



SANDRAIN[®]

Powered by

HYDROMAX[®] 

SIPHONIC STORM DRAINAGE

LEADERS IN SIPHONIC DRAINAGE

About Sangir

At Sangir, we strive to provide the most effective and cost-optimized solutions to our customers. We associate and collaborate with them to provide end-to-end solutions. We benchmark ourselves with the best in the international market and produce products conforming to global standards in manufacturing and quality. Accredited with ISO 9001:2016, ISO 14001:2015 & ISO 45001:2018 Certifications, we pride ourselves As a quality manufacturer of specialty thermoplastic products and a complete solution provider across the entire spectrum of Industries.

Sangir produces a broad array and a wide range of thermoplastic products, which includes Piping Systems, Sheets, Liners, Profiles, and specialties in diverse thermoplastics such as **PP, PPH, HDPE, PVDF, CPVC, PVC, and special anti-static, fire-retardant, higher-temperature** and Conductive Thermoplastic Grades.

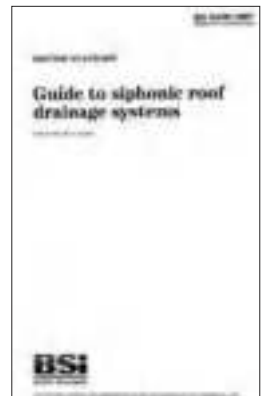


About HydroMax

With over 30 years experience in Siphonic Roof Drainage HydroMax Inc. Ltd., UK was established in 2003 by William Ross*. Hydromax are market leaders in many countries and in partnership with Sangir Plastics Pvt Ltd, India provides high level of technical compliance with local service. Hydro-max is an innovative solution which utilises the power of a natural siphon to create a high performance roof drainage solution.



***William Ross is the co-author of ASPE-45: Siphonic Roof Drainage standards by American Society of Plumbing Engineers.**



SIPHONIC ROOF DRAINS



What is HydroMax® Siphonic Drainage

Traditional gravity drainage requires 2/3 air & slope to move storm water. Sloped pipes intrude on valuable livable space requiring numerous penetrations, vertical drops to ground level, and multiple civil connections.

In a siphonic system **pipes run flat and fill 100%, no air needed. Pipe diameter & materials are reduced by half** and can be routed to a single civil connection.

How HydroMax® Siphonic Drainage Works

Siphonic storm drainage is based on the simple principle of a siphon with negative pressure, caused from the height of the building, to pull storm water off the roof. The bigger the difference the faster the flow.

 **Pipes are flushed at high velocity and self-clean as air exits the system.**

What's Wrong with Pitch

1. More material required
2. More space required
3. Numerous vertical drops & penetrations
4. Added civil connections & site disturbance
5. Pitch dictates pipe routing & discharge
6. Increased building elevations
7. Added chases needed throughout
8. Ponding & clogs

Gravity drains require 2/3 air and large pipes



Siphonic drains do not use air, pipes sized for 100% fill ratio, diameter reduced by 1/2



No pitch, slope, or equipment needed. Less penetrations, vertical drops, trenching, civil connections, and site disturbance. Just think of what you can do with all that extra ceiling space.

Pitch does not dictate design. You do.

Siphonic pipes run flat. By eliminating pitch and air smaller pipes stay in the ceiling, running to an exterior wall before discharging where you want.

Due to the lack of air, noise is reduced in full siphonic mode and water discharges up to 8x velocity.

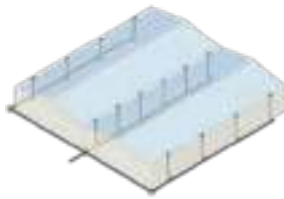
Siphonic drainage reduces ponding, clogs, and extends roof longevity.

Less is More

Siphonic roof, gutter, terrace, trench, and parking deck drains by HydroMax® reduce vertical drops, civil connections, project cost, construction time, material amount, **increase site sustainability**, space and provide the owner with a design flexible storm water drainage system.

Gravity VS Siphonic

6,000m²



Gravity
Traditional Gravity solution
530 metres pipework
Diameters 160mm to 450mm



HydroMax®
Siphonic scheme 360
metres HDPE Pipework
Diameters 56mm to 200mm

-50%

Reduction in
Pipe Size

-38%

Less Pipe &
Material

Siphonic Drains Save Owner



Less cost

provides savings
allowance for other scopes



Less install cost

with reduction of civil connections,
trenching & site disturbance



More space

increased ceiling height and fewer design
restrictions and obstructions



Reduced construction time

and coordination with other
scopes



Future additions,

allows easier integration for any
future renovations or design changes



Easier to maintain

with self-cleaning system



Increased roof longevity

with reduced ponding & clogs



Pre-installation meeting

with installation team



Earn LEED points in 6 categories

Sourcing of Raw Materials, Innovation
in Design, Reduced Site Disturbance,
Rain Water Management, Protect &
Restore Habitat, Water Use Reduction

Architect

- **More design freedom**, less vertical drops, drain locations, penetrations
- **Earn LEED points in 6 categories:** Sourcing of Raw Materials, Innovation in Design, Reduced Site Disturbance, Rain Water Management, Protect & Restore Habitat, Water Use Reduction
- **More space**, increased ceiling height and fewer design restrictions and obstructions
- **Increase site sustainability**, reduction of civil connections, trenching & site disturbance

Engineer

- **Less cost** provides savings allowance for other scopes
- **Reduced construction time** and coordination with other scopes
- **Complete coordination** with MEP
- **Complimentary design**, calculation, balancing, and bill of materials provided

Top Technical Benefits of Siphonic Roof Drainage

Smaller Diameter pipe used:

approximately half the size of gravity diameter pipe size



Smaller Diameter pipe =

- Smaller Fittings
- Smaller Couplings
- Smaller Hangers
- Smaller Insulation

Horizontal pipes are installed without **PITCH – Flat Level**

Easy co-ordination of services for BIM modeling due to pipework running flat



Fewer pipes = **Reduced construction time and cost**

Rainwater downpipes **routed to the Engineer's Preferred Locations**
- frees up valuable building space

Routing of rainwater downpipes to the perimeter of buildings
Eliminates Below Grade Excavation and Drainage Under the Building Floor

A significant **Reduction in Civil Below Grade Drainage**

(common range is from 20% to 60%)

Easily route rainwater pipes to **Retention Ponds or Detention Basins or Rainwater Harvesting**

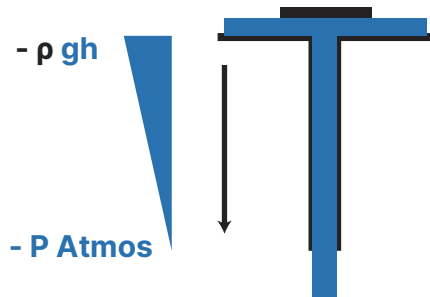
SanDrain HydroMax® drains suck the water quickly off the the roof = **less ponding than traditional gravity**

IPC Code Compliance

SanDrain® HydroMax® siphonic roof drains have performance graphs from testing to siphonic roof drains standard ASME A112.6.9

How Does HydroMax® Siphonic Drainage Function?

Negative Pressure

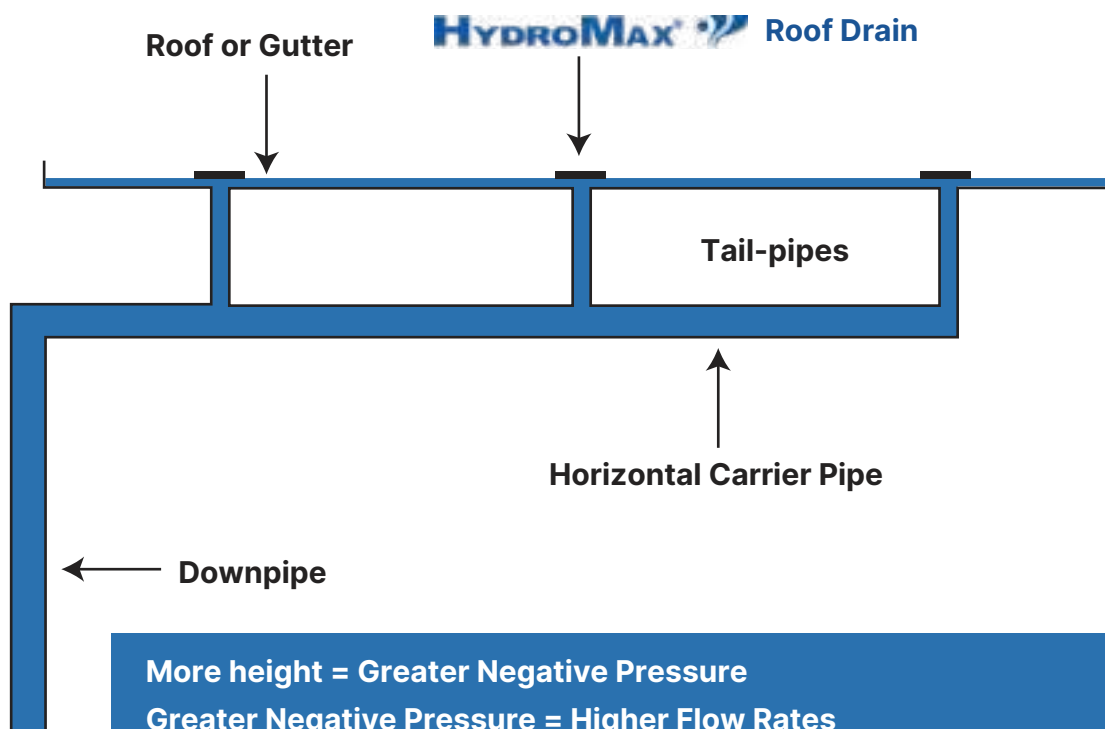


Rainwater (without air) falling down the vertical pipe accelerates, creating negative pressure, which draws water off the roof siphonically.

Primary Siphonic Drain

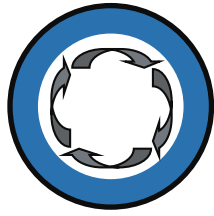


Overflow Siphonic Drain

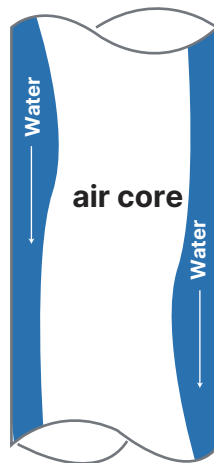


System Comparison

Traditional Gravity

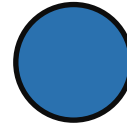


Water in
annular Flow



air core

HydroMax[®] Siphonic



No Air

Pipe Diameter half the size of Gravity

Restrictive Factors of Gravity Drainage

1. Gravity drains require 2/3 air to transport 1/3 water = bigger diameter pipes
2. The vortex formation of a gravity roof drain results in the water being transported in an inefficient spiral motion
3. The flow of water in gravity drainage is dictated by pitch, which limits the distance a pipe can travel
4. The pitch also dictates the location of discharge, rather than the design team's choice of where to route
5. The driving force is directly correlated to the depth of ponding

Gravity Layout vs. Siphonic Layout



Traditional Gravity solution
530 metres pipework
Diameters 160mm to 450mm

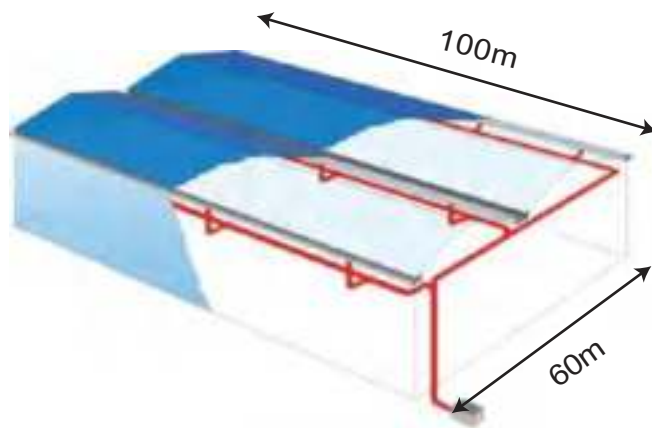
DRAINAGE UNDER BUILDING

Roof Size = 6,000m²

EXTENSIVE CIVIL DRAINAGE

HydroMax®

Siphonic scheme
360 metres HDPE Pipework
Diameters 56mm to 200mm



SanDrain® HYDROMAX® Solution
Pipes run flat to design team's chosen down pipe location.

Costs Savings Using A Siphonic System

1. Reduction in Pipe Diameters
2. Fewer Drains
3. Reduction of Down Pipes
4. Less Pipework
5. Elimination of Under-Slab Excavation
6. Reduced Material Costs for Pipes, Fittings, Couplings, Hangers, and Insulation
7. Reduction of Civil Excavation
8. Reduction of Manholes
9. Labor Savings from Less Pipe to Hang

Litres per second ready-reckoner from Roof Area x various design rainfall rates

HydroMax® Roof Area x Rainfall Rate = L/S ready reckoner chart																	
Design Rainfall Intensity (mm per hour) - Design Rainfall Intensity Litres per second per m ² (L/s/m ²)																	HydroMax® Roof Drains
Roof	75	100	125	140	155	170	185	200	215	230	245	260	275	300	350	400	Flow Capacity Range
Area(m ²)	0.021	0.028	0.035	0.039	0.043	0.047	0.051	0.056	0.060	0.064	0.068	0.072	0.076	0.083	0.097	0.111	
50	1.04	1.39	1.74	1.94	2.15	2.36	2.57	2.78	2.99	3.19	3.40	3.61	3.82	4.17	4.86	5.56	50mm Drains
100	2.08	2.78	3.47	3.89	4.31	4.72	5.14	5.56	5.97	6.39	6.81	7.22	7.64	8.33	9.72	11.11	
150	3.13	4.17	5.21	5.83	6.46	7.08	7.71	8.33	8.96	9.58	10.21	10.83	11.46	12.50	14.58	16.67	Min Inflow (l/s) 1.0
200	4.17	5.56	6.94	7.78	8.61	9.44	10.28	11.11	11.94	12.78	13.61	14.44	15.28	16.67	19.44	22.22	
250	5.21	6.94	8.68	9.72	10.76	11.81	12.85	13.89	14.93	15.97	17.01	18.06	19.10	20.83	24.31	27.78	Max Inflow (l/s) 12.0
300	6.25	8.33	10.42	11.67	12.92	14.17	15.42	16.67	17.92	19.17	20.42	21.67	22.92	25.00	29.17	33.33	
350	7.29	9.72	12.15	13.61	15.07	16.53	17.99	19.44	20.90	22.36	23.82	25.28	26.74	29.17	34.03	38.89	75mm Drains
400	8.33	11.11	13.89	15.56	17.22	18.89	20.56	22.22	23.89	25.56	27.22	28.89	30.56	33.33	38.89	44.44	
450	9.38	12.50	15.63	17.50	19.38	21.25	23.13	25.00	26.88	28.75	30.63	32.50	34.38	37.50	43.75	50.00	Min Inflow (l/s) 1.5
500	10.42	13.89	17.36	19.44	21.53	23.61	25.69	27.78	29.86	31.94	34.03	36.11	38.19	41.67	48.61	55.56	
550	11.46	15.28	19.10	21.39	23.68	25.97	28.26	30.56	32.85	35.14	37.43	39.72	42.01	45.83	53.47	61.11	Max Inflow (l/s) 25.0
600	12.50	16.67	20.83	23.33	25.83	28.33	30.83	33.33	35.83	38.33	40.83	43.33	45.83	50.00	58.33	66.67	
650	13.54	18.06	22.57	25.28	27.99	30.69	33.40	36.11	38.82	41.53	44.24	46.94	49.65	54.17	63.19	72.22	125mm Drains
700	14.58	19.44	24.31	27.22	30.14	33.06	35.97	38.89	41.81	44.72	47.64	50.56	53.47	58.33	68.06	77.78	
750	15.63	20.83	26.04	29.17	32.29	35.42	38.54	41.67	44.79	47.92	51.04	54.17	57.29	62.50	72.92	83.33	Min Inflow (l/s) 10.0
800	16.67	22.22	27.78	31.11	34.44	37.78	41.11	44.44	47.78	51.11	54.44	57.78	61.11	66.67	77.78	88.89	
850	17.71	23.61	29.51	33.06	36.60	40.14	43.68	47.22	50.76	54.31	57.85	61.39	64.93	70.83	82.64	94.44	Max Inflow (l/s) 100.0
900	18.75	25.00	31.25	35.00	38.75	42.50	46.25	50.00	53.75	57.50	61.25	65.00	68.75	75.00	87.50	100.00	
950	19.79	26.39	32.99	36.94	40.90	44.86	48.82	52.78	56.74	60.69	64.65	68.61	72.57	79.17	92.36	105.56	
1000	20.83	27.78	34.72	38.89	43.06	47.22	51.39	55.56	59.72	63.89	68.06	72.22	76.39	83.33	97.22	111.11	
1050	21.88	29.17	36.46	40.83	45.21	49.58	53.96	58.33	62.71	67.08	71.46	75.83	80.21	87.50	102.08	116.67	
1100	22.92	30.56	38.19	42.78	47.36	51.94	56.53	61.11	65.69	70.28	74.86	79.44	84.03	91.67	106.94	122.22	
1150	23.96	31.94	39.93	44.72	49.51	54.31	59.10	63.89	68.68	73.47	78.26	83.06	87.85	95.83	111.81	127.78	
1200	25.00	33.33	41.67	46.67	51.67	56.67	61.67	66.67	71.67	76.67	81.67	86.67	91.67	100.00	116.67	133.33	
1250	26.04	34.72	43.40	48.61	53.82	59.03	64.24	69.44	74.65	79.86	85.07	90.28	95.49	104.17	121.53	138.89	
1300	27.08	36.11	45.14	50.56	55.97	61.39	66.81	72.22	77.64	83.06	88.47	93.89	99.31	108.33	126.39	144.44	
1350	28.13	37.50	46.88	52.50	58.13	63.75	69.38	75.00	80.63	86.25	91.88	97.50	103.13	112.50	131.25	150.00	
1400	29.17	38.89	48.61	54.44	60.28	66.11	71.94	77.78	83.61	89.44	95.28	101.11	106.94	116.67	136.11	155.56	
1450	30.21	40.28	50.35	56.39	62.43	68.47	74.51	80.56	86.60	92.64	98.68	104.72	110.76	120.83	140.97	161.11	
1500	31.25	41.67	52.08	58.33	64.58	70.83	77.08	83.33	89.58	95.83	102.08	108.33	114.58	125.00	145.83	166.67	
1550	32.29	43.06	53.82	60.28	66.74	73.19	79.65	86.11	92.57	99.03	105.49	111.94	118.40	129.17	150.69	172.22	
1600	33.33	44.44	55.56	62.22	68.89	75.56	82.22	88.89	95.56	102.22	108.89	115.56	122.22	133.33	155.56	177.78	
1650	34.38	45.83	57.29	64.17	71.04	77.92	84.79	91.67	98.54	105.42	112.29	119.17	126.04	137.50	160.42	183.33	
1700	35.42	47.22	59.03	66.11	73.19	80.28	87.36	94.44	101.53	108.61	115.69	122.78	129.86	141.67	165.28	188.89	
1750	36.46	48.61	60.76	68.06	75.35	82.64	89.93	97.22	104.51	111.81	119.10	126.39	133.68	145.83	170.14	194.44	
1800	37.50	50.00	62.50	70.00	77.50	85.00	92.50	100.00	107.50	115.00	122.50	130.00	137.50	150.00	175.00	200.00	
1850	38.54	51.39	64.24	71.94	79.65	87.36	95.07	102.78	110.49	118.19	125.90	133.61	141.32	154.17	179.86	205.56	
1900	39.58	52.78	65.97	73.89	81.81	89.72	97.64	105.56	113.47	121.39	129.31	137.22	145.14	158.33	184.72	211.11	
1950	40.63	54.17	67.71	75.83	83.96	92.08	100.21	108.33	116.46	124.58	132.71	140.83	148.96	162.50	189.58	216.67	
2000	41.67	55.56	69.44	77.78	86.11	94.44	102.78	111.11	119.44	127.78	136.11	144.44	152.78	166.67	194.44	222.22	
2050	42.71	56.94	71.18	79.72	88.26	96.81	105.35	113.89	122.43	130.97	139.51	148.06	156.60	170.83	199.31	227.78	
2100	43.75	58.33	72.92	81.67	90.42	99.17	107.92	116.67	125.42	134.17	142.92	151.67	160.42	175.00	204.17	233.33	
2150	44.79	59.72	74.65	83.61	92.57	101.53	110.49	119.44	128.40	137.36	146.32	155.28	164.24	179.17	209.03	238.89	
2200	45.83	61.11	76.39	85.56	94.72	103.89	113.06	122.22	131.39	140.56	149.72	158.89	168.06	183.33	213.89	244.44	
2250	46.88	62.50	78.13	87.50	96.88	106.25	115.63	125.00	134.38	143.75	153.13	162.50	171.88	187.50	218.75	250.00	
2300	47.92	63.89	79.86	89.44	99.03	108.61	118.19	127.78	137.36	146.94	156.53	166.11	175.69	191.67	223.61	255.56	
2350	48.96	65.28	81.60	91.39	101.18	110.97	120.76	130.56	140.35	150.14	159.93	169.72	179.51	195.83	228.47	261.11	
2400	50.00	66.67	83.33	93.33	103.33	113.33	123.33	133.33	143.33	153.33	163.33	173.33	183.33	200.00	233.33	266.67	
2450	51.04	68.06	85.07	95.28	105.49	115.69	125.90	136.11	146.32	156.53	166.74	176.94	187.15	204.17	238.19	272.22	
2500	52.08	69.44	86.81	97.22	107.64	118.06	128.47	138.89	149.31	159.72	170.14	180.56	190.97	208.33	243.06	277.78	

Why Use SanDrain® HydroTechnic™ Design Software

HydroMax

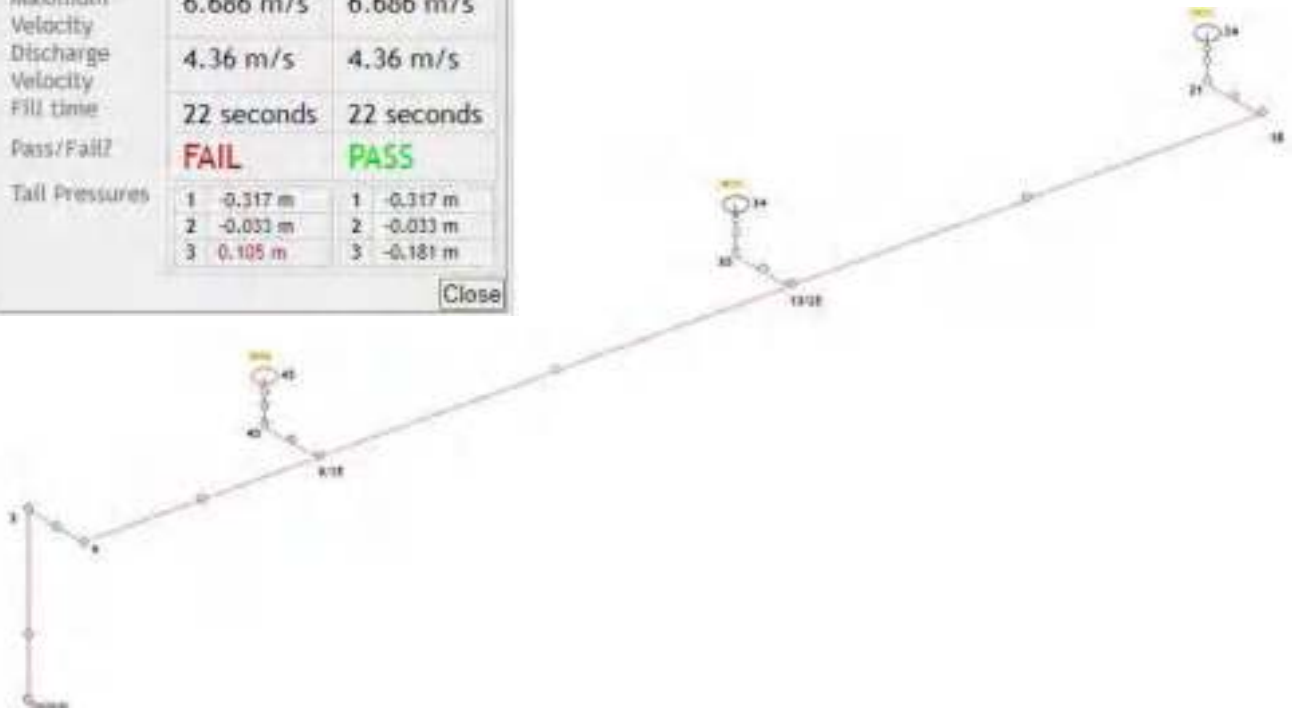
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Hydraulic Calculation Summary

	Previous	Current
Out of Balance	0.422 m	0.284 m
Minimum Pressure	-7.218 m	-7.218 m
Maximum Pressure	1.289 m	1.289 m
Minimum Velocity	2.407 m/s	2.407 m/s
Minimum Vertical Velocity	4.36 m/s	4.36 m/s
Maximum Velocity	6.686 m/s	6.686 m/s
Discharge Velocity	4.36 m/s	4.36 m/s
Fill time	22 seconds	22 seconds
Pass/Fail?	FAIL	PASS
Tail Pressures	1 -0.317 m	1 -0.317 m
	2 -0.033 m	2 -0.033 m
	3 0.105 m	3 -0.181 m

Close

Easy to use graphic input to create a design with HydroTechnic Software



Bill of Materials for HydroMax					
Material	Description	Diameter	Quantity	Rate/metre	Value
			m*		
HDPE	Pipe PE 80 PN 4 75mm	75	5		
HDPE	Pipe PE 80 PN 4 90mm	90	5		
HDPE	Pipe PE 80 PN 4 110mm	110	5		
HDPE	Pipe PE 80 PN 4 125mm	125	15		
HDPE	Pipe PE 80 PN 4 160mm	160	40		

17 April 2015

Bill Ross
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Dear Sirs,

HydroMax™ outlets and HydroTechnic™ software

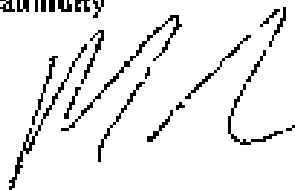
We at CRM, one of Europe's leading independent Consultant's for Siphonic Roof Drainage, along with HR Wallingford (formerly named Hydraulic Research, Wallingford) one of the world's leading research and test facilities for hydraulics, worked together on testing the HydroMax™ siphonic roof drainage system and HydroTechnic™ analytical design software program.

We are pleased to confirm that the system functioned well under all test conditions and satisfied the performance requirements of the current ruling standards for roof drainage design, ASPE/ANSI 45:2013. The HydroTechnic™ analytical design program has been proven to be extremely accurate, a fact endorsed by HR Wallingford (who were previously commissioned by a UK Governmental Department to analyse siphonic roof drainage systems). We believe that due to its technically advanced calculation process, HydroTechnic™ produces calculations of unsurpassed accuracy together with user friendly features, including the ability to calculate with varying piping materials..

We can confirm that the HydroMax 3", 4", 5" and 6" have been tested in accordance with standard ASME 112.6.9-2005

Please contact me if you require any further information.

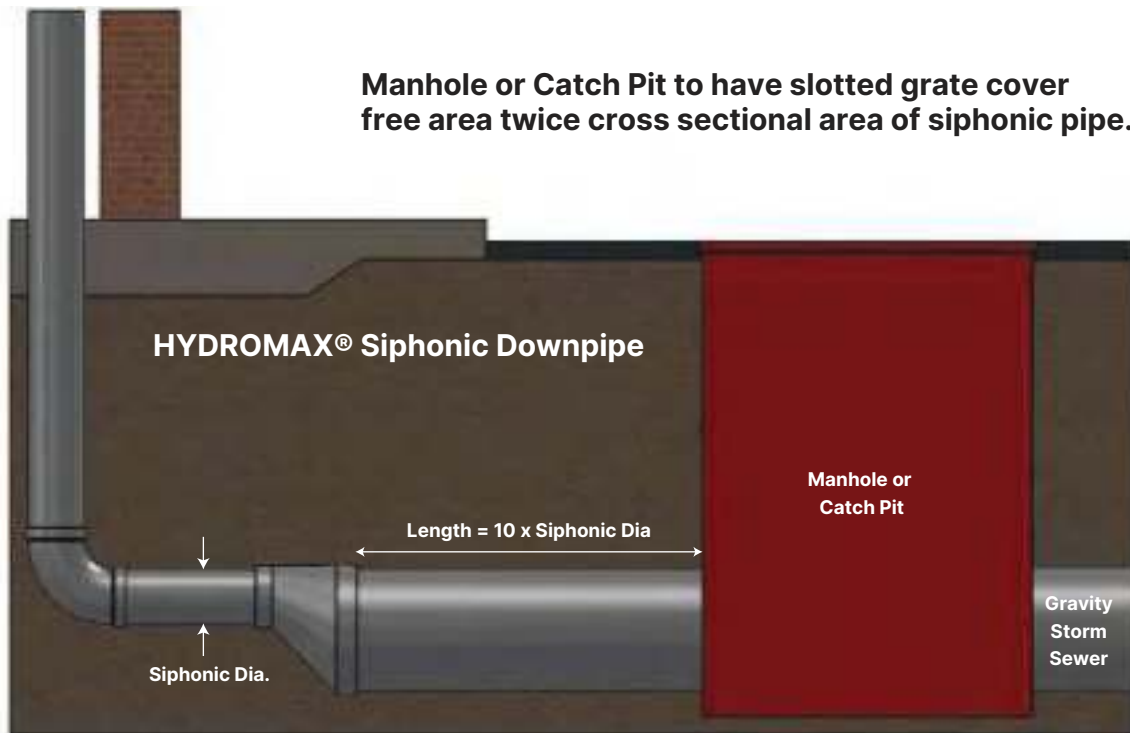
Yours faithfully



Dr Malcolm Wearing BEng PhD CEng MICE MCIWEM

Siphon Breaks

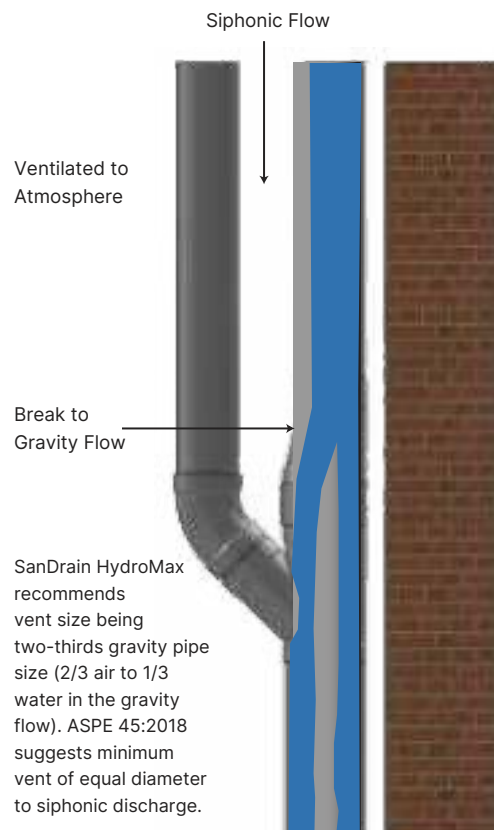
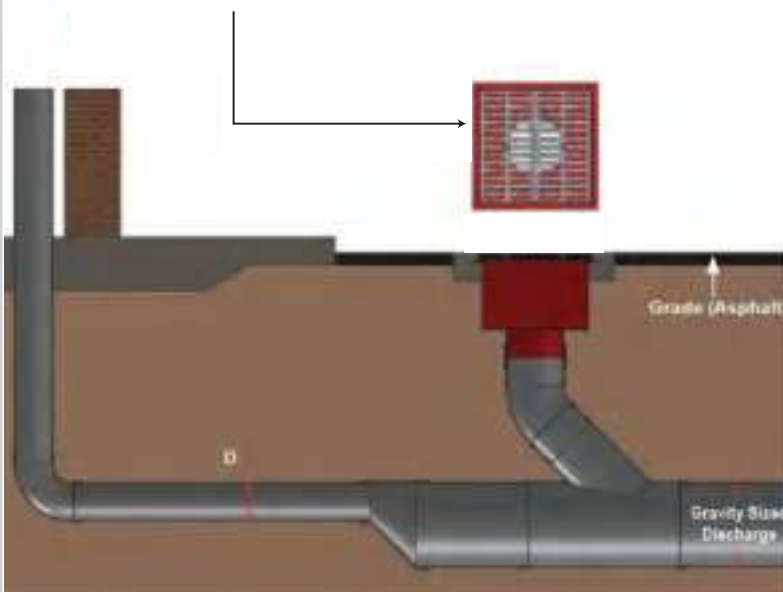
Manhole or Catch Pit to have slotted grate cover
free area twice cross sectional area of siphonic pipe.



Flare out discharge pipework 10 x siphonic pipe diameter in length from manhole and expect at least 2 step-ups in diameter for the transition to gravity pipe size

Siphonic Break in Vertical

SanDrain® HYDROMAX® MH-F1460 up to 6"
SanDrain® HYDROMAX® MH-F1580 8" to 12"



PE PIPING SYSTEMS



Chemical Resistant



Thermal Resistant



Weather Resistant



Smooth inner wall



Light Weight



Elastic



Impact Resistant



Thermally Insulating



Non Toxic

Polyethylene (PE) is a sturdy thermoplastic material produced from the polymerization of ethylene and is widely used in water, slurry, and gas applications. Sangir PE pipes are manufactured by extrusion in sizes ranging from 16mm to 1200mm. PE is available in rolled coils of various lengths (up to 125mm OD) or in straight lengths up to 12mtrs. PE pipe is available in a wide variety of wall thicknesses but is primarily based on Controlled Outside Diameter (OD). A promising

material, it has a design life extending up to 100 years for some applications.

PE pipe is available in many forms and colors such as the following:

- Single extrusion colored or black pipe
- Black pipe with coextruded color Stripe

Technical Information

			HDPE	MDPE	LDPE	PEUHMW
Specific gravity (p)	ISO 1183	g/cm ³	0.95	0.938	0.925	0.93
Max. Permissible service temp		oC	-50 to 90	-50 to 85	-50 to 60	-50 to 90
Tensile strength at yield (σ _S)	ISO 527	Mpa	27	20	11	17
Elongation at break (ε _R)	ISO 527	%	≥700	≥600	≥600	≥50
Impact strength (a _n)	ISO 179	kJ/m ²	No Break	No Break	No Break	No Break
Flexural strength (σ _B 3,5%)	ISO 178	Mpa	22	40	80	27
Modulus of elasticity (E _t)	ISO 527	Mpa	1150	760	260	680
Coef. of linear therm. expansion (α)	DIN 53752	K-1 X 10-4	1.5	1.5	1.4	2
Vicat Softening Temp	ISO 306		80	80	94	80

PIPING



HDPE

Range :
 20 - 1200mm | PN 2.5 -16
 Standards :
 ISO 4427 | EN 12201
 IS 4984 | IS14333
 ASNZ | ASTM
 4130 | 2619/3035



MDPE

Range :
 20 - 800mm | PN 2.5 -16
 Standards :
 ISO 4427



GAS

Range :
 16 - 800mm | PN 2.5 -10
 Standards :
 ASTM
 2513
 ISO 4437
 IS 14885

50,000+

Installations Worldwide by HydroMax

Retail / Warehouse



Walmart USA | Tesco | General Motors



Manufacturing Plants

Mercedes Benz | NASA | Boeing 737MAX



Airports

Phoenix Sky T2 | Incheon Airport | Gim Hae



Hotels / Malls

Nakheel Mall | Dundrum Retail | Marriott



Stadiums

Tottenham Hotspur | Royal Ascot Racecourse



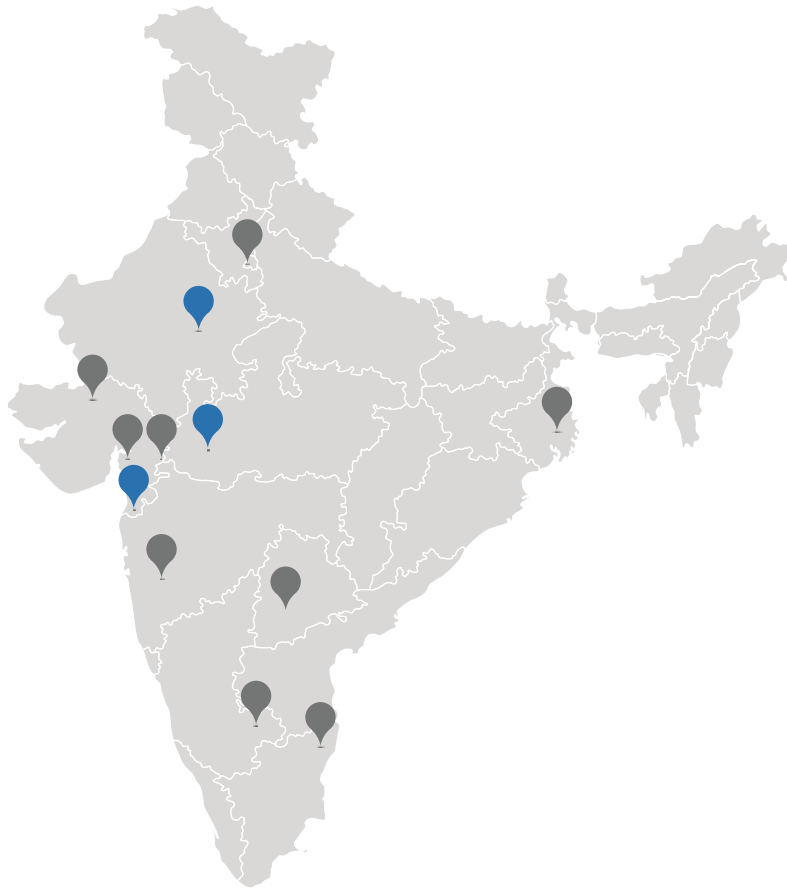
Pharmaceutical / Hospitals

Pfizer | Mercy Hospital | NG TENG FONG Hospital

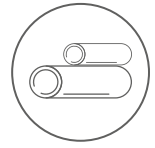


Commercial Offices & Parking Decks

Marina Heights | Peleton | JEM Jurong Gateway



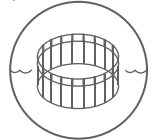
Piping Systems



Sheet & Profile Solutions



Marine Solutions



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