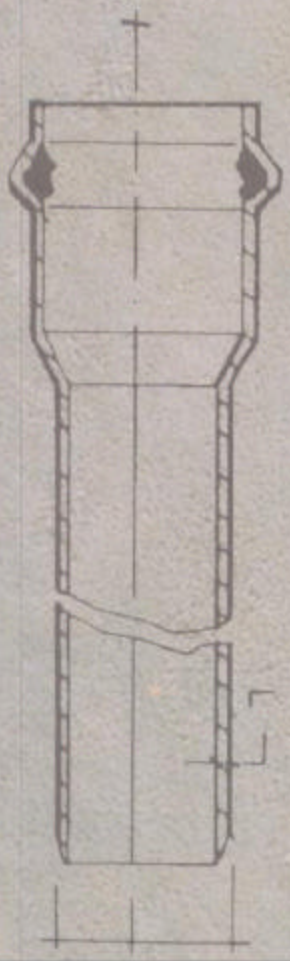
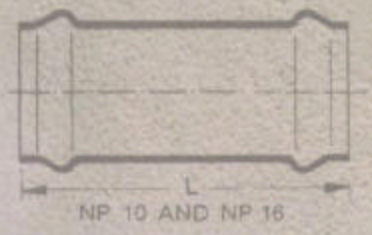
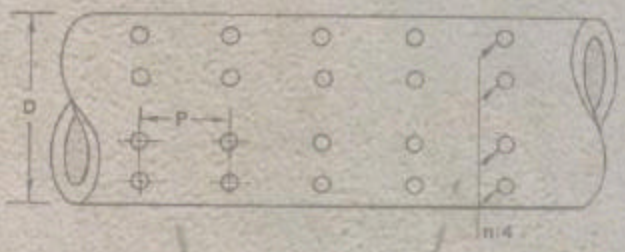
NEPRO PLASTICS

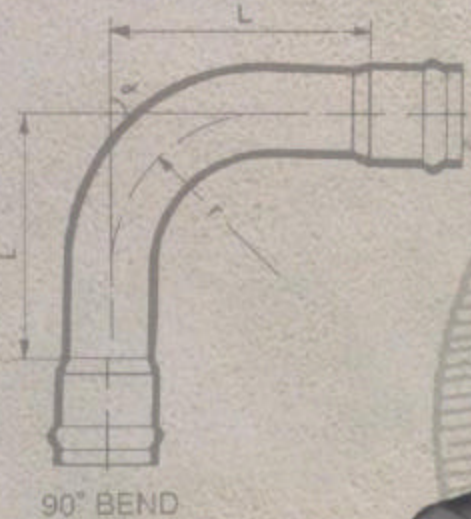
U P V C P I P E S

NATIONAL FACTORY FOR PLASTIC PIPES & FITTINGS









NEPRO FLOWGUARD CPVC NEPRO FLOWGUARD CPVC NEPRO

New Products Industries - " NEPRO"

National Factory for Plastic Pipes & Fittings
Licence No.49/ S dated 29/8/1390 H

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صناعات المنتوجات البلاستيكية نيبرو
NEPRO PLASTIC

FORWARD

After many years of experimentations and tests in the industrialized countries, NEPRO (New Products Industries) took the initiative of introducing uPVC pipes production to the Kingdom of Saudi Arabia back in 1969, thus becoming the first local uPVC pipes producer. Ever since, NEPRO has followed a policy of providing high quality pipes manufactured under strict quality control to its demanding clients.

For this purpose NEPRO used the most modern equipments and the best technical advises and experiences of its consultants.

NEPRO first started its uPVC pipes manufacturing according to British Standard specifications (BS 3505), then added new machines and moulds to produce pipes in accordance with International Specifications (ISO). Active participation with the Saudi Arabian Standards Organization came out the Saudi Arabian Standard (SAS 14/1396), followed in the mid 80s the American Standards out (ASTM) for Schedule 40, schedule 80 and CPVC pipes. This gives NEPRO a unique position of being able to produce the widest range of uPVC pipes and fittings for the uses in pressure lines, sewerage, drainage, electrical conduits etc. in both Rubber Ring or Solvent Cement Jointing Systems.

NEPRO uPVC pipes are marketed through National Marketing Est. in more than twelve cities and twenty outlets through out the Kingdom. National Marketing in its turn has gained a leading position in providing its clients with a full and varied range of fittings to meet the needs of selective NEPRO uPVC pipes.By expanding its geographical coverage from the three main cities to cover new developing areas such as Qassim, Madinah, Al Ahsa, Yanbu, Khamis Mushait, Taif and more to come. National Marketing has become the largest6 and leading distributor of uPVC pipes and fittings.

Isam K.Kabbani
Chairman
IKK Group of Compa nies

TABLE OF CONTENT

REFERENCES

MAJOR CLIENTS FOR NETPRO uPVC PIPES AND FITTING

A) Ministry of Agriculture and Water

01) Riyadh Water Treatment & Dist.System- Third Stage.Part One New Area, Part Six.
02) Extension of Riyadh Dist. System Stage Two – Part 3
03) Extension of Riyadh Water Supply - Riyadh East - West
04) Extension of Riyadh Water Supply - Riyadh Scattered Line
05) Riyadh Scattered lines and house connection.
06) Riyadh East. West. South, North Areas.
07) Neighbouring and surrounding villages
08) Dawadmi Dist. System
09) Jeddah Water Supply & Dist. System. Third Stage, Parts 1,2,&3.
10) Jeddah Water Supply & Dist. System, Fifth Stage, Part 2.
11) Jeddah Water Supply & Dist. System, Six Stage, Part 1.
12) Creek and Relocation of Khylais Lines.
13) Extension of Jeddah Water Supply, Seven Stage, Parts 2, 3 & 4.
14) Supply of Maintenance Materials for Jeddah Water Works.
15) Jeddah Scattered lines No.2.

B) Ministry of Defense and Aviation:

01) SSSP Projects
02) ABF Projects
03) Al Bayadh Air Base Project in Al-Kharj.
04) Peace Shield Projects.
05) King Abdul Aziz Military Academy in Tabouk KAMA.
06) King Khalid Military city in Riyadh KKMAC.
07) Royal Saudi Air Force Project.
08) ISF Housing Project.
09) Military Factory Housing Project.
10) Al Yamamah Project.
11) UPVC pipes and fittings for MODA Projects in Different Areas Through out the Kingdom of Saudi Arabia.

C) Ministry of P.T.T. and Saudi Telephone:

01) uPVC Conduits and cable duct for the Telephone System Through out the Kingdom.

02) uPVC cable duct for P.T.T project Tep.6

MAJOR CLIENTS FOR NEPRO UPVC PIPES AND FITTINGS

D) Sewage and Water Authority:

01) uPVC pipes in different projects in Central & Eastern Province.
02) Perforated uPVC pipes for Lowering of underground water table in various areas of Kingdom.

E) Royal Jubail Commission and Yanbu:

uPVC pipes and fittings hadeed and petrokemya, Housing Project, Olifins plant and most project in Jubail and Yanbu.

F) Civil Aviation and International Airport Authority:

01) King Abdul Aziz International Airport in Jeddah (KAIA).
02) King Khalid International Airport in Riyadh (KKIA).
03) King Fahad International Airport in Dammam (KFIA).
04) Airport in Arar, Tabouk, Qassim & Al Madina Al Munawary.

G) ARAMCO Projects:

01) uPVC pipes for Aramco Projects in Eastern Region & Hotat Bani Tamim.

H) Ministry of Petroleum and Minerals:

01) Petromin Head office project in Riyadh.
02) Mahad Al Dahad Project.
03) Different projects in Riyadh, Dammam and Jeddah.

I) Ministry of Education:

uPVC pipes and fittings for water distribution system & sewage for schools and colleges projects through out the Kingdom of Saudi Arabia.

J) Ministry of Higher Education:

01) King Abdul Aziz University project in Jeddah (KAAU).
02) Immam University project in Riyadh.
03) Petroleum and Mineral University Project in Dammam.

K) Directorate of Girls Education:

01) uPVC pipes and fittings for School and Colleges projects through out the Kingdom.

L) Saudi Arabian National Guard:

01) uPVC pipes and fittings National Guard Housing Project in Derab, Al Khasm Alaan. Jeddah, Dammam.

M) Ministry of Commerce:

01) uPVC pipes and Fittings for Green Silos project in Riyadh, Tabouk Jeddah.

N) Parts Authority:

01) uPVC pipes and fittings for King Abdul Aziz Port project in Jeddah.
02) uPVC pipes and fiftings for Dammam Sea Port.

O) Presidency of Youth Welfare:

01) uPVC pipes for King Fahad Stadium project in Riyadh.
02) uPVC pipes and fittings for Prince Jalawi Sports City Project in Dammam.
03) uPVC pipes and fittings for AlShahab Club Stadium in Riyadh.
04) uPVC pipes and fittings for Sports Club Projects through out the Kingdom.

P) Riyadh Development Authority:

01) uPVC pipes and fittings for Diplomatic Quarters Project in Riyadh.
02) uPVC pipes for Makkah Road Project in Riyadh. 0')
03) Kasr M Hokom project in Riyadh.

Q) Ministry of Communication:

01) uPVC pipes and fittings for Riyadh, and Al Qassim Ring Road.
02) Riyadh Al Qassim Express way project.
03) Riyadh Al-Dammam Express way project.

R) Ministry of Industry :

01) uPVC pipes and fittings for II nd Phase III rd for Industrial Estate in Riyadh Project.
02) uPVC pipes and fittings for Industrial Estate in Jeddah, Dammam and Al Qassim.

S) Ministry of Health:

01) uPVC pipes and fittings for 5 Hospitals project and other Hospitals in various areas of the Kingdom of Saudi Arabia.

T) Saline Water Conversion Corporation:

01) uPVC pipes and fittings for projects in Riyadh, Jeddah, Al-Khobar, Makah, Al-Qassim and Yanbu.

02) uPVC pipes for Rabeg sailing water station project. Jeddah Soiling water station project.

U) Ministry of Pilgrimage & Endowments :

01) Al Haram Extension projects.
02) Madina Al-Muawara Haram extension.

Also Nepro uPVC pipes and fittings have been supplied to different Agricultural Companies such as Hadco,Tadco, Nadec, and other Ministries project.

U) Export Activities:

High quality of Nepro products had been approved and exported to all G.C.C.countries, Middle East, African Countries and Europe.

V) Ministry of Municipality and Rural Affairs:

uPVC pipes for Sewage and Drainage Projects.
uPVC pipes for Street and High Way, Lighting.

X) Contractors:

- Bin Laden Org. (ISF Housing Project, Military Factory Housing Project. Ext. of the Haram in Makkah and Madinah, Wadi Dawaser Airport). Eastern Province,AlKharj.
- Technical Bidding (Several Projects for Water Supply in Eastern Province), CWC, Al Dirbas,Nesma & Al Fadle and C.C.C.
- Al Marafik Co. (Al Kharj Sewage Project)
- SAE (Qatif Housing Project- National Guard Housing Project ,Jeddah)
- Al Reda Co., (Several Projects for Water Supply in Eastern Province)
- Al Henaki, Civil Works Co., Khaled Bin H.Dossary, Imad East., Petrola, Saudi Condreco, Sartelco, Hyundai, SamWhan, Dong Ah, Daelem, Sam Ho, Saudi Construction, MAC, Al Muhaidib, Al Traiki, Kamco, A.A.Al Dossary etc.
- ABV Rock Group,Salco, Nesco, Middle East Agriculture, Saad Construction, Rabya, Hadeed Housing Project - Jubail, Petrokemya Housing Project and Oilfins Plant - Jubail, Gas Housing Project - Juabail, Dumez Makkah Road Project-Riyadh
- Arkan,Rakan, Al Khunaini, A.R.Al Dossary, Enpac, Salco, Nasser Al Hajery, Al Khodari, JGC (Japan), Technip (Italy),Techint, BMC, Al Mabani, Oasis, Al Husaini, Fafco, Shade Corp., Saudi Weimer, Middle East Co., Green Top, Azmeel, Al-Yamama Co., Al Bawani.

GENERAL ADVANTAGES OF NEPRO uPVC PIPES

The group of materials known as unplasticised PVC is one of the most important developments of the last few decades as it reduces the cost and improves the reliability of pipeline installations. The properties can be varied by small additions of modifying agents which have definite and controlled mechanical properties. They can be fabricated to close dimensional tolerances, light without being weak, rigid without being brittle.

Further more, these materials can be converted into pipes and fittings by very direct process of extrusion or injection moulding even though these processes demand heavy elaborate machinery and very precise process.

The principal reason for the great economy of NEPRO pipes is not so much their cost per meter as delivered to site but rather the dramatic, reduction in installation costs which can be achieved by intelligent exploitation of their light weight, availability in longer lengths, ease of jointing and their immunity from corrosion. These characteristics are of even greater importance to engineers now that the need to carry out water supply and sewerage schemes, industrial plant installations, etc. at minimum cost and maximum reliability.

Non-Corrosion:

NEPRO uPVC pipes resist corrosion caused by acid, alkalis, oils, salts, moisture and the media inside and outside the pipe. For further details refer to page 23. It is particularly reliable for resistance to the severe climatic and soil conditions in Saudi Arabia.

Sanitary:

NEPRO uPVC pipes are entirely non-toxic. It will not affect the taste, smell or colour of water or liquid nor react with any liquid to cause a precipitant.

Low Flow Loss:

NEPRO uPVC pipes have a mirror-smooth surface which minimize resistance and impede the build-up of deposits and corrosive scales.

Mechanical Strength:

NEPRO uPVC pipes have great tensile strength yet they are flexible enough to withstand displacement in the pipe line. They will not dent or flatten under pressure.

Light Weight:

NEPRO uPVC pipes are incredibly light. Their specific weight one fifth of steel pipe. This cuts down transportation costs and facilitates the installation of pipes and reduces its cost.

Ease of Maintenance:

NEPRO Upvc pipes can be quickly repaired with a minimum of complication or cost.

Fire Proof:

NEPRO uPVC pipes will not support combustion. In the event of fire, flames are unable to travel along the pipe. It is self extinguishing.

Insulator:

NEPRO uPVC pipes are ideal for electric conduits. Because uPVC in itself is an integral insulator, it eliminates the possibility of electrolytic corrosion which soften destroys underground piping.

Proven Experience:

NEPRO Upvc pipes have been used worldwide for 40 years in all climates.The experience of its many users have proved its supreme quality, economy ease of installation, and its non-corrosive qualities.

APPLICATIONS OF NEPRO uUPVC PIPES

Water Supplies:

Non-toxic NEPRO uPVC pipes will not affect the taste, color,or smell of drinking water. They will never corrode and are therefore extremely sanitary. Deposits and scales will not build up inside as in the case for conventional steel pipes. Their strength is greater than that of asbestos pipes. NEPRO obtained SASO Certification for drinking water use.

Irrigation Systems:

NEPRO uPVC pipes are ideal for agricultural irrigation and sprinkler systems. Non-corosive NEPRO uPVC pipes are perfect for carrying water which contains chemical fertilizers and insect inhibiters. In thickwall and large diameter NEPRO uPVC pipes liquids can be transported under high pressure, which is convenient for the management of large forms.

NEPRO uPVC pipes for Casing & Screen:

Engineering difficulties, and the, probability of adverse chemical reactions, make it impractical to overcome corrosion and encrustation through the use of protective coating, chemical treatment or cathodic protection. Thus, NEPRO non-corrosion PVC for water well casing and screens rapidly received approval by the appropriate ministry consultants and engineers.

Industry:

Resistant to most chemicals, NEPRO uPVC pipes have an important role to play in industrial plants. Light, noncorrosive, and easy to assemble, they allow more complex piping work than with steel or cast-iron pipes.

Soil, Waste & Drainage Sewer System :

Waste lines for corrosive gases, ventilation for office buildings and factories; drainage systems for private homes and elevated highways - these are a few of the many possibilities for NEPRO uPVC pipes. A full line of uPVC fittings is available to assure easy installation.

Mining :

NEPRO uPVC pipes particularly are well suited for draining corrosive liquids found in mines. They make an ideal vent line for pits because they are easily installed in hard to reach places.

Electrical & Telecommunications Cables:

NEPRO uPVC pipes form an integral insulator, hence there is an ever-increasing demand for them as electrical conduit. To facilitate work, a full line of fittings is available and fabricated from the same material as the pipes.

MANUFACTURING STANDARDS:

NEPRO uPVC pipes are manufactured in accordance with

- Saudi Arabian Standard (SSA 14 & 15 / 1966 for Potable Water) ISO International Organization for Standardization) 161/1 which conforms to German Standard DIN 8061, 8062 and 19532.
- Saudi Arabian Standards (SSA 255, 254 / (1981) Conforming to BS 6099 for Electrical Conduits.
- British Standards, BS 3505, BS 4660, BS 5481.
- ASTM Standards ASTM D-1785, FOR (Sch.40,80), ASTM D2241 (SDRS), ASTM D2665 DIN, ASTM F 441.
- NEMA Standards TC-2, TC-6 AND TC-8.
- DIN Standards 19534.
- EN Standard Pr EN 1401, Pr EN 1452-2

RANGE OF PRODUCTON :

PIPES from NEPRO are manufactured according to SSA and or DIN Standards from 16mm up to 630mm outside diameter in various pressure classes, details of which are shown later in this catalogue on page No.14.

SSA uPVC pipes are available with spigot and solvent weld socket joints for Diameters less than 63mm. Sizes of outside diameter 63mm. And larger are available with both mechanical rubber ring joints, or solvent weld socket joints.

Pipes manufact ured in accordance with ASTM & BS Standards are ranging from 1/2 inch up to 8 inches in various pressure ratings shown later in page Nos.17, 18.

ASTM PVC Pipes are available with plain spigot and socket joints only.

NEPRO pipes are produced in 6 meters standard length(other lengths are available on request), standard colours are grey, white and black (other colours are available on request).

PRODUCT DEVELOPMENT:

NEPRO is adopting a policy of continuous development, and research as an integral part of its operation.

NEPRO future plans are to widen its PVC & cPVC fittings. For further details please contact our technical sales Dept.

MARKING:

NEPRO uPVC pipes are marked automatically during the process of production. East pipe is marked according to its relevant standard classifications. Special making can be added on request.

NEPRO uPVC PIPES ACCORDING TO SAUDI 14 & 15/1396
ISO 161/1, DIN 8061/62 STANDARD
NOMINAL OUTSIDE DIAMETERS& NOMINAL WALL THICKNESS

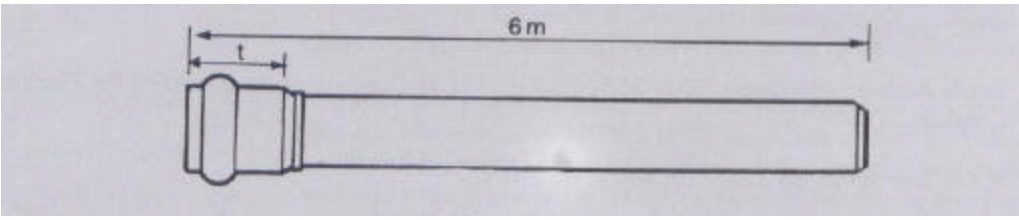


TABLE 1

Nominal outside diameter	Socket Depth mm (t)	CLASS 1 2 BAR		CLASS 11 4 BAR		CLASS 111 6 BAR		CLASS IV 10 BAR		CLASS V 16 BAR	
		Nom. Wt. kg./m	Nom. Thick. Of wall mm	Nom. Wt. kg./m	Nom. Thick. Of wall mm	Nom. Wt. kg./m	Nom. Thick. Of wall mm	Nom. Wt. kg./m	Nom. Thick. Of wall mm	Nom. Wt. kg./m	Nom. Thick. Of wall mm
16										0.090	1.2
20										0.137	1.5
25								0.174	1.5	0.212	1.9
32								0.264	1.8	0.342	2.4
40						0.334	1.8	0.350	1.9	0.525	3.0
50	75					0.422	1.8	0.552	2.4	0.809	3.7
63	100					0.562	1.9	0.854	3.0	1.289	4.7
75	110			0.642	1.8	0.782	2.2	1.22	3.6	1.82	5.6
90	110			0.774	1.8	1.13	2.7	1.75	4.3	2.61	6.7
110	120	0.950	1.8	1.16	2.2	1.64	3.2	2.61	5.3	3.90	8.2
125	119	1.08	1.8	1.48	2.5	2.13	3.7	3.34	6.0	5.01	9.3
140	125	1.21	1.8	1.84	2.8	2.65	4.1	4.10	6.7	6.27	10.4
160	132	1.39	1.8	2.41	3.2	3.44	4.7	5.47	7.7	8.17	11.9
180	145	1.57	1.8	3.02	3.6	4.37	5.3	6.88	8.6	10.4	13.4
200	145	1.74	1.8	3.70	4.0	5.37	5.9	8.51	9.6	12.8	14.9
225	152	1.96	1.8	4.70	4.5	6.76	6.6	10.8	10.8	16.1	16.7
250	160	2.40	2.0	5.65	4.9	8.31	7.3	13.2	11.9	19.9	18.6
280	170	3.11	2.3	7.11	5.5	10.4	8.2	16.6	13.4	24.9	20.8
315	180	3.78	2.5	9.02	6.2	13.1	9.2	20.9	15.0	31.5	23.4
355	180	4.87	2.9	11.4	7.0	16.7	10.4	26.5	16.9	39.9	26.32
400	200	6.10	3.2	14.5	7.9	21.1	11.7	33.7	19.1	50.8	29.7
450	200	7.65	3.6	18.3	8.9	26.8	13.2	42.7	21.5	….	…
500	250	9.37	4.0	22.4	9.8	32.9	14.6	52.6	23.9	….	…
560	260	11.8	4.5	28.1	11.0	41.4	16.4	65.8	26.7	….	….
630	300	14.7	5.0	35.7	12.4	52.2	18.4	83.2	30.0	….	….
710	320	18.9	5.7	45.3	14.0	66.1	20.7	….	….	….	….

NEPRO uPVC PIPES ACCORDING TO DIN 19/534

TABLE 2

Nominal Dia.(mm)	Outside Diameter (mm)	Wall Thickness (mm) (S)
100	110	3
125	125	3
150	160	3.6
200	200	4.5
250	250	6.1
300	315	7.7
400	400	9.8
500	500	*12.20
600	630	15.4

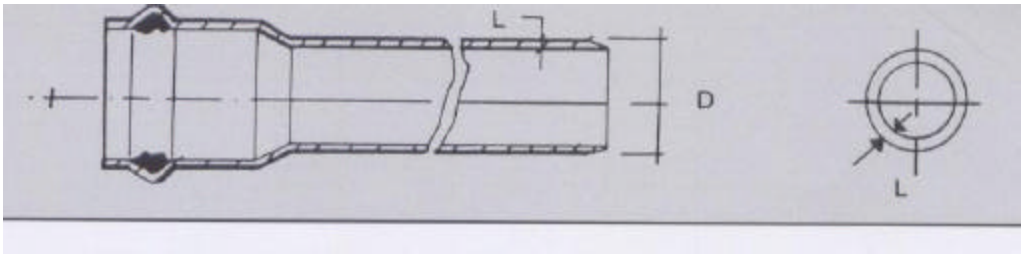
* For a Transitory period for this existing wall thickness S1 = 13.4mm may still be used. Special reference must be made to this when ordering.

NEPRO uPVC PIPES ACCORDING TO BRITISH STANDARD BS 3505/3506

TABLE 3

		Class C (9 Bar)		Class D (12 Bar)		Class E (15 Bar)	
Nominal Size	Out Dia. Mm	Thickness Mm	Nominal weight Kg / m	Thickness mm	Nominal Weight Kg / m	Thickness Mm	Nominal Weight Kg / m
1/ 2 “	21.2 - 21.5					1.7	0.158
3/ 4 “	26.6 - 26.9					1.9	0.225
1 “	33.4 - 33.7					2.2	0.350
1 1 / 4”	42.1 - 42.4			2.2	0.434	2.7	0.508
1 1/ 2 “	48.1 - 48.4			2.5	0.534	3.1	0.667
2 “	60.2 - 60.5	2.5	0.683	3.1	0.850	3.9	1.042
3 “	88.7 - 89.1	3.5	1.417	4.6	1.834	5.7	2.250
4 “	114.1 – 114.5	4.5	2.350	6.0	3.050	7.3	3.700
6 “	168.0 – 168.5	6.6	5.084	8.8	6.72	10.8	8.134
8 “	218.8 – 219.4	7.8	7.86	10.3	10.17	12.6	12.28

NEPRO uPVC PIPES FOR NON PRESSURE, SOIL, WASTE AND VENT APPLICATIONS



FOR BELOW GROUND GRAVITY DRAINAGE AND SEWERAGE

TABLE 4

EN1401-1				
Nominal Size Mm	Outside Diameter (D) mm		Wall Thickness (L) mm	
	Minimum	Maximum	Minimum	Maximum
110 (4”)	110.0	110.4	3.2	4.0
160 (6”)	16-.0	160.6	4.1	4.8

FOR GRAVITY SEWER

TABLE 5

BS 5481			
Nominal Size Mm	Mean Outside Diameter (D) mm		Wall Thickness (L) mm
	Minimum	Maximum	Minimum
200	200.0	200.6	4.9
250	250.0	250.7	6.1
315	315.0	315.9	7.7
400	400.0	401.0	9.8
500	500.0	501.0	12.2

* FOR SOIL & VENTILATION

TABLE 6

Bs 4514			
Nominal Size Inch	Outside Diameter mm	Nominal Weight Kg/m	Nominal Wall Thickness mm
3”	82.6	1.20	3.2
4”	110.2	1.62	3.2
6”	160.3	2.38	3.2

** Colour Grey*

NEPRO RIGID PVC PIPES ACCORDING TO ASTM D 1785
SCHEDULE 40 AND SCHEDULE 80

TABLE 7

NOMINL PIPE SIZE INCH	MEAN OUTSIDE DIAMETEINCH/ MM	SCHEDULE 40			SCHEDULE 80		
		MINIMUM WALL THICKNESS INCH / MM	NOMINAL WEIGHT KG / M	WORKING PRESSURE P.S.I	MINIMUM WALL THICKNESS INCH /MM	NOMINAL WEIGHT KG / M	WORKING PRESSURE P.S.I
1/ 2 “	0.840/21.34	0.109/2.77	0.248	600	0.147/3.73	0.309	850
3/ 4”	1.050/26.67	0.113/2.87	0.329	480	0.154/3.91	0.418	690
1”	1.315/33.40	0.133/3.38	0.483	450	0.179/4.55	0.614	630
11/4”	1.660/42.16	0.140/3.56	0.652	370	0.191/4.85	0.850	520
11/2”	1.900/48.26	0.145/3.68	0.779	330	0.200/5.08	1.030	470
2”	2.375/60.32	0.154/3.91	1.040	280	0.218.5.54	1.430	400
3”	3.500/88.9	0.216/5.49	2.160	260	0.300/7.62	2.910	370
4”	4.500/114.30	0.237/6.02	3.070	220	0.337/8.56	4.260	320
6”	6.625/168.28	0.280/7.11	5.410	180	0.432/10.97	8.130	280
8”	8.625/219.08	0.322/8.18	8.143	160	0.500/12.70	12.400	250

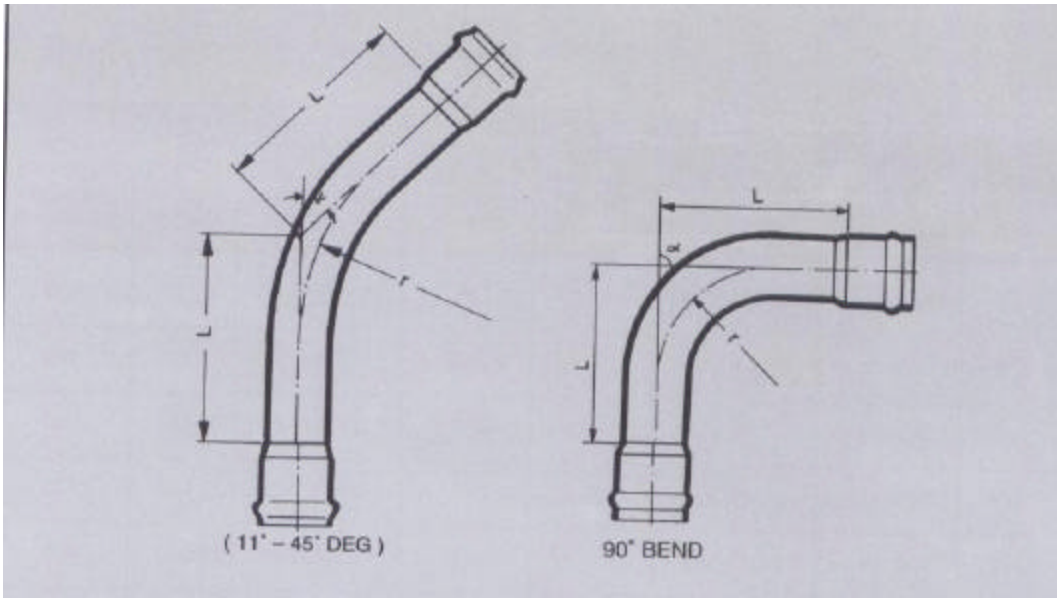
Pressure rating above is based on water temperature at 23 deg. C(73 deg.F)

- Pipe Lengths: Standard 6 & 4 meters length (others available on request).
- Pipe Colours : Schedule 40 (White) Schedule 80 (Grey).
- 1 Bar = 14.50 PSI = 1.02 Kg/Cm^2 = 0.10 M Pa.

Note: Separate Catalogue ……

FABRICATED uPVC LONG RADIUS BENDS
NP 6, NP 10 and NP 16 BARS

Both Rubber Ring as well as Solvent Cement Joint are of offered.



Double & Single Socket Bends are available upon request.

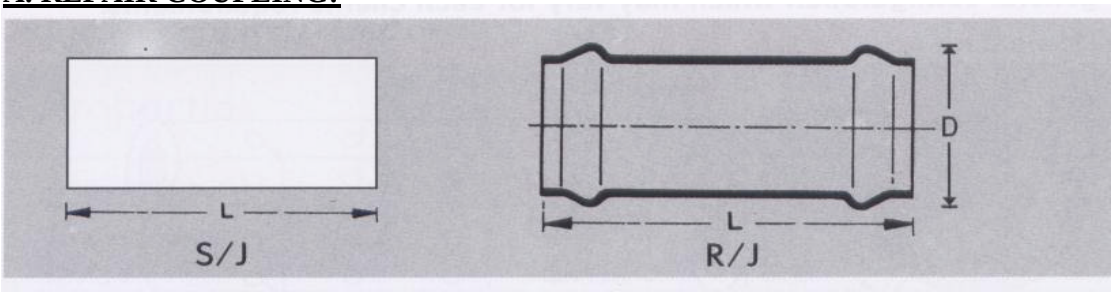
TABLE 8

Pipe O.D. mm d	Radius mm r	L			
		8			
		11.25 ^{0}	**22.5^0**	**45^0**	**90^0**
63	221	165	187	235	364
75	263	177	204	260	414
90	315	192	224	292	476
110	385	212	251	334	559
125	438	227	271	365	622
140	490	243	292	397	684
160	729	303	373	524	934
225	788	329	408	578	1039
250	852	350	435	595	1240
280	980	385	483	694	1268
315	1103	420	531	768	1414
355	1243	860	1110	1200	1840
400	1400	910	1160	1300	1940
450	1575	960	1210	1400	2090
500	1750	1110	1410	1500	2190

L = Leg Length
Other Angles can be produced on request.

FABRICATED COUPLERS
NP 6, NP10 AND NP 16 BARS

A. REPAIR COUPLING:



B. REGISTER COUPLING:

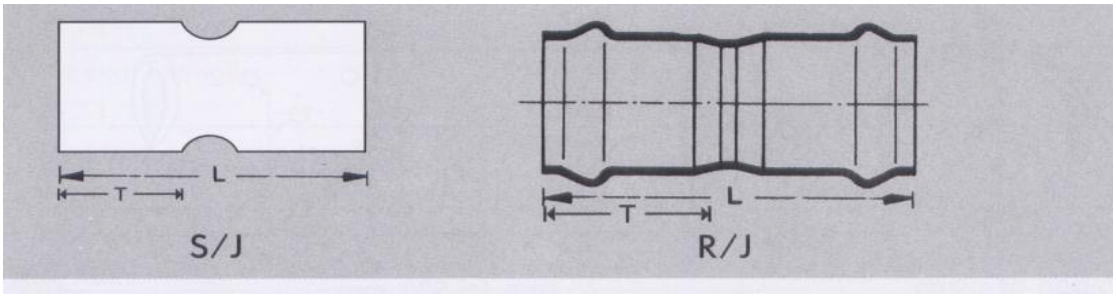


TABLE 9

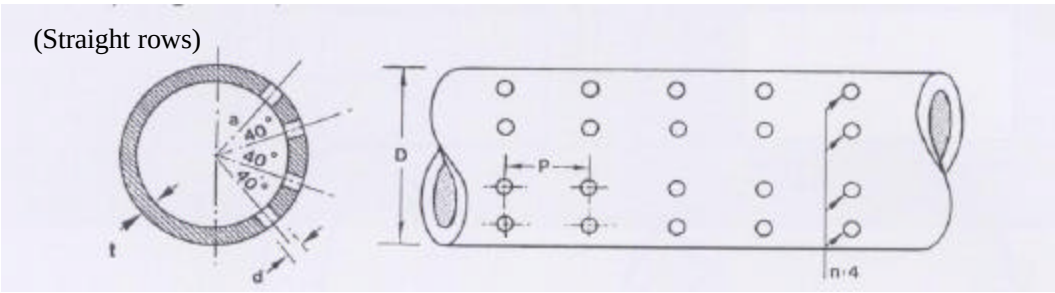
Pipe O.D mm	R/J Coupling			S/J Coupling	
	L.mm	D.mm	T.mm	L.mm	T.mm
16				56	25
20				58	27
25				66	30
32				74	34
40				94	39
50				96	45
63	240	90	100	126	53
75	250	105	103	140	60
90	270	125	111	160	69
110	290	150	116	185	81
140	330	192	125	230	99
160	350	211	135	250	111
200	375	247	144	300	135
225	430	290	154	360	150
250	445	310	162	380	165
280	495	360	172	425	183
315	545	403	185	478	204
355	588	434	194	520	224
400	612	485	205	570	246

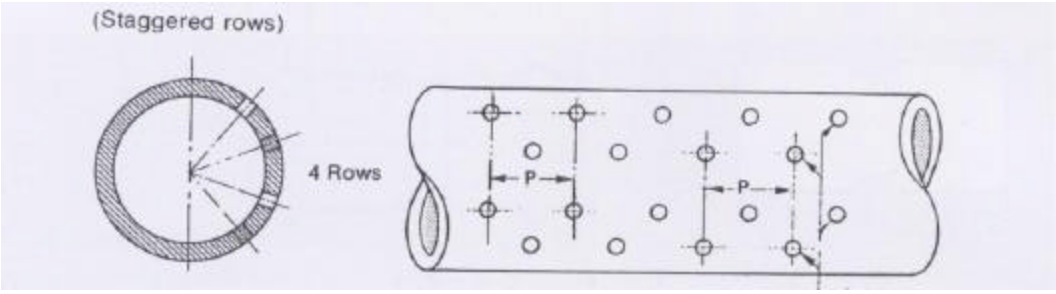
Dimensions stated above are indicative, Detailed specification for design purposes should be obtained from our Technical Sales Department.

L = Length.
Other lengths can be produced on request.

PERFORATED uPVC PIPES

NEPRO Perforated uPVC pipes are manufactured upon request depending on the size and class of the pipes. Below figures given a general configuration whichmay vary for each clients requirements.



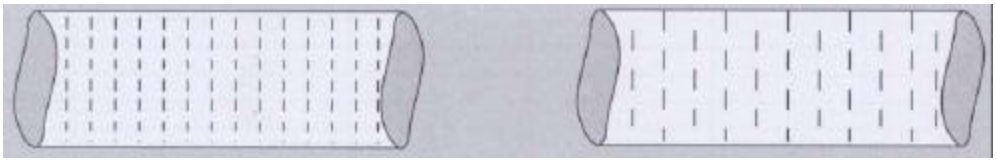


Range of sizes	**75 mm to 500 mm**
Longitudinal Pitch of wholes(LP)	**30 mm to 200 mm**
Hole Diameter	**05 mm to 13 mm**
Number of Rows	**1 to 6**
Angular Pitch of Holes	**40 degree for 3 or 4 rows**
	40, 80 or 120 degree for 2 rows.

For further details please refer to National Marketing Technical Sales Department

B. SLOTTED PIPE:

NEPRO slotted pipes are produced according to RDA requirements and for use in lowering the underground water table.



STRAIGHT SLOTS **STAGGERED SLOTS**

- Slot length : Depend to the size
- Sloth width : 1, 1/ 2, & 2 MM
- No. of Row : 4, 6, & 8 (but according to the size)
- Angular pitch : To be recommended by NEPRO

PROPERTIES OF NEPRO uPVC PIPES

TABLE: 10

All values are registered at 23^0 C (73^0F)

Properties	Test Method as per ASTM	Unit	Values
Mechanical			
Tensile Strength @ 73^0F	D-638	PSI	7,500 7,280
Modulus of Elasticity in Tension @ 73^0 F	D-639	PSI	420,000
Comprehensive Strength @ 73^0 F	D-695	PSI	9,600
Flexural Strength @ 73^0 F	D-790	PSI	12,700
Izod Impact 73^0F	D-256	Ft-Lbs/In Of Notch	0.65
Hardness @ 73^0F	D-2240 D-785	Durometer"D" Rockwell "R"	80+-3 110-120
Thermal Properties			
Coefficient of Thermal Linear Expansion per ^{0}F	D-696	**In/in/^{0}F**	**2.8 x 1.0-5**
Thermal Conductivity	D-177	BTU/hr/ft/^{0}F/in	1.3
Max. Operating Temp.		^{0}F	140
Heat Deflection Temp. @264 PSI	D-648	^{0}F	158
Electrical Properties			
Dielectric Strength Dielectric Constant 60 Hz @ 30 ^{0} F	D-147 D-150	Volts/Mil	1400 3.25
Specific Volume Resistivity @ 73^0F	D-257	Ohms/cm	3-5 x 10^{15}
General Properties			
Specific Gravity	D-792	g/cc	1.42
Water Absorption	D-570	%	<0.05%
Cell Designation	D-1784		12454-B
Flame Spread E-84			< 25
Poison's Ratio @ 730F			0.38
Smoke Density			500
Friction Coefficient	Hazen William	Factor C	150

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CHEMICAL RESISTANCE OF NEPRO uPVC PIPES.

Chemicals	Concentration %	Temperature of (oC) 68(20)	104(40)	140(60)
Acetaldehyde	100	NG	…	NG
“	40	….	G	…
Acetic acid	100	G	NG	…
“	25	E	E	G
“	25-60	E	E	G
“	80	E	G	G
“	85	…	…	…
“ (crude)	:5	…	G	…
Acetic acid anhydride	100	NG	…	NG
Acetone	trace	NG	…	…
“	100	NG	…	…
Adipic acid	sat.	E	…	G
Allyl alcohol	v6	G		NG
Alum	19	…	E	G
“	sat.	…	…	E
Aluminium chloride	10	…	E	G
“	sat.	E	E	E
Aluminium hydroxide	sat.	E	E	…
Aluminium sulfate	10	…	E	G
“	sat.	…	…	E
Amonium gas	100	…	…	E
“ (liquid)	100	G	…	…
Ammonia water	sat.	…	E	G
Ammonia chloride	10	E	E	G
“	sat.	…	…	E
Ammonium flurodie	not more Than 20	E	…	G
Ammonium nitrate	10	…	E	G
“	sat.	…	…	E
Ammonium sulfide	10	E	E	G
“	sat.	E	E	E
Amyl acetate	100	NG	…	…
Amyl alcohol	100	E	E	…
Aniline(pure)	100	NG	…	…
“	sat.	NG	…	…
Aniline hydrochlorid	sat.	G	…	NG
Antimony trichloride	10	E	…	…
Arsenic acid	10	…	E	G
“	80	…	E	G
Barium hydroxide	10	E	E	E
Beer		E	E	E
Benzaldehyde	0.1	…	…	NG
Benzine (Benzol)	100	NG		…
Benzine			…	E
Benzine sulfanic acid	100	…	…	…
Benzoic acid	10	E	E	G
	in all con-	E	E	
Bleaching soin	Centration	…		
Barax			E	G
“	10	…	E	G
	sat.	E	G	

Chemicals	Concentration %	Temperature of (oC) 68(20)	104(40)	140 (60)
Boric Acid	10	…	E	G
“	sat.	…	…	G
Bromine(liquid)	100	NG	…	…
“(vapot)	trac	G	…	…
Butance(gas)	50	E	…	…
Butadiene	100	…	…	E
Butanol	100	E	E	G
Butane diol	100 or below	G	…	…
Butance diol	100 or below	…	G	…
Butyl acetate	100	NG	…	…
Butyl phrnol	100	G	…	…
Butyl (liquid)	100	(-	…	…
40F)			…	…
Butyric acid	20	E	…	…
“	conc.	NG	E	…
Calcium bisulfite	sat.	E	E	G
Calcium chloride	10	…	…	E
“	sat.	…	E	…
Calcium nitrate	50	…	…	E
Carbon dixide(dry)	100	…	E	G
“ (wet)	in all con-	…		
	centrations			
Carbon dixoide				
Saturated in water	under 8 at,m.	E	…	…
Carbon tetrachloride	100	G	…	NG
Chlorine (dry gas)	100	…	G	…
“ (wet gas)	0.5	E	…	…
“ “	1	G	…	…
“ “	5	G	…	…
Chlorine water	sat.	G	…	…
Chloric acid	1	…	E	G
“	10	…	E	G
“	20	…	E	G
Chlorosulfonic acid	100	G	…	…
Chrome alum	sat.	E	E	…
Chromic acid	50	E	E	G
Chromic acid/sulfuric	50/15/35	…	E	G
Acid water				
Citric acid	10 or below	...	E	G
“	sat.	…	…	E
Cresol	90 or below	…	G	…
Crotonaldehyde	100	NG	…	…
Crude oil (sour)		E	E	…
Cupric chloride	sat.	E	…	…
Cupric sulfate	10	…	E	G
“	sat.	E	…	E
Cyclohexanol	100	NG	…	…
Cyclohexanone	100	NG	…	…

E: Excellent G: Good NG: Not Good Sat: Saturated Comm: Commercial Conc : Concentrated

الخواص الكيميائية لانابيب نيبرو يو . بي . في . سي

CHEMICAL RESISTANCE OF NEPRO uPVC PIPES.

Chemicals	Concentration %	Temperature of (oC) 68 (20)	104(40)	140(60)
Perchloric acid	sat.	…	…	E
Phenol	90 or below	…	G	…
“	1	E	…	…
Phenylhydrazine	100	NG	…	…
Phynylhydrazine Hydrochloride	sat.	G	…	NG
Phosgene(liquid)	100	NG	…	…
“ (gas)	100	E	…	G
Phosphoric acid	30 or below	…	E	G
“	30 or over	…	…	E
“	80	…	E	…
Phosphorus pentoxide	100	E	…	…
Phosphorus trichloride	100	NG	…	…
Photo-developer		…	E	…
Photo-fixing bath		…	E	…
Picric acid	1	E	…	…
Potassium borate	1	…	E	G
Pottassium bromade	10 or below	…	E	G
Pottassium bromide	10	…	E	G
“	sat.	…	…	E
Potassium chloride	10	…	E	G
“	sat.	…	…	E
Potassium chromate	40	E	…	…
Potassium dichromate	40	E	…	…
Potassium ferro(ferry)-Cyanide	10	…	…	G
“	sat.	…	…	E
Potassium hydroxide	40 or below	…	E	G
“	50 – 60	…	…	E
“	50	…	…	…
Potassium nitrate	10	…	E	G
“	sat.	…	…	E
Potassium perchorate	1	…	E	G
Potassium permon-ganate	6 or below	E	E	E
“ “	18 or below	…	E	…
Potassium persulfate	10	…	E	G
“	sat.	…	E	G
Propane (liquid)	100	E	…	…
“ (gas)	100	E	…	…
Propargyl alcohol	7	…	…	…
Payon spinning soln Containing CS2	100 mg/1	…	(112oF)	…
“ (112oF)	200 mg/1		…	…
“ (112oF)	700 mg/1		…	

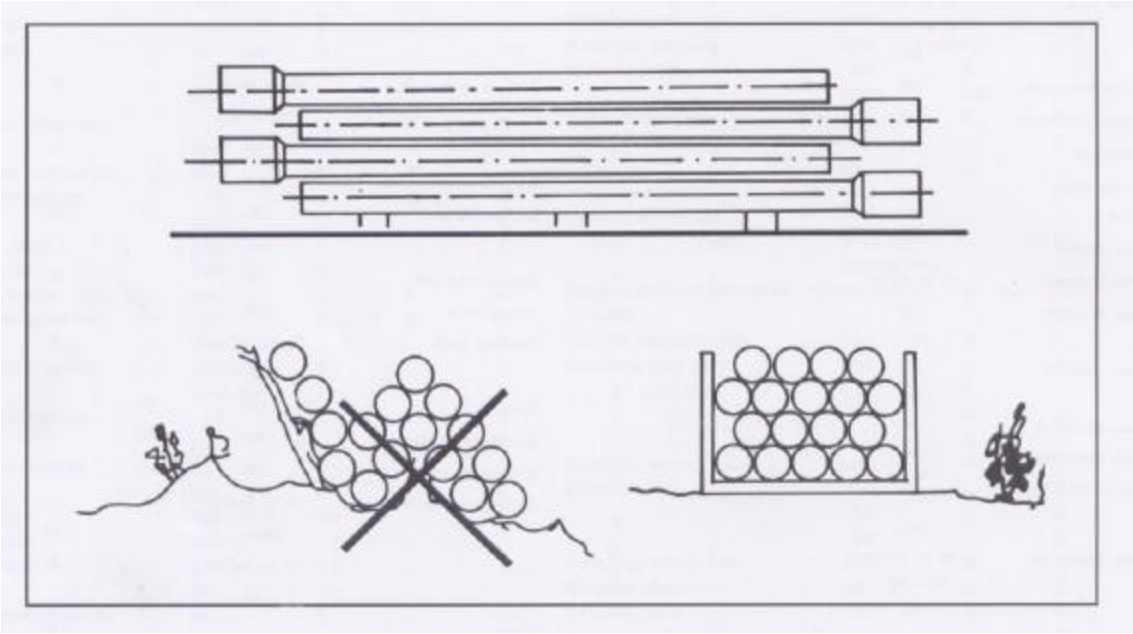
Chemicals	Concentration %	Temperature of (oC) 68(20)	104(40)	140(60)
Sea water		…	E	G
Silver nitrate	8 or below	…	E	G
Spermoil alcohol	comm.	E	…	…
Sodium benzoate	10 or above	…	E	G
“	36	…	…	G
Sodium bisulfite	10	…	E	G
“	sat.	…	…	E
Sodium chlorate	10 or below	…	E	G
“	sat.	…	…	E
'	10	G	…	…
Sodium hydroxide	40 or below	…	E	G
“	50-60	…	…	E
“	50	…	…	…
Sodium hypochlorite	10	E	…	…
Sodium sulfide	10	…	E	G
“	sat.	…	...	E
Stannic chloride	10	…	E	G
Stearic acid	100	…	…	E
Tartanic acid	10 or below	…	E	G
“	sat.	…	…	
Toluene	100	G	…	...
Trichloroethylene	100	E	…	…
Triethanol amine	100	NG	…	…
Trimethylol propane	10 or below	…	…	G
“	comm.	…	G	G
Urea	10 or below	…	E	G
“	33	…	…	E
Vineger		…	E	…
Vinyl acetate	100	NG	…	…
Waste gas containing HCI	In all concentrations	…	…	E
“ “ H2 SO4	In all concentrations	…	…	E
Wax alcohol	100	…	…	E
Whisky		…	E	E
Wine	comm.	E	…	…
Zinc chloride	10	…	E	G
“	sat.	…	…	E
Zinc sulfate	10	…	E	G
“	sat.	…	…	E

E. Excellent G : Good NG: Not Good Sat: Saturated Comm: Commercial Con: Concentrated

TRANSPORT, HANDLING & STORAGE

Unplasticized uPVC pipes are strong but light , its specific gravity being approximately one-fifth that of cast iron. As a result, these pipes are more easily handled than their metal counterparts. Reasonable care, however, should be exercised at all times, and when off loading, pipes should be lowered, not dropped to the ground.

Pipe should be given adequate support at all times. Pipes should not be stacked in large piles especially in warm temperature conditions, as the lower layers may distort; resulting in difficulties when joining and for pipe alignment. Any pipe with ends prepared for joining (socket and spigot joints, RR joints, etc.) should be stacked in layers with the socket, placed at alternate ends of the stack and with sockets protruding to avoid lop-sided stacks and the imparting of permanent set to pipes. Particularly in the case of RR pipe rubber rings should not be exposed to solar radiation for any length of time if they are not coated. It is recommended to stock them in a cool and shady place. Rubber rings should not come in touch with chemicals, grease, oil and to be stored for too long time.



For long-term storage, pipe racks should provide continuous support, but if this is not possible, timber of at least 75 mm bearing width at spacing not greater than 1 m centers for pipe sizes 150 mm and above, should be placed beneath the pipes and at 2 m centers at the side, if the stacks are rectangular. These spacing apply to pipe sizes 150 mm and above. Closer supports will be required for sizes below 150 mm. In such pipe racks, pipes may be stored not more than seven layers or 1.5 m high, whichever is the lesser, but if different classes of pipe are kept in the same racks, then the thickest classes must always be at the bottom.

For temporary storage in the field, where racks are not provided, the ground should be level and free from coarse stores. Pipes stored thus should not exceed three layers high and should be staked to prevent movement.

Stack heights should be reduced if pipes are nested, i.e. pipes stored inside pipes of larger diameters. Reductions in height should be proportional to the weight of the nested pipe compared to the weight of the pipes normally contained in such storages.

Since the soundness of any joint depends on the condition of the spigot and the socket, special care must be taken in transit, handling and storage to avoid damage to the ends.

When loading pipes on the vehicles, care must be taken to avoid their coming into contact with any sharp corners such as cope irons, loose nail-heads, etc., as pipes may be damaged by being rubbed against these during transit whilst in transit pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry. Pipes may be off loaded from lorries and or by rolling them gently down timbers, care being taken to ensure that pipes do not fall one upon another nor on any hard or uneven surfaces. Fork-lift trucks will have to be used for bundles and large unit loads.

DEFLECTION:

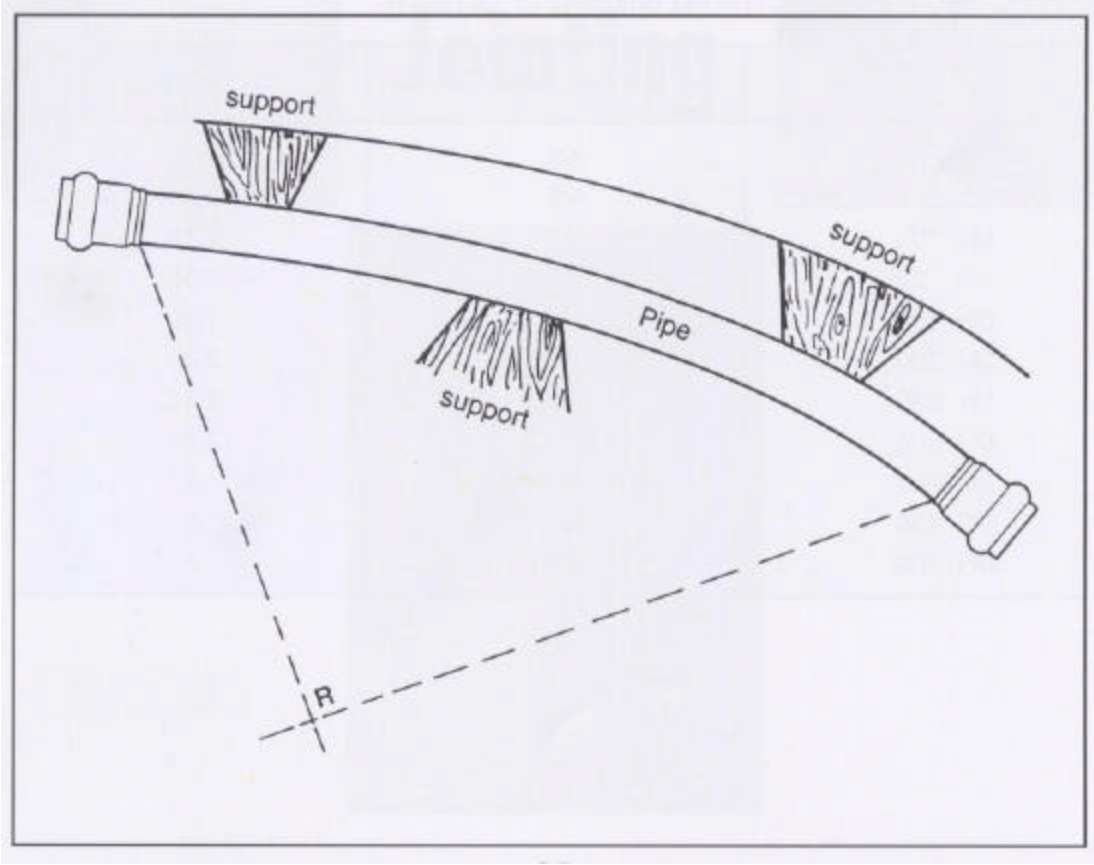
The ring Integral Socket permits an angular deflection at the joint of 2 to 3 degree.

The introduction of joint deflection is however, generally unnecessary in an inherently flexible uPVC pipeline. Sufficient flexibility is provided by individual pipe lengths to enable gentle curves to be negotiated without imparting deflection at the joints.

As a general guide the cold bending radius ® of a uPVC pipe length can be calculated as follows:

R = 300 x External Diameter

Where a shorter radius of curvature is required, then uPVC formed bends must be introduced.



The following information are intended to assist Engineers and Contractors to take full advantages of the physical and mechanical properties of uPVC pipes and to achieve the desired results:

A. Method of rubber ring joint installation :

1. Ensure that the mating areas of spigot and socket are thoroughly clean.
2. Setting the rubber ring in grove.
3. Assess the full socket depth by simple measurement and mark spigot accordingly.
4. Apply lubricant to the spigot side and to the inside of the joint on rubber.
5. Accurate axial alignment of the spigot and socket prior to jointing is important, hand feed spigot into rubber joint until resistance from the inner sealing section is felt.
6. Complete the joint by applying leverage to the following socket end using a timer block to prevent damage.

Importance notice :

If pipes are cut on site, make sure that the new spigot end are cut square with a find toothed saw and are charnfered to half pipe thickness with a coarse file before jointing.

For 100 Joints use the following amounts of lubricant :

Pipe outside Diameter DN	Dia. / mm	Kg. Of Lubricant
DN 50	63	0,5
DN 80	90	0,85
DN 100	110	1,10
DN 125	140	1,35
DN 150	160	1,80
DN 200	225	2,40
DN 250	280	3,15
DN 300	315	3,85
DN 400	400	5
DN 450	450	6
DN 500	500	7

Rubber Ring Jointing

B. Method of solvent welded joint installation :

1. Ensure that both spigot and socket are thoroughly clean.

2. Mark on spigot the full length of the socket side to make sure that the spigot will fit exactly the socket length.

3. Apply solvent cement to both spigot and socket side with an adequate quantity of cement.

4. Insert the pipe quickly into the socket and then turn the pipe 1/4 time in the inserting operation so that the solvent cement will be spread with uniformity.

5. Hold for a while until handling strength is developed and then wipe excess solvent cement with a cloth.

6. After jointing keep the jointing force from undue stresses for about ten minutes.

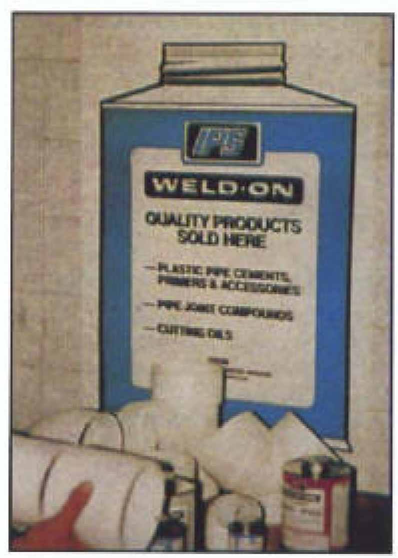
Important notice :

Close the open tin of solvent cement when not in use, do not work near a naked flame and do not mix cleaning liquid with the solvent cement.

FOR 100 JOINTS USE THE FOLLOWING AMOUNTS OF ADHESIVE AND CLEANSER.

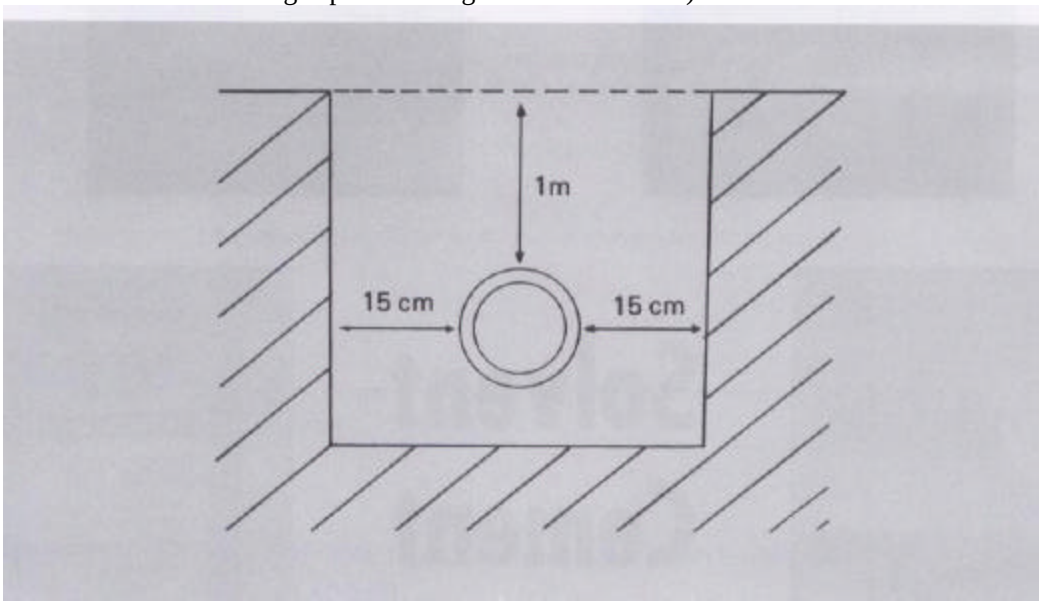
Pipe Outside Diameter DN	O.D Dia / mm	Cleaner kg	Adhesive kg
25	32	Approx. 0.5	Approx.08
32	40	Approx 0.7	Approx 1.1
40	50	Approx 0.9	Approx 1.6
50	63	Approx 1.7	Approx 1.7
60	75	Approx. 1.3	Approx 2.2
80	90	Approx 1.4	Approx 4.0
100	110	Approx 1.7	Approx 8.0
125	140	Approx 2.1	Approx 13.0
150	180	Approx 2.5	Approx 19.0
200	225	Approx 4.5	Approx 26.0
250	290	Approx 6.5	Approx 38.0
300	315	Approx 10.2	Approx 52.0

Solvent Cement Jointing



"UNDERGROUND INSTALLATION
TRENCH WIDTH PREPARATION COVER AND BACKFILLING"

The width of trench for most purposes is enough to be 30 cm wider than the diameter of the pipe to allow enough room for jointing. Depth of cover should be at least 1 m from top of pipe to ground surface (it is wise to consider in early planning stages how future road widening plans could affect this depth of cover and to consider the frosting depth according to the local climate).



When laying Nepro water mains piping the usual recommendations relating to sound pipe laying practice should be followed. However, in view of the greater flexibility of PVC than most traditional materials, some of the procedures attain special importance.

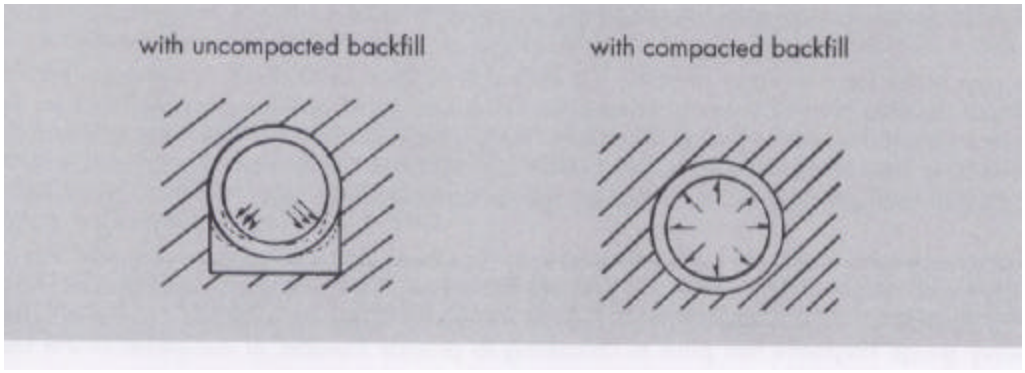
To avoid possible damage or deformation of the pipe, its support by the ground in which it is laid should be made as uniform as possible, and materials in contact with the pipe must be free from large stones, sharp edged flints or other hard objects. The trench bottom should be carefully examined for irregularities and any hard projections removed. In good uniform conditions, where the trench bottom can be readily brought to an even finish so as to support the pipes uniformly over their length no underbedding will be necessary. Elsewhere and especially in rock or variable soils containing large stones, boulders, flints, tree roots or soft pockets a prepared bed is necessary. This bed should consist of suitable well compacted selected granular material.

The ideal material for the trench bed and for compacting is one that will pass through a tin sieve but which is free from very fine particles which may impede drainage. The thickness of bed should be a minimum of 150mm.

In all cases, care should be taken to remove any leveling pegs or temporary packing such as wooden wedges, bricks or stones. Selected granular materials similar to the material used for bedding should then be carefully placed and compacted in uniform layers alongside and under the pipe up to a height of 150mm or more above the crown. Any trench sheeting if used should be partially withdrawn so as to ensure that the spaces between the pipes and soil faces of the trench are completely filled with well compacted granular materials in order to provide the necessary side support for the pipes and prevent excessive deformation under load. It may be helpful especially when thin wall piping is being laid if the pipe can be full of water during this operation.

Under roads or verges, or where mechanical plant is to be used for the placing and/or compacting of the backfill, the remainder of the first 300mm depth of fill above the crown of the pipe should be compacted by hand and should consist of selected, uniform, readily compactable material, placed and compacted in uniform layers. The remaining fill should then be placed in layers of 300mm. Or more depending on the compactors used.

If piping is laid in hot weather, precautions should be taken to allow for the contraction of the line which will occur when it cools to its normal working temperature. The best method is to allow the pipe to fill with cold water from its normal supply when the trench has only been partially back filled. This will result in the reduction of the overall length of the pipe due to shrinkage and it will therefore be necessary, before final back filling, to carefully examine any detachable or other joints to see that sufficient reserve of draw is still available and that they have not become subject to any undue stress.



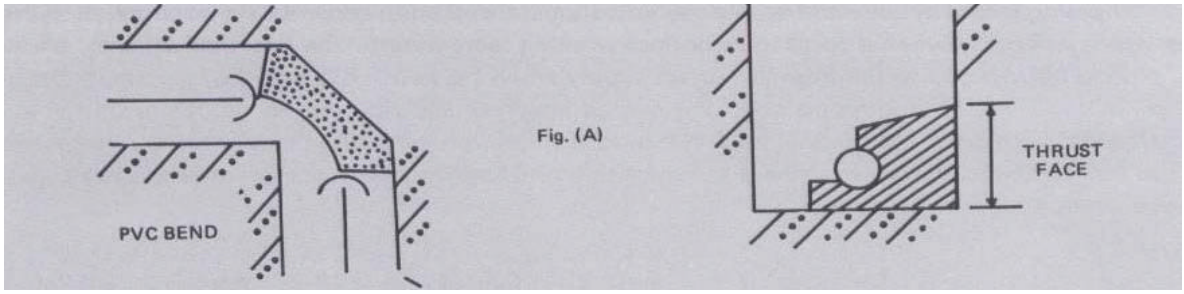
The ideal material should be free from large clay lumps (retained on a 3 in. sieve) from stones (retained on a 1 in. sieve) and sharp edged stones or flints, vegetable matter and from soil.

ABOVE GROUND INSTALLATION

The jointing procedure for above-ground pipelines is identical to that for underground pipelines. Above-ground installations should be fully supported, firmly enough to avoid strain on all joints but flexible enough to allow for a certain amount of thermal expansion in a pipeline. All flanged joints should be supported on both sides. 'Anger' joints should be anchored against end trust. Pipelines should be protected from abrasion by metal supports with felt or foam rubber strips.

THRUST FORCES

When a pipeline is constructed using push-fit joints, joint separation due to internal pressure and resulting thrust forces must be prevented. This is achieved using concrete trust blocks at directional changes, branches, end cops, valves etc.



The design of uPVC pipes provides a safety factor of 2.1 after a life of 50 years at maximum working pressure. In designing thrust blocks it is logical to apply a similar factor of safety after calculating thrust forces on the maximum foreseeable line pressure.

In view of the flexible nature of uPVC it is desirable in trust block install at design to permit the largest possible area of contact between the fitting concerned and the concrete block so that a restraint against excessive flexing, as well as thrust, is provided (Fig.A). This feature, in certain soil conditions, may also be applied to Solvent Welded pipelines which need no support against thrust but which can benefit by flexing restraint at abrupt directional changes.

Thrust block concrete should not be allowed to encase the fitting as the external diameter of a uPVC pipe must be left free to distend due to pressure fluctuation. The block may be designed as shown in (Fig.A) or it total encasement is preferred the fitting should first be wrapped in several layers of heavy gauge Polythene film prior to concreting to provide freedom of movement and a barrier against abrasion.

Pipe Along Bridge:

1) This work should be carried out in accordance with the following conditions:

B. Piping Along Bridge:

This work should be carried out in accordance with the following conditions:

1) When the bridge itself is of curving construction expansion or flexible fitting such as RR joint and dresser joint and dresser joint should be used.
2) Air valve should be fixed.
3) At the both ends of pipe, concrete protection should be given to protect disconnection of fitting and falling down of pipe.
4) Metal hanger of pipe may or may not be required depending on the structure of bridge. However, in any case, pipe itself should be fixed firm to the bridge not to be swayed or shake.

C. Pipe under railway

Piping work under railway tracks should be carried out in accordance with the following conditions:

1) Such work should only be started after due understanding with railway companies or with competent railway authorities.
2) Piping work should be carried without any interruption against railway operation.
3) At night work, alarming yellow lamp should be provided for traffic safety purpose.
4) Proper protection work or device such as protective concrete or metal casing should be given to pipe to avoid shaking.

HYDROSTATIC TESTING

The length of test section will be determined by practical reasons such as availability of water, or the number of pipes, fittings and joints to be tested. Long pipelines should be tested in sections as mainlaying progresses.

The pipe length to be tested may be blanked off using a blank iron or Steel flange previously drilled and tapped for test equipment connection and strutted as necessary against end thrust. The blank flange may be attached to the pipeline by a Viking Johnson Flange Adapter or similar.

Testing should be preferably not be carried out against closed valves. All charging and testing should preferably be carried out from the lowest point of the under test section and all testing equipment should be located at this point. The pressure gauge also should be located at the lowest point or adjustment must be made for the level of the pressure gauge relative to the pipe's position.

Prior to testing, care should be taken to ensure that all anchor blocks have attained adequate maturity and that any solvent welded joints included in the pipe system have developed full strength. Correct support and anchorage of any above ground section of the pipeline is also necessary. Underground pipelines should be back-filled, taking particular care to consolidate around lengths which may have been deflected to negotiate curves. All joints may be left exposed until testing is completed.

With the stand pipe, valves and pressure gauge assembled, filling of the main can begin. The main should be charged slowly, preferably from the lowest point with any air cock in the open position. They should be closed in sequence from the lowest point only when water, visibly free from aeration, is being discharged through them.

Satisfactorily charged, the main should be allowed to stand overnight to allow any residual air to ' settle-out' and percolate to the pipe soffit. Re-venting is then necessary and any water deficiency should be made-up.

Pressure testing can then begin by pumping slowly until the required test pressure is attained. A single or double cylinder hand pump should be used for this purpose. Mechanical pumps are not recommended unless incorporating a pre-set blow-off mechanism.

The hydrostatic test specification will be at the discretion of the responsible Engineer but should not exceed 11/2 times the designed working pressure of the lowest rated component in the system and a time duration of 24 hours.

A permissible water loss of 3 liters per kilometer of pipe per 25mm nominal bore, per 3 bar of test pressure, per 24 hours, may be considered reasonable.

Air testing is not recommended If, however, for practical reasons, pneumatic testing is necessary, this should be limited to a maximum pressure of 1.5 bar.

Air leakage can be detected by applying soap solution to the joints or by pre-odourising the air with Ethyl Mercaptan. This will reduce the time duration of an otherwise long term pneumatic test.

During any air-pumping operations no one should be working on or near the test section and precautions should be taken to avoid heavy objects striking the main whilst under pneumatic pressure.

Although Nepro cement joints achieve initial setting in a very short time the joints does not reach its full strength for about 24 hours. Therefore, cemented joints must be left overnight before pressure testing is carried out.

Flow & Friction

The smooth bores of uPVC pipes have better flow characteristics than those metal pipes. The following is the coefficient of fiction given when using the Hazen-Williams formula:

$$f = 0.2083 \left(\frac{100}{C}\right) \frac{Q^{1.85}}{di^{4.87}}$$

Q = Flow in gallons/min

di = inside dia of pipe in inches

up to 315 mm C = 137 - 150

over 315 mm C = 151

C = constant for inside roughness of pipe

f = friction head in feet of water/100 feet of pipe

Head losses attributable to fittings can be found by applying :-

$$h = \frac{KV^2}{2g}$$

Values of K

Elbow 90^0 - 1.00

Elbow 45^0 - 0.40

Moulded Bends 90^0C – 0.75

Formed Bends 90^0 – 0.20

Formed Bends $22\frac{1}{2}^0$ - 0.10

Tees 90^0

Flow in Line - 0.35

Flow in the line to branch or branch to line – 1.20

h = Head loss (m).

K = Constant

V = Velocity of fluid (m/s).

g = Acceleration due to gravity (m/s^2)

Surge pressures

Surge pressures commonly termed as “Water Hammer” are generated in any piping system when a flow changes its velocity.

$$P = \frac{4660\ V}{V\sqrt{\frac{1+K\ (DR-2)}{E}}}$$

P = Surge pressure in PSI

V = Maximum velocity change in Ft/Sec.

g = Acceleration due to gravity 32.2 Ft. Sec^2 or Sec/Sec.

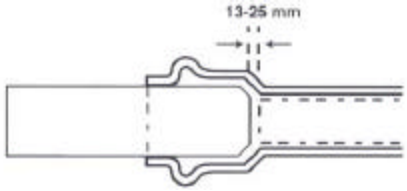
K = friction head in feet of water /100 feet of pipe

DR = Pipe outside diameter/wall thickness.

E = Modules of elasticity of the pipe in PSI. (420,000 PSI for PVC)

Expansion Gap:

To be sure that the spigot enters the socket to within 13 – 23 MM of the bottom of the socket dimension, the depth of chamber should be one third of the wall thickness of the pipe.



Calculation of pipe diameter based on required flow an velocity.

$$ID = 10 \sqrt{\frac{40 \cdot Q}{V}}$$

ID : Inside diameter (mm)

Q : Flow rate in L/S or m /F

V : Velocity of Flow (M/S)

*Determination of the length changes caused by difference in temperature.

L = L T &

L = IN ^{0}C, L = MM

= for uPVC = 0.05

THERMAL MOVEMENT

Where the temperature of a PVC pipeline is likely to vary due to atmospheric temperature, it is important to plan the variations in pipeline length which may arise as a result of temperature differences.

Expansion and contraction can be calculated using the formula.

$$dl = \alpha \times L \times dt$$

Where
dl = Change in length in millimeters
α = 0.08mm/m/C.
L = Original length of pipe in meters
dt = Total temperature range in ^{0}C.

Calculation of expansion and contraction should take account of the minimum and maximum foreseeable temperature conditions.

When the total length variation of the pipeline has been established, the positioning of both support and anchor brackets can be determined.

Anchor brackets, can be so arranged to sub-divide the total length variation and to control movement in a specific direction. Support brackets must allow the pipeline to move freely.

It is normally possible by correct bracket arrangement to direct movement in such a manner that this is a accommodated by directional changes in the line.

Expansion bellows may be used to accommodate excessive movement but in such instances the pipes so connected must be restrained against possible separation.

Any line valves must be firmly anchored and independently supported so that no stresses are transmitted to the pipeline.

PIPE BRACKETS

Standard or purpose made metal pipe brackets are normally employed. These should be of the maximum possible bearing width and should have no sharp edges likely to cause pipe damage.

The brackets may be plastic coated but where this is not practical a layer of rubber, felt or similar soft, non abrasive membrane must be fixed to the bearing face prior to installation.

PIPE SUPPORT

UPVC pipes must be adequately supported. The following table shows the recommended support intervals for horizontal pipes conveying water. Where liquids of greater density are being conveyed the intervals of support should be reduced proportionately.

For vertical pipe runs, the support intervals may be increased to double those shown except in exposed situations where wind loading, etc., may dictate adherence to the intervals tabulated below.

	Classes II & III		Classes IV & V	
Nom. Size	**20^{0}C m**	**40^{0}C m**	**20^{0}C m**	**40^{0}C m**
12	.	.	0.70	0.60
20	.	.	0.77	0.70
25	.	.	0.85	0.80
32	.	.	0.90	0.85
40	.	.	1.07	0.90
50	1.07	0.92	1.15	1.00
63	1.22	1.07	1.30	1.15
75	1.30	1.15	1.37	1.22
90	1.34	1.18	1.45	1.26
110	1.37	1.22	1.52	1.30
140	1.52	1.37	1.67	1.45
160	1.60	1.45	1.82	1.60
180	1.75	1.52	2.00	1.75
200	1.82	1.60	2.05	1.82
205	1.90	1.67	2.20	1.90
250	2.05	1.75	2.37	2.05
315	2.30	2.05	2.52	2.20
355	2.37	2.20	2.67	2.42
400	2.60	2.45	2.75	2.60
450	2.90	2.75	2.97	2.82
500	3.20	3.05	.	.
.	.	.	.	.
.	.	.	.	.

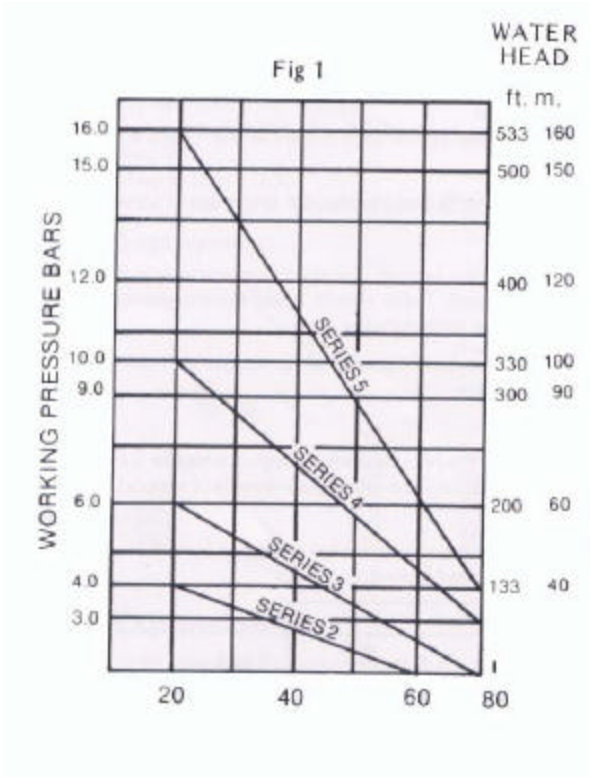
uPVC Pipe at Elevated Temperature

When uPVC pressure pipe operates at temperature other than the temperature at which the pipe is rated (20 or 23'C) pressure rating should be established on thermal design factors. Examples given below are for guidance only.

PRESSURE TEMP.RELATIONSHIP

Ambient Variable

Internal Temp 20^0

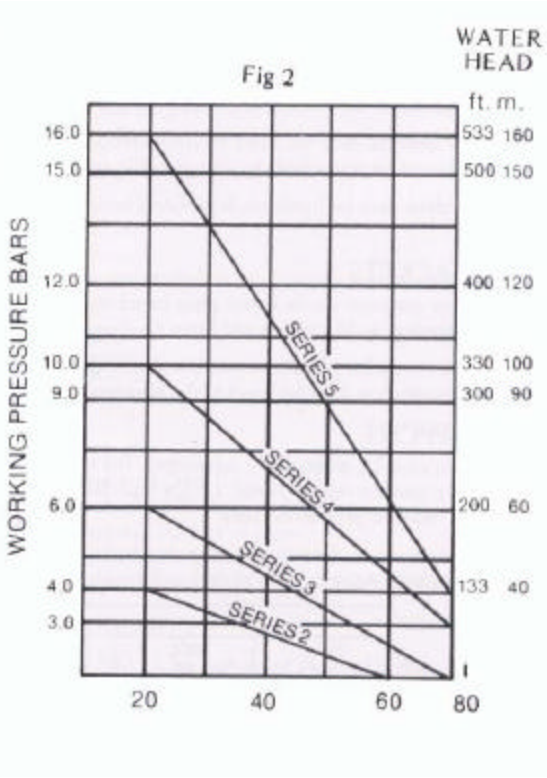


AMBIENT TEMPERATURE OF 40^0 C a
Required working pressure of 6.0 bars
Use 1 10 bar rated pipe.

PRESSURE TEMP.RELATIONSHIP

Internal Variable

Ambient Temp. 20^0C



Required Working Pressure 7.0 bar with a liquid temperature o-f 40'C therefore A 10 bar rated pipe to be used.

TEMPERATURE CONVERSION

$$F = \frac{9}{5}(C + 32)$$

$$C = \frac{5}{9}(F - 32)$$

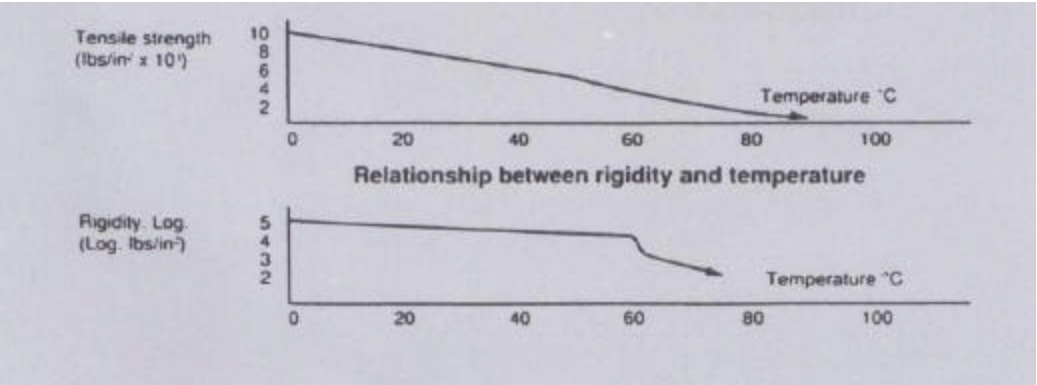
Pressure Temperature relationship

Temperature ^0C	^0F	% of Working Pressure reduction
20	68	100
30	86	90
35	95	80
40	104	70
45	113	60
50	122	45
55	131	30
60	141	15

Where the carried in a pipeline is 20 ^0C and the ambient temperature is higher 20 ^0C – the maximum working pressure should be reduced by 1 ½% per degree above 20 ^0C. The ambient temperature is above 20 ^0C.

Where the carried in a pipeline is 20 ^0C and the ambient temperature is 20 ^0C – the maximum working pressure should be reduced by 2% for every degree ^0C the fluid temperature is above 20^0C.
The above pressure reductions apply to maximum operating temperature of 60 ^0C.

Relationship between tensile strength and temperature



CERTIFICATE OF REGISTRATION

MOODY INTERNATIONAL CERTIFICATION

This is to certify that the Quality Management Systems of:

New Product Industries
National Factory for Plastic Pipes and Fittings (NEPRO PLASTICS)
P.O. Box 460, Jeddah, 21411
Kingdom of Saudi Arabia

have been assessed and registered against the following quality assurance standard/s:

ISO 9002: 1994

The scope of the registration:

The Manufacture of uPVC and CPVC Plastic Pipes and Fittings

Certificate Number **0006483**

Date **7th July 2000**

UKAS QUALITY MANAGEMENT
Registration Number 014

Signed for and on behalf of Moody International Certification Limited

The Lord McNally Chairman

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بسم الله الرحمن الرحيم

تشهد الهيئة العربية السعودية للمواصفات والمقاييس بأن

المصنع الوطني لإنتاج أنابيب وقطع البلاستيك

قد رخص له باستعمال علامة الجودة على إنتاجه من

أنابيب عديد كلوريد الفينيل غير اللدن لمياه الشرب

لمطابقته للمواصفة القياسية السعودية

رقم ١٤/١٩٩٨م

وتسري هذه الشهادة حتى تاريخ ١٤٢٢/٦/٢٩هـ الموافق ٢٠٠٢/٩/٦ م

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والله الموفق

رقم الترخيص : ١٤١٦/٩٤

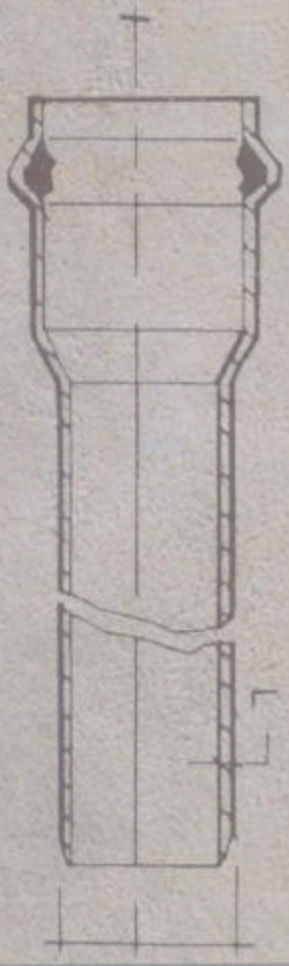
تاريخ : ١٤٢٢/٧/١هـ

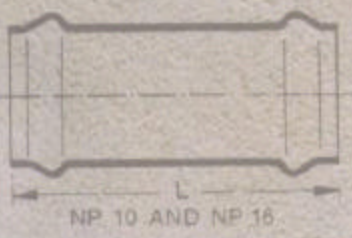
هذه الوثيقة ملك للهيئة يجب إعادتها عند انتهاء سريانها.

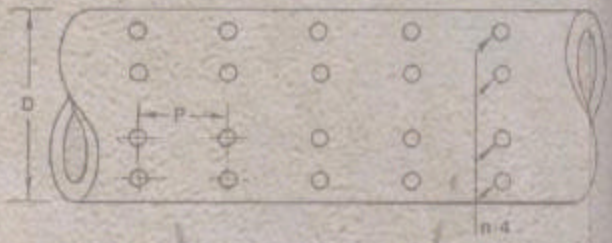
نيبرو للبلاستيك

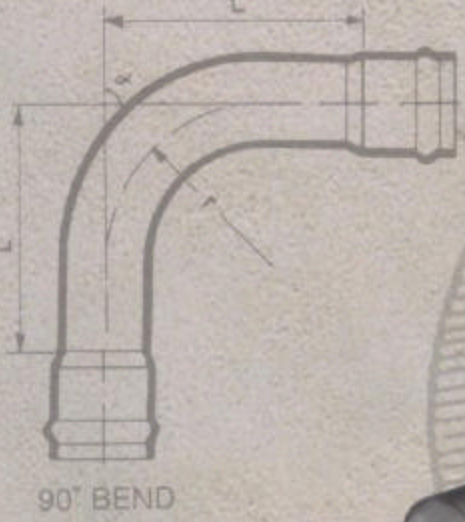
أنابيب يو بي في سي

المصنع الوطني لانتاج أنابيب وقطع البلاستيك









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