Chezy Siphonic Rainwater Drainage System

The Cost-Effective Rainwater Drainage Solution

Faster Water Removal Rates, 10 Times More Than Gravity Assisted Flow

Reliable Installation, 12 Years Guarantee On The System

www.chezy.com.my

Chezy Siphonic **Rainwater Drainage System**

Chezy Industries Sdn. Bhd. Together with their partners, Zhejiang Zhongcai Pipes Science & Technology Co. Ltd. Will provide a complete package for rainwater drainage systems. This package includes design, the manufacture of pipes and fittings, installation at site and 12 years warranty on our rainwater drainage system. Our system can be used in industrial factory buildings, railway stations, high-rise buildings, large supermarkets, libraries, opera houses, gymnasiums, large warehouses, airports, and other large roof buildings.

Chezy with their technological partners who have more than 20 years of experience in this field and having completed more than 500 projects, will provide you with design flexibility and peace of mind. Having a large experienced design team, we are able to provide you a cost-effective and safe design for all of your rainwater applications. We produce calculations, factory-ready drawings, bill of quantities, and installation of our system.

Understanding roof drainage systems

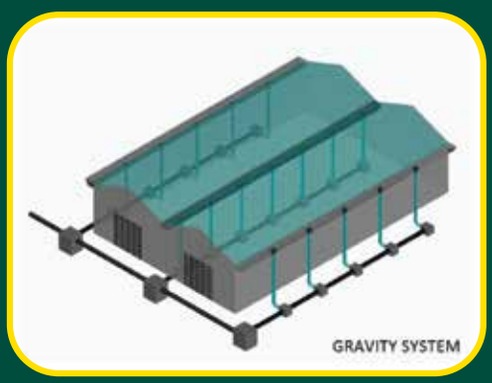


Figure 1: Gravity drainage system pipeline network (many branches)

Gravity System

The gravity roof drainage systems function by guiding rainwater from the roof through gutters, outlets, and downpipes. However, a drawback of this system is the vortex action it creates, pulling air into the pipes and causing a substantial reduction in drainage capacity, up to two-thirds, due to the significant volume of air present.

Chezy Siphonic System

In comparison to gravity systems, Chezy siphonic roof drainage systems has two main distinctions. Firstly, our outlets are uniquely designed to limit air entry. Secondly, the rainwater pipes run full-bore from gutter to downpipe. The essential "priming" process introduces siphonic action, which enables faster water discharge, resulting in quicker gutter clearing than traditional gravity systems.

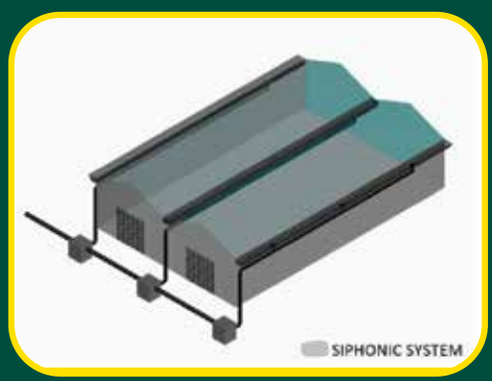
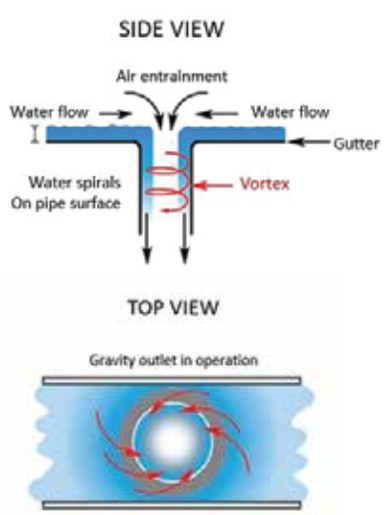
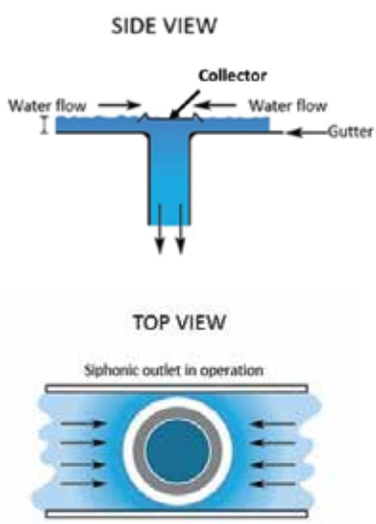
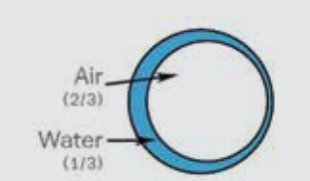


Figure 2: Chezy Siphonic drainage system pipeline network (very less branches and pipes)

Gravity System Vs
Chezy Siphonic System

CRITERIA	GRAVITY SYSTEM	CHEZY SIPHONIC SYSTEM
System	In a gravity system, as water flows through the downpipe, it creates a spiral motion along the inner wall (vortex), leaving an air-filled core at the center of the water flow. This inefficient drainage leads to reduced effectiveness. 	Chezy Siphonic systems effectively prevents air entry and maintains a full-bore flow, allowing water to flow with negative pressure, ensuring highly efficient drainage. 
Flow Condition	The pipe's cross-section contains approximately one-third water and two-thirds air. 	100% water (full-bore flow) 
Pipe Sizes	Large	Small Small
Flexible in Design	Inflexible	Flexible Flexible
Underground pipe	Many	Less Less
Gutter size	Large	Small Small
Horizontal pipe slope	Required. Consumes building's vertical space.	No graident required. Saving valuable space.
Price	High (in case of large buildings)	Cost saving up to 30%

How Chezy Siphonic System Works?

The water flow through Chezy siphonic system can be summarized in four steps.

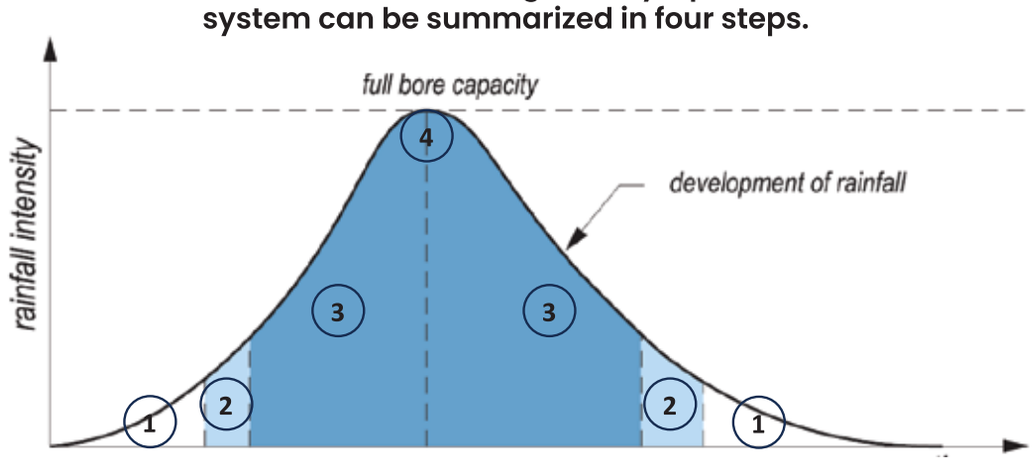


Figure 3: Rainwater flow pattern with rainfall intensity

1) GRAVITY FLOW

During the initial and final stages of rainfall or when the rainfall intensity is low, the siphonic system behaves similarly to a gravity rainwater system, allowing both air and water to enter. In this scenario, the flow pattern operates as gravity flow.

2) PLUG FLOW

As rainfall intensity increases, the flow pattern transitions into a Plug flow stage, where the pressure-driven approaches atmospheric pressure. Hydraulic plugs form inside the pipe as water fills up. This stage triggers a self-cleaning action to take place.

3) BUBBLE FLOW

As water rapidly fills up the pipe, the flow pattern continues to carry air bubbles inside, propelled by atmospheric pressure.

4) FULL BORE FLOW

During heavy rainfall, the system becomes fully primed as the pipe system fills up with water and becomes de-pressurized, operating below atmospheric pressure. With water driven at high velocity, the system achieves its optimal designed capacity, delivering peak performance and high discharge volume.

Chezy Siphonic
System Services & Products

With Chezy, your rainwater drainage systems are solved without issues. Our team accompanies you from planning stage, from design including installation and maintenance service.

SOLUTION DEVELOPMENT

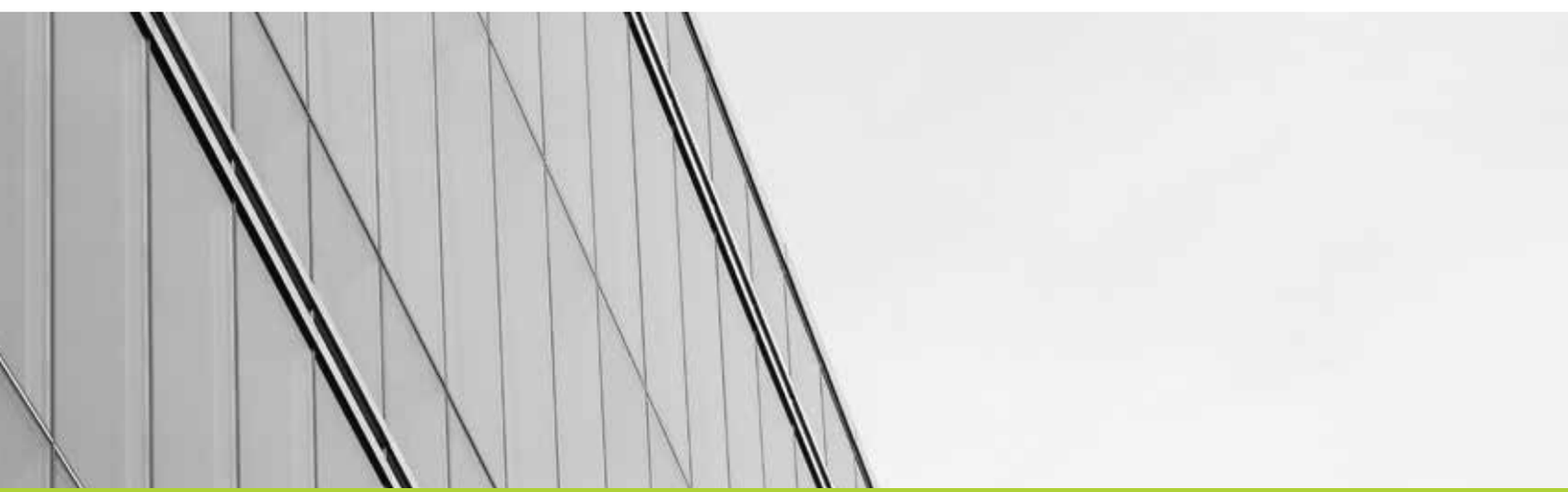
Our application engineering team is dedicated to deliver solutions for your water draining requirements from the project's outset. Using cutting-edge German software, we perform precise calculations based on your architectural drawings to tailor a solution perfectly suited to your needs. If necessary, we also offer customized solutions to meet specific demands.

INSTALLATION

All installations are carried out by our in-house team of qualified engineers and installers. We ensure every step is executed in accordance with the approved designs and technical drawings. Our team works closely with architects, consultants and other contractors to maintain accuracy and efficiency on site. This approach guarantees a seamless installation process with consistent quality control.

AFTER SALES AND WARRANTY

After the installation is finished and validated, Chezy offers a 12-year warranty for the proprietor's peace of mind. Should any needs arise, our dedicated after-sales service team is readily available to provide support and assistance.



Why Chezy Siphonic?

A. Faster water removal rates, 10 times more than gravity assisted flow

B. Reliable installation, 12 years guarantee on the system

C. Structural and space savings

D. Ideal for complex roof shapes

E. Fewer openings in roof, reducing chances of roof leakages

F. Project cost reduction (save up to 30%)

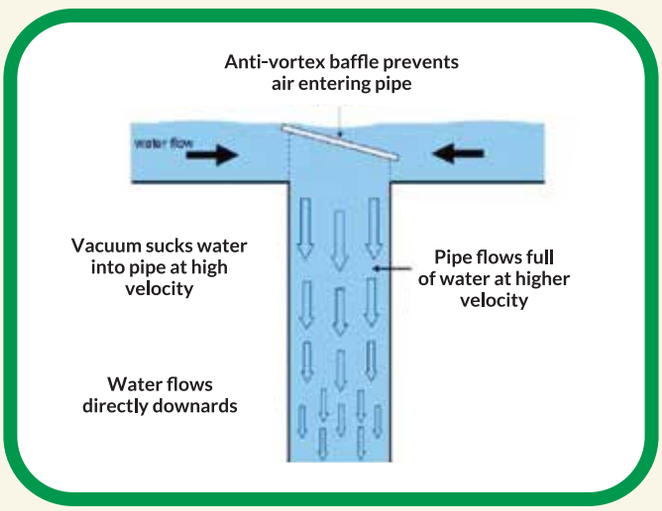
G. Fewer and smaller downpipes, 75% less pipes required

H. Enable water storage to desired location

I. Safety and practicability

A Faster water removal rates, 10 times more than gravity assisted flow

Unlike gravity drainage system, the absence of air and atmospheric pressure in the Chezy Siphonic Drainage system creates a negative pressure in the pipe and the siphonic effect begins. The system then 'sucks' water from the roof at 10 times more than gravity assisted flow, resulting in higher operating discharge velocities of 1m/s up to 10m/s.



B Reliable Installation, 12 years guarantee on the system

Chezy offers excellent installations managed by our own specialists. This guarantees that the installation adheres to design and drawings. On top of that, after the installation is finished and validated, Chezy offers 12 years warranty for the proprietor's peace of mind. Should any needs arise, our dedicated after-sales service team is readily available to provide support and assistance.

C Structural and space savings

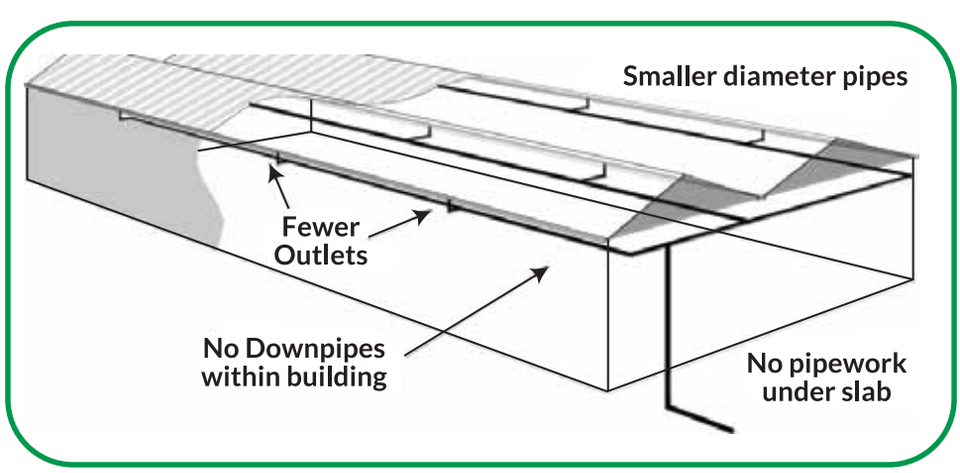
A gravity system requires multiple droppers dictated by pitch, once the pipework crosses into liveable space, a vertical dropper is needed. This inhibits design flexibility. Chezy Siphonic Drainage system offers great design flexibility as the pipe runs at zero slope and only a very few droppers are required, resulting in structural and space savings.

D Ideal for complex roof shapes

Our rainwater collector is so flexible that it can be stationed on all types of roofs and flexibly can adapt to all modern and irregular roof designs.

E Fewer openings in roof, reducing chances of roof leakages

Chezy Siphonic System requires very less roof openings to be made. Fewer roof openings drastically reduce the chance of roof leakages, making our siphonic system a trouble-free and cost-effective complete drainage system.



F Project cost reduction (save up to 30%)

By using the Chezy Siphonic system, your project cost can be greatly reduced, most notably by cutting drainage pipes in half. Larger diameter pipes are not required as the air is restricted from entering the Chezy Siphonic System. Thus, our system is designed with smaller pipes with full bore flow capacity. Additionally, Chezy Siphonic Drainage System pipes run with zero slope, the roof drains can now be collected on the top floor and channel pipes to one vertical dropper, compared to the costly gravity system which requires multiple droppers to be installed. Outside the building, our system only requires fewer underground pipes, resulting in very minimal trenching work for underground pipes, reducing the project cost greatly. Chezy's Siphonic Drainage system is proven to produce material savings from pipes, fittings, couplings, box ups and hangers. The labour savings is more substantial when compared to the gravity drainage system.

G Fewer and smaller downpipes, 75% less pipes required

In the Chezy Siphonic Drainage System, the pipes run with zero slope, allowing the collection of roof drains on the top floor, and channelling them all into fewer droppers. This contrasts with the expensive gravity system, which requires the installation of many multiple droppers.

H Enable water storage to desired location

Chezy Siphonic System provides a complete solution by enabling the project owner to customise the system. We can integrate drainage solutions for all requirements from roof collection to rainwater harvesting and storage to recycling with a complete range of pipework solutions.

I Safety and Practicability

Chezy has taken all steps to ensure the high safety of our siphonic system. The system design and material requirements are precisely computed using software to eliminate human errors. The Chezy system also offers more roof discharge flow rate using lesser space as compared to the gravity assisted flow, being a practical solution to roof drainage problems.

Chezy Siphonic Drainage
Rainwater Technical Section

Chezy Siphonic Rainwater Discharge System– Overview

Cavitation, Positive and Negative Pressures

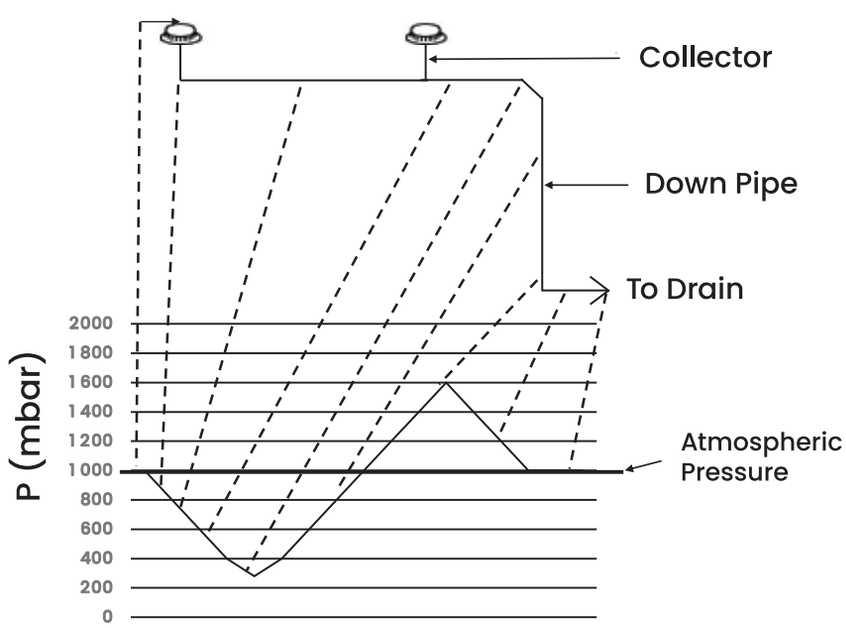
As the rainfall intensity increases, the pipework fills up with water. Once the Chezy outlets are submerged below the water level in the gutter, the special design of the outlet will prevent air from entering the pipework, the system is than termed as fully primed.

At the roof or podium outlets, atmospheric pressure is present on the rainwater surface level and as the water moves through the changing pipework size, energy is conserved (Bernoulli's theorem), resulting in changing velocities and pressures of the water flow along the flow path. As a result of these changes in velocities and pressures, it is generally found that the highest negative pressure is found at the top of the vertical down pipe in the system, this generates a suction effect below the outlet, resulting in higher flow rates in the piping system.

These negative pressure effects are more severe than positive pressure effects on pipes used in the pipework. High negative pressures may cause the pipes to deform and buckle. It is therefore important to design the siphonic system such that it does not have a negative pressure exceeding -8m head of water.

In tall buildings, it may be possible for the negative pressure values in siphonic systems to drop so low as to approach the vapor pressure of water. When this occurs, the water will effectively boil and form cavities filled with water vapor. This process is known as **cavitation** and these cavities will result in turbulence and pressure fluctuations in the flow. When these cavities with water vapor collapse, they generate high impact pressures which may cause damage to the pipes. Cavitation must be avoided in the design of siphonic systems. Avoidance of cavitation can be done by using different SDR or pipe diameters. Our software will calculate and warn us on the possibility of cavitation on the pipe sizes used in our design.

Normal pressure variations in a high rise siphonic system



Chezy Siphonic Rainwater Discharge System

Design Process

1. **Identify Exposed Roof Areas**
   Review the architectural AutoCAD drawings to identify all exposed roof surfaces that will contribute to rainwater collection.

2. **Calculate Roof Catchment Area**
   Accurately measure and calculate the total exposed roof area and other areas in square meters (m^2) using architectural drawings.

3. **Determine Rainfall Intensity (RFI)**
   Refer to the MSMA 2nd Edition 2012 guidelines to determine the design rainfall intensity (in mm/hour) for the specific geographical location of the project.

4. **Calculate Design Flow Rate**
   Use the formula:
   Q (L/s) = A (m^2) x RFI (mm/hour) / 3600

   This provides the peak design flow rate in liters per second (L/s) for each catchment area. (A m^2)

5. **Select Rainwater Collector Size & Quantity**
   Based on the calculated design flow rate, determine the appropriate size and number of rainwater collectors required to accommodate the designed flow rate.

6. **Plan Pipe Routing**
   Design the routing of piping from each rainwater collector to the discharge location, which may include:

   - Rainwater Harvesting Tank (RWHT)
   - On-site Detention Tank (OSD)
   - Perimeter Drain
   - Other specified discharge points as per project requirements.

7. **Simulate System Using Approved Software**
   Perform system simulation and hydraulic calculations using BBA-approved software to determine optimal horizontal and vertical pipe sizes and to ensure proper siphonic function.

8. **Comply with Siphonic Design Standards**
   Ensure all system designs comply with BS 8490 – the British Standard for siphonic rainwater drainage systems – covering layout, flow conditions, efficiency, material compatibility, and safety margins.

Chezy System
Capability

Chezy uses a German Software to design their siphonic rainwater system, which fully complies to **BS 8490:2007 (Guide to siphonic roof drainage systems).**

This software is able to give us the flow rates, velocity and static pressure all along the individual flow paths from the individual outlets to the exit, this ensures that our siphonic system complies to the safety and performance of the British Standard.

Chezy is able to provide the routing of the pipe sizes and fittings in the building (layout), schematic drawings (to show the placing and number of collectors), calculations of efficiency, velocities, static pressure and flow rates in our design.

The following design and rules criteria for the Chezy siphonic system are used:

a) The value for pipe roughness for determining the flow capacity of the system is 0.025 (dimensionless).

b) A safety factor for siphonic systems should be provided by increasing the design rates of run-off by 10%, these increased rates should also be used for sizing gutters drained by siphonic systems (to allow for possible partial clogging of outlets).

c) The minimum velocity in tailpipes and horizontal sections of pipe (longer than 1 m) should not be less than 1.0 m/s under design conditions to ensure flushing of the system.

d) The minimum allowable velocity in vertical downpipes should not be less than 2.2 m/s under design conditions.

e) The filling time of the system to achive full siphonic state should not be greater than 60 seconds.

f) Pressures in siphonic systems under design conditions should not be lower than -8 m water head below atmospheric pressure.

Project Layout

With reference from one of our projects, in figure **4**, we calculate the flow rates, velocities and static pressure at critical points on each and every flow path to the exit ensuring safety and siphonic action.

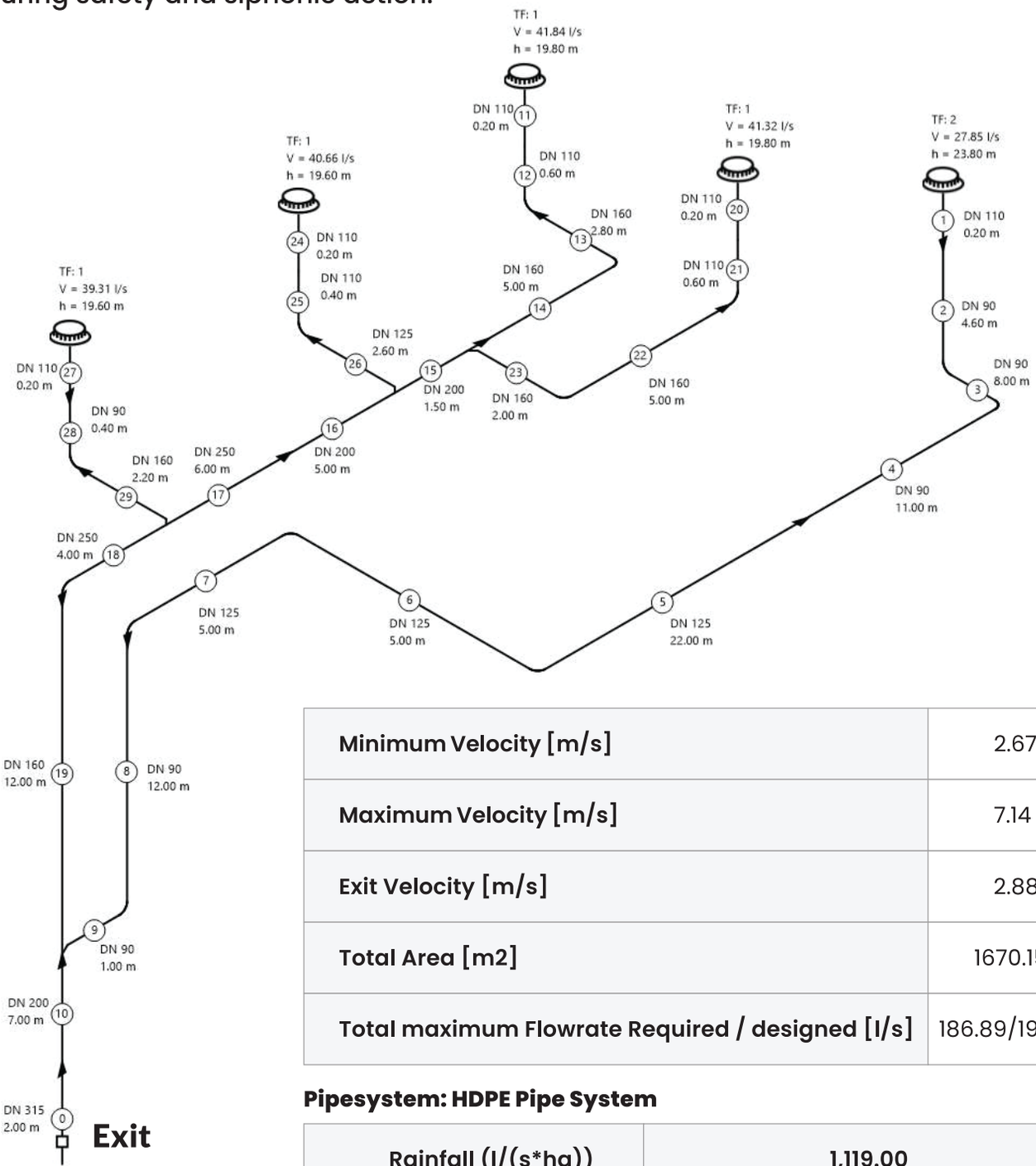


Figure 4

Minimum Velocity [m/s]	2.67
Maximum Velocity [m/s]	7.14
Exit Velocity [m/s]	2.88
Total Area [m2]	1670.15
Total maximum Flowrate Required / designed [l/s]	186.89/190.98

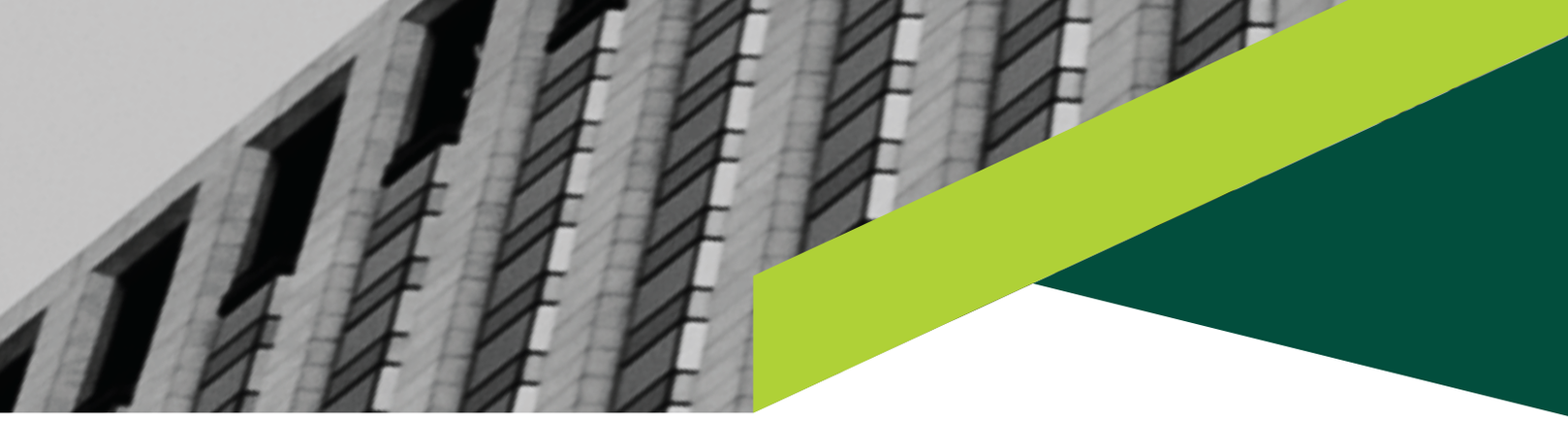
Pipesystem: HDPE Pipe System

Rainfall (l/(s*ha))		**1,119.00**
Roof Segment	**Coefficient of Discharge**	**Rainfall Collection Area (m2)**
1	**1.0**	**1,432.00**
2	**1.0**	**238.15**
C/D: 2 x 45°		
2 x 45°		

Flow Path	Roof Segment	A (mbar)	Nominal [l/s]	Actual [l/s]	Actual [%]	Length [m]	Roof Outlet Height [m]
1	2	-0.18	26.65	27.85	105%	75.80	23.80
11	1	0.09	40.06	41.84	104%	44.10	19.80
20	1	0.12	40.06	41.32	103%	43.30	19.80
24	1	0.09	40.06	40.66	101%	37.20	19.60
27	1	0.10	40.06	39.27	98%	25.80	19.60

Ts	Roof Segment	DN	Length [m]	Height [m]	l/s	m/s	Static Pressure [mbar]	dh	di	Zeta
1	2	DN110	0.20	23.80	27.85	3.48	-121.32	0.20	101.00	1.30
2		DN90	4.60	23.60	27.85	5.15	28.09	4.60	83.00	0.80
3		DN90	8.00	19.00	27.85	5.15	-292.95	0.00	83.00	0.80
4		DN90	11.00	19.00	27.85	5.15	-628.42	0.00	83.00	0.30
5		DN125	22.00	19.00	27.85	2.67	-675.08	0.00	115.20	0.80
6		DN125	5.00	19.00	27.85	2.67	-729.74	0.00	115.20	0.80
7		DN125	5.00	19.00	27.85	2.67	-795.10	0.00	115.20	1.10
8		DN90	12.00	19.00	27.85	5.15	-143.70	12.00	83.00	0.80
9		DN90	1.00	7.00	27.85	5.15	-303.03	0.00	83.00	1.00
10		DN200	7.00	7.00	190.98	7.14	-254.66	7.00	184.60	1.50
0		DN315	2.00	0.00	190.98	2.88	0.00	0.00	290.80	0.00

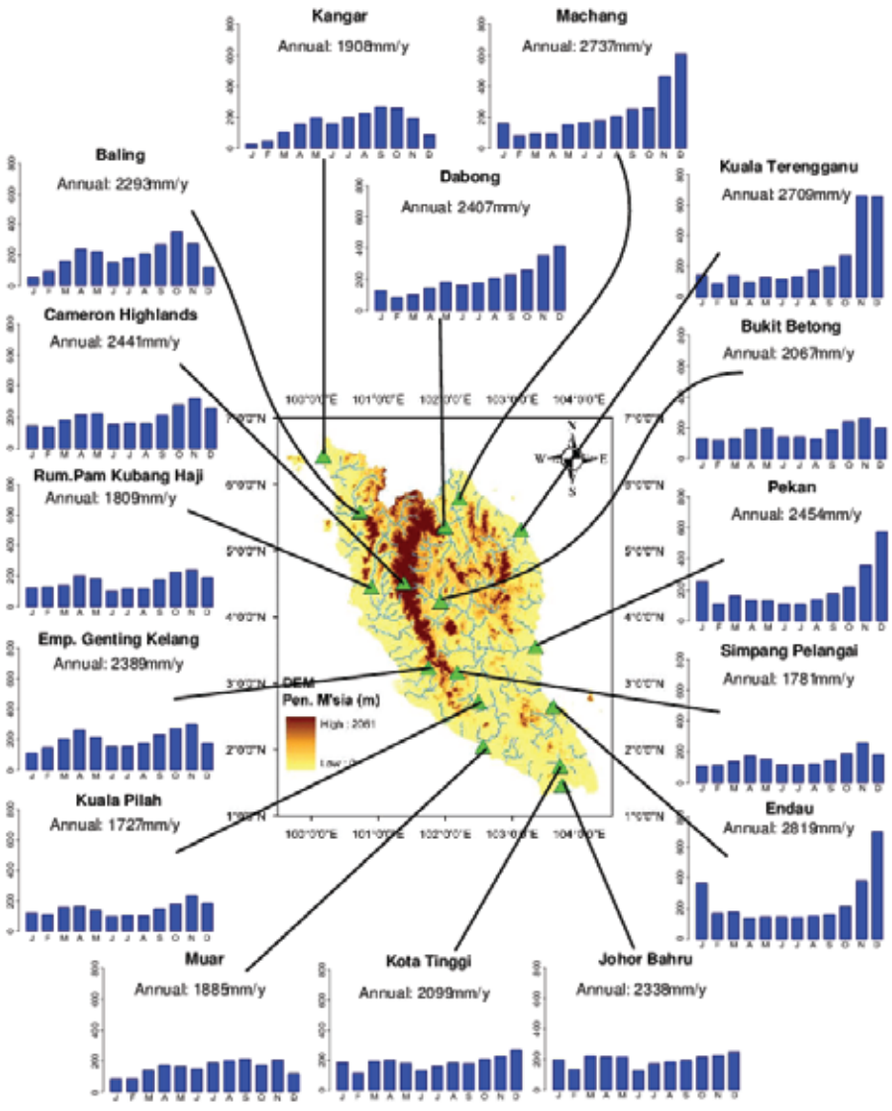
On simulation of the layout we are able to obtain the efficiencies, the imbalance in the different flow paths, flow capacities, maximum and minimum velocities and pressures (both positivie and negative). Chezy is able to know the exact performance of their design.



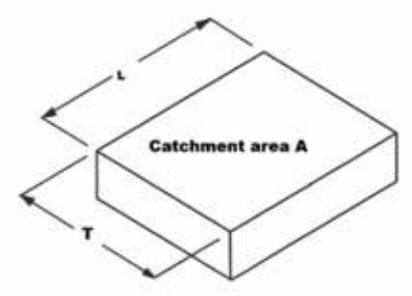
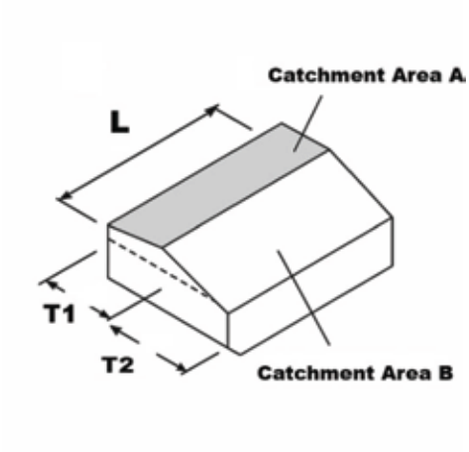
Design Rainfall Capacity

Our rainfall intensity (r) in our design is based on the nearest meteorological station data from the site (extracted from MSMA 2nd edition 2012). Chezy's siphonic design generally takes a 100 year return period rainfall with a maximum intensity for a 5 minute rainfall duration. Alternatively we can also design our rainwater siphonic system to our clients requirements.

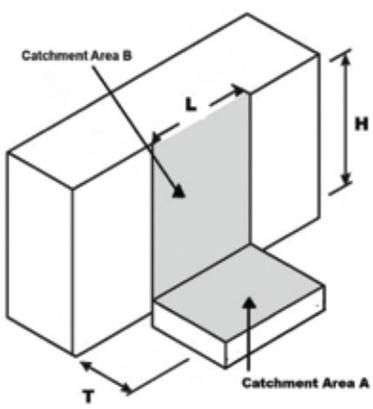
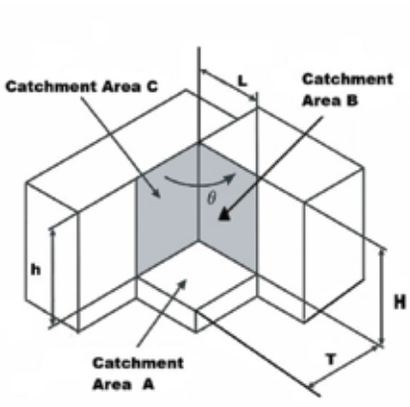
Note: 1:100 years storm is a rainfall event that has a 1/100 or 1% probability of occurring within any one-year period (very intense rainfall).



Effective Catchment Area of Roofs

Roof Type	Diagram	Catchment Area Calculation
Flat roofs For a flat roof with a freely exposed horizontal surface the effective catchment area is equal to the plan are of the area to be drained.		Catchment Area A = L x T All dimensions in linear metres.
Dual Pitch Flat Roof For a dual pitch flat roof, split the roof into discrete areas to isolate the catchment areas as shown:		For a dual pith flat roof, split the roof into discreate areas to isolate the catchment areas shown: Catchment Area A = L x T_1 Catchment Area B = L x T_2 All dimensions in linear metres.

Effective Catchment Area of Roofs

Roof Type	Diagram	Catchment Area Calculation
Adjacent vertical surfaces Flat roofs that are adjacent to vertical walls and/or glazed surfaces will be subject to an increased hydraulic load due to the effects of wind driven rain against these vertical surfaces and subsequently running off onto the roof.		Catchment Area A = L x T Catchment Area B = L x $\frac{H}{2}$ Total Catchment Area = L (T + $\frac{H}{2}$) All dimensions in linear metres.
Flat Roof with One Adjacent Vertical Wall For a flat roof exposed to a single wall, assume the effective catchment areas to be half the exposed vertical area of the wall.		
Flat Roof with Two Adjacent Vertical Walls Similarly, for a flat roof exposed to two or more vertical walls forming an angle or bay, the assumed resulting wind direction requires that the combined areas of the walls should be considered together.		Catchment Area A = L x T Catchment Area B = L x $\frac{H}{2}$ Catchment Area C = T x $\frac{h}{2}$ Total Catchment Area = $A + \frac{1}{2}\sqrt{B^2 + C^2 - 2\,C\cos\theta}$ All dimensions in linear metres, angles in degrees.

Quantity of rainwater runoff, Q

The design rainfall quantity to be used for the roof under steady state hydraulic calculations is:

$Q = r \times A \times C$

In which:

Q = the rate of flow in l/s

r = rainfall intensity in l/(s.m2)

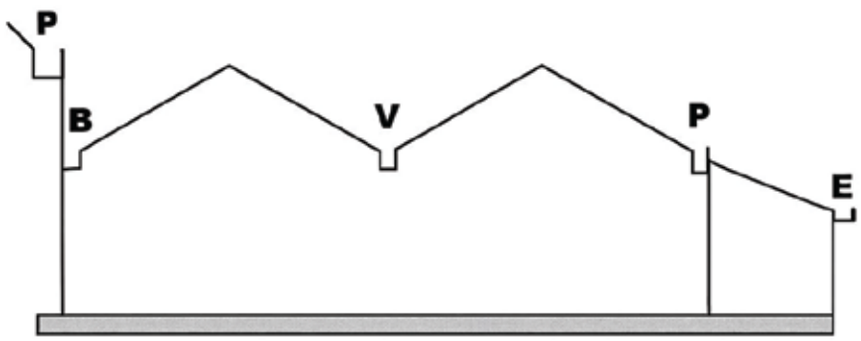
A = effective catchment area in m2

C = run-off coefficient (taken as 1.0 unless national and local regulations and practice state otherwise), dimensionless.

Our engineers use the following guidelines for the run-off coefficients "C" of various roof types:

Type of roof	Run off coefficient C
Sheet roof with slope > 3°	1
Sheet roof with slope < 3°	0.8
Gravel roof	0.5
Intensive green roof	0.3

Gutters



DIFFERENT TYPES OF GUTTERS ON BUILDINGS

The different types of gutters which can be found on a building a**re**

(E) – Eaves gutters are always fixed externally to a building and are able to overflow along its length away from the face of the building

(P) – Parapet gutters are located around the perimeter of a building either with a higher outer edge or located behind a parapet or fascia

(B) – Boundary-wall gutters are geometrically similar to parapet gutters but typically located across the width of a wall

(V) – Valley gutters are internal gutters located along the valley of multi-gabled buildings formed by two roofs or catchment areas.

Gutters Shapes and Capacity Design

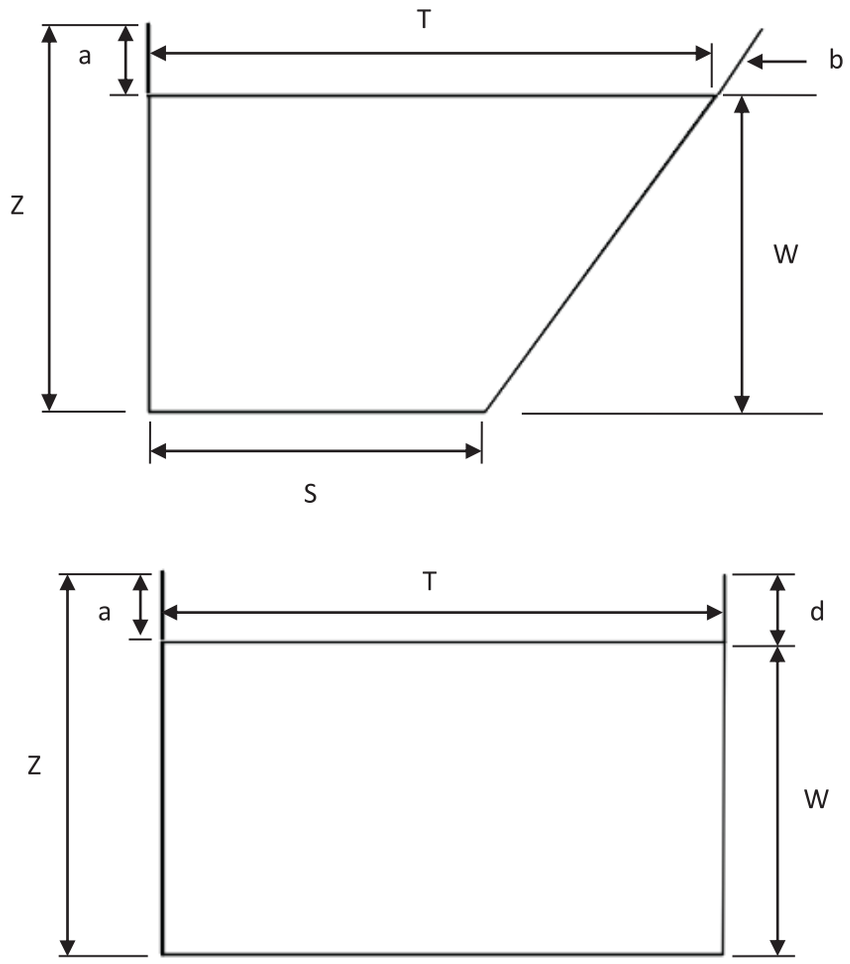


Figure 6

a Freeboard

b Extensions of the sides of valley gutters do not form part of the gutter

d Spillover level

S Width at sole

T Width at designed water line

W Depth below designed water line

A gutter is assumed to be hydraulically short if the drainage length, L, is not more than 50 times the maximum design depth of flow, W (in mm) in the gutter. If L > 50 W, the gutter is termed as hydraulically long.

A) Eaves gutters of semicircular or similar shape

Hydraulically short (L<50 W)

The nominal flow capacity, Q_N (in l/s) is determined from the following equation:

$$\mathbf{Q_N = 2.78 \times 10^{-5} A^{1.25}}$$

Where A (in mm2) is the cross sectional area of water in the gutter when it is filled to its overspill level.

Having determined the nominal flow capacity, Q_N (in l/s).
The design capacity Q (in l/s) is:

$$\mathbf{Q = 0.9\ Q_N\ l/s}$$

The coefficient 0.9 converts the nominal capacity to design capacity (flow capacity).

Hydraulically long (L > 50 W)

The design capacity, Q, is:

$$\mathbf{Q = 0.9\ F\ Q_N\ l/s}$$

Q_N (in l/s) is the nominal capacity

Factor F allows for the effects of gutter length if the gutter is hydraulically long

$$F = 1 - \frac{0.2}{150}\left(\frac{L}{W} - 50\right) \quad ; \quad 50 < \frac{L}{W} \leq 200$$

Or

$$F = 0.8 - \frac{0.2}{300}\left(\frac{L}{W} - 200\right) \quad ; \quad 200 < \frac{L}{W} \leq 500$$

B) Eaves gutters of rectangular, trapezoidal or similar shape

Hydraulically short (L<50 W)

The nominal flow capacity, Q_N(l/s) having a flat sole is:

$$Q_N = 3.48 \times 10^{-5} F_D F_S A^{1.25}$$

where

- A (in mm2) is the cross sectional area of water in the gutter when it is filled to its overspill level.
- The factor F_D = 1 for square gutter. For other shapes in this category:
  $F_D = \left(\frac{W}{T}\right)^{0.25}$
- The factor F_S depends on the shape of the gutter. F_S =1 for square gutters. For trapezoidal or similar shapes:
  $F_S = 0.8943 + 0.2013 \left(\frac{S}{T}\right) - 0.0965 \left(\frac{S}{T}\right)^2$

Having determined the nominal capacity, Q_N, the design capacity, Q (in l/s) is:

$$Q = 0.9\, Q_N \text{ l/s}$$

The factor 0.9 converts the nominal capacity into design capacity.

Hydraulically long (L > 50 W)

Having determined the nominal capacity Q_N (in l/s) from above, the design flow capacity, Q (in l/s), for hydraulically long gutters is:

$$Q = 0.9\, F\, Q_N \text{ l/s}$$

Q_N (in l/s) is the nominal capacity

Factor F allows for the effects of gutter length if the gutter is hydraulically long

$$F = 1 - \frac{0.2}{150}\left(\frac{L}{W} - 50\right) \quad ; \quad 50 < \frac{L}{W} \leq 200$$

Or

$$F = 0.8 - \frac{0.2}{300}\left(\frac{L}{W} - 200\right) \quad ; \quad 200 < \frac{L}{W} \leq 500$$

Design method for non eaves gutters

The design method is based on the same hydraulic principles earlier with eaves gutters, over topping of gutters area to be prevented during storms. Free board allowances, area to be provided above the maximum designed depth of water flow in the gutters are as follows (refer to figure 6):

Overall depth of gutter, Z mm	Minimum freeboard, a, mm
Less than 85	25
85mm - 250	0.3 Z
Greater than 250	75

The maximum design depth of the flow W (mm) is given by

$$W = Z - a$$

Chezy Siphonic Rainwater Drainage System - Components

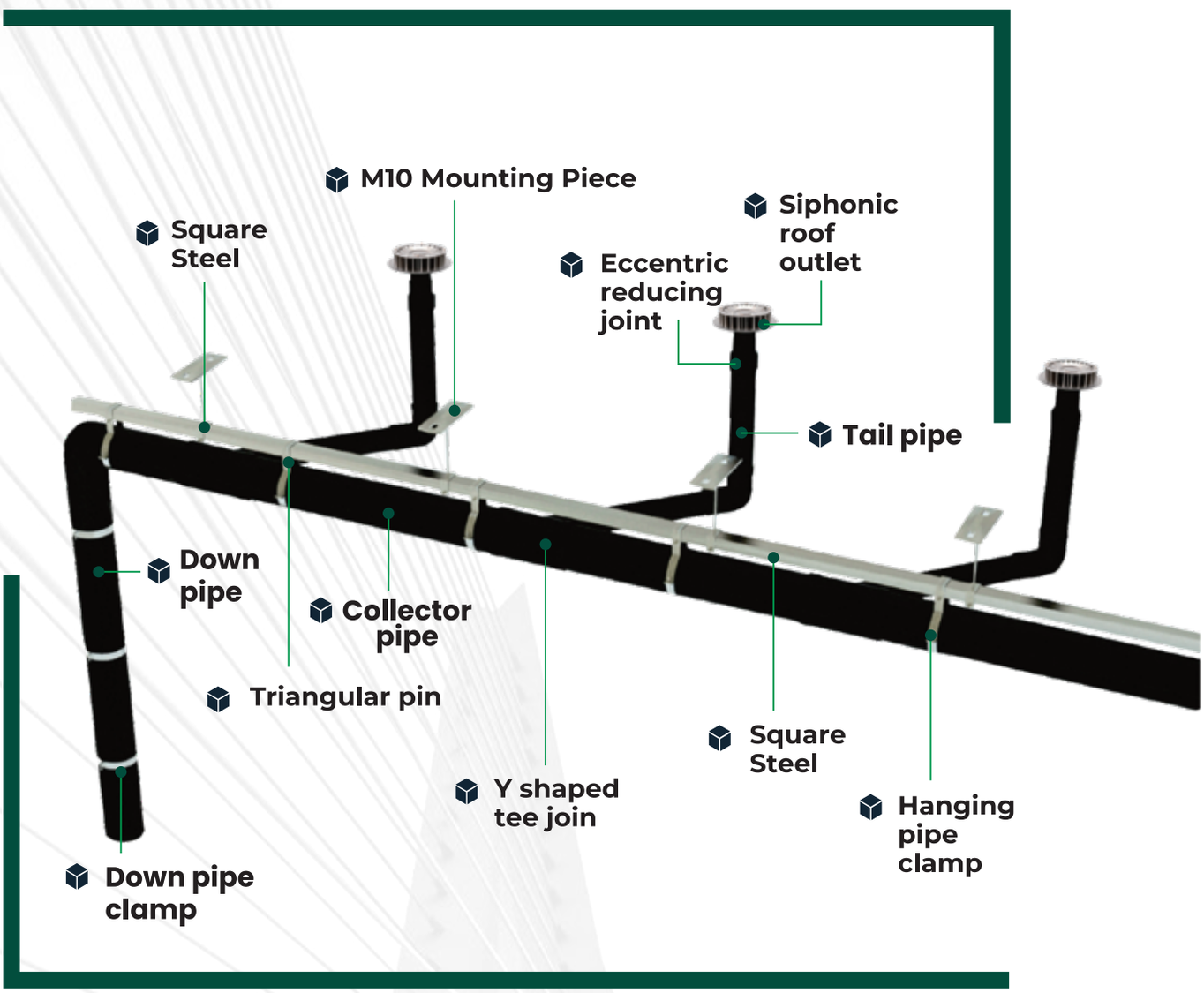
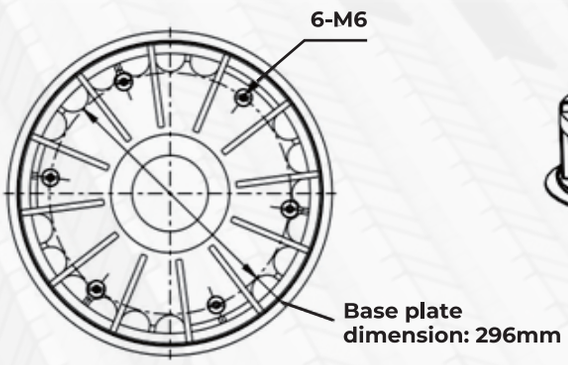


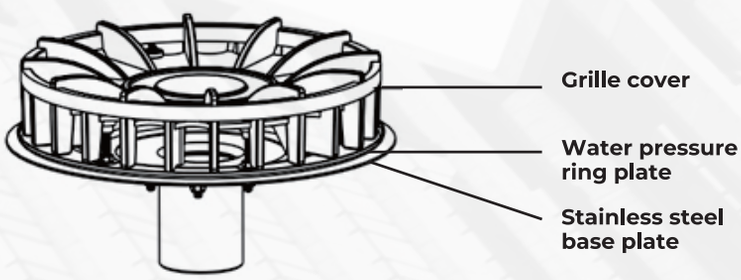
Figure 5: Chezy Siphonic Rainwater Drainage System Components

Chezy siphonic roof rainwater system generally consists of the siphon rainwater collector, pipes (tail pipe, collector pipe, down pipe, discharge pipe), pipe fittings, and a fixing system.

The fixing system consists of a suspension fixing system (m10 mounting piece, m10 screw rod, small riding clamp, hanging pipe clamp, triangular pin, square steel connector, square steel), and a stand pipe fixing system (m20 mounting piece, m20 screw rod, stand pipe clamp).

Collector





Chezy Siphonic collector is the starting point of Chezy's siphonic rainwater drainage system. With air-water separation and anti-vortex functions, it facilitates the formation of full-bore flow throughout the entire system. The collector is made of 304 stainless steel material, and the grille cover is made of cast aluminum.

Our siphonic roof collector is the central component of the entire system. Rainwater within the collection area is channeled through gutters and directed into the roof collectors. With the special features of the siphonic roof collector, such as anti-vortex devices, it prevents the formation of vortices and effectively blocks air from entering the system, thus optimizing the drainage efficiency of the system.

The Chezy Siphonic Rainwater Drainage Supports and Clamps are the backbone of the system. Due to the siphonic action in the Chezy Siphonic rainwater drainage system, the water in the pipes flows at high speed. When the high-water mass changes its flow direction rapidly, the system may experience sudden shocks at the joints, shaking the pipeline.

Therefore, it is recommended to use support equipment that is strong. Once the clamp is installed to the HDPE rainwater down pipe, the clamp installation point (at joints) becomes a fixed point, preventing pipelines from shock and shaking, ensuring a safe system.

Chezy Siphonic HDPE Pipeline Size (mm)	Recommended Support and clamp spacing - Horizontal (m)	Recommended Support and clamp spacing - Vertical (m)
63	1.3	1.3
75	1.5	1.5
90	1.7	1.7
110	1.7	1.7
125	1.9	1.9
160	2.00	2.4
200	2.00	3.00
250	2.00	3.00
315	2.00	3.00

Table 1: Chezy Supports and Clamps Spacing

Note: The spacing for Chezy Supports and Clamps at site may vary.
The actual spacing is precisely calculated by our software.

Design rules for Siphonic Drainage Systems

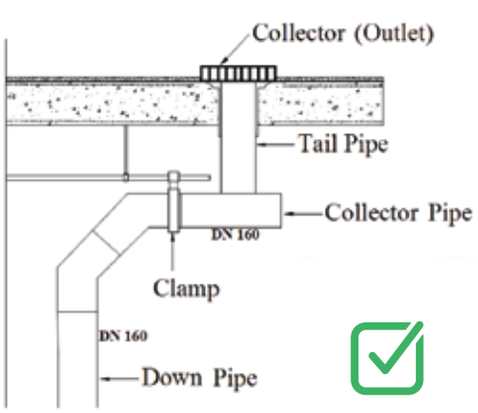
During rainfall, it is imperative that the roof outlets discharge the volume that they are designed for. In this situation we will have a well balanced system. To have a well balanced system, the efficiencies of the system should be in the range of 95% to 105% and the imbalance in pressure for all flow paths should not exceed ± 100 mbar.

Roof height differences of more than 1 meter should not be joined to the same collector pipe.

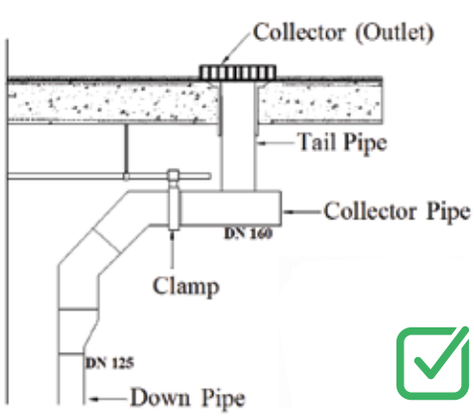
Siphonic Connections to the Downpipe

The collector pipe must always be equal or larger than the down pipe

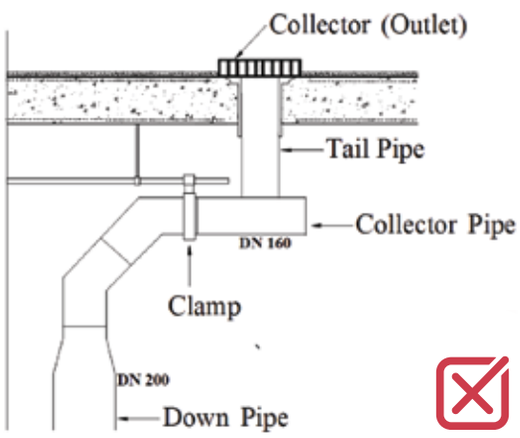
Downpipe of equal dimension



Downpipe of reduced size



Downpipe larger (never install like this)



Emergency overflow system for roofs

As a safety precaution for roof areas, emergency overflow should be located at a maximum distance of 30 meters apart. The capacity of the emergency overflow system shall be at least the design capacity of the siphonic rainwater system. The emergency outlets should be as close as possible to the outlets and at a height more than the maximum allowable depth of the water above the outlet.

Capacity, Q, of flow over emergency weirs.

$$Q = \frac{L - h^{1.5}}{24000}$$

Q = flow rate over weir, l/s

L = length of weir, mm

h = head over weir, mm

Maintenance

The frequency of inspection has to be established depending on the local situation. The siphonic roof drainage system must be inspected at least once a month. Roof and gutters must be cleared of deposits and leaves, as it is not allowed to flush the dirt through the roof outlets. All roof outlets must be inspected and checked for proper functioning by letting water run into the outlets.

The reception chamber or drain downstream of the discharge of the siphonic system must be inspected at least once a year and if necessary all deposits have to be removed.

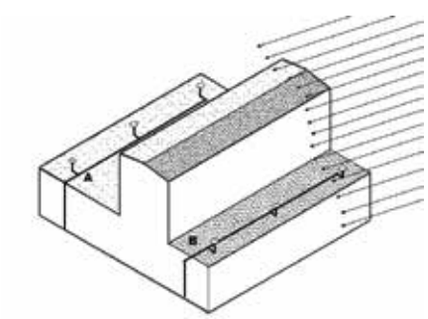
A good design will have a balanced flow path in the siphonic rainwater system from the outlet (entrance) to the exit for each and every flow path. Factors that may cause imbalance in the system are:

- deviations from design made
- clogging of outlets
- wind effects

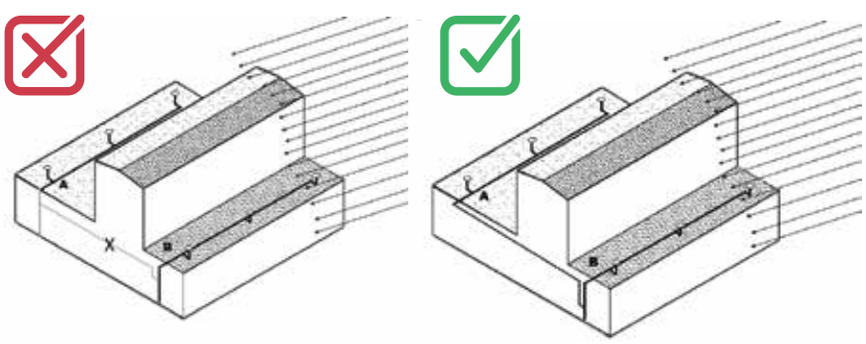
Outlets connected to the same collector pipe should be at the same level. If a different roof (up to a maximum of height difference of 1m), may be connected to the same collector pipe to provide communication.

If wind influences the amount of water falling on different roofs, the collector pipes from different roofs are not allowed to be connected together joined to a common dropper pipe as the negative pressure could be too high. Alternatively, it may result in areas that receive less rainwater may allow air to enter the system, breaking the siphonic action.

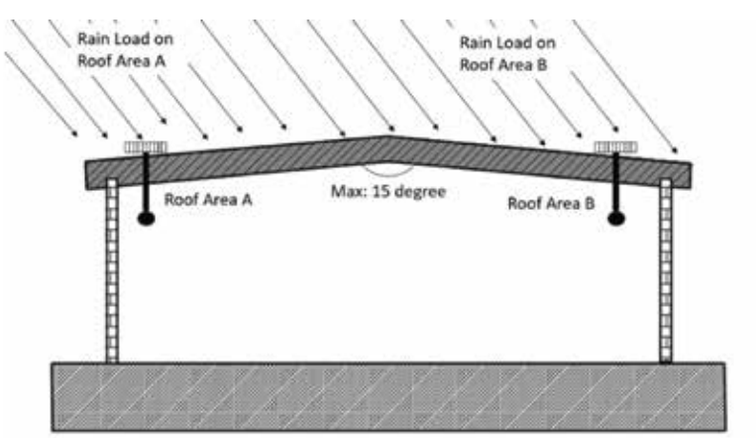
Wind effect may cause different loading on different roof areas



Preferred connections for different roof situations



To avoid excessive or in sufficient rain load on roofs with different slopes. It is advised that collector pipes for different roofs not be connected to each other if the slopes of different roofs are more than 15 degrees.

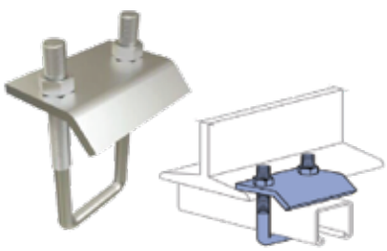


Chezy Siphonic
Material List

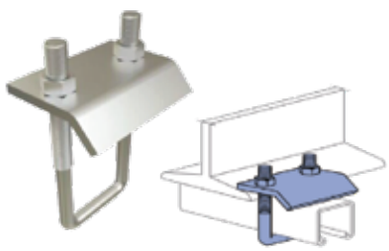
Pipe Support, Clamps and Accessories

Unistrut
41mm(H) x 41mm(W)
2mm(t) x 6m(L)

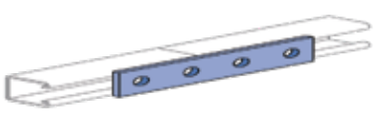
Unistrut beam Clamp



Unistrut beam Clamp



M10 x 38mm(W) x 190mm(L) x 6mm(T) x 4nos hole flate Plate



M10 Nut

M10 Nut

M10 washer

M10 threaded Rod

M10 x65mm (L) Bolt

Chezy Siphonic
Material List

Pipe Support, Clamps and Accessories

M10 x 38mm (OD) x 3mm(T) round flat washer

M8 nut

M8 washer

M8 x 40mm (L) Bolt

M10 Drop in Anchor

Sika Flex silicone 255

Type D Bracket with Long Nut

110mm/125mm/160mm/
200mm/250mm

Type D Bracket

160mm/200mm/315mm

Chezy Siphonic
Material List

Chezy HDPE Pipes, Fittings and Collector with Leaf Protector

HDPE Pipe fittings

HDPE Pipes

Collector with Leaf Protector

CHEZY SIPHONIC HDPE PIPES AND FITTINGS

HDPE Pipe

DN50	DN125
DN63	DN160
DN75	DN200
DN90	DN250
DN110	DN315

HDPE Elbow 45°

DN50	DN125
DN63	DN160
DN75	DN200
DN90	DN250
DN110	DN315

HDPE Reducer

D63 x 50	D110 x 90	D200 x 160
D75 x 50	D125 x 75	D250 x 200
D63	D125 x 90	D315 x 200
D90 x 50	D125 x 110	D315 x 250
D90 x 63	D160 x 110	
D90 x 75	D160 x 125	
D110 x 63	D200 x 110	
D110 x 75	D200 x 125	

Y Tee

D90 x 50	D125 x 75	D160 x 125	D200 x 160	D250 x 200
D90 x 75	D125 x 90	D160 x 160	D200 x 200	D250 x 250
D90 x 90	D125 x 110	D200 x 63	D250 x 75	D315 x 110
D110 x 50	D125 x 125	D200 x 75	D250 x 90	D315 x 250
D110 x 75	D160 x 75	D200 x 90	D250 x 110	D315 x 315
D110 x 90	D160 x 90	D200 x 110	D250 x 125	
D110 x 110	D160 x 110	D200 x 125	D250 x 160	

End Cap

D63	D160
D75	D200
D90	D250
D110	D315
D125	

PROJECT REFERENCES

Project Location: **Zhoushan**

Project Owner: **Zhejiang Huaye Plastic Machinery Co., Ltd.**

Roof structure: ***Steel structure***
Roof catchment area: ***99,870 m2***

Project Name: **Lanzhou International Trade Center**

Project Location: **Lanzhou City, Gansu Province**

Project Owner: **Lanzhou Oriental Friendship Trading Center Co., Ltd.**

Building area: ***604,215.63 m2***
Roof structure: ***Concrete***
Podium roof catchment area: ***48,130 m2***

Project Name: **Yuyao Zhong'an Times Square**

Project Location: **Yuyao, Ningbo**

Project Owner: **Yuyao Zhong'an Times Square Development Co., Ltd.**

Building area: ***400,000 m2***
Roof structure: ***Concrete***
Podium roof catchment area: ***24,500 m2***

PROJECT REFERENCES

Project Name: **The precision line construction project of Haiyan Zhongtuo New Material Technology Co., Ltd. with an annual output of 600,000 tons of high-quality steel**

Project Location: **Haiyan Ganpu Project**

Project Owner: **China United Engineering Co., Ltd.**

Roof structure: ***Steel structure***
Roof catchment area: ***43,139 m2***

Project Name: **Shengzhou Liangwen Packaging**

Project Location: **Shengzhou, Shaoxing**

Designer: **Ningbo Mingzhou Architectural Design Institute Co., Ltd.**

Roof structure: ***Steel structure***
Roof catchment area: ***27,217 m2***

City	Project	Catchment area m
Liaoning Shenyang	Shenyang world financial center	90000
Zhejiang Shengzhou	Wuyue Square	20500
Zhejiang Ningbo	Yuyao Zhongan Times Square	24500
Hunan Changsha	Hengfei Cable Corporation	210000
Tianjin	Tianjin Lingang industrial park	40900
Zhejiang Yiwu	Yiwu Automobile Trading Center	37187
Sichuan	Southwest Light Industry Expo City	12000
Jiangsu Taizhou	China Medical City	60000
Anhui Bozhou	Jingkai City	60000
Zhejiang Ningbo	Fenghua Incity Plaza	15000
Zhejiang Jinhua	Urban planning exhibition hall	20000
Zhejiang Yiwu	Maternal and child health hospital	15000
Henan Luoyang	Luoyang Damage Gree Rea Estate Co., Ltd	11000
Zhejiang Huzhou	Zhejiang Aoyou Power System Co., Ltd	50000
Fujian Putian	Xianyou international painting city	30000
Liaoning Dalian	Yifeng Motor Town	30000
Zhejiang Zhoushan	Wugongzhi passenger transport center	12000

and many more. Available upon request