

**osman
plast**

Variety of Solutions

The new endeavor

In succession to the construction guru of Egypt Eng. Osman Ahmed Osman, we, at OSMASON complex, have been following his steps to provide the construction industry with various much needed building materials.

Being part of Osman Group, we are keen to follow the group's core values; such as but not limited to innovation and quality excellence to manufacture high performance building materials.

Osmason complex has 3 main business units as follows:

- OsmaBoard, leading manufacturer of Gypsum boards and laminated Gypsum ceiling tiles,
- Osman Plast, Manufacturer of uPVC pipes,
- HDPE concrete liners and Osma Kraft, Kraft sac producer servicing Gypsum industries.

Powered by the will to innovate and the endeavor to excel, our continuous researches conducted by our highly qualified people allow us to meet not only the international standards for our export market but also the local market needs.

Our Mission

- To serve and provide the Egyptian construction industry needs with modern, reliable and affordable products through continuous enhancements and updated products.

Our Vision

- To become the Middle East leader in supplying the building materials and serving the construction industry with our high quality products that exceed our customers' expectations.

Quality Assurance Policy

- To be able to provide a stable and high performance quality, our Quality Assurance process is being observed throughout the supply chain and production processes. This is done by conducting a comprehensive follow-up system that guarantees continuous monitoring process that includes not only the quality of the raw materials but also the final products' one. Our In-House lab testing process coupled with the validation process by conducting periodic testing at well recognized third party's laboratories helps meet the group's Quality Excellence Core Value. We strictly adhere to the industry, local and international standards and comply with regulations and norms.



Our Core Values

- **Integrity;** building trust with customers, communities and suppliers ...
- **Transparency;** ensuring openness, communication, and accountability in our various engagements.
- **Quality Excellence;** building an organizational culture based on high quality products plus operational excellence in thought and in execution.
- **Customer Service;** building long term relationships through extra ordinary service and products that consistently meet our customers' highest standards.
- **Sustainable Improvement;** building an organizational path based on not only searching for the best practices but also thinking out of the box to always guarantee high quality products and creative solutions for the relevant logistical issues.

Osman Plast uPVC pipes

Polyvinyl-Chloride (PVC)

Polyvinyl-Chloride (PVC) is a plastic product which has matchless versatility. Vinyl chloride (VC) is produced from ethylene and chlorine at a ratio of 43% to 57%. VC is the monomeric building block of PVC.

PVC products are derived from a white, odourless powder which is mixed with additives for the further processing of semi-finished and finished products. Such admixtures are not only found in practically all plastics, but also in materials such as glass, steel, concrete, etc.

PVC is one of the few polymers which can be processed thermoplastically and by means of pastes. Thermoplastic processes take place primarily on extruders or so-called screw presses. The final products are pipes, profiles, sheets, tubes, and cables. A Wide Range of Products PVC can be used in numerous products due to its outstanding properties and therefore is an integral part of our lives

Versatile Material Properties PVC is an all-around talent: it is hard and durable or soft and flexible as need be. Simple changes in the formula allow for practically any desired material property. Therefore, PVC exists crystal-clear or coloured, electrically well-insulating or anti- static. This durable plastic is largely resistant to chemicals, weather and abrasion, and harmless to human health. Moreover, the chlorine content makes the material highly flame retardant. Further advantages of the material include efficient production and easy processing as well as the material-saving manufacturing of consumer goods

Economic Factors PVC products are distinguished by their longevity, low costs for maintenance, and recyclability. Their life-cycle costs are correspondingly low: this is a fact that has direct influence on their market success.

- low-energy expenditure in manufacturing and processing.
- the use of the practically unlimited resource of salt.
- the combined production of chlorine and sodium hydroxide.
- low emissions and waste during manufacturing and processing.
- mechanical and feedstock recycling.
- good price-performance ratio of products along with environmental costs.
- immense ecological/social optimization potential based on outstanding economic advantages.

PVC is a modern, high-performance material which will be urgently needed in the future as well. The low share of crude oil saves limited resources and increases the economic efficiency of this material. Longevity and resistance to environmental factors make PVC the material of choice for economic planning and sustainable construction.



PVC Pipes

PVC pipes are the most widely used all over the world on account of their most favourable balance of properties. PVC pipes are light in weight, rates for use under pressure, easy to install, low on maintenance cost, and have low frictional loss. Rigid PVC pipes have wide variety of uses in fields like city/town/rural water supply scheme, spray irrigation, deep tube well schemes and land drainage schemes.

PVC pipes are used for a variety of purposes e.g. water supply schemes, spray irrigation, deep tube well schemes and land drainage schemes.

The usage of PVC pipes also depends upon the size of these pipes too. It is manufactured in different sizes having innumerable usage value.

PVC Pipes Properties

This thermoplastic material is the largest volume member of the vinyl family. It is polyvinyl material for plastic pipe, valves, and fittings. PVC has many advantages over conventional piping materials. Just a few are:

- Corrosion Resistance -outstanding chemical resistance to nearly all acids, alkalis, alcohols, halogens and many other corrosive materials, temperatures.
- Fluid Friction-less friction loss as compared to metallic.
- Lower pressure drop smaller pumps = less electricity
- Less moisture condensation, reduced heat Specifications and requirements are set forth
- Electrical-a nonconductor of electricity
galvanic or electrolytic corrosion that causes expensive repairs.

Technical Data of Osma Plast uPVC Pipes

General Properties at 20deg Celsius		
Test	Unit	Value
Specific gravity		1.42-1.43
Shore Hardness	Deg.	70-90
Tensile Strength	Kg/cm ²	500
Bending Strength	Kg/cm ²	950
Modulus of elasticity	Kg/cm ²	3.2 x 10
Impact Strength Izod	Joules	4.7-5.4
Water absorption	Mg/cm ²	1.05
Elongation AT break	-	>80%
Softening point	°C	80
Fabrication Temperature	°C	110-140
Coefficient of linear expansion @70 °C	Mm/m °C	0.08
Specific Heat	Lcal/kg °C	0.025
Specific volume resistivity	Ohm/cm	>3-5x10 ¹⁵
Dielectric Strength	kV/mm	>40

Fire retarding properties

PVC has inherently superior fire retarding properties due to its chlorine content, even in the absence of fire retardants. For example, the ignition temperature of PVC is as high as 455°C, and is a material with less risk for fire incidents since it is not ignited easily

Furthermore, the heat released in burning is considerably lower with PVC, when compared with those for PE and PP. PVC therefore contributes much less to spreading fire to nearby materials even while burning.

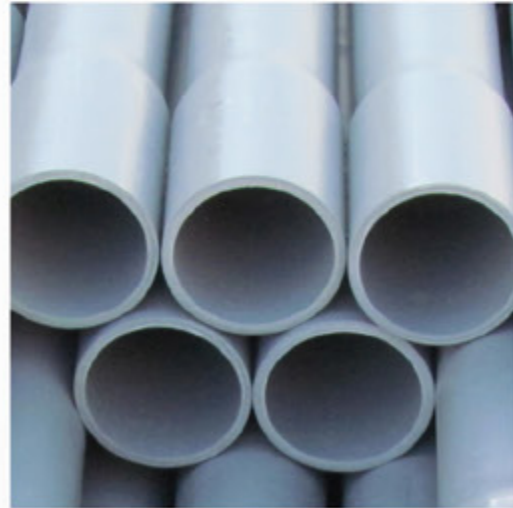
Therefore, PVC is very suitable for safety reasons in products close to people's daily lives.

Osman Plast uPVC pressure pipes

Manufactured according to the German standards DIN8061/8062 ,
The Egyptian Standards 848/2008 and the International standards ISO 1452 .

Usage:

- Pressurized water distribution networks.
- Underground water distribution networks.
- Underground drainage networks.
- Drainage Installations between manholes.
- Irrigation networks.
- Transport of wide range of fluids in the industry.



Product Range

Table 1:Osman Plast uPVC pressure pipes according to Din 8061/8062

Pressure	4 Bar		6 Bar		10 Bar		16 Bar	
	Nominal Diameter (mm)	Thickness (mm)	Weight (Kg/m)	Thickness (mm)	Weight (Kg/m)	Thickness (mm)	Weight (Kg/m)	Thickness (mm)
20	--	--	--	--	--	--	1.5	0.139
25	--	--	--	--	1.5	1.177	1.9	0.215
32	--	--	--	--	1.8	0.264	2.4	0.347
40	--	--	1.8	0.334	1.9	0.355	3	0.533
50	--	--	1.8	0.422	2.4	0.552	3.7	0.809
63	--	--	1.9	0.562	3.0	0.854	4.7	1.29
75	1.8	0.642	2.2	0.782	3.6	1.22	5.6	1.82
90	1.8	0.774	2.7	1.13	4.3	1.75	6.7	2.61
110	2.2	1.16	3.2	1.64	5.3	2.61	8.2	3.9
125	2.5	1.48	3.7	2.13	6.0	3.34	9.3	5.01
140	2.8	1.84	4.1	2.65	6.7	4.18	10.4	6.27
160	3.2	2.41	4.7	3.44	7.7	5.47	11.9	8.17
180	3.6	3.02	5.3	4.37	8.6	6.88	13.4	10.4
200	4.0	3.7	5.9	5.37	9.6	8.51	14.9	12.8
225	4.5	4.7	6.6	6.76	10.8	10.8	16.7	16.1
250	4.9	5.65	7.3	8.31	11.9	13.2	18.6	19.9
280	5.5	7.11	8.2	10.4	13.4	16.6	20.8	24.9
315	6.2	9.02	9.2	13.2	15	20.9	23.4	31.5
355	7.0	11.4	10.4	16.7	16.9	26.5	26.3	39.9
400	7.9	14.5	11.7	21.1	19.1	33.7	29.7	50.8
450	8.9	18.3	13.2	26.8	21.5	42.7	--	--
500	9.8	22.4	14.6	32.9	23.9	52.6	--	--
560	11.0	28.1	16.4	41.4	26.7	65.8	--	--
630	12.4	35.7	18.4	52.2	30.0	83.2	--	--

Pipes are offered in Light Grey (LG) and /or Dark Grey (DG) colour in standard lengths of 6 meter.

Pipes are offered plain or single socketed, based on diameter and class of pipe.

Table 3: Osman Plast uPVC pressure pipes according to ES 848/2008 with C=2.5

OD mm	PN6		PN8		PN10		PN12.5		PN16		PN25	
	e (mm)	Mass kg/m	e (mm)	Mass kg/m	e (mm)	Mass kg/m	e (mm)	Mass kg/m	e (mm)	Mass kg/m	e (mm)	Mass kg/m
20	--	--	--	--	--	--	--	--	1.5	0.137	2.3	0.196
25	--	--	--	--	--	--	1.5	0.170	1.9	0.212	2.8	0.294
32	--	--	--	--	1.6	0.264	1.9	0.277	2.4	0.342	3.6	0.482
40	--	--	1.6	0.291	1.9	0.350	2.4	0.437	3	0.525	4.5	0.75
50	--	--	2	0.422	2.4	0.552	3	0.683	3.7	0.809	5.6	1.16
63	1.9	0.562	2.5	0.717	3	0.854	3.8	1.09	4.7	1.29	7.1	2.04
75	2.2	0.782	2.9	0.990	3.6	1.22	4.5	1.54	5.6	1.82	8.4	2.6
90	2.7	1.13	3.5	1.43	4.3	1.75	5.4	2.21	6.7	2.61	10.1	4.14

Pipes are offered in Light Grey (LG) and /or Dark Grey (DG) colour in standard lengths of 6 meter.
Pipes are offered plain or single socketed, based on diameter and class of pipe.

Table 2: Osman Plast uPVC pressure pipes according to ES 848/2008 with C=2.0

OD mm	PN8		PN12.5		PN20		PN25	
	Thickness (mm)	Weight (Kg/m)	Thickness (mm)	Weight (Kg/m)	Thickness (mm)	Weight (Kg/m)	Thickness (mm)	Weight (Kg/m)
110	3.4	1.7	5.3	2.61	8.1	3.9	10	5
125	3.9	2.21	6	3.34	9.2	5.01	11.4	6.48
140	4.3	2.74	6.7	4.18	10.3	6.27	12.4	8.09
160	4.9	3.57	7.7	5.47	11.8	8.17	14.6	10.63
180	5.5	4.51	8.6	6.88	13.3	10.4	16.4	13.4
200	6.2	5.64	9.6	8.51	14.7	12.8	18.2	16.57
225	6.9	7.06	10.8	10.8	16.6	16.1	--	--
250	7.7	8.76	11.9	13.2	18.4	19.9	--	--
280	8.6	10.96	13.4	16.6	20.6	24.9	--	--
315	9.7	13.91	15	20.9	23.2	31.5	--	--
355	10.9	17.62	16.9	26.5	26.1	39.9	--	--
400	12.3	22.4	19.1	33.7	29.4	50.8	--	--
450	13.8	28.27	21.5	42.7	33.1	67.82	--	--
500	15.3	34.83	23.9	52.6	36.8	83.77	--	--
560	17.2	43.85	26.7	65.8	--	--	--	--
630	19.3	55.36	30	83.2	--	--	--	--

Osman Plast uPVC Non- pressure pipes
 Manufactured according to German standards Din 19534 ,
 The Egyptian standards ES 1717/2008 and International standards ISO 4435

- Usage**
- Non-pressure underground drainage and sewerage.
 - Conveyance of soil and waste discharge.
 - Surface water networks.

Product Range

Table 4: Osman Plast uPVC non-pressure pipes according to DIN19534 and ES 1717/2001

OD mm	Wall	Mass
Nominal Diameter (mm)	e (mm)	Mass kg/m
110	3.0	1.630
125	3.0	1.870
160	3.6	2.650
200	4.5	4.120
250	6.1	7.00



Pipes are offered in Light Grey (LG) and /or Dark Grey (DG) colour in standard lengths of 6 meter. Pipes are offered single socketed.

Table 5: Osman Plast uPVC non-pressure pipes according to ES 1717/2008 and ISO 4435

OD mm	SN2		SN4		SN8	
	e (mm)	Mass kg/m	e (mm)	Mass kg/m	e (mm)	Mass kg/m
110	--	--	3.2	1.64	3.2	1.64
125	--	--	3.2	1.87	3.7	2.13
160	3.2	2.4	4	3	4.7	3.44
200	4	3.7	4.9	4.5	5.9	5.37
250	4.9	5.65	6.2	7.1	7.3	8.31
315	6.2	9.02	7.7	11.11	9.2	13.2
355	7	11.4	8.7	15.37	10.4	16.7
400	7.9	14.5	9.8	19.44	11.7	21.1
450	8.9	18.3	11	24.57	13.2	26.8
500	9.8	22.4	12.3	30.49	14.6	32.9
630	12.4	35.7	15.4	48.06	18.4	52.2



Pipes are offered in Light Grey (LG) and /or Dark Grey (DG) colour in standard lengths of 6 meter. Pipes are offered single socketed.

Osman Plast uPVC plumbing system pipes

Table 6: Osman Plast plumbing system according to the US standards ASTM D 1785

Nominal Diameter Inch	Outside diameter	80		40	
		wall thickness	Weight	wall thickness	Weight
	mm	mm	kg/m	mm	kg/m
1"	33.27				
1 ¼"	42.03	4.55		35.9	520
1 ½"	48.360	5.10	1.03	3.70	0.77
2"	60.320	5.50	1.30	3.90	1.02
2 ½"	72.840	7.01	2.20	5.16	1.57
3"	88.990	7.60	2.96	5.50	2.14
4"	114.300	8.60	4.37	6.00	3.05



Table 7: OsmanPlast plumbing system according to the US standards ASTM D-2241

OD		ASTM D2241													
ASTM D-1785 D-2241	BS 3506	SDR 64		SDR 41		SDR 32.5		SDR 26		SDR 21		SDR 17		SDR 13.5	
		4.3 bar		6.9 bar		8.6 bar		11 bar		13.8 bar		17.8 bar		21.7 bar	
		62 PSI		100 PSI		125 PSI		160 PSI		200 PSI		250 PSI		315 PSI	
		thickness	weight	thickness	weight	thickness	weight	thickness	weight	thickness	weight	Thickness	weight	thickness	weight
MM	KG	MM	KG	MM	KG	MM	KG	MM	KG	MM	KG	MM	KG	MM	KG
21.34	21.2-21.6													1.60	0.14
26.67	26.6-26.9									1.50	0.16	1.60	0.17	2.00	0.22
33.40	33.4-33.7							1.50	0.20	1.60	0.22	2.00	0.27	2.50	0.34
48.36	48.1-18.4					1.50	0.34	1.90	0.42	2.30	0.51	2.80	0.62	3.60	0.75
60.32	60.2-60.5					1.80	0.48	2.30	0.61	2.90	0.76	3.60	0.95	4.50	1.06
88.99	88.7-89.1			2.20	0.92	2.70	1.13	3.40	1.39	4.20	1.68	5.20	2.03	6.60	2.75
114.30	114.1-114.5	1.80	1.03	2.80	1.51	3.50	1.80	4.40	2.28	5.40	2.79	6.70	3.45	8.50	4.32
168.28	168-168.5	2.60	2.10	4.10	3.18	5.20	4.00	6.50	5.00	8.00	6.15	9.90	7.61	12.50	9.60



Table 8: White UPVC Pipes for plumbing system with Blue line metric

OD (mm)	Class 1		Class 2		Class 3	
	Wall mm	Mass kg/m	Wall mm	Mass kg/m	Wall mm	Mass kg/m
32			1.8	0.285	2.4	0.37
48			2.5	0.55	3	0.533
60			2.5	0.701	3	0.834
63			1.9	0.568	3	0.842
75	1.8	0.68	2.2	0.83	3	1.311
110	3	1.635	4	2.122	5	2.632
160	3.2	2.41	4	3.31	5	3.763

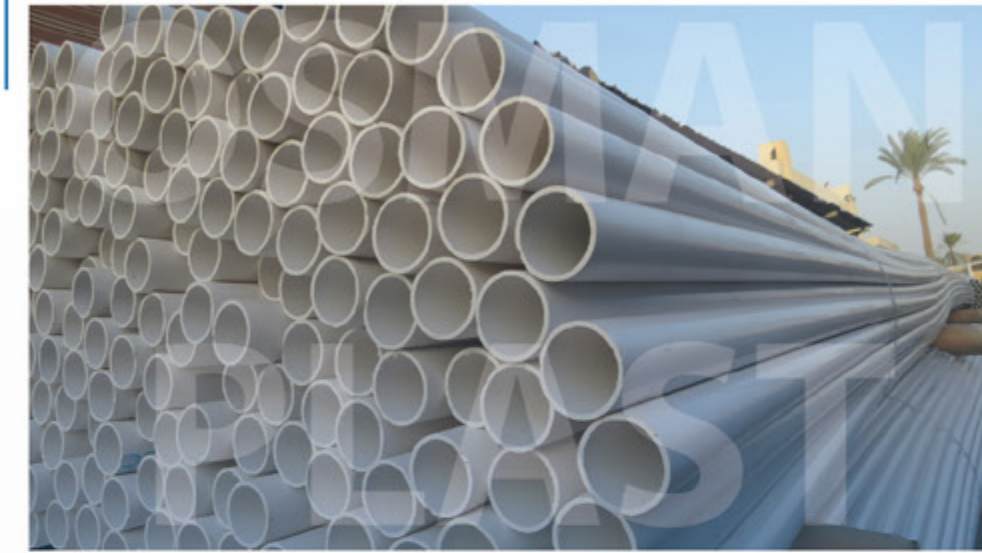
Pipes are offered in White with Blue line in standard length of 6m solvent socket.

Osman Plast uPVC plumbing system pipes

Table 5: Osman Plast uPVC ducts for telephone cables according to TC. 161 A

OD (mm)	Spigot		
	Wall mm	Mass kg/m	L1 mm. min
50	1.8	0.422	80
110	3.2	1.640	170

Ducts are offered in Light grey / dark grey colour in standard lengths of 6 meter rubber ring.



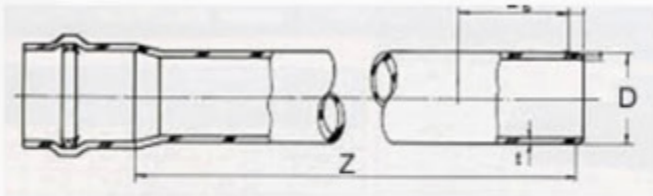
Annex 1: Socket types for water transportation pipes:

Sockets for solvent cementing

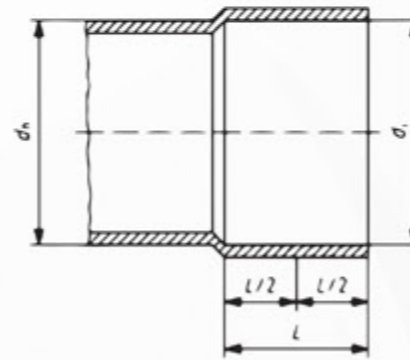
- At no point shall the inside diameter of the socket be greater than the mouth inside diameter of the associated socket.
- Cleaner primer must be used to prime and clean all jointing surfaces, prior to application of solvent cement
- No additive of any kind should be introduced to the cleaner primer, or to the solvent cement. Ensure that the solvent cement is in good condition and runs freely from the brush.

Sockets for elastomeric ring seal joints

- Clean the socket, especially the ring groove. Do not use rag with lubricant on it.



- Check that the spigot end, if cut in the field, has a chamfer of approximately 12° to 15°.
- Run your finger around the lead-in angle of the rubber ring to check that it is correctly seated.
- Apply jointing lubricant to the spigot end as far back as the witness mark and especially to the chamfered section.
- Align the spigot with the socket and apply a firm, even thrust to push the spigot into the socket
Use pipes puller for large diameters.



Annex 2: Installation guide for sewage and potable water uPVC pipe lines:

Alignment and Grade

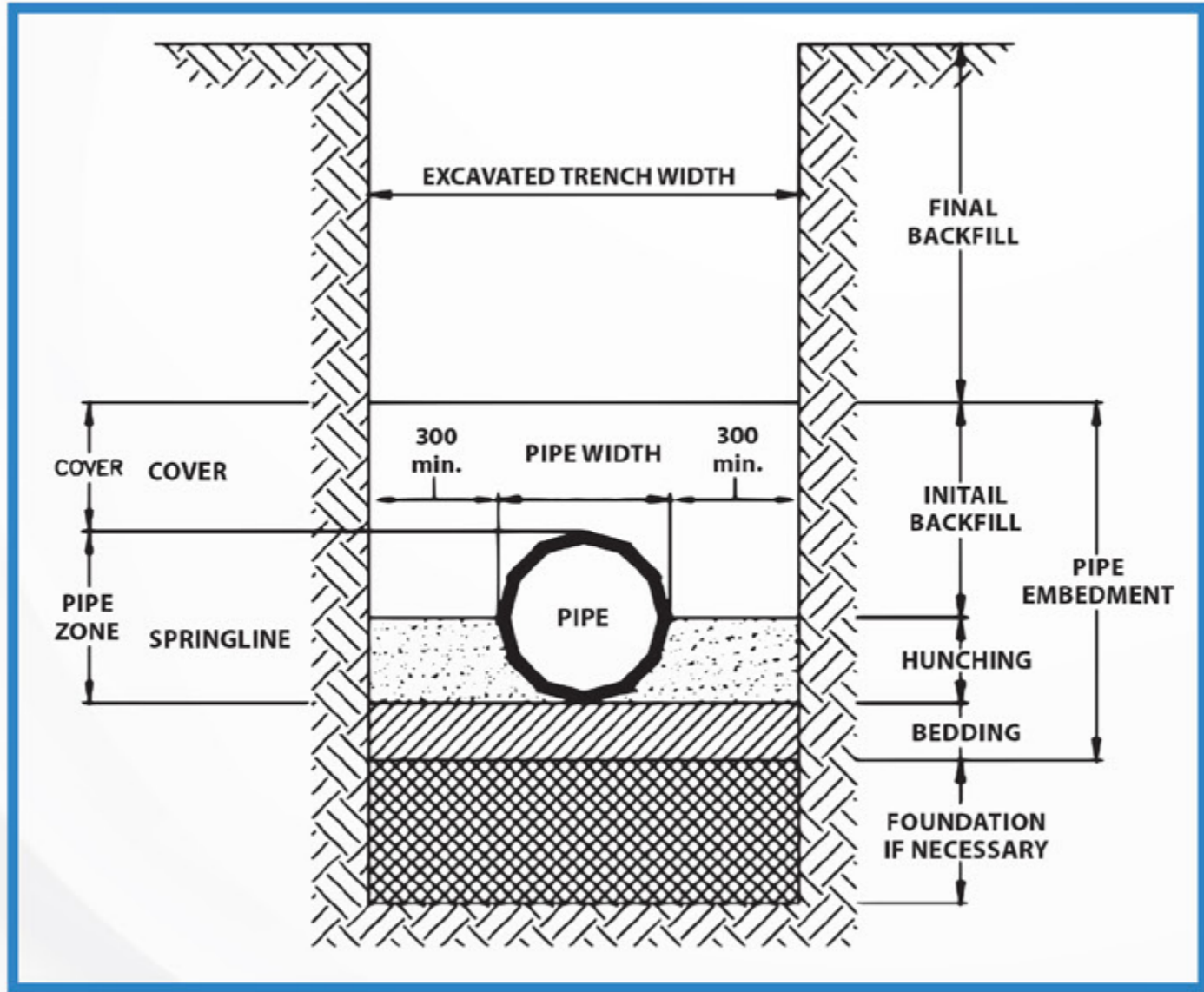
All pipe should be laid to, and maintained at required lines and grades established by the project consultant.

Trench Width

Trench width at the ground surface may vary with and depend upon the depth, type of soils, and the position of the surface structures to be specified by the project design consultant. The minimum clear width of the trench, measured at the spring line of the pipe should be 300mm greater than the outside diameter of the pipe. The maximum clear width of the trench at the top of the pipe should not exceed a width equal to the pipe diameter plus 600mm. If the above defined trench widths must be exceeded, or if the pipe is installed in a compacted embankment, the pipe embedment should be compacted to a point of at least 2.5 pipe diameters from the pipe on both sides of the pipe or to the trench wall, whichever is less.

Preparation of Trench Bottom

- The trench bottom should be constructed to provide firm, stable and uniform support for the full length of the pipe.
- Bell holes should be provided at each joint to permit proper joint assembly and pipe support. Any part of the trench bottom excavated below grade should be backfilled to grade and should be compacted as required to provide firm pipe support.
- When an unstable sub-grade condition which will provide inadequate pipe support is encountered, additional trench depth should be excavated and refilled with a suitable foundation material as recommended by the project's Geotechnical Engineer. Ledge rock, boulders and large stones should be removed to provide 100mm of soil cushion on all sides of the pipe and accessories.



OSMAN PLAST

T-Rib

OSMAN PLAST



OSMAN PLAST

T-Rib Osman Plast HDPE Concrete Liner

Osman Plast T-Rib sheets are HDPE lining sheets fabricated by extrusion method from Premium Grade High Density Polyethylene. T-Rib sheets are characterized by high level of chemical resistance. HDPE can be used in pipes and funnels and is also suitable for tanks and chambers in both sewerage and chemical storage service. HDPE operates in a wide range of temperature from Minus 50 degrees centigrade up to 80 degrees centigrade. T-Rib sheets are applicable for a wide range of structures due to its perfect mechanical anchoring to the HDPE liner in the concrete.

T-Rib smooth surface, ease of installation, resistance to corrosion while submersed in fluids and exposed to high humidity, in addition to high flexibility, ensures covering any deformation in the concrete structure.

Properties:

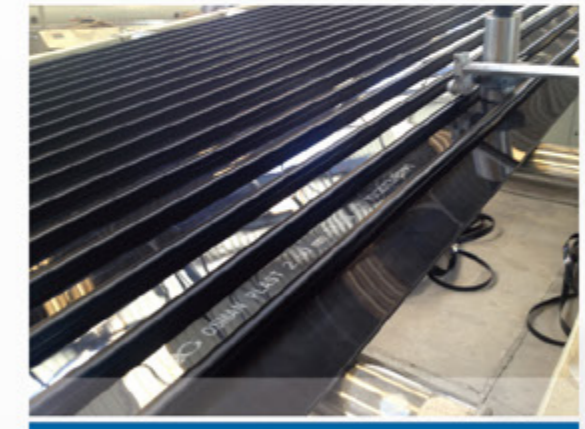
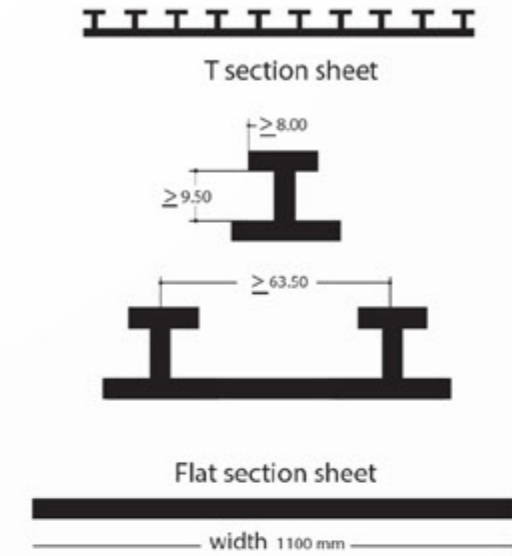
- UV stabilised- Black & Yellow only
- High chemical resistance
- Outstanding processing parameters
- High strength and rigidity
- Extremely versatile
- Approved for contact with food

Product Range

T-Rib Lining Sheets
 Thickness : 1.5 – 5 mm
 Width: 1100 mm
 Length: to request

T-Rib Lining Rolls (welded sheets)
 Thickness: 1.5 – 5 mm
 Width: 1100 – 6000 mm
 Length: to request

Flat lining sheets
 Thickness : 1 – 8 mm
 Width: 1100 mm
 Length: to request



Color: black , Blue , Orange (as per customer request)

Applications

- Lining of concrete pipes
- Lining of concrete storage tanks
- Storage of ground water dangerous media in collection basins
- Lining of reservoirs and drains in the chemical industry
- Lining of sewage water basins
- Protection for concrete foundations from sub terrain water

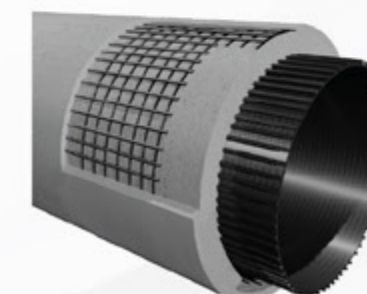


Installation of T-Rib Osman Plast HDPE Concrete liners

- The lining shall be held snugly in place against inner forms by means of steel banding straps or other means recommended by the manufacturer. Banding straps must be located in the interstitial space between studs to prevent crushing or tilting of the embedment studs. Minimal amount of banding straps to perform requirements shall be used and shall not interfere with concrete consolidation.
- Where liner is extended for the purpose of joint overlap, embedment studs shall terminate not more than 10mm from the end of the inside surface of the pipe section. Joint flaps shall extend approximately 100mm beyond the end of the inside surface.
Concrete poured against lining shall be vibrated in careful manner so as to protect the
- lining and produce a dense, homogenous concrete, securely anchoring the locking studs into the concrete.
Forms shall be properly cleaned and prepared to remove any abrasive areas that may
- damage the liner. In removing forms, care should be taken to protect the lining from damage. Sharp instruments shall not be used to pry forms from lined surfaces
Hot joint compounds, such as coal tar, shall not be poured or applied to the lining.
- Solvents or adhesives shall not be used in fusion of material in any manner.

- T-Rib HDPE is welded using Hot-Air, Butt-welding and Extrusion welding techniques. Generally Butt-Welding is only used for thicknesses of 2mm and above:

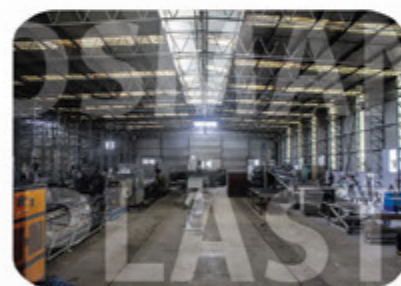
1. Strip Type: The joint shall be made with a separate 100mm wide joint strip and two welding strips. The 100mm joint strip shall be centered over the joint, and then extrusion welded to the liner. The width of the space between adjacent sheets shall not exceed 20mm. The 100mm joint strip shall lap over each sheet a minimum of 35mm. It may be used at any transverse or longitudinal joint.
2. Lap Type: The joint shall be made by lapping sheets not less than 50mm. The lower sheet shall overlap the upper. The lap shall use double-sided tape flexible mastic initially placed on lower sheet and set onto upper sheet.
3. Butt Type: The joint shall be made by applying an extrusion bead to the back of the butt joint or by some other method acceptable to the CONSTRUCTION MANAGER to prevent concrete from getting under the sheet After the forms have been stripped, a second extrusion weld bead shall be applied over the butt joint on the face of the sheet The maximum gap shall be 6mm for this method.



Basic Properites

General Properties for embedded T-Rip HDPE sheet material.

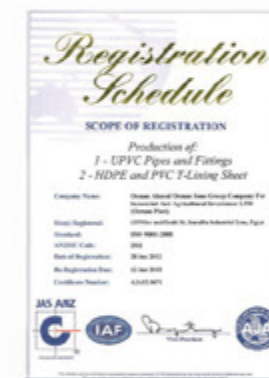
s.#	Test	UOM	Value	Test Method	
1	Material		HDPE		
2	Density	g/cm3	≤0.94	ASTM D 1505	
3	Melt index (190 deg. C, 5kg. wt.)	g/10min	≤0.69	ASTM D 1238	
	Melt index (190 deg. C, 2.16kg.wt)	g/10min	≤1.00	ASTM D 1238	
4	Tensile strength at yield	MPa (lb/in2)	>15.2 (2200)	ASTM D6693, Type IV, Dumbell	
	Tensile strength at break	MPa	>27		
5	Elongation at yield	%	12		
	Elongation at break	%	700		
6	Carbon Black content	%	2	ASTM D 1603	
7	Shore durometer		1-SEC. ≥50	ASTM D 2240	
			10-SEC ≥40		
8	Water absorption	%	≤0.02	ASTM D 570	
9	Sheet Dimensions			ASTM D 4801	
		Thickness	mm		1.5-5
		width	mm		1100
		length	mtr		As required
10	Sheet color		Black or other colors		



CHEMICAL RESISTANCE ASTM D542 - 7 DAYS @ 20° C

Ammonium Hydroxide 5%	Unaffected
Sodium Hypo-Chloride 1%	Unaffected
Sodium Hydroxide 5%	Unaffected
Ferric Chloride 1%	Unaffected
Nitric Acid 1%	Unaffected
Detergent Solution 2%	Unaffected
Sulfuric Acid 20%	Unaffected

Certifications



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