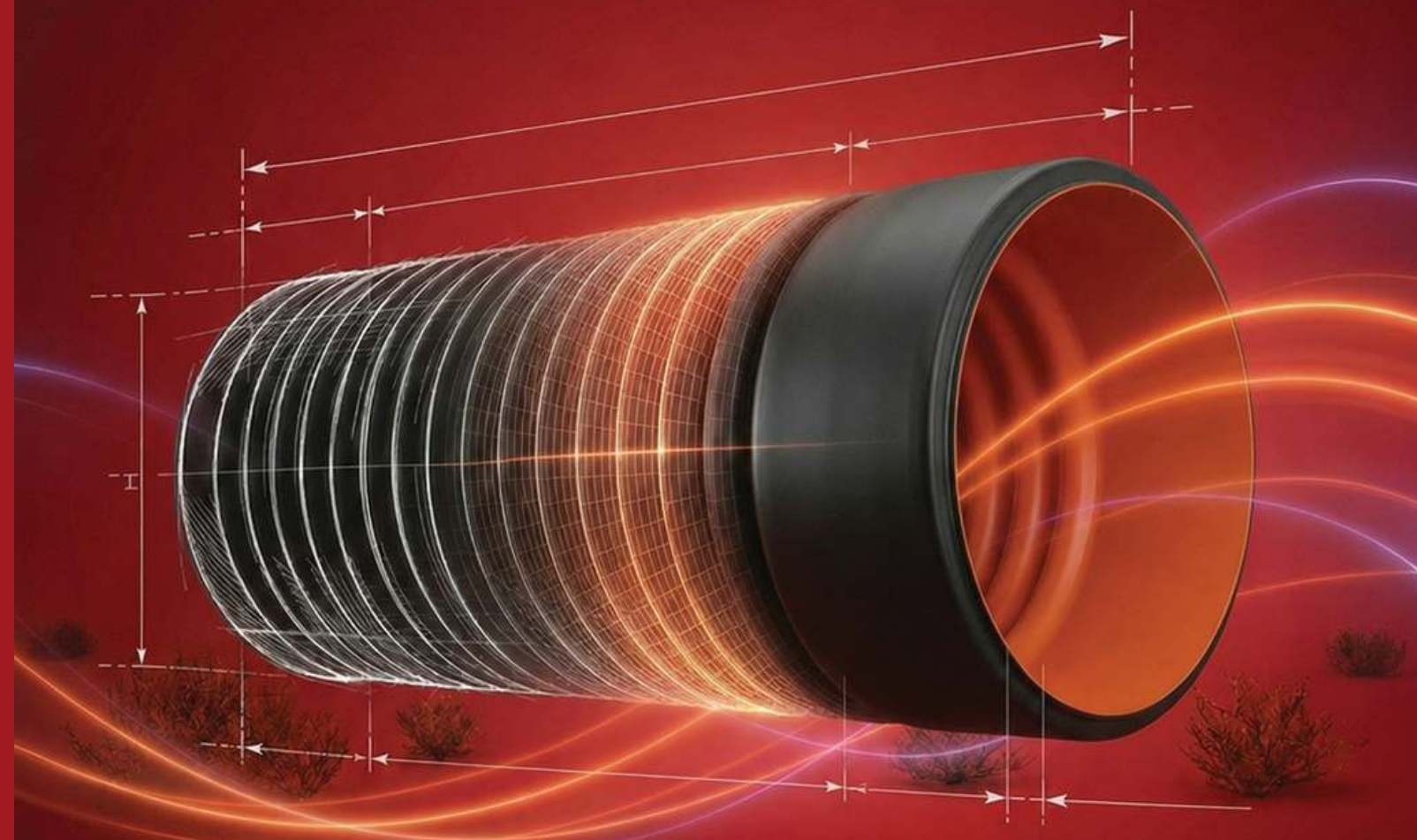
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TAKWEEN PLAST
One of Innovation Experts Brands إحدى علامات شركة صادرات الابتكار التجارية

**HDPE DOUBLE WALL
CORRUGATED (DWC)
PIPES & FITTINGS**



رسالتنا

بناء قاعدة صلبة ومتنامية من العملاء المخلصين عبر تقديم أنظمة أنابيب بلاستيكية عالية الجودة تتوافق مع أرفع المعايير الدولية. نحن ملتزمون بتوفير منتجات موثوقة وحلول مبتكرة وخدمات استثنائية تدعم النجاح طويل الأمد لعملائنا وشركائنا، وتسهم بفاعلية في التنمية المستدامة للبنية التحتية الحديثة.

رؤيتنا

أن نصبح رائداً عالمياً معترفاً به في مجال أنظمة الأنابيب البلاستيكية، واضعين معايير جديدة للثقة والابتكار والتميز الصناعي. نطمح "تكوين بلاست" لقيادة الأسواق الإقليمية من خلال التقنيات المتقدمة والحلول المستدامة والشراكات الاستراتيجية، لتصبح مرجعاً موثقاً لمشاريع البنية التحتية والمرافق العامة حول العالم.

قيمنا الجوهرية

1. التميز في الجودة: نلتزم بأعلى معايير التصنيع لتقديم حلول أنابيب موثوقة وطويلة الأمد تلبي المتطلبات الدولية وتتجاوز تطلعات عملائنا.
2. الالتزام تجاه العملاء: نضع عملاءنا في قلب اهتماماتنا، ونبني شراكات طويلة الأمد قائمة على الثقة، والأداء المتفوق، والنجاح المشترك.
3. الابتكار والتحسين المستمر: نسعى دوماً لتطوير حلول متقدمة وتحسين عملياتنا لمواكبة الاحتياجات المتطورة في قطاع البنية التحتية والصناعة.
4. النزاهة والموثوقية: نعمل بشفافية ومسؤولية ومهنية عالية، بما يضمن أداءً يعتمد عليه في كل مشروع ندعمه.
5. الاستدامة والمسؤولية: نلتزم بممارسات تصنيعية مسؤولة بيئياً تسهم في تطوير بنية تحتية مستدامة وحماية البيئة للأجيال القادمة.



من نحن تكوين بلاست



تعد شركة "صائدات الابتكار" المظلة المؤسسية والمالك لعلامة "تكوين بلاست" التجارية. حيث يجسد هذا الارتباط تكاملاً استراتيجياً يجمع بين الرؤية الاستثمارية والخبرة الصناعية المعمقة؛ بينما تقود "صائدات الابتكار" قاطرة الابتكار والنمو، تبرز "تكوين بلاست" كذراع صناعي متميز يمثل تحالفاً استراتيجياً لنخبة من كبار المصنعين في العديد من الدول عبر خمس دول.

نحن ملتزمون بتقديم حلول مستدامة ومبتكرة لأنظمة الأنابيب البلاستيكية المستخدمة في شبكات تصريف المياه، والاتصالات، وأنظمة التكييف (HVAC)، وتطبيقات الطاقة. ونفخر بتوفير أنظمة متطورة تتماشى مع المتطلبات المتسارعة لمشاريع البنية التحتية الحديثة، على المستويين الإقليمي والعالمي.

تكمّن قوتنا في العمل التشاركي، والوحدة التنظيمية، والالتزام المشترك بالتميز. ومن خلال تواجدها الاستراتيجي في مراكز الأعمال الرئيسية بالملكة العربية السعودية ومنطقة الخليج والشرق الأوسط، تستند "تكوين بلاست" إلى كوادرات بشرية عالية الكفاءة، وشبكة موثوقة من الموزعين، وشراكات تجارية متينة لخدمة قاعدة عريضة ومتنوعة من العملاء.

وتعمل "تكوين بلاست" كشبكة متكاملة من شركات التصنيع المحلية، بالتعاون مع أكثر من 20 شريك إنتاج دولي، مدعومة بسلسلة توريد قوية في كافة أنحاء المملكة ودول مجلس التعاون الخليجي والشرق الأوسط الكبير. تتيح لنا هذه القدرات الجماعية تقديم جودة ثابتة، وحلولاً مخصصة، وخدمات موثوقة في كافة الأسواق التي نتواجد فيها.

Who We Are **TAKWEEN PLAST**



About Us "Innovation Expeerts" (Innovation Exports) is the institutional umbrella and the proud owner of the "Takween Plast" brand. This relationship represents a strategic integration combining investment vision with industrial expertise, where "Innovation Expeerts" drives innovation and growth, while "Takween Plast" operates as a distinguished industrial arm representing a strategic consortium of leading Saudi manufacturers. We are committed to delivering sustainable and innovative plastic piping solutions for water drainage, telecommunications, HVAC, and energy applications. We take pride in providing advanced piping systems that align with the evolving requirements of modern infrastructure projects, both regionally and globally. Our strength lies in collaboration, organizational unity, and a shared commitment to excellence. With a strategic presence across key business hubs in the Kingdom of Saudi Arabia, the Gulf region, and the Middle East, TAKWEEN PLAST leverages a highly skilled workforce, a trusted network of distributors, and strong business partnerships to serve a broad and diverse client base. Operating as an integrated network of local manufacturing companies, and collaborating with more than 20 international production partners, TAKWEEN PLAST is supported by a robust distribution chain throughout Saudi Arabia, the GCC, and the wider Middle East. This collective capability enables us to deliver consistent quality, customized solutions, and reliable service across all markets we serve.



OUR MISSION

To build a strong and continuously expanding base of satisfied and loyal customers by consistently delivering high-quality plastic piping systems that meet the highest international standards. We are committed to providing reliable products, innovative solutions, and exceptional service that support the long-term success of our clients and partners while contributing to the sustainable development of modern infrastructure.

OUR VISION

To become a globally recognized leader in plastic piping systems, setting benchmarks for trust, innovation, and manufacturing excellence. Takween Plast aims to lead regional markets through advanced technologies, sustainable solutions, and strategic partnerships, becoming a trusted reference for infrastructure and utility projects worldwide.

Our Core Values

1. **Quality Excellence:** We uphold the highest standards in manufacturing, delivering reliable and long-lasting piping solutions that meet international requirements and exceed customer expectations.
2. **Customer Commitment:** We place our customers at the center of everything we do, building long-term partnerships based on trust, performance, and mutual success.
3. **Innovation & Continuous Improvement:** We continuously develop advanced solutions and enhance our processes to meet evolving infrastructure and industry demands.
4. **Integrity & Reliability:** We operate with transparency, accountability, and consistency, ensuring dependable performance in every project we support.
5. **Sustainability & Responsibility:** We are committed to environmentally responsible manufacturing practices that contribute to sustainable infrastructure development and long-term environmental protection.

HDPE DOUBLE WALL CORRUGATED (DWC) PIPES & FITTINGS

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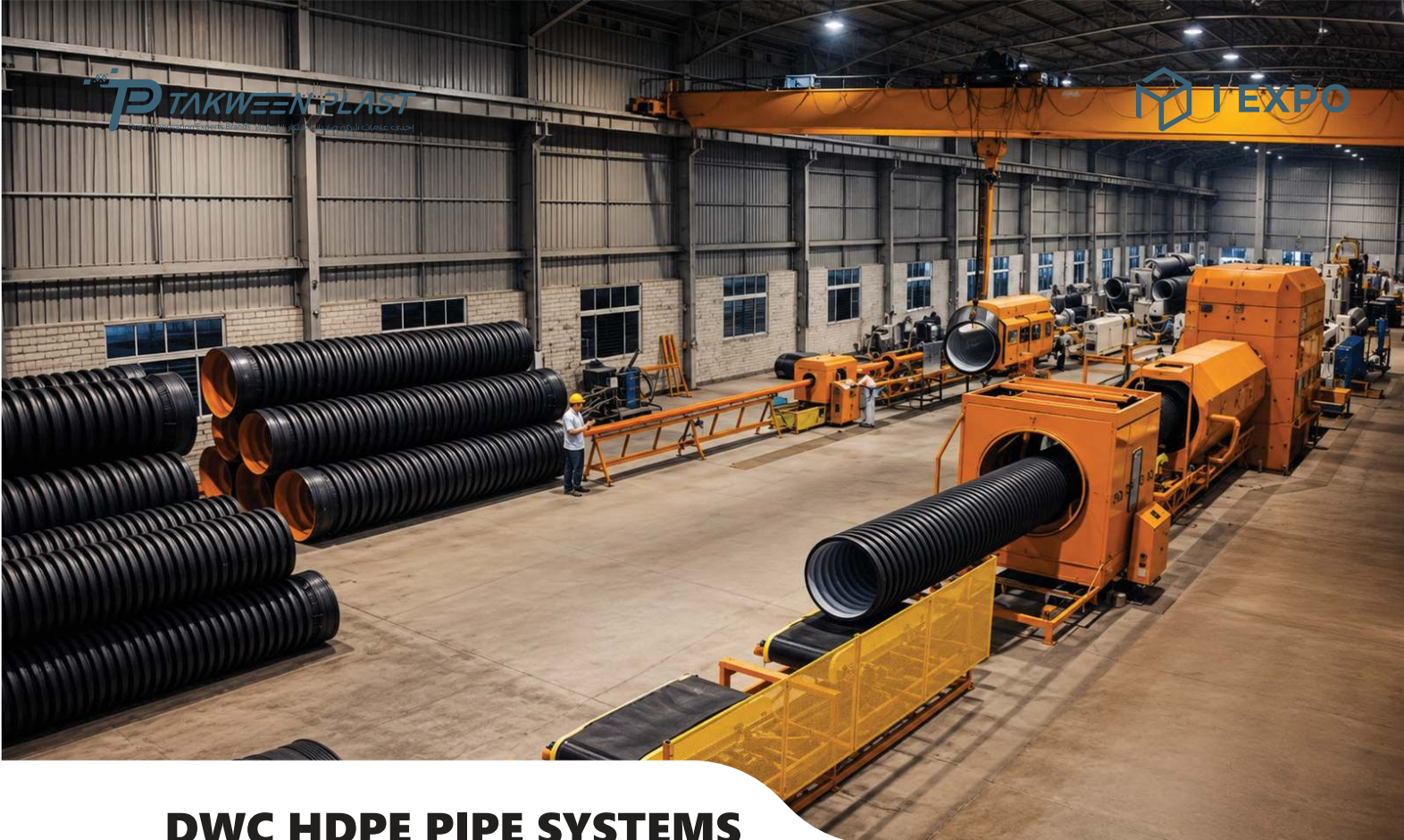
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DWC HDPE PIPE SYSTEMS

DOUBLE WALL CORRUGATED PIPES:

An advanced piping solution designed to provide enhanced strength and durability. These pipes feature a dual-layer structure, consisting of a corrugated outer wall and a smooth inner wall. This innovative design offers excellent resistance to external pressure, making the system ideal for a wide range of applications, including drainage, sewage, and cable protection.

Thanks to their lightweight yet robust construction, double wall corrugated pipes ensure reliable performance in underground installations. They deliver long-lasting durability and maintain efficient flow for both fluids and cables.

TAKWEEN PLAST DWC Pipes are significantly stronger than solid wall pipes of the same wall thickness.

Their unique corrugated external wall structure, combined with a glass-smooth inner surface, ensures uninterrupted flow without blockages while providing the stiffness and flexibility required to withstand both soil and traffic loads.

This innovative design offers an exceptional combination of:

- Minimal internal friction.
- Smooth flow characteristics.
- High flexibility with tight joints.
- Superior strength-to-weight ratio.
- Capability to support and evenly distribute live and dead loads.

These pipes are significantly lighter than traditional solid-wall plastic pipes such as PVC, HDPE, or PP. This exceptional characteristic provides a clear advantage in terms of handling and installation compared to many other conventional pipe systems.

TAKWEEN PLAST has developed highly durable and efficient large-bore pipe systems designed to meet the demanding requirements of modern infrastructure projects.

TECHNICAL GUIDE: STD [EN 13476 / DIN 16961]

Specifications: Polyethylene (PE) pipes with a profiled double-wall structure, featuring a corrugated outer surface and a smooth inner surface.

RAW MATERIAL: High Modulus of Elasticity PE

Polyethylene is a type of thermoplastic known for its exceptional properties that make it suitable for use in water and sewer systems, as well as in the manufacturing of containers for both liquid and solid substances.

PHYSICAL & MECHANICAL PROPERTIES OF MATERIAL

PROPERTIES	VALUE
Density	0.960 kg/m ³
Modulus Of Elasticity	1100 MPa
Elongation	> 600 %
Thermal stability	> 20 min
Oxidation induction	
Color	Black/Orange



The ring stiffness of a pipe refers to its ability to withstand radial forces and resist ring deflection and structural damage. Pipes that are buried, such as sewer and water pipes, are exposed to soil pressure, hydrostatic pressure, and live loads from traffic.

The pipe class SN4 is suitable for light and medium traffic loads, while SN8 and SN12 are designed for heavy traffic loads, as specified in the EN ISO 9969 standard for thermoplastic pipes.

The EN 13476-3 standard emphasizes the importance of the sewerage pipes' resistance to external loads, specifically the ring stiffness (SN). The pipe resistance is a characteristic feature of elastic pipes and is determined by the relationship between geometric data and material properties.

TECHNICALLY, THE PIPE'S RING STIFFNESS IS DEFINED AS:

$$SN = \frac{EI}{Dm^3}$$

WHERE:

- E = Modulus of elasticity (Pa)
- I = Moment of inertia (m⁴/m)
- Dm = Mean diameter of the pipe (m)

STANDARD RING STIFFNESS CLASSES AS PER ISO 9969 INCLUDE:

- SN 4** SN 4 (4 kN/m²)
- SN 8** SN 8 (8 kN/m²)
- SN 12** SN 12 (12 kN/m²)

WHY IT MATTERS
Higher ring stiffness means higher load resistance, better durability, and long-term performance in demanding applications.

- High structural performance
- Better load resistance
- Long-term durability
- Reliable in demanding applications

STRENGTH VS STIFFNESS

Strength and stiffness are distinct physical properties of materials, with strength denoting the ability to endure force and pressure, while stiffness indicates resistance to deformation.

Strength and stiffness, though related, differ in that strength is about withstanding stress without breaking, while stiffness is about resisting deformation under stress.



Application Field

TAKWEEN PLAST Double Wall Corrugated Pipes are designed for long-term performance with minimal maintenance. They are commonly used in:

- Underground drainage and sewer systems.
- Industrial effluent disposal.
- Storm-water drainage.
- Rainwater harvesting.
- Groundwater recharge.
- Road and highway cross-drainage applications.

TAKWEEN PLAST Double Wall Corrugated Pipes

Our innovative corrugated pipes are meticulously developed by our dedicated R&D team and manufactured using advanced, specialized machinery. They fully comply with EN 13476 and DIN 16961 standards, making them suitable for a wide range of applications, including private sewage systems, public wastewater drains, and industrial wastewater discharge under specific conditions.

TAKWEEN PLAST ensures that all sewage pipe systems undergo rigorous inspection and approval by national authorities before entering the market. The company is globally recognized for its expertise in combining a smooth inner wall with a profiled outer wall, utilizing premium HDPE material to meet market demands and customer expectations for optimal rigidity, flexibility, and material quality.

Applicable Standards

TAKWEEN PLAST Double Wall Corrugated (DWC) Pipes are manufactured in accordance with the following international and local standards: SASO ISO 21138-(1, 2, 3), EN 13476 (Parts 1–3) and DIN 16961.

EN 13476-1	PART1 – GENERAL REQUIREMENTS AND PERFORMANCE CHARACTERISTICS
EN 13476-3	PART 3 – SPECIFICATIONS FOR PIPES AND FITTINGS WITH SMOOTH INTERNAL AND PROFILED EXTERNAL SURFACE AND THE SYSTEM, TYPE B
EN 13476-4	PART 4 – ASSESSMENT OF CONFORMITY
EN ISO 9969	THERMOPLASTICS PIPES – DETERMINATION OF RING STIFFNESS
EN ISO 9967	PLASTICS PIPES – DETERMINATION OF CREEP RATIO
ISO 12091	STRUCTURED WALL THERMOPLASTICS PIPES – OVEN TEST
ISO 13967	THERMOPLASTICS FITTINGS – DETERMINATION OF RING STIFFNESS
EN 681-2	ELASTOMERIC SEALS – MATERIAL REQUIREMENTS FOR PIPE JOINTS SEALS USED IN WATER AND DRAINAGE APPLICATIONS – PART 2: THERMOPLASTIC ELASTOMERS
EN 1610	CONSTRUCTION AND TESTING OF DRAINS AND SEWERS
DIN16961	SIZES RANGES COVERED BY EN13476 -DN100-DN1200 & THE ONLY EU STANDARD COVERED SIZES OVER DN1200 MM IS DIN16961 SO FOR LARGE DIAMETER PIPES MANUFACTURE MADE ACCORDING TO DIN16961

UNIQUE FEATURES OF DWC PIPES

1. **Corrosion & Chemical Resistance** DWC pipes offer exceptional resistance to corrosion, chemicals, and abrasion, ensuring outstanding durability. Unlike metal or concrete pipes, they provide superior protection against biogenic hydrogen sulfide corrosion, which is critical for the longevity of buried pipelines. Biogenic sulfide acid corrosion affects only partially filled pipes above the water level. With DWC systems, maximum security and durability are guaranteed thanks to the advanced materials used.
2. **Flawless Hydraulic Characteristics** The smooth inner surface, with a constant coefficient of 0.009 – 0.010, ensures highly efficient wastewater disposal. This smoothness minimizes the risk of blockages and enhances flow performance, delivering up to 40% higher carrying capacity compared to concrete pipes.
3. **Resistance to Weathering & UV** Black polyethylene pipes demonstrate long-term resistance to atmospheric corrosion and UV radiation. This feature allows safe outdoor use and storage without degradation, aging, or loss of performance.

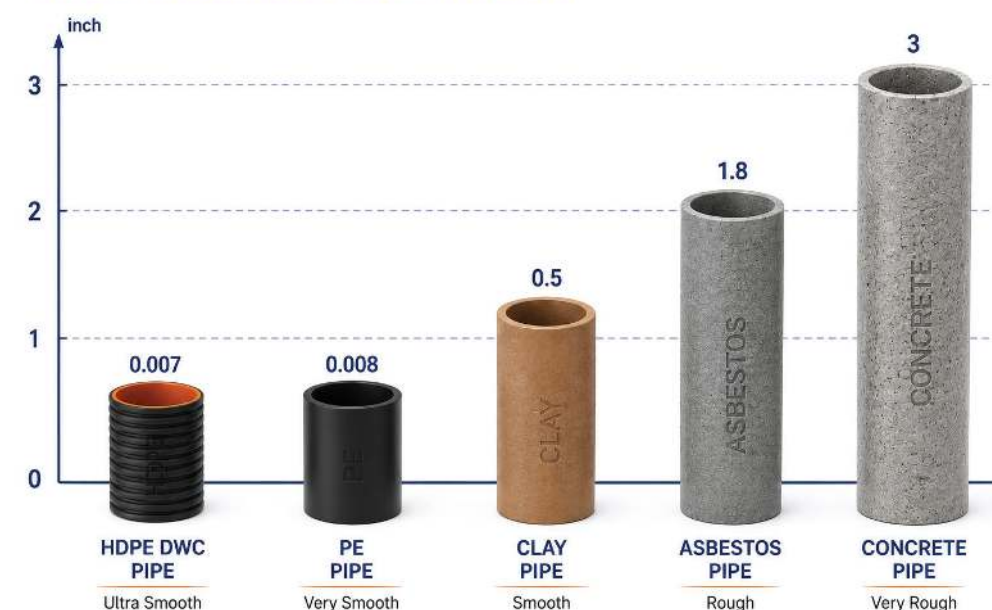
DEFLECTION & FLEXURE

The settlement of the soil controls the deflection of flexible pipes, rendering traffic and other loads ineffective after settlement. In contrast, when pipes are stiffer than the soil, they must resist the traffic and other loads. Practical experience has demonstrated that flexible pipes (b) are more effective in resisting traffic and other loads compared to rigid pipes (a) made of concrete or other inflexible materials. The flexible pipes deflect to accommodate selective strain, allowing the surrounding soil to absorb the strain.

HIGHLY DURABLE AGAINST BACTERIA, VIRUSES, RODENTS, AND TERMITES.

Rodents are unable to cause damage to plastic pipes due to their smooth and round surface, which does not provide enough grip for their teeth. Additionally, it is worth noting that termites have never caused any damage to polyethylene pipelines in countries where they are prevalent. Furthermore, polyethylene and polypropylene do not serve as a food source for bacteria, fungi, or spores, making them highly resistant to microbial attacks, as well as sulfide acid and sulfates.

WALL ROUGHNESS COMPARISON





HDPE CORRUGATED PIPE VS CONCRETE FEATURE COMPARISON

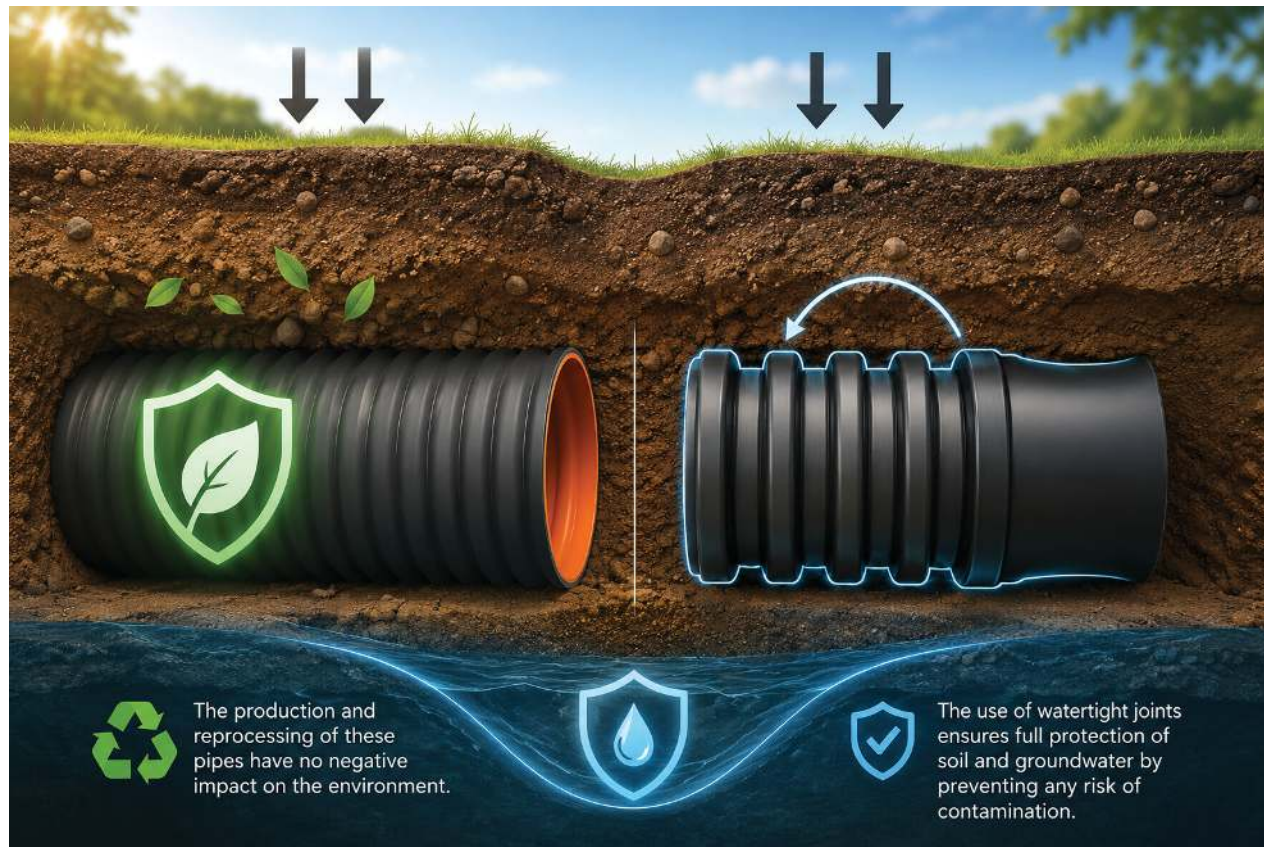
PARAMETERS	HDPE CORRUGATED PIPES	CONCRETE
Length of pipes available	6.0 m	2.0 – 2.5 m
Pipe material property	Flexible pipe	Rigid pipe
Pipe design (structural property)	Its flexibility enables it to deform in diameter and joints when subjected to external loads and natural soil movements, allowing it to function for years without impacting the environment.	The inflexible nature of the material prevents it from bending, resulting in damage when subjected to external pressure or leaks caused by soil movement at the joint. This can lead to the contamination of groundwater by sewage, posing a threat to the environment.
Pipe jointing	Socket & Spigot joint with elastomeric sealing ring.	1. Coller joint with help of cement mortar. 2. Socket & Spigot joint with rubber ring and cement mortar.
Pipe weight	Very light	Heavy (19-20 times heavy than DWC pipes)
Pipe roughness coefficient	0.009 The increased flow rate is a result of the lower roughness coefficient, leading to smaller pipe diameter requirements during design when compared to concrete and DI pipes.	0.014 A higher roughness coefficient results in a lower flow rate, leading to a larger pipe diameter requirement compared to DWC pipe during the design process.
Handling of pipe	Easy due to its light weight	Difficult due to its heavy weight
Chemical and Corrosion resistance	This material exhibits exceptional resistance to chemicals and corrosion, particularly against Hydrogen Sulphide gas commonly found in sewer pipes, as well as other harsh chemicals.	Cement is vulnerable to harm caused by strong chemicals and corrosion, making it unsuitable for exposure to Hydrogen Sulphide gas. Therefore, Sulphate resistant cement is utilized in its production to prevent deterioration.
Installation	Excellent flexibility, minimal foundation requirements for installation, superior bending capabilities.	The pipe has a high level of rigidity and requires a strong foundation for installation. It is not easily maneuverable or flexible, and connecting it with other pipes can be challenging.
Pipe class	Stiffness class SN 4, SN 8 (Non-Internal Pressure Applications)	NP 1, NP 2, NP 3, NP 4 (Non-Internal Pressure Applications)
Pipe stacking on site	By stacking pipes on a level ground, it is possible to nest smaller diameter pipes inside larger diameter pipes.	The items are arranged individually on a flat surface. They are too heavy to be stacked on top of each other.
Pipe handling on field	This product is designed to be lightweight, ensuring safe and easy manual handling. Additionally, it offers high impact resistance and is virtually unbreakable even when mishandle	Excessive weight can result in compromised safety during handling, potentially causing damage as a result of improper handling practices.
Working features	High safety under buried installation	Low safety under buried installation
Lifetime	More than 50 years	Around 15-20 years

FLOW RATE COMPARISON

Size	Concrete				HDPE Corrugated Pipe			
	Flow Capacity (m3/s) at 1% Slope		Flow Capacity (m3/s) at 10% Slope		Flow Capacity (m3/s) at 1% Slope		Flow Capacity (m3/s) at 10% Slope	
	at 60% fullness	at 70% fullness	at 60% fullness	at 70% fullness	at 60% fullness	at 70% fullness	at 60% fullness	at 70% fullness
225mm	0.028	0.0349	0.0886	0.1104	0.042	0.0524	0.1329	0.1657
250mm	0.0371	0.0462	0.1173	0.1462	0.0559	0.0696	0.1767	0.2202
300mm	0.0603	0.0752	0.1908	0.2377	0.0905	0.1128	0.2863	0.3568
400mm	0.1299	0.1619	0.4108	0.512	0.1954	0.2435	0.618	0.7702
500mm	0.2356	0.2936	0.7449	0.9283	0.3548	0.4422	1.122	1.3983
600mm	0.3831	0.4774	1.2113	1.5095	0.5749	0.7164	1.818	2.2656



GREEN / SUSTAINABLE



The production and reprocessing of these pipes have no negative impact on the environment. Additionally, the use of watertight joints ensures full protection of soil and groundwater by preventing any risk of contamination.

ECONOMICAL/ AFFORDABLE

These pipes deliver remarkable cost saving weight reduction of 60–70% compared to plastic pipes and are up to 95% lighter than concrete pipes, making them one of the most cost-solutions available.



EXCELLENT STIFFNESS

The durability of these pipes allows them to withstand heavy overload pressure, including soil and traffic loads, as well as sustain the different loads encountered during installation and use.

MAINTENANCE-FREE SOLUTION

Without scaling, encrustation, or chemical reactivity, regular maintenance is unnecessary. Periodic flushing with water maintains a smooth surface and improves functionality.

EXTENDED LIFESPAN

Designed to resist corrosion, chemical reactions, and abrasion, these pipes guarantee exceptional durability with a service life exceeding 100 years.

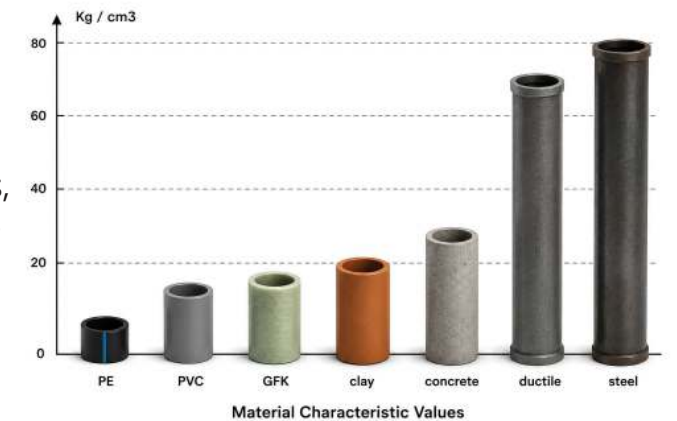
WATERPROOF CONNECTIONS

The joints are 100% watertight, preventing leakage, infiltration, ex-filtration, or even root penetration. This ensures maximum protection of the surrounding environment and eliminates any risk of soil or groundwater contamination.

INSTALLATION MADE SIMPLE AND FAST

The installation process is made easier and faster with longer and lighter pipes. Slip-on techniques are used to easily connect these pipes, either with integrally welded couplers or separate couplers.

Unlike traditional concrete or metallic pipes, these pipes are lightweight and do not need heavy equipment for installation. This makes it convenient to lay them in restricted areas, resulting in cost savings.

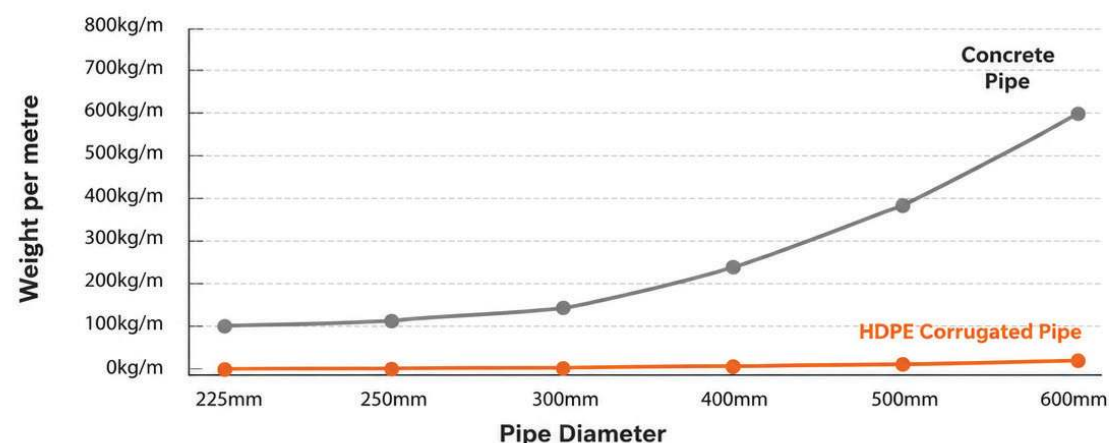


The table clearly illustrates that HDPE Corrugated Pipes provide a significantly higher flow rate due to their lower roughness coefficient. As a result, when designing pipeline systems, it is often possible to use a smaller diameter TAKWEEN PLAST HDPE Corrugated Pipe compared to concrete pipes of the same nominal size—while still achieving equal or superior hydraulic performance.



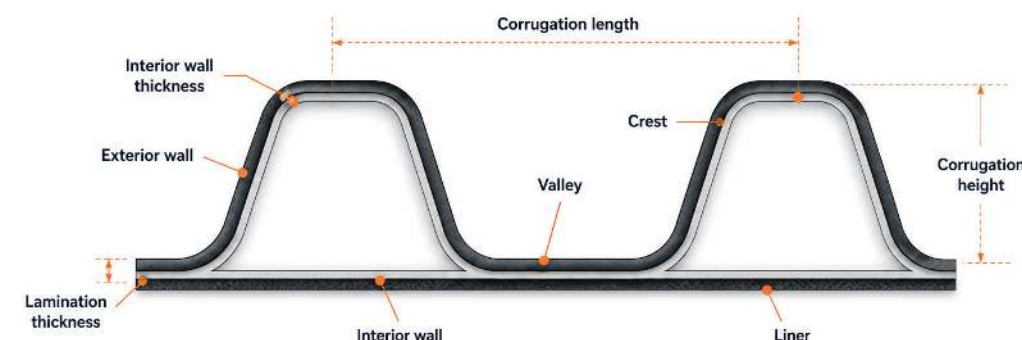
WEIGHT COMPARISON

The weight disparity between TAKWEEN PLAST HDPE Corrugated Pipes and Concrete Pipes is clearly depicted in the below chart. Consequently, these pipes offer enhanced convenience and safety during handling and allow for easier field adjustments. As a result, installation costs and time are reduced.



DOUBLE WALL CORRUGATED PE PIPES AND FITTINGS [DIN16961 /EN13476]

SYSTEM	EN13476-DIN16961
MATERIAL	HIGH MODULUS OF ELASTICITY PE
SIZES	ID 100 - 1000mm
STIFFNESS KN/M2	SN4 & SN8
PERFORATION	APPLICABLE
JOINTING	RUBBER GASKET - EN681



PIPE DIMENSION

The material and profile design are crucial factors for the product's success, with **TAKWEEN PLAST** pipes are engineered and customized to meet specific requirements outlined in DIN 16961 and EN 13476 profile design standards.

TABLE 1: PIPE DIMENSION.

NOMINAL SIZE DN (MM)	ID* (MM)	OD* (MM)	STIFFNESS CLASS KN/M2
100	98	113	SN4 / SN8
150	148	171	SN4 / SN8
200	197	228	SN4 / SN8
250	247	286	SN4 / SN8
300	296	344	SN4 / SN8
400	394	458	SN4 / SN8
500	493	576	SN4 / SN8
600	593	691	SN4 / SN8
800	791	923	SN4 / SN8
1000	989	1151	SN4 / SN8

Approximate

SN Stands for Nominal Ring Stiffness. It represents the Ring Stiffness of a flexible pipe and indicates the pipes' ability to resist Traffic Load as well as Soil Load against proposed depth

BASIC SELECTION OF SN CLASS OF PIPE

The selection of SN class of Pipe depends upon major two factors:

- 1- Burial depth (Cover height).
- 2- Type of Traffic load on site.



ON PIPE RING STIFFNESS

The double wall corrugated pipes are available with a **Blue Sideline** and Ring Stiffness SN4, while the pipes with an **Orange Sideline** have Ring Stiffness SN8.



DWC PIPES LENGTH

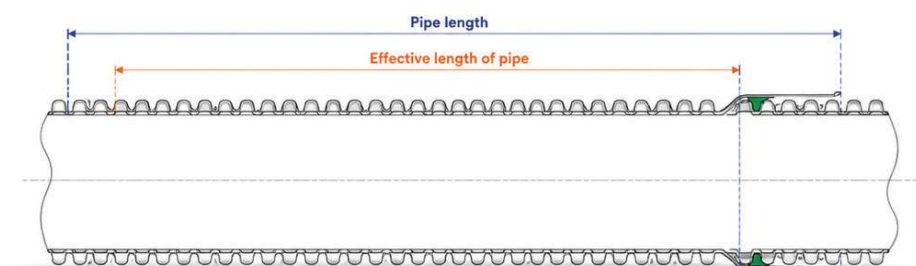


TABLE 2: PIPE LENGTH.

ID* (MM)	TOTAL LENGTH OF PIPE WITH SOCKET	EFFECTIVE LENGTH	SOCKET LENGTH
100	6261	6171	90
150	6164	6043	121
200	6187	6048	139
250	6213	6052	161
300	6220	6018	202
400	6237	6004	233
500	6317	6032	285
600	6306	5983	323
800	6254	5907	347
1000	6286	5912	374

The corrugated pipes displayed here have been developed by our research and development team and manufactured using a specially designed series of machines. They fully comply with the standards of EN 13476 and DIN 16961, making them suitable for various applications such as sewage systems on private properties, public wastewater drains, and industrial wastewater discharge under specific conditions.

On-Site Features

TAKWEEN PLAST pipes offer significant on-site advantages:

- Built-in socket for easy custom length adjustment.
- Tool-free connections – no welding or bonding required; simply connect manually.
- Single gasket per connection ensures a secure and watertight joint.

TAKWEEN PLAST corrugated pipes offer outstanding usability. Various connection concepts are available for pipe systems, with the inline produced single-layer socket system being the most cost-effective based on a practical model calculation. TAKWEENPLAST PIPES opted for this technology for their pipe production.

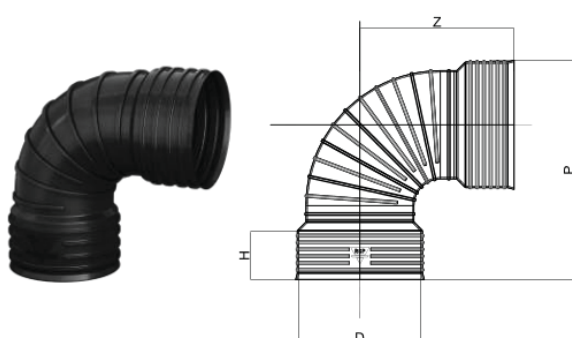
SYSTEM	EN13476-DIN16961
MATERIAL	HIGH MODULUS OF ELASTICITY PE
SIZES	ID 100 – 1000 MM
STIFFNESS KN/M2	SN4 & SN8
JOINTING	RUBBER GASKET - EN681
FABRICATED FITTINGS	APPLICABLE
FABRICATED BACKDROP	APPLICABLE

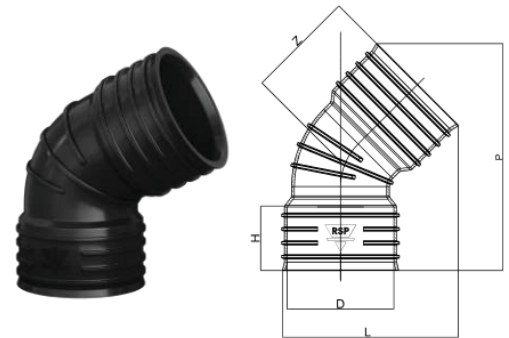


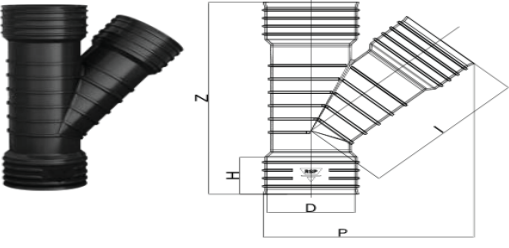
FITTINGS

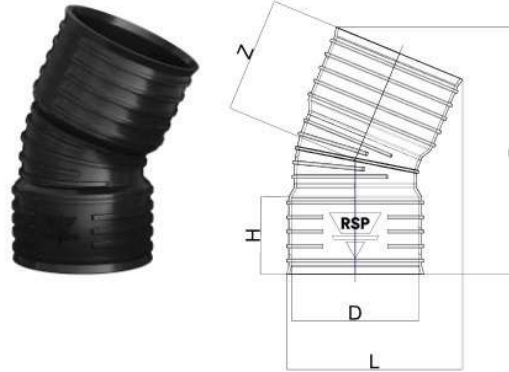
DOUBLE WALL CORRUGATED HDPE Drainage Fittings consist of a high-density polyethylene pipe that features a smooth interior wall and a corrugated exterior wall, providing excellent hydraulic performance and durability. Our range of fittings includes bends with angles of 22.5°, 45°, and 90°, catering to all requirements of our Double pipes.

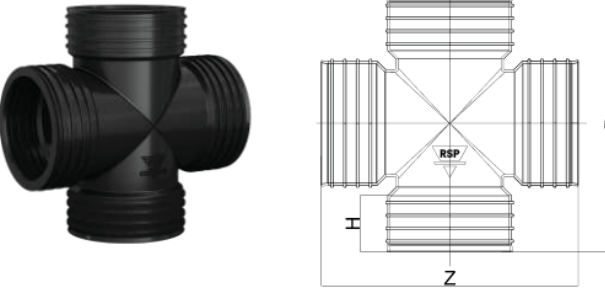
Polyethylene molded fittings are designed for use in non-pressurized sewerage and drainage systems. These fittings, available in black, come in standard shapes and angles, with joint sockets on both ends.

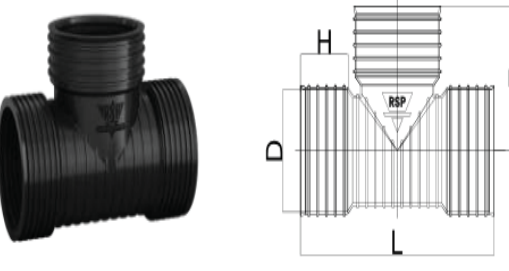
ELBOW 90°	Size (D) (mm)	H (mm)	Z (mm)	P (mm)	Stiffness SN kN/m²
	100	70	174	237	SN4 / SN8
	150	113	266	363	SN4 / SN8
	200	134	336	461	SN4 / SN8
	250	155	407	564	SN4 / SN8
	300	190	493	681	SN4 / SN8
	400	168	574	821	SN4 / SN8
	500	218	724	1031	SN4 / SN8
	600	270	877	1247	SN4 / SN8
	800	314	1179	1672	SN4 / SN8
	1000	408	1409	2017	SN4 / SN8

ELBOW 45°	Size (D) (mm)	H (mm)	Z (mm)	L (mm)	P (mm)	Stiffness SN kN/m²
	100	70	118	190	246	SN4 / SN8
	150	113	184	295	383	SN4 / SN8
	200	134	222	363	460	SN4 / SN8
	250	155	272	459	573	SN4 / SN8
	300	190	330	552	694	SN4 / SN8
	400	168	357	672	782	SN4 / SN8
	500	218	458	846	997	SN4 / SN8
	600	270	548	1017	1194	SN4 / SN8
	800	374	758	1375	1640	SN4 / SN8
	1000	408	911	1679	1983	SN4 / SN8

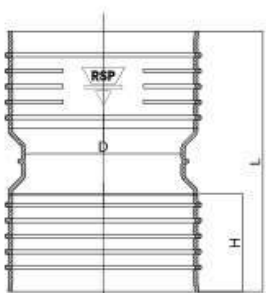
Y-TEE	Size (D) (mm)	I (mm)	H (mm)	Z (mm)	P (mm)	Stiffness SN kN/m²
	100	70	241	360	278	SN4 / SN8
	150	113	371	553	427	SN4 / SN8
	200	134	466	713	541	SN4 / SN8
	250	155	562	851	664	SN4 / SN8
	300	190	698	1021	813	SN4 / SN8
	400	168	814	1148	996	SN4 / SN8
	500	218	1039	1448	1257	SN4 / SN8
	600	270	1277	1824	1533	SN4 / SN8
	1000	408	1911	2824	2353	SN4 / SN8

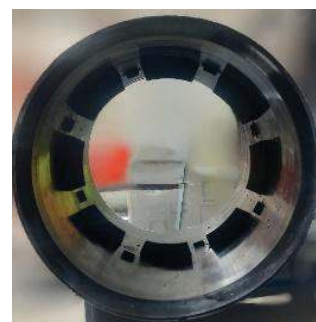
ELBOW 22.5°	Size (D) (mm)	H (mm)	Z (mm)	L (mm)	P (mm)	Stiffness SN kN/m²
	100	70	118	162	230	SN4 / SN8
	150	113	184	248	351	SN4 / SN8
	200	134	222	301	426	SN4 / SN8
	250	155	272	391	512	SN4 / SN8
	300	190	330	471	628	SN4 / SN8
	400	168	357	593	694	SN4 / SN8
	500	218	458	734	846	SN4 / SN8
	600	270	548	891	1049	SN4 / SN8
	800	374	758	1189	1408	SN4 / SN8
	1000	408	911	1461	1711	SN4 / SN8

CROSS TEE	Size (D) (mm)	H (mm)	Z (mm)	P (mm)	Stiffness SN kN/m²
	100	70	280	280	SN4 / SN8
	150	93	396	396	SN4 / SN8
	200	110	502	502	SN4 / SN8
	250	118	586	586	SN4 / SN8
	300	145	710	710	SN4 / SN8
	400	168	890	890	SN4 / SN8
	500	220	1120	1120	SN4 / SN8
	600	270	1340	1340	SN4 / SN8
	800	374	1830	1830	SN4 / SN8
	1000	409	2220	2220	SN4 / SN8

EQUAL TEE	Size (D) (mm)	H (mm)	Z (mm)	L (mm)	P (mm)	Stiffness SN kN/m²
	100	70	143	284	207	SN4 / SN8
	150	113	218	436	313	SN4 / SN8
	200	134	275	550	400	SN4 / SN8
	250	155	330	660	486	SN4 / SN8
	300	190	400	800	586	SN4 / SN8
	400	168	445	890	691	SN4 / SN8
	500	218	560	1120	867	SN4 / SN8
	600	270	670	1340	1038	SN4 / SN8
	800	374	915	1830	1403	SN4 / SN8
	1000	408	1110	2220	1720	SN4 / SN8

DWC HDPE Fittings.

COUPLER		Size (D) (mm)	H (mm)	L (mm)	Stiffness SN kN/m ²
 		100*	70	205	SN4 / SN8
		150*	113	329	SN4 / SN8
		200*	134	361	SN4 / SN8
		250*	155	417	SN4 / SN8
		300*	190	472	SN4 / SN8
		400	168	444	SN4 / SN8
		500	218	586	SN4 / SN8
		600	270	701	SN4 / SN8
		800	374	943	
		1000	408	1040	



QUALITY ASSURANCE

Product Testing

To ensure that our products meet the highest manufacturing standards, TAKWEEN PLAST guarantees consistent technical performance.

This is achieved through rigorous product testing conducted either by a TAKWEEN PLAST accredited ISO/IEC 17025:2017 laboratory or by a reputable third-party laboratory.

Our testing capabilities cover all necessary assessments in accordance with DIN 16961 and EN 13476 standards. These tests are essential to maintain the high quality and reliable performance of our Double Wall Corrugated Polyethylene Pipes.

Quality, testing, and certification are central to our commitment to excellence.

Tests for Quality:

1. Ring Flexibility
2. Oxidation Induction Time Test
3. Impact Test
4. Melt Flow Index Test
5. Ring Stiffness
6. Creep Ratio
7. Physical Properties
8. Water Tightness Test
9. Effect of Heating



Key factors that influence the performance and long-term reliability of DWC Pipes



EXCAVATION:

TRENCH PREPARATION:

Prior to pipe installation, a sand bedding layer must be prepared at the base of the trench. This layer minimizes pressure on the pipes, protecting them against potential damage such as breakage, bending, or deflection caused by soil movement, rocks, or sharp objects. The bedding thickness beneath the pipes should be equivalent to one-third of the pipe's outer diameter, ensuring proper support and long-term stability. The excavation dimensions must be determined according to the required bedding height above the pipes, as well as the trench width, to preserve the overall integrity and functionality of the pipeline system.

ELEVATION OF BEDDING OVER THE PIPES:

Road Type	The minimum Depth m
Traffic	1.2
Side	0.9
Other destination	0.6
agriculture / Farms	0.45

WIDTH OF EXCAVATION:

Pipes OD MM	The minimum Width Per Each Side
<315	30 cm
≥ 315	40 cm



Bedding Layer Thickness & Compaction

- For rocky soil, the bedding layer beneath the pipes should have a minimum thickness of 15 cm.
- For sandy soil, the bedding layer should be at least 30 cm thick.
- Proper compaction of the bedding layers is essential. Use compaction equipment to compact the soil up to 150 mm above the top of the pipe, while avoiding direct compaction over the pipe crown to prevent damage.

TAKWEEN PLAST DWC Pipes & Fittings

- Nominal Diameter: 100 to 1000 mm
- Effective Length: 6 meters
- Jointing: Rubber gasket connections in accordance with EN 681
- Pipe Type: Socket and spigot
- Ring Stiffness Options: 4 and 8 kN/m²



Storage Guidelines

- Maximum vertical stacking height: 3 meters
- Ensure the storage surface is level
- Avoid applying any load or stress on the pipe sockets



Bedding for Trench (According to EN 1610 & ISO 16098 Standards)

Bedding for trench according to EN1610 - ISO 16098 standards.
Sand material used for trench bedding with 150:300 mm height.
Measurement of trench bedding in terms of width and depth.

DN (Pipes)	Minimum trench width (OD + x) m
	Supported Trench
<225	OD+0.40
>225 to <350	OD+0.50
>350 to <700	OD+0.70
>700 to <1200	OD+0.85
>1200 to	OD+1.00

The minimum working space between the pipe and the trench wall or support is equal to half of the sum of the external diameter (OD) and x, where OD represents the external diameter in meters.

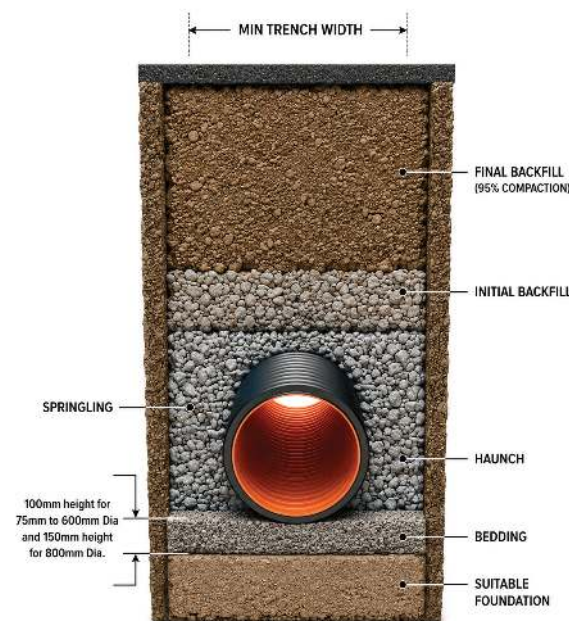
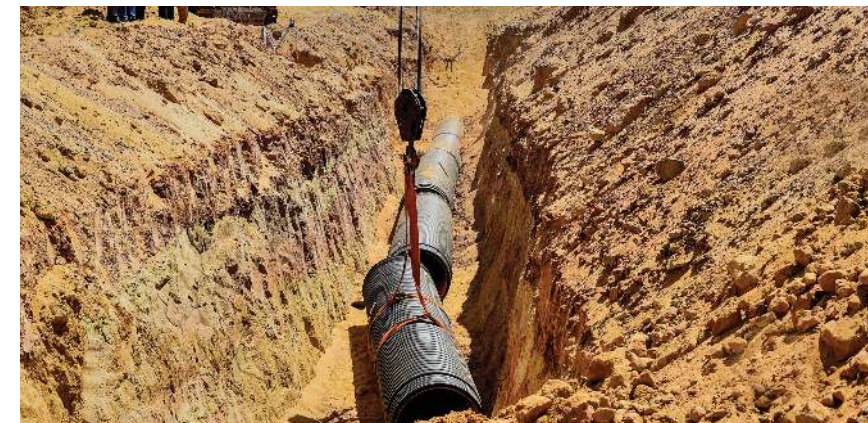


Figure 7: Cross Section of a Typical Trench

Maximum and Minimum Burial Depths for SN4 and SN8 Pipes



The load carrying capacity of pipes and their surrounding soil envelope depends on Several factors:

Cover Height:

- Minimum cover heights are determined by the type of backfill and the expected traffic loads.

Burial Depth:

- Increasing burial depth allows the live load to be distributed over a larger area of surrounding soil.
- However, it also increases the weight of the soil column directly above the pipe.

Maximum Cover Height Influenced by factors such as:

- Pipe stiffness class (SN4, SN8)
- Groundwater table level
- Backfill material
- Maximum allowable burial depth

Pipe Class Recommendations:

- SN4 Pipes: Suitable for low or negligible traffic loads and shallow burial depths.
- SN4 & SN8 Pipes: Recommended burial depths range from 0.8 m to 6.0 m, depending on soil conditions and load requirements.

NOTES

- The installation should adhere to the guidelines set by the standards followed by **TAKWEEN PLAST**.
- The height of the cover will vary depending on the backfill material and soil stiffness.
- The minimum depth of cover should be measured from the top of the pipe's crown to the ground level.
- The design deflection limits recommended are in accordance with the standards followed by **TAKWEEN PLAST**.

INSTALLATION GUIDELINES (PROCEDURES)

CLEANING

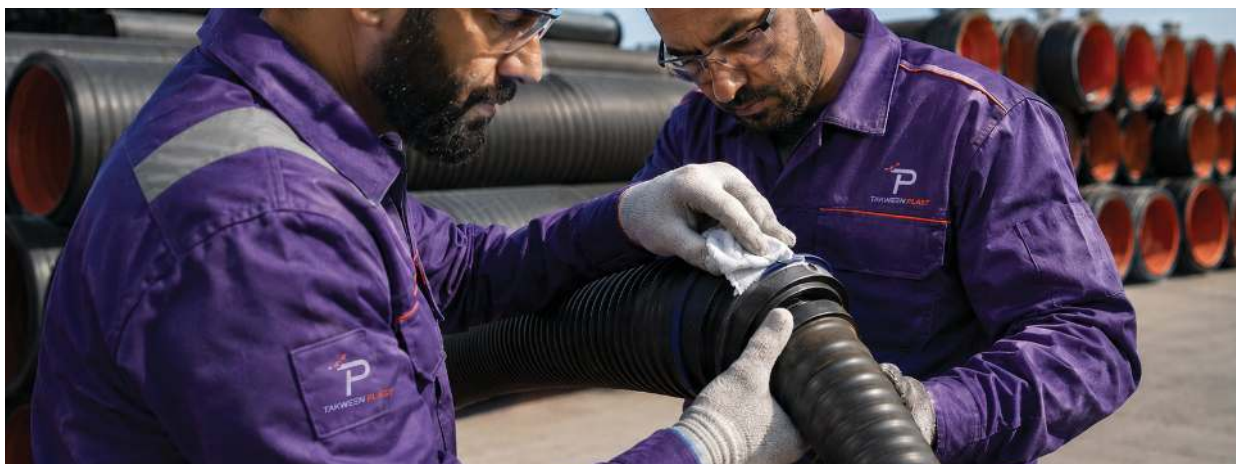
A- SOCKET CLEANING



B- SPIGOT CLEANING



C- RUBBER GASKET CLEANING



2- PLACE THE GASKET BETWEEN THE INITIAL CORRUGATED VALLEY



3- LUBRICATING



Ensure the socket is properly lubricated.

Lubricate the rubber gasket for better performance.

4- JOINTING

JOINTING JACK METHOD



ROPE METHOD

- Insert the spigot with jointed gasket into the socket ensuring proper vertical and horizontal alignment, and maintain the pipe level throughout the process.
- Apply consistent lateral pressure until the gasket is correctly placed.

BACKHOE METHOD

RUBBER GASKETS



TESTING (IT IS STRONGLY ADVISED TO CONDUCT AN AIR TEST FOR TESTING PURPOSES.)

PRECAUTIONS:

Prior to conducting tests, it is strongly advised to examine the joints for:

- Misalignment.
- Gasket rolling.
- The presence of foreign materials.

TESTING WITH AIR METHOD

Table 3 provides the testing durations for pipelines, excluding manholes and inspection chambers, based on pipe size and testing methods (LA; LB; LC; LD). Initially, a pressure that is about 10% higher than the required test pressure, P₀, should be maintained for approximately 5 minutes. Subsequently, the pressure should be adjusted to the test pressure specified in table 3 for testing methods LA, LB, LC, or LD. If the pressure drop observed after the designated testing period is lower than the value Δ mentioned in table 3, the pipeline is considered compliant.

Testing Method	P ₀ kPa	ΔP kPa	Testing Time Min						
			DN100	DN200	DN300	DN400	DN600	DN800	DN1000
LA	10 (1)	25.5 (0.25)	5	5	7	10	14	19	24
LB	50 (5)	10 (1)	4	4	6	7	11	15	19
LC	100 (10)	15 (1.5)	3	3	4	5	8	11	14
LD	200 (20)	15 (1.5)	1.5	1.5	2	2.5	4	5	7
K _p -Values			0.058	0.058	0.04	0.03	0.02	0.015	0.012

$$t = \frac{1}{K_p} \times \frac{P_0}{P_0 - \Delta P} \quad K_p = \frac{12}{DN}$$

Table 3: Test pressure, pressure drop and testing times for testing with air

With t rounded to the nearest 0,5 minute
when t ≤ 5 min, to the nearest minute when t > 5 min.

TESTING STEPS:

- 1- The compressor is positioned at one end of the pipeline for testing purposes.
- 2- Once the end of the pipe is confirmed to be clean, an inflatable balloon is inserted and pressurized with air until it covers the entire diameter of the pipe opening.
- 3- opening.
- 4- The compressor is then relocated to the opposite end of the pipeline.
Following the cleaning of the hole, a balloon designed for filling and pushing
- 5- is placed inside the pipe.
- 6- The balloon is inflated with air until it completely covers the pipe opening.
Subsequently, the air inlet of the balloon is redirected to fill the line, and the pipes are pressurized to the required level.
- 7- A gauge is attached to the balloon filling channel to monitor the air pressure inside the pipeline throughout the designated testing period.

TESTING PROCEDURES:

- 1-Test duration depends on the diameter of the pipes being tested.
- 2-The gauge is monitored once the required pressure is reached, for a period corresponding to the tested diameter.
- 3-Table (1) displays the test duration, test pressure value, and corresponding diameter according to European code EN1610.



DWC-SOIL STIFFNESS

The HDPE corrugated pipe is a flexible pipe used in municipal engineering. Buried flexible pipes share the earth's pressure with the surrounding soil. Due to the pipe's lower stiffness compared to the soil, when a load is applied, the adjacent soil prism deflects less than the central soil prism. This results in an upward friction force on the central soil prism, causing the earth pressure on the pipe to be less than the weight of the central soil prism [1].

The behavior of a buried flexible pipe is affected by both the hoop stiffness of the pipe and the stiffness of the backfill [2].

The stiffness of the backfill is primarily determined by compaction level [3], water content [4], soil properties [5], and grade [6].

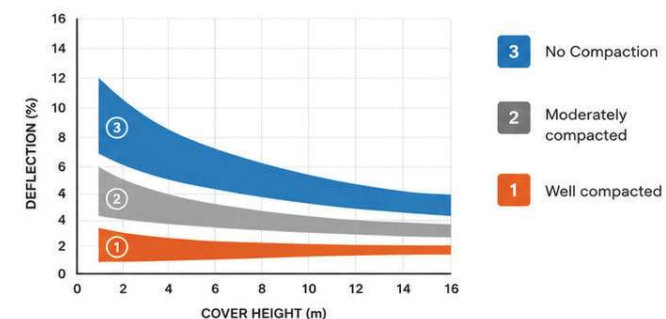
Earth pressure above a flexible pipe significantly impacts pipe deformation, with loads categorized as soil loads and external loads.

The force transferred from external loads to the crown of the pipe varies depending on soil conditions [7] [8].

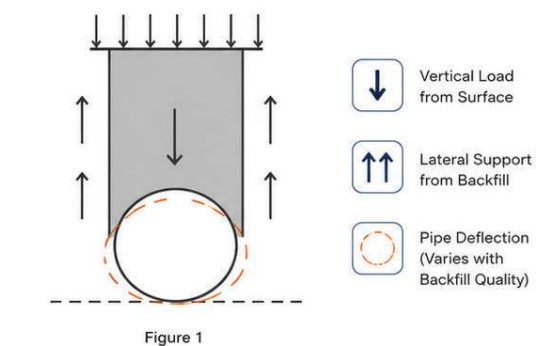
The deformation of a pipe during installation is influenced by factors such as the compaction method [9], compaction equipment [10], groove width, backfill material, backfill pipe cover thickness, pipe diameter, and pipe hoop stiffness [11].

PIPE DEFLECTION & TRENCH BACKFILL QUALITY

The level of pipe deflection depends on the quality of trench backfilling.



INSTALLATION SCHEMATIC



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