BESSTEM®

BS4576 uPVC

Rainwater Downpipe System

contents

Product Technical Information

BESSTEM

Quality Products

BESSTEM *BS4576 uPVC Rainwater Downpipe System* complies where applicable with the requirements of :-

a) BS4576:Part 1:1970 and BS4576:Part 1:1989 Unplasticized Polyvinyl Chloride (PVC-U) rainwater goods and accessories. It is suitable for internal and external exposed installations.

b) ISO3633:1991(E) Unplasticized Poly (vinyl chloride) (PVC-U) Pipes and fittings for soil and waste discharge (low and high temperature) system inside buildings. It is suitable for internal and external exposed installations.

c) ISO4422-2:1996(E) Pipes and fittings made of unplasticized Poly (vinyl chloride) (PVC-U) for water supply. It is suitable for casting within reinforced concrete (RC) columns and also for buried underground sump's connection.

Material

The uPVC Rainwater Downpipes and Fittings are generally manufactured from Unplasticized Polyvinyl Chloride (PVC-U). Ring seals are EPDM and Natural Rubber complying with the requirements of BS2494:1976.

Sizes

Complete range of pipes and fittings are available in Seven (7) nominal sizes ie :- 50mm (2"); 82mm (3"); 110mm (4"); 160mm (6"); 200mm (8"); 250mm (10") & 315mm (12"). The standard pipe length is Six (6) meter long plain ended.

Colour

All pipes and fittings are manufactured in Two (2) colours :-
- WHITE for internal and external walls of the building used.
- LIGHT GREY for bridges and elevated highway project used.

Chemical Resistance

BESSTEM uPVC products are resistant to the wide range of chemical listed in BS.CP312:Part 1.

Temperature Range

For use with intermittent discharges of water up to 90°C. The coefficient of expansion of uPVC is 5 X 10° per degree C. i.e. 0.5mm per 10°C change in temperature.

Service Life

The impact resistance tends to decrease with the increasing age of the uPVC for external used, but this does not impair performance except indirectly, for example through possible damage from ladder. uPVC components require no maintenance. Painting is unnecessary for protection but may eventually become desirable to change colour after many years of use out of doors. One or two coats of gloss paint suffice without an undercoat.

Product Technical Information

Solvent Weld Joints

Pipes should be cut and all rough removed with a half round file. Simply clean the pipe and fitting to be jointed, apply an even coat of PVC Solvent Cement on the pipe's external surface and the fitting's socket internal surface, push together and hold in position for approximately 20~60 seconds. For pipe nominal sizes 110mm and below could use Fast Dry PVC Solvent Cement, and for 160mm and above is recommended to use Slow Dry Solvent Cement.

Roof Drainage

BS6367:1983 give information on recommended methods for the design of roof drainage system. Section 3, Clause 7, of the BS6367:1983 code give very comprehensive information on the design of system in a variety of situations. The Code should be referred to whenever large industrial type installations are envisaged or whenever particularly severe weather conditions are expected.

Downpipe Sizing

In the tropical country like Malaysia where torrential rain falls over the years, the rainwater downpipe size ratio is recommended for 75 square feet roof area to 1 square inch downpipe size (75:1).

Bracket

The rainwater downpipe are used in intermediate position to maintain the vertical line of the stack. The distance between brackets must comply to the table shown in page 38 of this catalogue (Hangers and Brackets).

Typical Properties of PVC-U

Property	Values
Density	1,420kg/m^3
Bending strength (ASTM D-790)	860kg/cm^2
Thermal conductivity	1.6W/(m.K)
Vicat softening temperature (min) For BS4576:1989 tested to - BS2782 : Method 120B	75°C
Modulus of elasticity	3,000N/mm^2
Tensile strength at yield 20°C (min)	45N/mm^2

Property	Values
Specific heat	1000J/(kg.K)
Coefficient of linear expansion	6 x 10^{-5} /K
Vicat softening temperature (min) For ISO4422-2:1996(E) tested to - ISO 2507-1 and ISO 2507-2	80°C
Poisson's ratio	0.3
Elongation at break (min)	80%

Estimated Coverage Of Solvent Cement Required For Jointing

Nominal Pipe Sizes	Average number of Joints per 500 grams can	Nominal Pipe Sizes	Average number of Joints per 500 grams can
32 mm	85	160 mm	12
40 mm	70	200 mm	8
50 mm	37	250 mm	4
82 mm	30	315 mm	2
110 mm	20	350 mm	1

Product Technical Information

Product's License

BESSTEM Products had granted the SIRIM QAS Sdn Bhd. License on 19th October 2000. License No : PO005101 for BS4576:Part 1:1989.

Caution

BESSTEM Products are designed to fine tolerance and are manufactured from high grade material. The Company will not be responsible for the malfunction of any installation that includes components not supplied by BESSTEM PLASTICS (M) SDN. BHD. (*Formerly known as Osmaly Plastics (M) Sdn Bhd.*)

Product's Patents

Patent numbers related to products in this publication are :-

a) Pipe Sleeve - Granted Patent = MY109661A (Malaysia)
GB2278387B (United Kingdom)

b) Balcony Drainage Outlet Grating – Patent Pending = PI9503714 (Malaysia)

c) Balcony Horizontal Outlet Grating – Patent Pending = PI20013597 (Malaysia)

d) Large Diameter Plastic Fittings – Patent Pending = PI99004152 (Malaysia)

e) BESSTEM Trade Mark - Granted Number = 97-04424, Class 19

References

BS 2494:1976 Material for elastomeric joint ring for pipework and pipelines.

BS 3505:1968 Unplasticized PVC pipe for cold water services.

BS 4514:1983 Unplasticized PVC soil and ventilation pipes, fittings and accessories.

BS 4660:1973 Unplasticized PVC underground drain pipe and fittings.

BS 5255:1976 Plastic waste pipe and fittings.

BS 5481:1977 Unplasticized PVC pipe and fittings for gravity sewers.

MS 628:1982 Specification for unplasticized PVC pipe for cold water services.

ISO3633:1991(E) Unplasticized Poly (vinyl chloride) (PVC-U) Pipes and fittings for soil and waste discharge (low and high temperature) system inside buildings.

ISO4422-2:1996(E) Pipes and fittings made of unplasticized P oly (vinyl chloride) (PVC-U) for water supply.

Product Technical Information

Dimensions

Pipe and fitting dimension, tolerance, area of circle and weights as follows :-

A) " LIGHT DUTY " To BS4576 - Part 1 : 1989

For Low-rise Building (below 2 storey) Exposed Installation Only

Nominal Size	Code No.	Mean Outside Diameter		Min. Wall Thickness For Pipes	Average Pipe Weight	Area Of Circle For Pipe's I/D
		Min.	Max.			
82 (3")	3R056:1989	82.4	82.8	1.8	0.9 kg/m	7.60 sq.in.
110 (4")	4R056:1989	110.0	110.4	2.2	1.3 kg/m	13.63 sq.in.

B) " NORMAL DUTY " To BS4576 - Part 1 : 1970

For Exposed Installation Only

Nominal Size	Code No.	Mean Outside Diameter		Min. Wall Thickness for Pipes & Fittings	Average Pipe Weight	Area Of Circle For Pipe's I/D
		Min.	Max.			
50 (2")	2R086	55.75	56.05	2.0	0.6 kg/m	3.80 sq.in.
82 (3")	3R086	82.4	82.8	3.2	1.3 kg/m	7.07 sq.in.
110 (4")	4R086	110.0	110.4	3.2	1.6 kg/m	13.14 sq.in.
160 (6")	6R086	160.0	160.6	3.2	3.0 kg/m	28.83 sq.in.
200 (8")	8R086	200.0	200.6	4.9**	4.6 kg/m	44.18 sq.in.
250 (10")	10R086	250.0	250.7	6.2**	7.0 kg/m	69.04 sq.in.
315 (12")	120R086	315.0	315.9	7.7**	11.0 kg/m	109.60 sq.in.

** These Wall Thickness are made complied to " ISO 3633:1991(E) PVC-U Pipes & Fittings for soil and waste discharge ".

All dimensions in mm.

Dimensions

Pipe and fitting dimension, tolerance, area of circle and weights as follows :-

C) " MEDIUM DUTY " To BS4576 - Part 1 : 1970

For Exposed & Casting In The Small Size of R.C. Column

Nominal Size	Code No.	Mean Outside Diameter		Min. Wall Thickness For Pipes	Average Pipe Weight	Area Of Circle For Pipe's I/D
		Min.	Max.			
110 (4")	4R066MD-ISO	110.0	110.4	4.2 ^	2.1 kg/m	12.62 sq.in.
160 (6")	6R066MD-ISO	160.0	60.6	6.2 ^	4.5 kg/m	26.63 sq.in.
200 (8")	8R066MD-ISO	200.0	200.6	7.7 ^	7.3 kg/m	41.62 sq.in.
250 (10")	10R066MD-ISO	250.0	250.8	9.6 ^	11.0 kg/m	65.05 sq.in.
315 (12")	12R066MD-ISO	315.0	316.0	12.1 ^	17.3 kg/m	103.27 sq.in

^ These Wall Thickness are made complied to " ISO 4422-2 : 1996(E) SDR26 PN10 PVC-U Pipes & Fittings for Water Supply with a Working Pressure of 10 Bar ".

D) " HEAVY DUTY " To BS4576 - Part 1 : 1970

For Casting In The R.C. Column / Buried Underground

Nominal Size	Code No.	Mean Outside Diameter		Min. Wall Thickness For Pipes	Average Pipe Weight	Area Of Circle For Pipe's I/D
		Min.	Max.			
82 (3")	3R096HD	82.4	82.8	4.6 *	1.8 kg/m	6.56 sq.in.
110 (4")	4R096HD-ISO	110.0	110.4	5.3 **	2.7 kg/m	12.08 sq.in.
160 (6")	6R096HD-ISO	160.0	160.6	7.7 **	5.6 kg/m	25.54 sq.in.
200 (8")	8R096HD-ISO	200.0	200.6	9.6 **	8.4 kg/m	39.93 sq.in.
250 (10")	10R096HD-ISO	250.0	250.8	11.9 **	13.7 kg/m	62.51 sq.in.
315 (12")	12R096HD-ISO	315.0	316.0	15.0 **	21.5 kg/m	99.23 sq.in.

* This Wall Thickness is made complied to " BS3505 : 1975 Class ' D ' uPVC Pressure Pipes for Water Services " with a Working Pressure of 12 Bar.

** These Wall Thickness are made complied to " ISO 4422-2 : 1996(E) SDR21 PN12.5 PVC-U Pipes & Fittings for Water Supply " with a Working Pressure of 12.5 Bar.

All dimensions in mm.

Special Products Introduction

BESSTEM *BS4576 uPVC Rainwater Downpipe System* are available sizes from 50, 82, 110, 160, 200, 250 & 315mm. Each size is complete with a comprehensive range of fittings to suite the Architect or Engineer's requirements for various type of projects. Designed to fine tolerances, the system meets internationally recognized standards, complying with BS4576 / ISO3633 / ISO4422. Its made from superior grade uPVC raw material, the downpipe offers the benefits inherent in plastics such as lightweight, strength and corrosion resistance.

The uPVC downpipe has offered Four (4) different wall thickness categories :-

"**Light Duty**" - for low-rise (building below 2 storey) exposed installation;
"**Normal Duty**" - for high-rise building exposed installation;
"**Medium Duty**" - for high-rise building exposed installation and casting within small reinforced concrete (RC) columns and
"**Heavy Duty**" - for casting within reinforced concrete (RC) columns and also for buried underground sump's connection.

In addition, the system offers several key advantages over rainwater downpipe system likes :-

1. PIPE SLEEVE

This innovatively designed product comes with external ribs which allows it to hold firm inside the concrete floor slab and prevents water seepage along the external smooth surface of uPVC pipes, this also eliminates the problem of ugly stains that usually plague bathrooms, balconies, concrete flat roofs, corridors and multi-stories car parks.
As no special waterproofing material is required, the use of this unique Pipe Sleeve will help costs saving, BESSTEM **Pipe Sleeve** is produced in various sizes and the height also cater to suite for different pipe's diameter and thickness of the concrete slab. It is also suitable to be used in uPVC Soil, Waste & Vent (SWV) System.
This Pipe Sleeve has been **Granted Patents Right** for its products in **Malaysia** (MY109661A) and **United Kingdom** (GB2278387B).

2. ACCESS PIPE

This fitting provide another convenient feature to allow someone to have an easy access by the big twist lock access door, to any part of the downpipe system for cleaning and maintenance purposes. This BESSTEM **Access Pipe** is usually installed near the bend or tee junction and also at the vertical downpipe before it is connected to the underground drainage pipe.

This fitting is highly recommended to be installed at the horizontal runner drainage pipe for elevated highway and bridges for maintenance purposes.

3. DOMED ROOF OUTLET GRATING

It is designed to have a removable push fit high dome grating. The purpose of this high dome grating is to prevent blockage and is strong enough to withstand normal foot traffic. It can be installed in reinforced concrete roofs, scupper drain or with metal rain gutters.

This special BESSTEM **Domed Roof Outlet Grating** is produced with extra Ultra Violet (UV) stabilizers and it has a longer life span when being exposed under the direct sunlight.

4. BALCONY DRAINAGE OUTLET

This product is suitable for use in apartment and flats' balconies, corridors and multi level car parks which the downpipe for exposed installation. It comes with a vertical inlet grating to prevent blockage and have a built-in funnel to prevent rainwater from gushing out from upper floors. With this specially designed fitting, rainwater can be discharged in a neat single pipe system.

It is highly recommended to have its own dropper to discharge rainwater from balcony and corridor in typical level of multi storey building, and not advisable to share with discharge from the roof outlet.

5. BALCONY HORIZONTAL OUTLET GRATING

This new innovative designed product is highly recommended to be used for the rainwater discharged from the balcony which downpipe is concealed in the brick wall (box-up), especially for condominiums and hotels projects, and it also suitable for corridors, multi storey car parks and RC gutter for bungalow houses.

The vertical slotted grating flush with the brick wall looks neat and minimize blockage and also get rid of below floor maintenance.

It is highly recommended to have its own dropper to discharge rainwater from balcony and corridor in typical level of multi storey building, and not advisable to share with discharge from the roof outlet.

Product Range List - Pipes

LIGHT DUTY PIPES
For Low-rise Building Exposed Installation Only

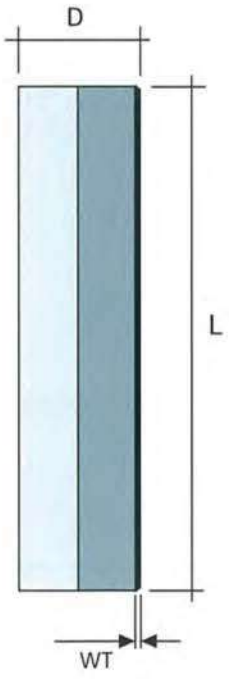
Code	Size	WT	D	L
3R056:1889	82 (3")	1.8	82	6.0M
4R056:1889	110 (4")	2.2	110	6.0M

Plain End

NORMAL DUTY PIPES
For Exposed Installation

Code	Size	WT	D	L
2R086	50 (2")	2.0	50	6.0M
3R086	82 (3")	3.2	82	6.0M
4R086	110 (4")	3.2	110	6.0M
6R086	160 (6")	3.2	160	6.0M
8R086	200 (8")	4.9	200	6.0M
10R086	250 (10")	6.2	250	6.0M
12R086	315 (12")	7.7	315	6.0M

Plain End



MEDIUM DUTY PIPES
For Exposed & Casting In The Small Size of R.C. Column

Code	Size	WT	D	L
4R066MD	110 (4")	4.2	110	6.0M
6R066MD	160 (6")	6.2	160	6.0M
8R066MD	200 (8")	7.7	200	6.0M
10R066MD	250 (10")	9.6	250	6.0M
12R066MD	315 (12")	12.1	315	6.0M

Plain End

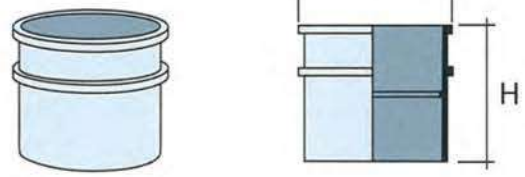
HEAVY DUTY PIPES
For Casting In The R.C. Column / Buried Underground

Code	Size	WT	D	L
3R096HD	82 (3")	4.6	82	6.0M
4R096HD	110 (4")	5.3	110	6.0M
6R096HD	160 (6")	7.7	160	6.0M
8R096HD	200 (8")	9.6	200	6.0M
10R096HD	250 (10")	11.9	250	6.0M
12R096HD	315 (12")	15.0	315	6.0M

Plain End

All dimensions in mm.

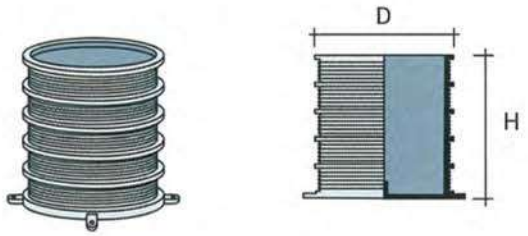
Product Range List - Fittings



STRAIGHT COUPLING

Code	Size	D	H
2R404	50	61	67
3R404	82	95	97
4R404	110	124	108
6R404	160	177	160
8R404	200	220	166
10R404	250	265	170
12R404	315	333	207

Joints : SW x SW

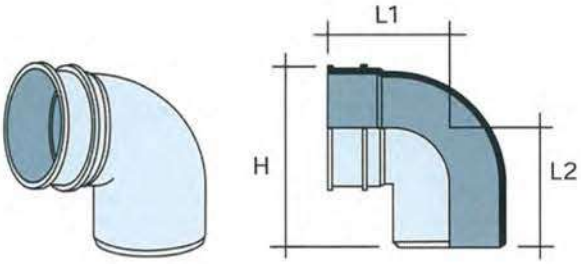


PIPE SLEEVE

Code	Size	D	H
4Z131	32	53	110
5Z131	40	58	110
2Z131	50	72	110
3S131	82	100	111
4S1313	110	128	90
4S131	110	128	110
4S1316	110	128	166
6S131	160	178	166
8R131	200	220	166
10R131F	250	280	175
12R131F	315	350	210

Joints : SW x SW

Malaysia Granted Patent No : MY109661A
United Kingdom Granted Patent No : GB2278387B



91° BEND - One Spigot End

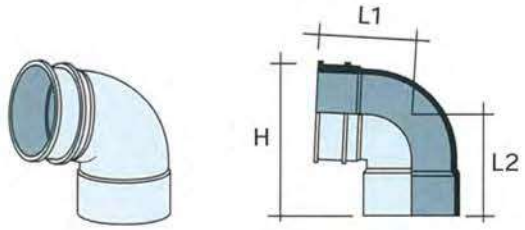
Code	Size	L 1	L 2	H
4R460	110	124	109	171
6R460	160	177	160	248
8R460	200	203	184	294

Joints : SW x SE

Abbreviations :-
SW = Solvent cement Welded socket joint end (Female end)
SE = Spigot End / Plain end (Male end)
WT = Wall Thickness

All dimensions in mm.

Product Range List - Fittings

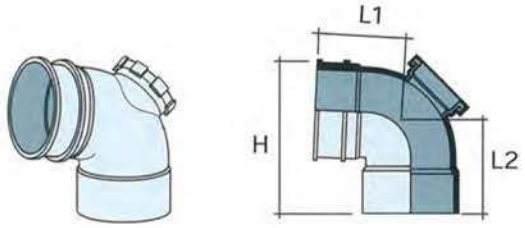


91° BEND

Code	Size	L 1	L 2	H
2R461*	50	72	66	100
3R461*	82	106	106	166
4R461	110	124	131	194
6R461	160	177	185	260
8R461	200	203	211	306
10R461	250	235	235	364
12R461	315	275	275	354

Joints : SW x SW

* Swept Bend



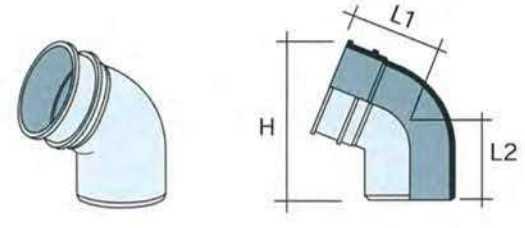
91° ACCESS BEND

Code	Size	L 1	L 2	H	ØAD
2R487 *	50	53	56	104	38
3R487 *	82	106	106	166	37
4R487 *	110	124	131	194	76
6R487 *	160	162	160	273	100
8R487	200	193	190	306	106
10R487	250	230	230	364	197
12R487	315	270	270	460	197

Joints : SW x SW

* Swept Bend

ØAD = Inspection Opening / Access Door's Diameter



112° BEND - One Spigot End

Code	Size	L 1	L 2	H
4R462	110	104	80	187
6R462	160	144	120	271
8R462	200	200	180	315

Joints : SW x SE

Abbreviations :-

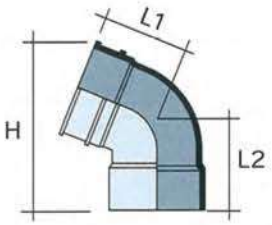
SW = Solvent cement Welded socket joint end (Female end)

SE = Spigot End / Plain end (Male end)

WT = Wall Thickness

All dimensions in mm.

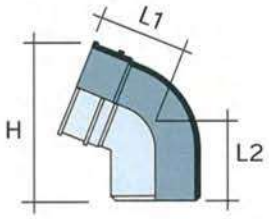
Product Range List - Fittings



112° BEND

Code	Size	L 1	L 2	H
4R463	110	120	130	220
6R463	160	180	170	295
8R463	200	185	205	330

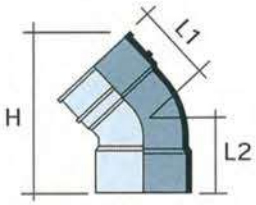
Joints : SW x SW



135° BEND - One Spigot End

Code	Size	L 1	L 2	H
8R464	200	135	119	300

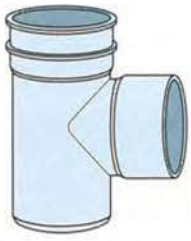
Joints : SW x SE

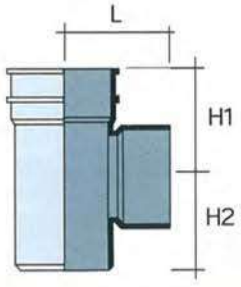


135° BEND

Code	Size	L 1	L 2	H
2R465	50	46	47	98
3R465	82	76	72	140
4R465	110	90	95	180
6R465	160	130	155	266
8R465	200	133	148	305
10R465	250	175	180	380
12R465	315	200	220	460

Joints : SW x SW





91° EQUAL TEE - One Spigot End

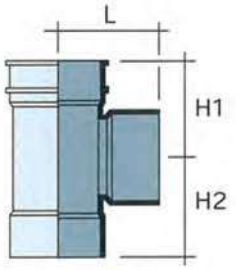
Code	Size	L	H1	H2
4R490	110	122	110	107
6R490	160	175	163	157
8R490	200	200	188	182

Joints : SW x SW x SE

Abbreviations :-
SW = Solvent cement Welded socket joint end (Female end)
SE = Spigot End / Plain end (Male end)
WT = Wall Thickness

All dimensions in mm.

Product Range List - Fittings

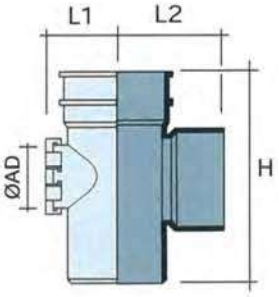


91° EQUAL TEE

Code	Size	L	H1	H2
2R491 ^	50	80	50	80
3R491 ^	82	120	82	126
4R491	110	122	110	130
6R491	160	175	163	181
8R491	200	200	190	210
10R491	250	265	200	250
12R491 *	315	300	300	300

Joints : SW x SW x SW ^ Swept Tee

*** Malaysia Patent Pending No : PI9904152**

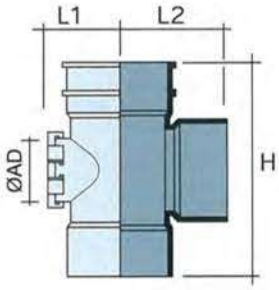


91° EQUAL ACCESS TEE - One Spigot End

Code	Size	L 1	L 2	H	ØAD
6R579	160	121	163	345	106
8R579	200	142	188	397	106

Joints : SW x SW x SW

ØAD = Twist Lock Access Door's Diameter



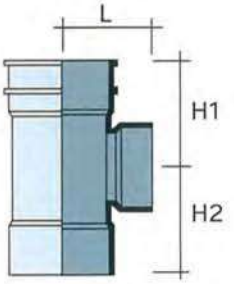
91° EQUAL ACCESS TEE

Code	Size	L 1	L 2	H	ØAD
2R580 ^	50	50	80	132	37
6R580	160	121	163	345	106
8R580	200	142	188	397	106
10R580	250	208	200	450	197
12R580 *	315	240	300	600	197

Joints : SW x SW x SW ^ Swept Tee

ØAD = Inspection Opening / Access Door's Diameter

*** Malaysia Patent Pending No : PI9904152**



91° UNEQUAL TEE

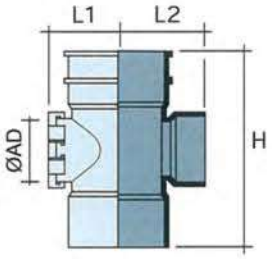
Code	Size	L	H1	H2
6R394	160 x 110 x 160	180	130	200
8R396	200 x 160 x 200	198	145	195
12R396 *	315 x 160 x 315	250	300	300
12R398 *	315 x 200 x 315	252	300	300

Joints : SW x SW x SW

*** Malaysia Patent Pending No : PI9904152**

All dimensions in mm.

BESSTEM

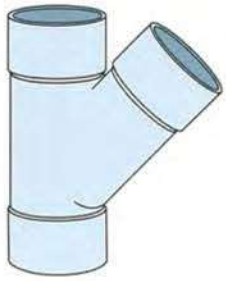


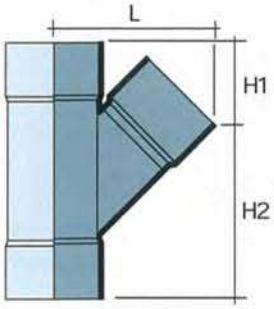
91° UNEQUAL ACCESS TEE

Code	Size	L 1	L 2	H	ØAD
6R584	160x 110x 160	125	180	200	106
8R586	200x 160x 200	140	198	340	106
12R586 *	315x 160x 315	240	252	600	197
12R588 *	315x 200x 315	240	257	600	197

Joints : SW x SW x SW
ØAD = Twist Lock Access Door's Diameter

*** Malaysia Patent Pending No : PI9904152**

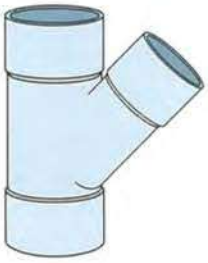


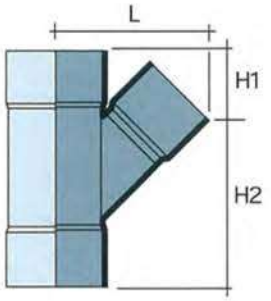


135° EQUAL ' Y ' TEE

Code	Size	L	H1	H2
4R495	110	182	92	184
6R495	160	249	130	252
8R495	200	307	158	288
10R495	250	382	220	355

Joints : SW x SW x SW

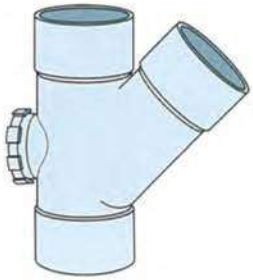


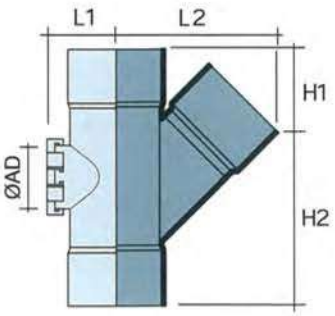


135° UNEQUAL ' Y ' TEE

Code	Size	L	H1	H2
6R374	160 x 110 x 160	201	105	206
8R376	200 x 160 x 200	265	167	248

Joints : SW x SW x SW





135° EQUAL ACCESS ' Y ' TEE

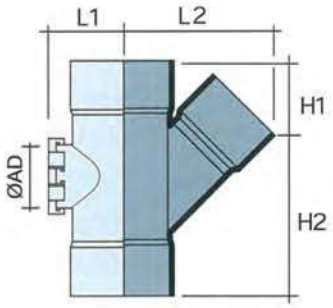
Code	Size	L 1	L 2	H 1	H 2	ØAD
6R585	160	125	249	130	252	106
8R585	200	140	307	158	288	106
10R585	250	180	382	220	355	197

Joints : SW x SW x SW
ØAD = Twist Lock Access Door's Diameter

Abbreviations :-
SW = Solvent cement Welded socket joint end (Female end)
SE = Spigot End / Plain end (Male end)
WT = Wall Thickness

All dimensions in mm.

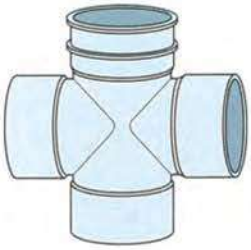
Product Range List - Fittings

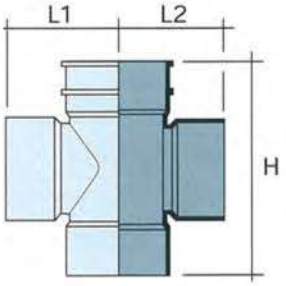


135° UNEQUAL ACCESS ' Y ' TEE

Code	Size	L 1	L 2	H1	H2	ØAD
6R574	160 x 110	125	201	105	206	106
8R576	200 x 160	140	265	167	248	106

Joints : SW x SW x SW
ØAD = Twist Lock Access Door's Diameter

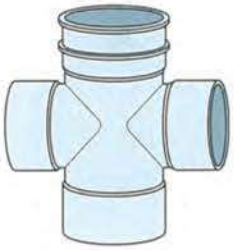


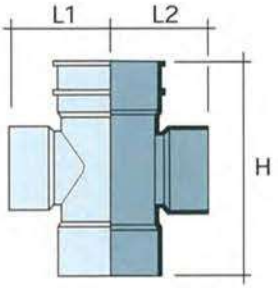


91° EQUAL CROSS TEE

Code	Size	L 1	L 2	H
4R360	110	132	132	240
6R360	160	178	178	322
8R360	200	215	215	384
12R360 *	315	300	300	600

Joints : SW x SW x SW x SW
*** Malaysia Patent Pending No : PI9904152**

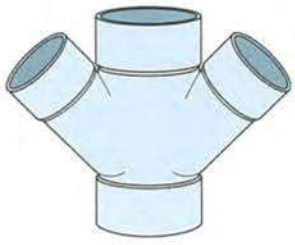


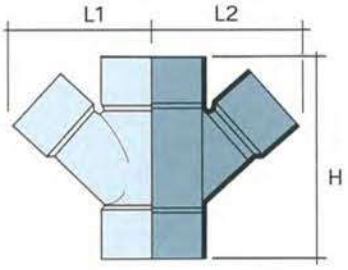


91° UNEQUAL CROSS TEE

Code	Size	L 1	L 2	H
6R364	160x110x110x160	160	160	262
8R366	200x160x160x200	209	209	335
12R366 *	315x160x160x315	252	252	600
12R368 *	315x200x200x315	252	252	600

Joints : SW x SW x SW x SW
*** Malaysia Patent Pending No : PI9904152**





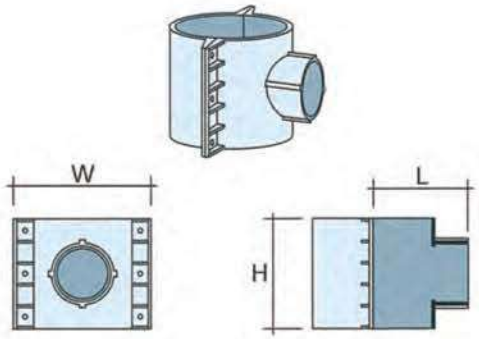
135° UNEQUAL DOUBLE ' Y ' TEE

Code	Size	L 1	L 2	H
6R664	160x110x110x160	205	205	310
8R666	200x160x160x200	260	260	408

Joints : SW x SW x SW x SW

Abbreviations :-
SW = Solvent cement Welded socket joint end (Female end)
SE = Spigot End / Plain end (Male end)
WT = Wall Thickness

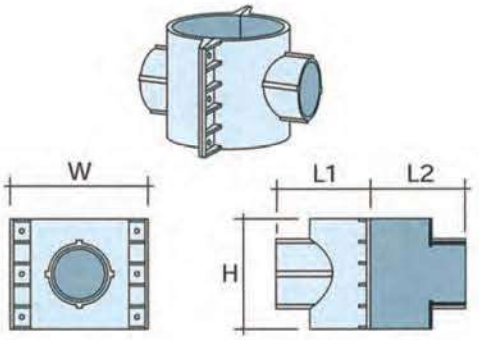
All dimensions in mm.



91° CLAMP SADDLE - (Reducing Tee)

Code	Size	L	W	H
4R420 *	110 x 50	90	128	118
6R362	160 x 50	109	205	170
6R363	160 x 82	125	205	170
8R383	200 x 82	150	247	212
8R384	200 x 110	158	247	212

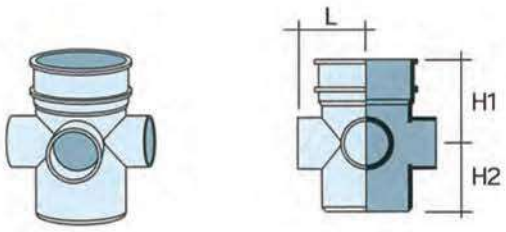
Joints : SW x Solvent cement welded on the main pipe.
Supplied with stainless steel bolts and nuts.
* 4R420 - Boss Connector c/w bracket.



91° DOUBLE CLAMP SADDLE
(Reducing Cross Tee)

Code	Size	L 1	L 2	W	H
6R362 X 2	160 x 50 x 50	113	113	205	170
6R363 X 2	160 x 82 x 82	129	129	205	170
8R383 X 2	200 x 82 x 82	150	150	247	212
8R384 X 2	200 x 110 x 110	158	158	247	212

Joints : SW x SW x Solvent cement welded on the main heavy duty type of pipes only.
Supplied with stainless steel bolts and nuts.

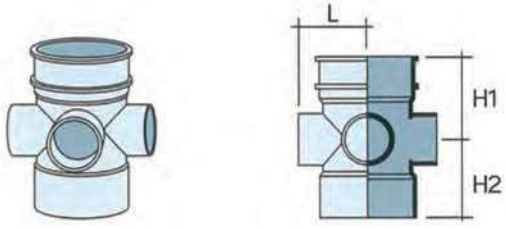


1 ~ 4 WAY BOSS PIPE - One Spigot End

Code	Size	L	H 1	H 2
4R492	110 x 50 x 50 x 50	87	94	83

Joints : SW x SW x SW x SE

With one Ø50mm x 91° opening inlet, additional opening by hole saw.



1 ~ 4 WAY BOSS PIPE

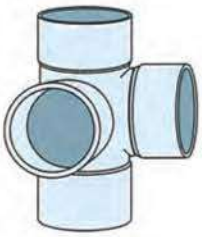
Code	Size	L	H 1	H 2
4R493	110 x 50 x 50 x 50	87	94	83

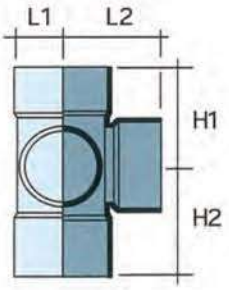
Joints : SW x SW x SW x SW

With one Ø50mm x 91° opening inlet, additional opening by hole saw.

All dimensions in mm.

Product Range List - Fittings

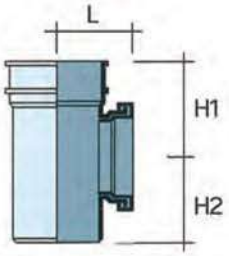




2 WAY 90° ANGLE EQUAL TEE

Code	Size	L 1	L 2	H1	H2
4R499	110	59	134	107	133

Joints : SW x SW x SW x SW

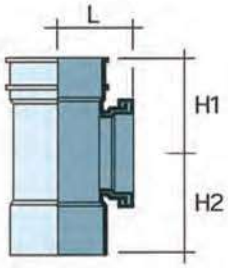


ACCESS PIPE - One Spigot End

Code	Size	L	H 1	H 2	ØAD
4R470	110	87	110	108	106
6R470	160	127	162	158	150
8R470	200	158	189	175	187
10R470F	250	190	325	217	197
12R470F	315	270	216	320	197

Joints : SW x SE

ØAD = Twist Lock Access Door's Diameter.



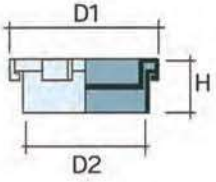
ACCESS PIPE

Code	Size	L	H 1	H 2	ØAD
4R471	110	90	113	127	106
6R471	160	127	163	163	150
8R471	200	162	199	209	187
10R471F ^	250	238	300	300	197
12R471F ^	315	270	300	300	197

Joints : SW x SW

ØAD = Twist Lock Access Door's Diameter.

^ c/w Ø200mm twist lock opening door at the centre.



ACCESS PLUG

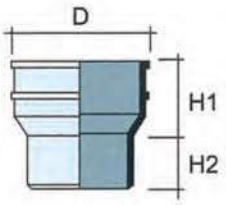
Code	Size	D1	D2	H
4R473	110	143	120	53
6R473	160	194	169	85
8R473	200	240	212	113
10R473F ^*	250	240	250	142
12R473F ^*	315	240	315	145

Joints : SW * SE

^ c/w Ø200mm twist lock opening door at the centre.

All dimensions in mm.

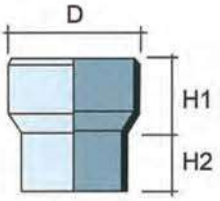
BESSTEM



REDUCING SOCKET / HOPPER
- One Spigot End

Code	Size	D	H 1	H 2
8R600	200 x 160	232	112	74
10R800	250 x 200	282	133	84

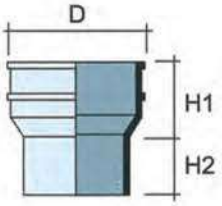
Joints : SW x SE



REDUCING SOCKET
- Spigot End On Big Diameter

Code	Size	D	H 1	H 2
4R300	110 x 82	110	50	60
6R400	160 x 110	160	107	53

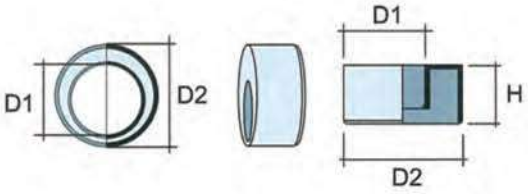
Joints : SE x SW



REDUCING SOCKET / HOPPER

Code	Size	D	H 1	H 2
4R301	110 x 82	124	65	48
6R401	160 x 110	180	105	53
8R601	200 x 160	232	106	76
10R801	250 x 200	282	127	86

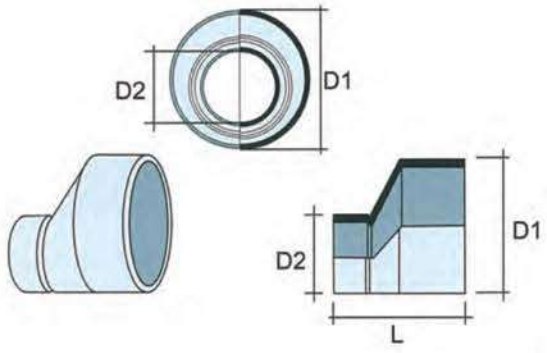
Joints : SW x SW



REDUCING BUSH

Code	Size	D 1	D 2	H
4R043	110 x 82	82	110	50
6R064	160 x 110	110	160	78
8R486	200 x 160	165	200	85

Joints : SE x SW



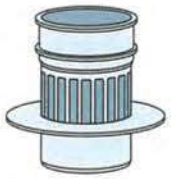
LEVEL INVERT REDUCING SOCKET

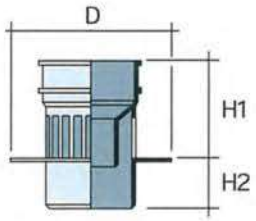
Code	Size	L	D 1	D 2
8R604	200 x 110	192	210	118
8R606	200 x 160	177	210	168
10R606	250 x 160	210	263	168
10R608	250 x 200	210	263	210
12R608	315 x 200	265	332	210
12R610	315 x 250	256	332	264

Joints : SW x SW

All dimensions in mm.

Product Range List - Fittings



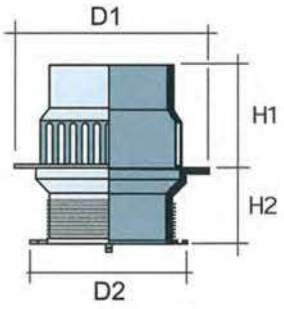


BALCONY DRAINAGE OUTLET
- One Spigot End

Code	Size	D	H 1	H 2
4R431	110	210	119	57

Joints : SW x SE

Malaysia Patent Pending No : PI9503714

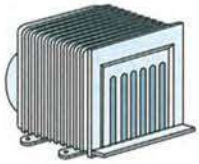


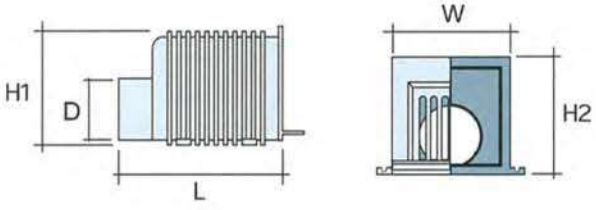
BALCONY DRAINAGE OUTLET
- Pipe Sleeve Base

Code	Size	D 1	D 2	H 1	H 2
6R432	160	271	170	143	115

Joints : SW x SW

Pipe Sleeve Body to be cast inside the R.C. floor slab.





BALCONY HORIZONTAL OUTLET GRATING
- One Spigot End

Code	Size	L	W	H 1	H 2	D
4R432	50	164	100	105	100	56
4R432CP	50	164	100	105	100	56

Joints : SE

Malaysia Patent Pending No : PI20013597

CP = Chrome plated on the grating surface.

Supplied complete set with Square Plug-Off & Blind Grating.

BALCONY HORIZONTAL OUTLET GRATING

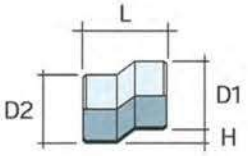
Code	Size	L	W	H 1	H 2	D
4R433	50	167	100	105	100	62
4R433CP	50	167	100	105	100	62

Joints : SW

Malaysia Patent Pending No : PI20013597

CP = Chrome plated on the grating surface.

Supplied complete set with Square Plug-Off & Blind Grating.



OFFSET ADAPTOR X 12MM
- Both End Spigot

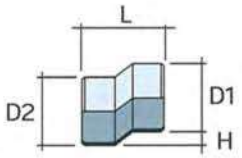
To be use with Balcony Horizontal Outlet Grating

Code	Size	H	L	D 1	D 2
2R260	50	12	70	56	56

Joints : SE x SE

All dimensions in mm.

BESSTEM



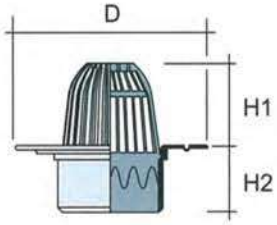
OFFSET ADAPTOR X 8MM

- One Spigot End

To be use with Balcony Horizontal Outlet Grating

Code	Size	H	L	D 1	D 2
2R261	50	9	70	62	56

Joints : SW x SE



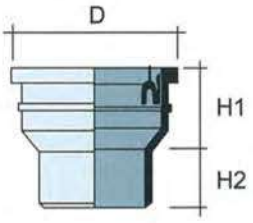
DOMED ROOF OUTLET GRATING

- Spigot End

Code	Size	D	H 1	H 2
4R414	110	210	105	72
6R414	160	270	140	88
8R414	200	300	140	88
10R414F ^	250	300	140	90
12R414F ^	315	365	140	90

Joints : SE

^ The centre Domed Grating diameter is Ø152mm X 136mm Height.



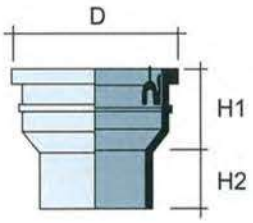
VIBRATION ABSORBING JOINT

- Spigot End

Code	Size	D	H 1	H 2
6R730	160	232	143	74
8R730	200	282	165	84

Joints : Rubber Gasket Joint X SE

Malaysia Patent Pending No : UI20040766

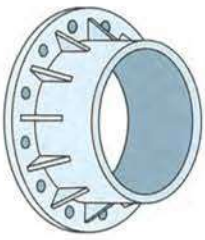


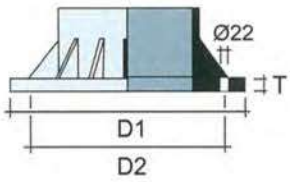
VIBRATION ABSORBING JOINT

Code	Size	D	H 1	H 2
4R731	110	193	135	54
6R731	160	232	143	74
8R731	200	282	165	84

Joints : Rubber Gasket Joint x SW

Malaysia Patent Pending No : UI20040766





FLANGE (PRESURE TYPE)

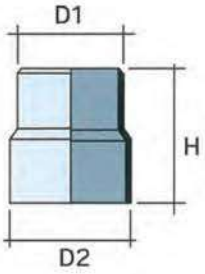
Code	Size	D 1	D 2	L	T
10R990G	250	395	350	162	27
12R990G *	315	445	400	205	55

Joints : SW Grey Colour

* Supplied in loose Body and Flange Circle Consists of 12 Nos. Ø22mm Bolt Holes and Rubber Gasket

All dimensions in mm.

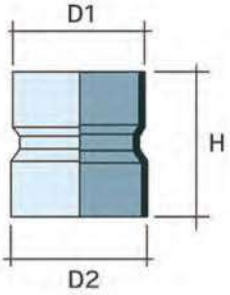
Product Range List - Fittings



PIPE ADAPTOR FOR BS4576 TO BS3505

Code	Size	D 1	D 2*	H
4RPABSF	110 To 100	110	114.3	244
6RPABSF	160 To 155	160	168.3	280
8RPABSF	200 To 200	200	219.1	277

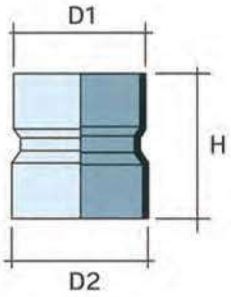
Joints : SE (D1- BS4576) x SW (D2 - BS3505 Class B, C, D, & E)
* D2 - Internal Diameter
Fabricated Type



PIPE ADAPTOR FOR BS4576 TO BS3505

Code	Size	D 1*	D 2*	H
10RPABSF-G	250 To 250	250	273	320
12RPABSF-G	315 To 300	315	323.8	350

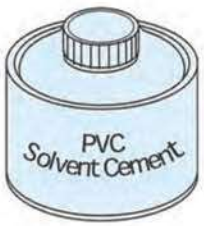
Joints : SW (D1- BS4576) x SW (D2 - BS3505 Class B, C, D, & E)
* D1 & D2 - Internal Diameter
Fabricated Type - Grey Colour



PIPE ADAPTOR FOR BS4576 TO JIS K6741

Code	Size	D 1*	D 2*	H
6RPAJISF-G	160 To 155	160	165	280
8RPAJISF-G	200 To 200	200	216	277
10RPAJISF-G	250 To 250	250	267	320
12RPAJISF-G	315 To 300	315	318	350

Joints : SW (D1- BS4576) x SW (D2 - JIS K6741 Class AE & AW)
* D1 & D2 - Internal Diameter
Fabricated Type - Grey Colour



PVC SOLVENT CEMENT - FAST DRY

Code	Capacity
05PV.SC(B)	500 gms
3PV.SC(B)	3 kgs

PVC SOLVENT CEMENT - SLOW DRY

Code	Capacity
05PV.SC(B)SD	500 gms
3PV.SC(B)SD	3 kgs

All dimensions in mm.

Abbreviations :-
SW = Solvent cement Welded socket joint end (Female end)
SE = Spigot End / Plain end (Male end)
WT = Wall Thickness

BESSTEM

DOMED ROOF OUTLET GRATING

Domed Roof Outlet Grating is designed with a removable push fit high domed grating to prevent blockage and it is made with high quality uPVC material with extra Ultraviolet (UV) stabilizers. This Grating is offered with all the inherent advantage of plastics, strength, lightness and resistance to impact and corrosion. The Grating is strong enough to withstand normal foot traffic force. It is suitable to be installed in the reinforcement concrete (RC) roof and scupper drain (see Fig. 1) or metal gutter (see Fig. 2), but it is Not Recommended to install inside the sump unless is vented.

The high domed grating is to prevent the uPVC rainwater downpipe from getting burst or deform in shape, as a result of great suction force (vacuum inside the pipe) if the mouth of the downpipe (outlet) is blocked and closed sealed during heavy rainfall.

NEVER use a flat grating or without grating for the uPVC rainwater downpipe system, as it would cause the pipe getting burst or deform easily.

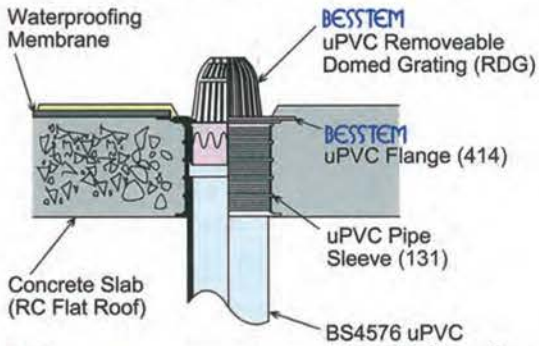


Fig. 1

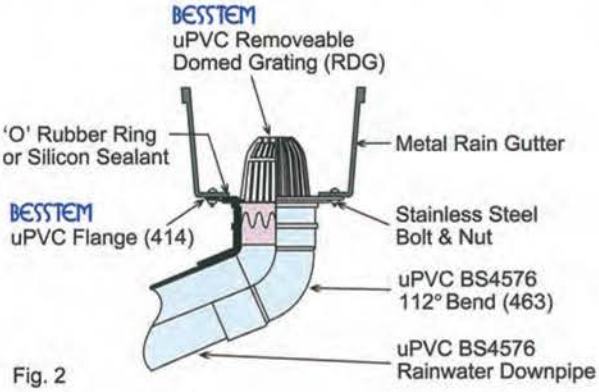


Fig. 2

BALCONY DRAINAGE OUTLET

Balcony Drainage Outlet is designed with a vertical grating to prevent blockage and it comes with an internal build-in funnel to prevent the rainwater gushing out from the upper floor. It is highly recommended to be use in multi storey apartments and low cost flats in typical floor's balconies (see Fig. 3) and is also suitable for corridor and car park areas, whereby the rainwater downpipe are exposed installation. With this special design fitting, the rainwater downpipe can discharge water in a single pipe system and it is neat in appearance.
Patent Pending No : PI9503714 (Malaysia)

For high-rise building with multi-level discharge it is advisable to have a separate downpipe and not recommended to share the discharge from the roof.

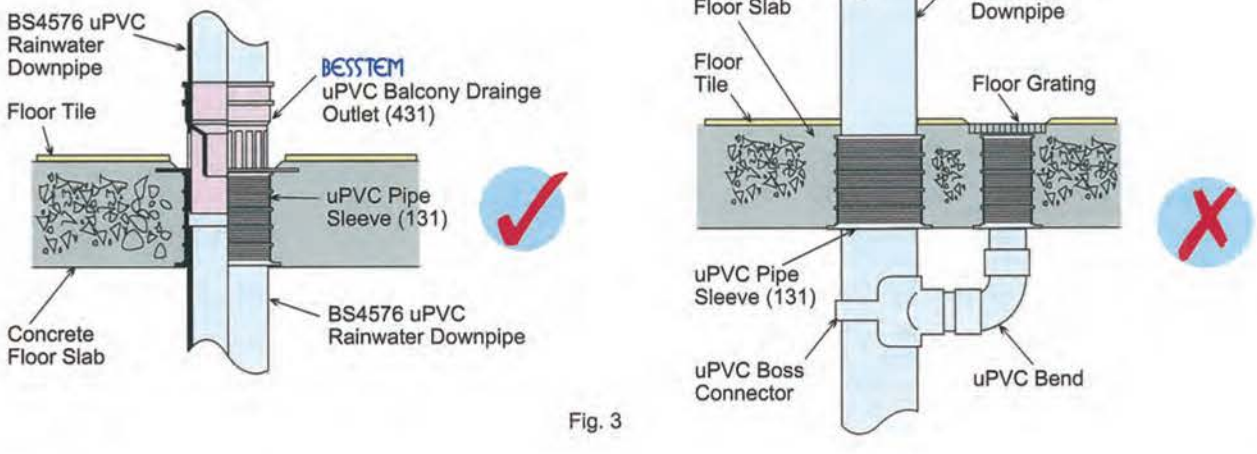


Fig. 3

Product Features & Advantages

ACCESS PIPE

Access Pipe is to provide a big twist lock access door for cleaning and maintenance purpose. The diameter of the access door is designed as the same size with the downpipe or Ø200mm diameter for 250mm and 315mm sizes of fittings, so that it is easily accessible to any part of the downpipe. It is recommended to install this fitting at the vertical downpipe where offset to horizontal runner pipe just after the Bend (see Fig. 4) and also at the downpipe before it is connected to the underground drainage pipe (just above the ground floor level) (see Fig. 5).

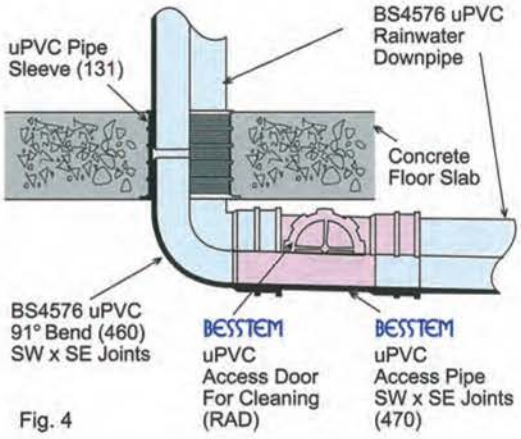


Fig. 4

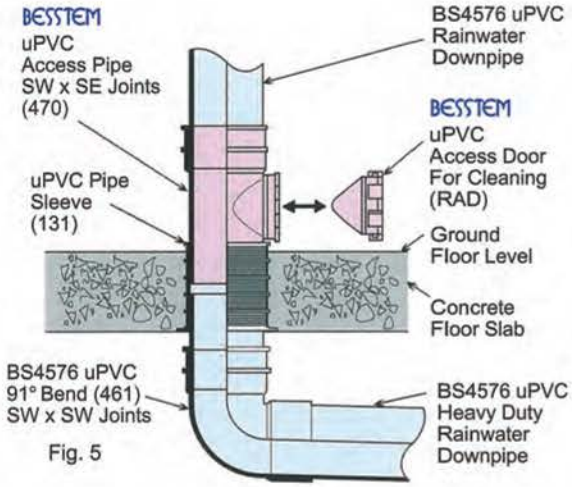


Fig. 5

91° BEND WITH SPIGOT END

Specially designed Bend with one spigot end (R460) for horizontal rainwater downpipe to run close to the concrete floor slab (softfit). It is just solvent welded directly into the Pipe Sleeve which casted inside the slab. With this way of installation, it gives a higher head clearance and is also neat in appearance (see Fig. 6).

OFFSET BEND

Bend with one spigot end (R460/462/464) can directly be welded by solvent cement into the socket of the other Bend (R461/463/465). It will minimize the distance of 'W' to form a narrow offset (see Fig. 7 & 8).

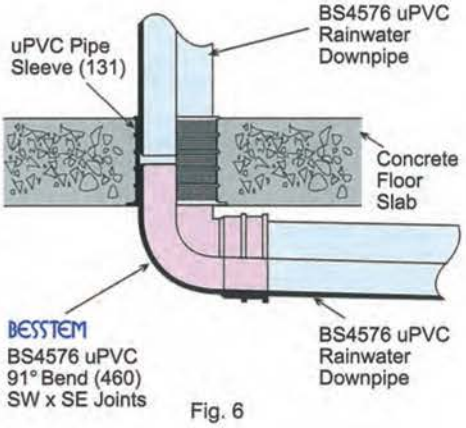


Fig. 6

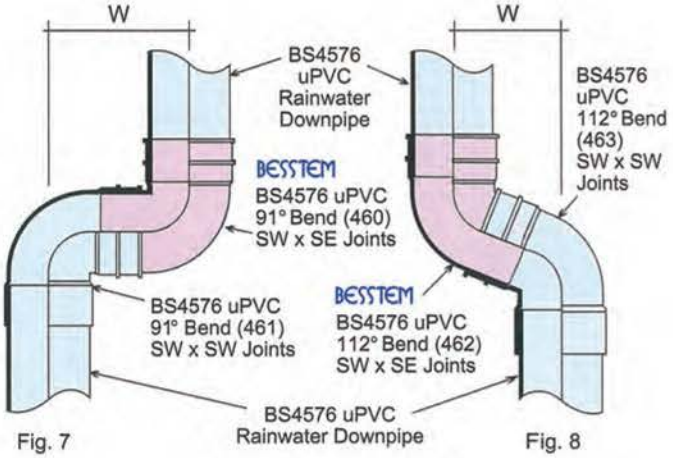
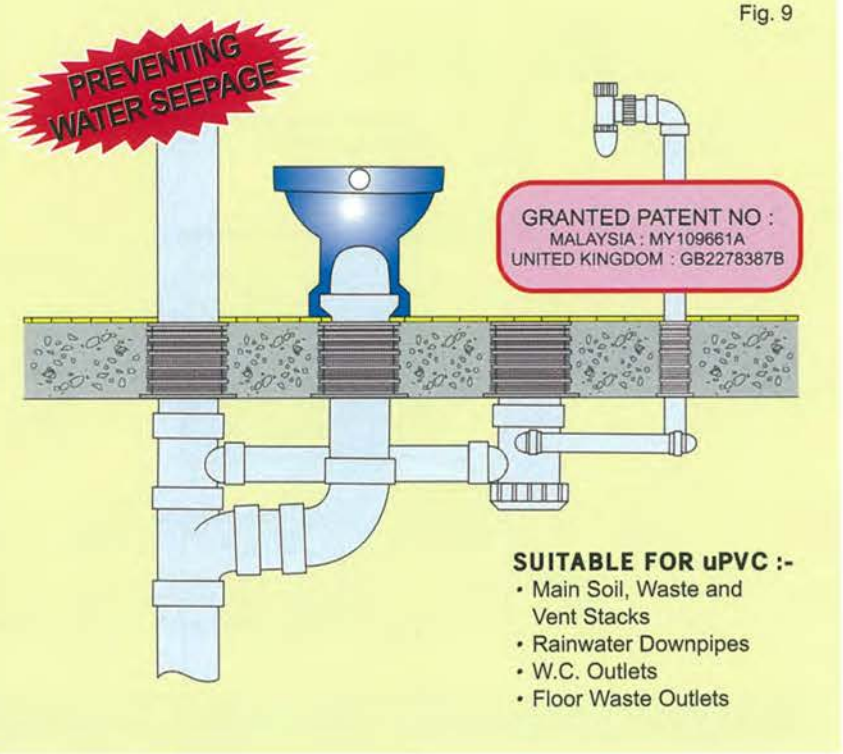


Fig. 7 Fig. 8

PIPE SLEEVE

Fig. 9



SUITABLE FOR uPVC :-

- Main Soil, Waste and Vent Stacks
- Rainwater Downpipes
- W.C. Outlets
- Floor Waste Outlets

Advantages Of Using The BESSTEM uPVC Pipe Sleeve

- Our innovative product BESSTEM Pipe Sleeve fully meets the requirements of BS4576 ; BS5255 ; BS4514 ; MS976 ; MS1073 ; SS213 ; AS1415 & ISO3633 for PVC-U Pipes and Fittings for Soil, Waste and Vent System and Rainwater Drainage System. It minimize installation problems and saves both money and time.
- The BESSTEM Pipe Sleeve is designed to leave behind an access hole with a solvent welded pipe socket in the concrete floor slab for installation of uPVC pipes.
- Prevents water seepage through the uPVC pipes from wet area like : Bathroom ; Balconies ; RC Flat Roofs ; RC Gutter ; Multi Storey Car Parks etc (see Fig. 11).
- The external ribs help the BESSTEM Pipe Sleeve hold firm inside the concrete floor slab and also prevent water seepage along the external smooth surface of the uPVC pipes (see Fig. 10).
- Easy and quick installation by two fastening methods on the formwork before the concrete is cast into the floor slab (see Fig. 9).
- It is designed as a through socket so that the uPVC pipes can be connected to the BESSTEM Pipe Sleeve from either end (ie. from the floor above or below).
- No special water proofing material is needed, simply connect the uPVC pipes into the BESSTEM Pipe Sleeve with PVC solvent cement to BS6209 or BS4346: Part 3.

Product Features & Advantages

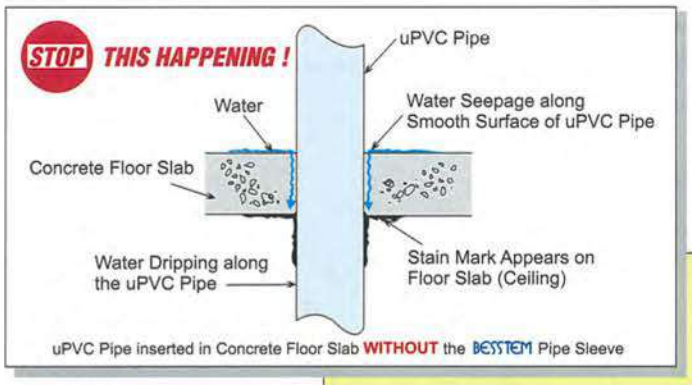


Fig. 10

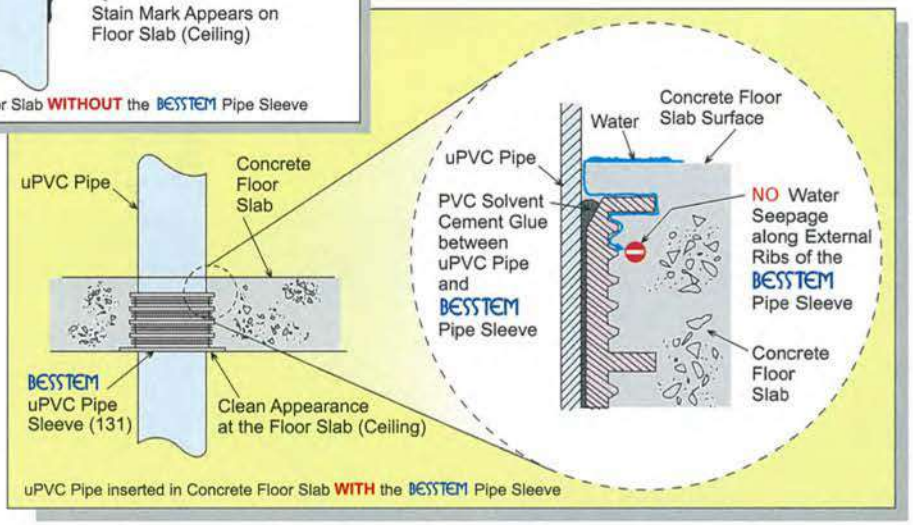


Fig. 11

DIMENSIONS

Code No.	Sizes	D (mm)	H (mm)	R (mm)	Materials	Colour
4Z131	32mm (1¼")	53	110	22	ABS	White
5Z131	40mm (1½")	60	110	26	ABS	White
2Z131	50mm (2")	73	110	33	ABS	White
3S131	82mm (3")	100	112	48	uPVC	White
4S3131	110mm (4")	128	90	61	uPVC	White
4S131	110mm (4")	128	112	61	uPVC	White
4S1316	110mm (4")	128	166	61	uPVC	White
6S131	160mm (6")	178	166	87	uPVC	White
8R131	200mm (8")	220	166	110	uPVC	White
10R131F	250mm (10")	280	170	--	uPVC	White
12R131F	315mm (12")	350	210	--	uPVC	White

Fig. 12

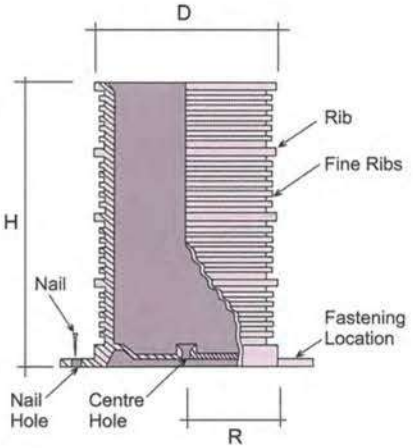
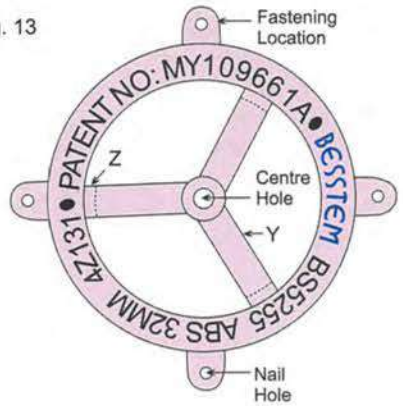


Fig. 13



Methods Of Installation

Method 1 :-

1.1) Mark a center point on the formwork (plywood) where the uPVC pipe is to pass through the concrete floor slab. Then get a nail to punch a small hole on the said point.

Put the BESSTEM Pipe Sleeve on top of the formwork so that the center hole is perpendicular to the hole already marked and fastening the sharp screw onto the formwork (see Fig. 14).

1.2) By fastening the sharp screw from the BESSTEM Pipe Sleeve central hole to the formwork the 'Y' portion will naturally bend downward and force the BESSTEM Pipe Sleeve to clamp against the formwork firmly. This is to ensure correct and stable positioning of the BESSTEM Pipe Sleeve during concrete casting (see Fig. 15).

1.3) When the formwork is removed after the concrete floor slab is cast, the 'Z' and 'Y' portions will break off leaving the BESSTEM Pipe Sleeve cast within the concrete floor slab. Some touch-up filling is necessary at 'Z' portion before connection of uPVC pipes (see Fig. 16).

Method 2 :-

2.1) The BESSTEM Pipe Sleeve is provided with four (4) nail holes fastening locations outside the cylindrical body (see Fig. 13 Top Plan View). The BESSTEM Pipe Sleeve is placed on top of the formwork where the uPVC pipe is to pass through the concrete floor slab. Four (4) nails are then fastened firmly onto the formwork (see Fig. 17).

2.2) When the formwork is removed after the concrete floor slab is cast, the nails will be exposed beneath the BESSTEM Pipe Sleeve. Bend the nails toward the floor slab or cut then away. Additional cement plastering will cover the bent nails (see Fig. 18).

Fig. 14

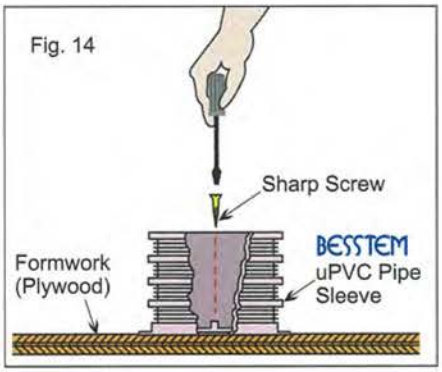


Fig. 15

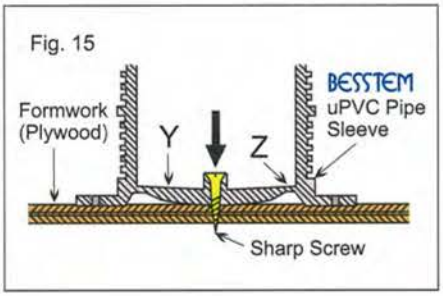


Fig. 16

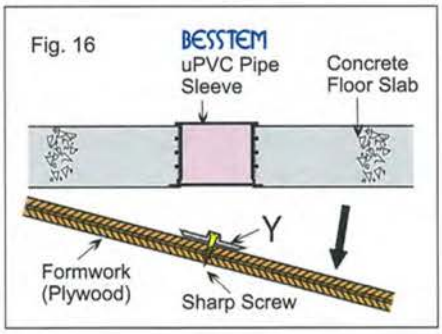


Fig. 17

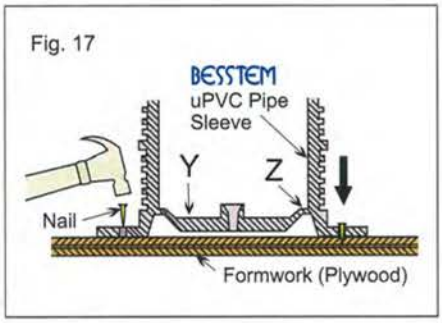
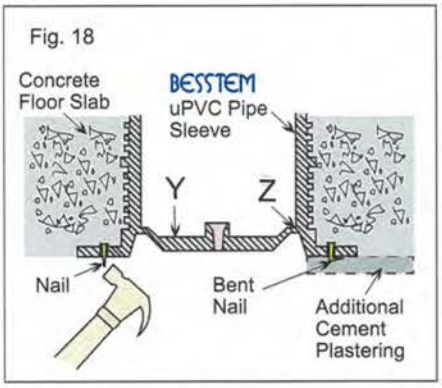
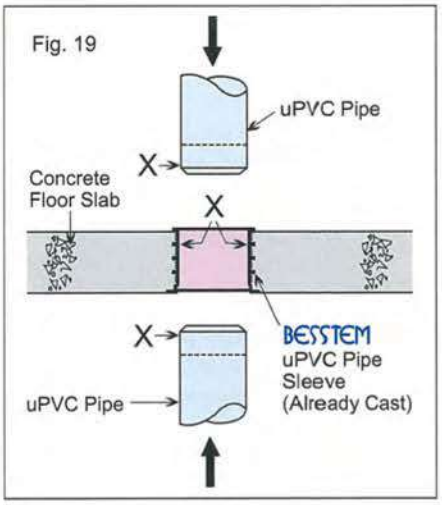


Fig. 18



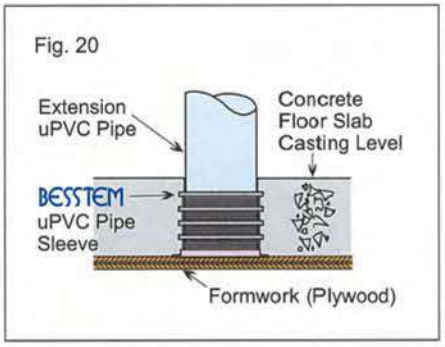
Methods Of Installation (continue)

3) Apply the PVC solvent cement on 'X' portions all round for connection of the uPVC pipes into the BESSTEM Pipe Sleeve (see Fig. 19).



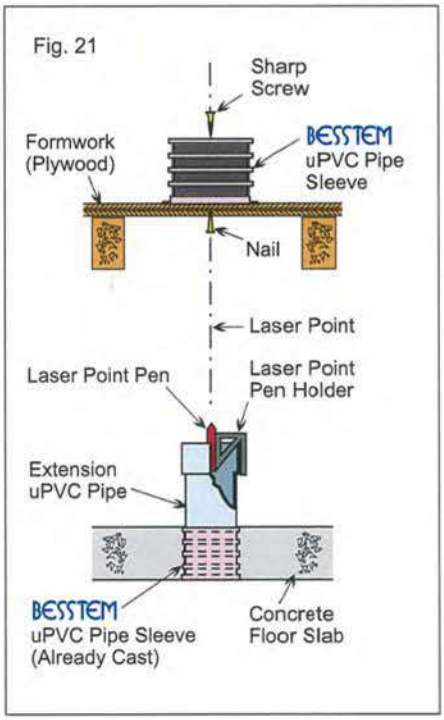
4) Please ensure that the extension uPVC pipe are fitted (without apply PVC solvent cement) into the BESSTEM Pipe Sleeve before the concrete is cast, if the thickness of the concrete floor slab exceeds the height of the BESSTEM Pipe Sleeve.

Remove the extension uPVC pipe from the BESSTEM Pipe Sleeve after the concrete floor is cast (see Fig. 20).



5) In order to have a better discharging flow system for the main stack, it is important to align the connecting uPVC pipes' center points to ensure optimum efficiency. Insert an extension uPVC pipe (about 2' long) into the BESSTEM Pipe Sleeve which had already casted in the floor slab below. Then place a Laser Pointer holder onto the uPVC pipe, so that the center point can be located at the underneath upper floor formwork.

Thereafter made a nail hole and then place a BESSTEM Pipe Sleeve on top of the formwork, and fastening by the sharp screw (see Fig. 21).



Malaysia Patent Pending No : PI20013597

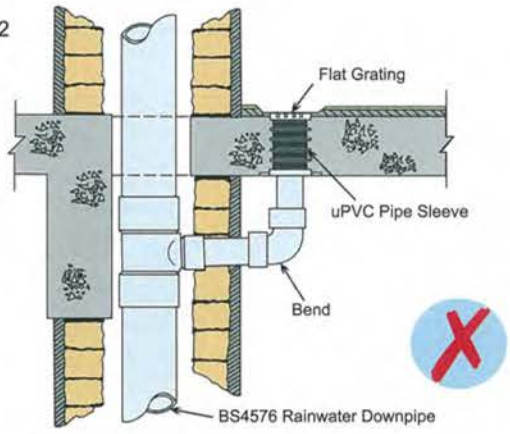
MADE IN MALAYSIA

BALCONY HORIZONTAL OUTLET GRATING

In any multi-stories building such as : hotel ; condominium ; apartments and flats normally use to have a balcony or open places like corridors ; service yard and also in the multi-lever car park the uPVC rainwater downpipes are used to traverse between each floors. There is an access hole (traditionally) with a flat grating provided in the concrete floors for discharging rainwater or wastewater. Each of these access holes is connected to an adjacent uPVC downpipe through interconnecting pipework and associated fittings below the concrete floor (see Fig. 22). These pipework and fittings are considered unsightly and ugly to the Architect and some homeowners.

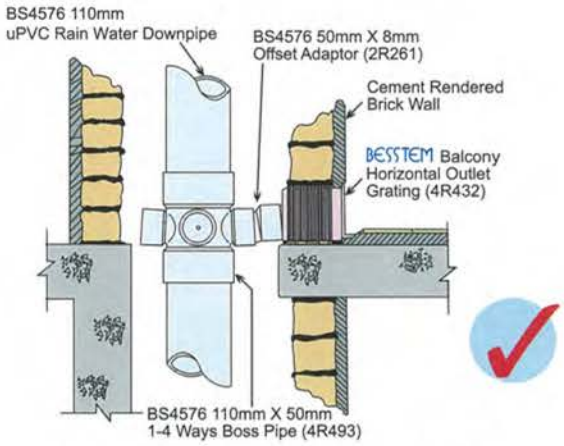
BESSTEM *BS4576 uPVC Rainwater Downpipe System* would like to present a newly designed product call Balcony Horizontal Outlet Grating. This product is to overcome the above mentioned problems (see Fig. 23). This new innovative product is supplied with a complete accessories like : Square Sleeve Body ; Grating Panel ; Slotted Grating ; Square Plug-off and Blind Grating (see picture below Fig.24). This Grating is neat and easy to install and it supplied with the Square Plug-off and Blind Grating is to prevent the square Sleeve Body from choke-up during cement rendering and tiling works, which carried out at the construction site.

Fig.22



• **Traditionally pipework for balcony outlet Connection**

Fig.23



• **Use ' BESSTEM ' Balcony Horizontal Outlet Grating Connection**

Fig.24

A) Slotted Grating - Chrome Plated
Code No : 4R433/5/SG/CP

B) Square Grating Panel - Chrome Plated
Code No : 4R433/1/SGP/CP

C) Slotted Grating
Code No : 4R433/5/SG

D) Square Grating Panel
Code No : 4R433/1/SGP

E) Blind Grating
Code No : 4R433/4/BG

F) Square Plug-Off
Code No : 4R433/3/SPO

G) Square Sleeve Body
Code No : 4R432 - Spigot End Outlet (SE)
Code No : 4R433 - Solvent Weld Socket Outlet (SW)

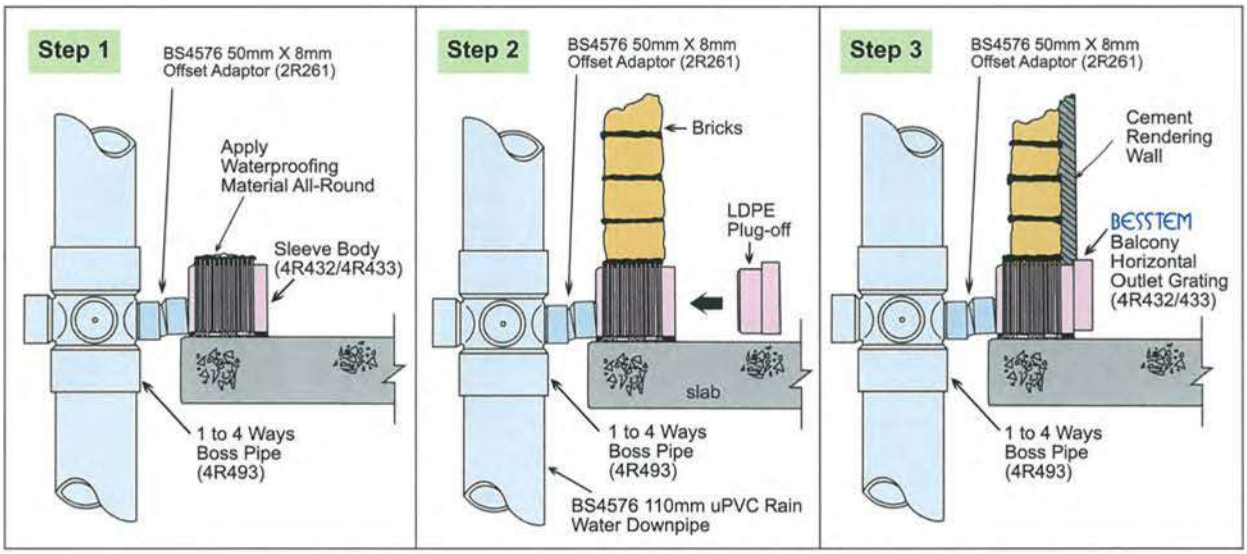
Product Features & Advantages

BALCONY HORIZONTAL OUTLET GRATING (continue)

Special Features

- Suitable to use in balconies (see Fig. 26) ; corridors ; service service yard ; multi-lever car park and small roof's RC gutter (see Fig. 25).
- Vertical grating panel flush with the wall.
- Conceal the whole downpipes.
- Vertical slotted grating is to minimize blockage.
- Get rid of below floor maintenance.
- Replaceable grating (slot-in design).
- Grating panel surface with superior Chrome plated.
- Sleeve body with many ribs to prevent water seepage.
- Made from superior quality plastic material, corrosive free.
- Square sleeve body made easy for stacking of brick works.
- With plug-off is to prevent the square sleeve body from closing-up during cement rendering.
- With blind grating for preventing cement to drop into the square sleeve body during tiling works.

Method of Installations



Step 1

Apply waterproofing material all-round the external ribs of the Square Sleeve Body. Please ensure that good work must be carried-up to prevent water seepage.

Step 2

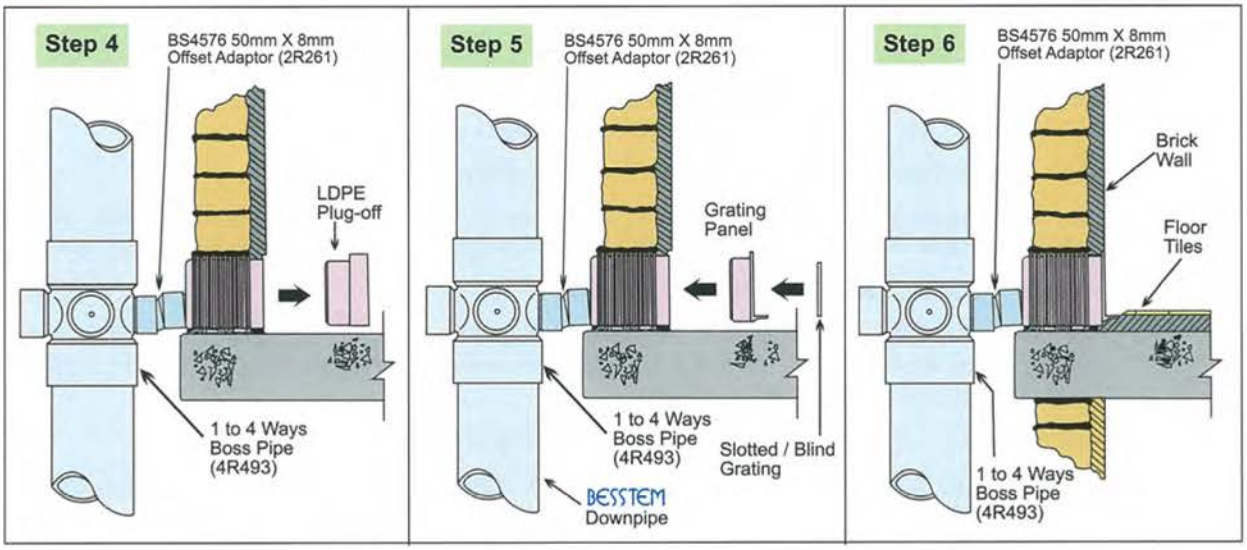
Fit-in the Plug-off into the Square Sleeve Body (without any glue or sealant).

Step 3

During cement rendering on the wall, the Plug-off is to prevent cement from closing-up the Square Sleeve Body.

BALCONY HORIZONTAL OUTLET GRATING (continue)

Method Of Installations



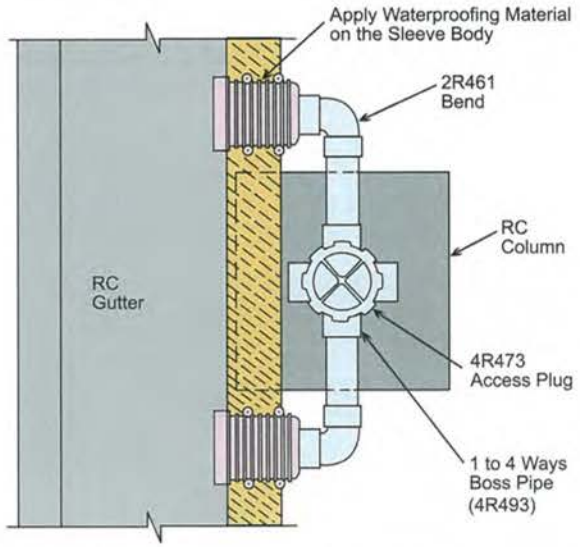
Step 4 After cement rendering on the wall set, remove the Plug-off (just pull it out).

Step 5 5.1) Insert the Grating Panel and apply with PVC solvent cement or waterproof sealant (for Chrome Plated Grating – Code No: 4R432CP / 4R433CP) and glue Inside the Square Sleeve Body.

5.2) Fix the Blind Grating into the Grating Panel before carrying out the floor tiling works.

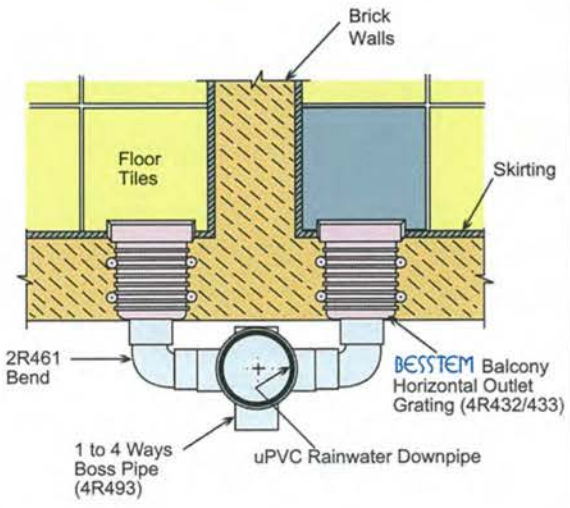
Step 6 When complete the floor tiles, remove the Blind Grating and replace the Slotted Grating.

Top View Fig 25



BESSTEM **Balcony Horizontal Outlet Grating** used in RC gutter which downpipe cast-inside RC column.

Top View Fig 26



BESSTEM **Balcony Horizontal Outlet Grating** used in two balconies side by side with the downpipe run outside the building. (exposed installations)

uPVC PIPE FOR BURIED UNDERGROUND

A) NORMAL / MEDIUM DUTY PIPE BEDDING WITHOUT CONCRETE PROTECTIVE LAYER

Bedding Sequence (see Fig. 27)

The following depths and sequence of bedding and backfilling should be carried out.

1. Trench widths should be as narrow as practicable but never less than 300mm wider than the pipe diameter, i.e. 150mm clear each side of the pipe.
2. Clean excavated based removing protuberances and hard spots.
3. Lay bedding to a minimum depth of 100~150mm. In very soft or waterlogged ground, bedding should be up to twice this depth. Thoroughly tamp the bedding true to gradient.
4. Withdraw trench sheeting as tamping proceeds.
5. Reloosen bedding under the liner of the pipe to allow a slight bedding of the pipe and its socket. Then lay the pipes, holding them in position with a small banking of bedding material, rather than with bricks, blocks or timbers.
6. Test the system. (Refer to BS. CP301 and BS. CP2005).
7. Place suitable sidefill material evenly each side of the pipe in 100mm layers, hand tamping well at each layer up to the pipe crown, but leaving it exposed.
8. Place between 100mm and 300mm of suitable material over the crown of the pipe across the full trench width, fully hand tamp now at the sides of the pipe, whilst tamping only lightly over the pipe.
9. Excavated material may now be backfilled in 300mm layers. Hand tamping should continue until a finished layer of 300mm is over the pipe. Subsequent layers may be mechanically tamped. Under no circumstances should dumpers or other vehicles be driven along runs for compacting.

B) NORMAL / MEDIUM DUTY PIPE BURIED UNDERGROUND WITH CONCRETE PROTECTIVE LAYER

Maximum And Minimum Depths (see Fig. 28)

Under roads and verges, pipes may be buried with a maximum cover of 6.1 metres and a minimum depth of 1.2 metres. At depths of less than 1.2 metres, special consideration should be given to all the engineering factors involved, such as class of road, its construction and the position of other services. Under these circumstances, concrete may be used as a protecting raft above the pipeline, provided a cushion of fill lay between the pipe crown and the raft.

Fig 27 : Bedding Sequence

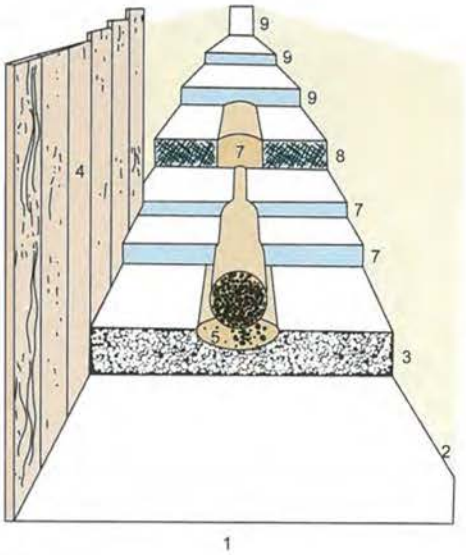
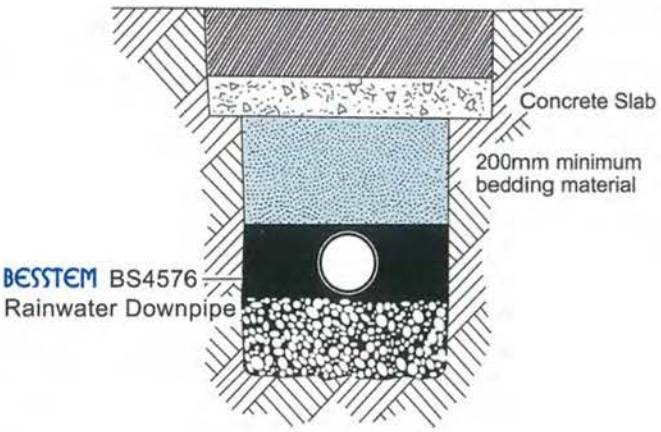


Fig 28 : Protecting Underground Pipe from Loads for Normal and Medium Type of BESSTEM BS4576 Rainwater Downpipe



uPVC PIPE FOR BURIED UNDERGROUND

C) HEAVY DUTY TYPE OF PIPE BURIED UNDERGROUND

Trench Widths And Depths (see Fig. 29)

For BESSTEM heavy duty type of rainwater downpipe to be buried underground the following widths and depths of bedding and backfilling should be carried out.

1. The bed of the trench is reasonably flat to give adequate uniform support to the pipe over its overall length.
2. There are no protruding rocks or tree roots in the trench bed.
3. If pipes are jointed above ground, they should remain undisturbed for two (2) hours before being 'snack' into the trench. Alternatively, they may be jointed in the trench.
4. If necessary the trench bed can be filled by fine subsoil in areas where the soil is rock laden.

Backfilling

When the pipes have been laid, backfilling may commence as illustrated below, making sure that the backfilling material is progressively compacted as the trench is filled with materials free from large stones or rocks, especially so in areas around the pipe.

Use Of Concrete

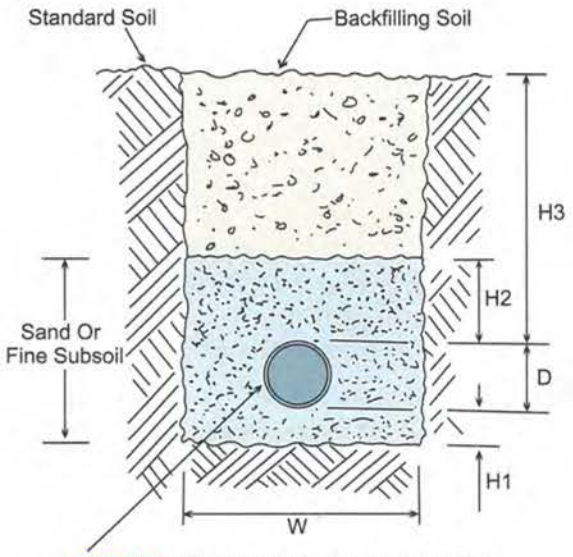
Contact with concrete is not detrimental as such to uPVC but unless the engineering requirements of the installation so re quire it, surrounding uPVC pipes with concrete is wasteful since it converts a flexible pipeline into a rigid beam, which may fracture underground movement.

When pipes are to be set in concrete, ensure that they do not float when the concrete is poured. Filling the pipes with water will generally provide sufficient ballast, but additional side restraint may be required to maintain alignment.

Where pipes are set in concrete, joints should be wrapped to prevent the ingress of cement. Wrapping should be with polyethylene sheet or any adhesive tape material.

BESSTEM BS4576 Heavy Duty Type of Pipe Buried Underground

Fig. 29



BESSTEM BS4576 Rainwater Downpipe

Nominal Size D (mm)	Width W (mm)	H 1 (mm)	H 2 (mm)	H 3 (mm)
82	600	100	300	900
110	600	100	300	900
160	700	100	300	900
200	700	100	300	900
250	850	100	300	900
315	900	100	300	900

CHEMICAL RESISTANCE CHART FOR BESSTEM uPVC BS4576 RAINWATER DOWNPIPE SYSTEM

The resistance of BESSTEM uPVC pipes to a wide range of chemical is listed below. The information given based on tests carried out by the Company and other authorities and is correct to the best of our knowledge. It is intended as a guide on the suitability of BESSTEM uPVC pipes and fittings for operationunder various conditions but it must be understood that no guarantee can be given that actual results obtained will in every case, be exactly as indicated.

Chemical	20°C	60°C
Acetic Acid (20%)	S	S
Acetic Acid (80%)	S	D
Acetone	U	U
Alcohol (40%)	S	D
Alcohol (100%)	S	D
Aluminium Chloride	S	S
Aluminium Flouride	S	S
Aluminium Hydroxide	S	S
Aluminium Sulphate	S	S
Ammonia Gas (dry)	S	S
Ammonia 0.88SG Aqsion	S	S
Ammonium Chloride	S	S
Ammonium Carbonate	S	S
Ammonium Hydroxide	S	S
Ammonium Nitrade	S	S
Ammonium Phospate (ammoniacal)	S	S
Ammonium Phospate Neutral	S	S
Ammonium Sulphate	S	S
Aniline	U	U
Aniline Hydrochloride (40% Aq)	U	U
Barium Carbonate	S	S
Barium Chloride	S	S
Barium Hydroxide	S	S
Barium Sulphate	S	S
Beet Sugar Liquors	S	S
Benzene or Benzol	U	U

Chemical	20°C	60°C
Bleach (12.5% Active Chlorine)	S	S
Brine	S	S
Butanol Primary (Butyl Alcohol)	S	U
Calcium Carbonate	S	S
Calcium Chlorate	S	S
Calcium Chloride	S	S
Calcium Hydroxide	S	S
Calcium Hypochlorate	S	S
Carbon Dioxide (wet or dry)	S	S
Castor Oil	S	S
Chloroacetic Gas / Acid	S	D
Chloric Acid (20%)	S	S
Chlorine Gas (dry)	S	D
Chlorine Gas (wet)	D	U
Chrome Alum Sat Soln	S	S
Chlorine (liquid)	U	U
Chromic Acid (10%)	S	S
Chromic Acid (30%)	S	S
Chromic Acid (50%)	S	D
Cottonseed Oil	S	S
Cresylic Acid (50%)	S	S
Cresylic Acid (100%)	D	U
Crude Oil	S	D
Chlorine Water	S	S
Diesel Oil Derv	S	S
Diesel Oil Gas	S	S

Chemical	20°C	60°C
Detergents (normal dilutions)	S	S
Disodium Phospate	S	S
Ethylene Glycol	S	S
Fatty Acids	S	S
Ferric Chloride	S	S
Ferric Nitrate	S	S
Ferric Sulphate	S	S
Ferrous Sulphate	S	S
Fish Solubles	S	S
Flourine Gas (wet)	S	S
Formaldehyde (40%)	S	S
Formic Acid (50%)	S	D
Gallic Acid	S	S
Gas-manufactured	D	U
Gas-natural	S	S
Hydrochloric Acid	S	S
Hydrochloric Acid 50%	S	U
Hydrochloric Peroxide (50%)	S	S
Hydrogen Sulphide (wet aqueous solution)	S	S
Hypochlorous Acid	S	S
Linseed Oil	S	S
Magnesium Carbonate	S	S
Magnesium Chloride	S	S
Magnesium Hydroxide	S	S
Mercuric Chloride	S	S
Mercury	S	S
Methyl Chloride	U	U

KEY : **S = Satisfactory** **D = Some Attack** **U = Unsuitable**

BESSTEM

CHEMICAL RESISTANCE CHART FOR BESSTEM uPVC BS4576 RAINWATER DOWNPIPE SYSTEM

(continue)

Chemical	20°C	60°C
Milk	S	S
Mineral-Oils	S	D
Potassium Chloride	S	S
Moiasses	S	S
Nickel Chloride	S	S
Nickel Nitrate	S	S
Nickel Sulphate	S	S
Nitric Acid (10%)	S	D
Nitric Acid (68%)	D	D
Nitric Acid (90%)	U	U
Oil and Fats - Animal, Mineral Vegetable	S	S
Oleum	U	U
Oxygen	S	S
Phosgen-Gas	S	D
Petrol (depending upon type)	U	U
Phosphate Acid (50%)	S	S
Phosphate Acid (80%)	S	S
Photographic Solutions	S	S
Potassium Bromate	S	S
Potassium Dichromate	S	S
Potassium Chloride	S	S
Potassium Hydroxide	S	S
Petroleum Products (curde)	S	S
Silver Cyanide	S	S
Silver Nitrate	S	S
Sodium Bicarbonate	S	S

Chemical	20°C	60°C
Sodium Carbonate	S	S
Sodium Chloride	S	S
Sodium Dichromate	S	S
Sodium Hydroxide	S	S
Sodium Nitrate	S	S
Spirits (whisky etc)	S	S
Sulphur Dioxide (dry)	S	S
Sulphur Dioxide (wet)	S	D
Sulphuric Aicd (100%- 75%)	S	S
Sulphuric Aicd (75%- 90%)	S	D
Sulphuric Aicd (95%)	D	U
Sulphuorus Acid	S	S
Sulphur Trioxide-Gas	S	S
Tri-Sodium Phosphate	S	S
Urine	S	S
Vinegar	S	S
Water (acidic mine water)	S	S
Water (fresh)	S	S
Water (salt)	S	S
Wetting Agents (oil)	S	U
White Liquor Wine and Spirits	S	S
Xylene or Xylol	U	U
Zinc Chloride	S	S
Zinc Nitrate	S	S
Zinc Sulphate	S	S

KEY : S = Satisfactory D = Some Attack U = Unsuitable

CHEMICAL RESISTANCE CHART FOR BESSTEM uPVC BS4576 RAINWATER DOWNPIPE SYSTEM

CORROSION IN INDUSTRIAL ENVIROMENT

Chemical	20°C	60°C
Textile Industry		
Bleaching soln 12.5% chlorine	S	S
Detergents (normal dilutions)	S	S
Dutch paste	S	
General	S	S
Soap soin conc.	S	
Viscose liquid (real conc.)	S	
Spinning bath (conc. CS):		
under 100mg/litre	S	
over 100mg/litre	S	
Food Industry		
Acetic Acid 15%	S	S
Beer brewery-general	S	S
Beer sugar liquors	S	S
Beer pigment (commercial)	S	S
Brine	S	S
Cane sugar, cold sat	S	
Dairy farming general	S	S
Fatty Acids	S	S
Fermentation alcohol	S	
Fruit juice pulp	S	S
General	S	S
Milk	S	S
Molasses	S	S
Oil and Fats-Mineral	S	S
Oil and Fats-Vegetables	S	S
Oil and Fats-Animal	S	S
Spirits (whisky etc)	S	S
Starch	S	S
Vineger	S	S
Water (fresh)	S	S
Wines and spirits	S	S
Pulp Industry		
Alum	S	S
Chloride beaching	S	S
Green liquor	S	S
Kraft liquor	S	S
Liquor	S	S
Slack liquor	S	S
Sulfite liquor	S	S
Iron and Steel Industry		
Hydrochloric clening soln		
H_2SO_4 HNO_3	S	S
Sulfuric cleaning soin	S	S
Fertilizer Industry		
General	S	S
Miscellaneous		
Brine	S	S
Fish Solubles	S	S
Leather marking	S	S
Mineral Oils	S	S
Parafin	S	S
Photographic sensitive emulsion	S	S
Photographic developer emulsion	S	
Sea water		S
Soap solution (acqueous)	S	
Tannin extract	S	S
Thermoplastic Resin Emulsion	S	S
Urine	S	S
Water and sewage	S	S
Luandry Shop		
Waste liquid	S	S
Gasoline Station		
Benzene or Benzol	U	U
Crude Oil	S	U
Fuel Oil	S	S
Gas-natural	S	S
Lubricating Oil	S	S
Petroleum	S	
Petrol	U	U
Petrol Benzine mixture (80:20)	U	U

KEY : **S = Satisfactory** **D = Some Attack** **U = Unsuitable**

RAINWATER GOODS

uPVC Gutters

uPVC gutters shall be from an approved proprietary system complete with all the required accessories i.e. end stoppers, mitre joints, joiners, down spout head, is leak proof and the material resistant to weather and ultra-violet rays. Brackets support shall be of approved material suitable for the installation and rust proofed. Gutter brackets support shall be fixed at not more than 600mm centres. On completion of the whole installation conduct pounding test on the gutter for 24 hours.

Metal Gutters

Metal gutters shall be galvanized iron gauge 20 material, custom made to the profile shown in the drawings. Experienced gutter tradesmen shall carry out the installation with compatible solder joints at all connections. Brackets support shall be approved material suitable for the installation and rust proofed. Gutter brackets support shall be fixed at not more than 600mm centres. On completion of the whole installation conduct pounding test on the gutter for 24 hours.

uPVC Rainwater Downpipe

Provide uPVC integrated piping system that is complete with all fittings i.e. from "BESSTEM" piping system or other equivalent. The system shall be save, leak proof, durable, is resistant to the external weather and ultra-violet rays. uPVC pipes for rainwater drainage shall confirm to BS4576 : 1970 Normal Duty type for exposed installation. Where rainwater piping casted in reinforced concrete (RC) columns and buried underground shall be BS4576 Heavy Duty type. (This pipes' wall thickness shall comply to ISO4422-2:1996(E) SDR21 PN12.5 (PVC-U) Pipes and fittings for Water Supply / BS3505 Class "D" pipe with a minimum working pressure of 12 BAR.)

uPVC Accessories

uPVC rainwater downpipe system shall be an integrated system possessing all the required fittings complete for the installation.

Pipe Sleeves

All uPVC piping works running through concrete floor slab shall be carried out with proprietary pipe sleeves connections at the concrete floor to prevent water seepage along the external smooth surface of the uPVC pipes. Proprietary pipe sleeves shall be of the type from "BESSTEM" rainwater system or approved equivalent suitable for the whole rainwater piping works.

Access Doors

Rainwater piping systems is to be provided with approved proprietary removable openings for cleaning after every pipe bend below the floor slab.

Pipe Bends

All pipes running below the concrete slab are to be installed closed to the concrete soffit as not obstruct the installation of MEP services and false ceiling works by using approved proprietary 91° bends or approved equivalent.

Architectural Specifications

RAINWATER GOODS (continue)

Access Pipes

Provide approved proprietary removable opening access doors to all piping running at the top of the ground slab before connecting into the ground. The access doors size shall be the same as the downpipe diameter.

Offset Bend

All down droppers shall be run close to the walls and where obstructions are encountered, proper approved proprietary 91°, 112° or 135° offset bends or swan-neck are to be provided.

Balcony Discharged

For balconies which designed the uPVC rainwater dropper to be exposed installation shall be use the Balcony Drainage Outlet from "BESSTEM" rainwater system or other approved equivalent to discharged the rainwater above the floor slab in order to get rid of below floor maintenance.

Balcony Horizontal Outlet Gratings

For high-rise building like apartments, condominiums, hotel & etc. to conceal or box-out the rainwater downpipe (dropper) for discharged the rainwater from all balconies, corridors, multi-stories car park or reinforced concrete gutter through the square grating fixed at the wall (just above slab) should used "BESSTEM" or other approved equivalent's Balcony Horizontal Outlet Gratings.

Domed Roof Outlet Grating With Flange

All gutters / concrete roof / or metal roof outlets are to be fitted with approved proprietary removable and shall be strong enough to withstand normal foot traffic uPVC High Domed Gratings. The high domed grating is to prevent the uPVC rainwater downpipe from getting burst or made deform in shape, as a result of great suction force (vacuum inside the pipe) if the outlet is blocked and close sealed during heavy rainfall. The cause may be due to plastic sheet material, paper cardboard, plywood, soft metal sheet or any other solid material. No Flat Grating or those of Without Grating should be recommended for use at the outlet of the uPVC rainwater downpipe system.

Pipe Installation

All pipeworks used shall comply with and be installed in accordance with the regulations of the Local Authority.

All pipes and fittings shall be thoroughly cleaned before erection. All stains and obstructions shall be removed prior to installation. Piping shall be carefully arranged to give true alignment with minimum number of crossovers. Cut piping shall be reamed to remove all burrs.

Run all piping generally parallel to walls and arrange piping to conform to building requirements and to suit the necessities of clearance for other mechanical ducts, beams, columns, conduits and work of other trades.

Run all piping as close to ceiling and away from other construction as possible, free of unnecessary traps or bends.

Where pipes passed through the concrete floor slab and roof slab, approved proprietary pipe sleeves shall be provided. The Contractor shall be required to provide a waterproofing membrane to floor at the pipe up-stand area.

RAINWATER GOODS (continue)

Pipe Installation (cont'd)

Use the fitting and jointing methods recommended by the manufacturer of each type of plastic pipe.

Use the recommended adaptors when jointing to pipes of different materials or to appliances.

uPVC solvent weld systems shall include provision for expansion joints by means of rubber ring joint sockets to accommodate thermal movement. Push the pipe fully into the rubber ring push-fit joint and slightly withdraw about 5 - 10mm.

Obtain approval before making any joint or using any fittings not included in the manufacturer's range.

Solvent Cement Joints

A square cut shall be made on the pipe using a mitre box and fine-toothed panel saw. Remove all burrs and swarf. Slightly chamfer the external pipe edge.

Clean the pipe and matching sockets, using primer fluid.

Keep the cleaned surfaces free of dirt and grease.

Apply an even coat of approved PVC solvent cement by using a clean brush to the outside of the spigot pipe and the inside of the socket.

While the surface is still wet, push the pipe (spigot end) straight into the socket until the full depth of the socket is reached with a slight twisting motion. Hold for 20~30 seconds without movement.

Remove any surplus cement from the mouth of the socket with a soft cloth. The pipe may be handled, but not unduly strained for 1 hour. Wait 4 hours before putting to use.

For pipe nominal sizes 110mm and below could use Fast Dry PVC solvent cement, and for 160mm and above is recommended to use Slow Dry PVC solvent cement.

Hangers and Brackets

Provide sufficient hangers, clamps, clips, insets, mounting devices & etc to support all piping installed to prevent sagging.

Install all hangers straight and true and in perfect alignment.

The fitting brackets shall be mounted at the recess provided on the uPVC fittings to hold firm the piping in position.

Where piping runs along walls, provide suitable wall type and gang type hangers.

Brackets and hanger rods shall be threaded and fabricated from hot rolled steel, with hot dipped galvanized and shall be of the following minimum sizes :-

Normal Duty Type Of uPVC Pipe

Nominal Sizes	50 ~ 82mm	100mm	150mm	200mm	250mm	315mm
Diameter of hanger rod	12mm	16mm	20mm	20mm	20mm	20mm
Max. spacing of hangers Horizontal *	0.8m	1.2m	1.5m	1.6m	1.8m	2.1m
Vertical	1.6m	2.4m	3.0m	3.2m	3.6m	4.2m

* As a general rule the above figures can be reduce by 10% ~ 20% for Medium and Heavy Duty Type of uPVC pipes, it because these Pipes are much heavier than the Normal Duty Pipes.

APRIL 2007