

# RAINPLUS

Siphonic rainwater  
drainage system

MADE IN ITALY



**valsir**<sup>®</sup>  
QUALITY FOR PLUMBING



## Rainplus<sup>®</sup>, the only solution in case of rain

**Rainplus<sup>®</sup>** is the Valsir siphonic system used for the drainage of rainwater from medium and large sized roofs.

Through its special operation, this system is **capable of discharging large flows of water at high flow speed**, keeping the size of pipes reduced thanks to the possibility of using their full cross section.

For this reason, **Rainplus<sup>®</sup> is the most suitable system to respond to the increasing levels of rainfall** experienced in recent years.

The heart of the system is made up of special outlets designed and tested in accordance with **ASME A112.6.9 and EN 1253-2 standards**; these outlets prevent air from entering inside them and, consequently, inside the Valsir HDPE high density polyethylene pipes to which they are connected. In this way, positive and negative pressures are generated in the system and allow it to move water **without the need for slopes**, therefore with **perfectly horizontal pipes that reduce possible interference** with other technological systems or structural parts of the building.

This allows getting as close as possible to water delivery points, making it possible to easily implement the most current strategies of **recovery and reuse of rainwater** according to a design approach aimed at **environmental sustainability**.



The advantages offered by this technology are numerous; among them a **significant cost containment** thanks to the reduction of the material used and of the **installation time**, as well as an **increase in the efficiency** of the entire drainage system.

**MADE IN ITALY**



# CHARACTERISTICS OF EXCELLENCE

## The advantages of Rainplus®

- **Low costs.** Thanks to Rainplus®, fewer outlets need to be installed and there is a reduction in the number and size of pipes and fittings. All this results in savings in the purchase of the material required and in shorter installation times, with a significant reduction in the total cost of the system.
- **Saving space with greater design flexibility.** Rainplus® works with very small pipe diameters and with horizontal sections with no slope. The number of vertical stacks decreases significantly and their position is not constrained, but can be freely chosen. Thanks to its characteristics, Rainplus® limits any interference with possible structural and architectural constraints, offering greater design flexibility.
- **High performance.** With the same pipe diameter, Rainplus® allows for drainage flow rates up to six times greater than a conventional system, making 100% use of the cross section of the pipe.
- **Safety.** Each outlet is equipped with a leaf guard that prevents dirt from entering the drainage system. If dirt or very small debris is able to pass through the filter of the guard, it is carried outside the system thanks to the very high flow speeds that are achieved within the pipes. That is why system is referred to as “self-cleaning”.
- **Eco-sustainability.** Rainplus® facilitates the collection of rainwater for reuse in irrigation systems, fire-fighting tanks or cisterns intended for non-potable water use. The Valsir Rainplus® system and HDPE are manufactured from fully recyclable materials that can be recycled at the end of their service life. Valsir embraces Green Building principles, with a view to respecting the environment and preserving resources. Pipes and fittings are certified by the prestigious Green Building Council of Singapore.

## A quality system

The Rainplus® siphonic system is made up of roof outlets, pipe clamps and other clamping accessories, Valsir HDPE pipes and fittings, a software for 3D design and extremely professional computations.

Valsir HDPE pipes and fittings are manufactured according to EN 1519 and have been approved to many standards worldwide (CSTB, IIP, KIWA, SKZ, ETA, Lloyd's Register, etc.).

The light weight and wide range of pieces available make Valsir HDPE the ideal solution for the construction of siphonic drainage circuits. Valsir HDPE also offers great installation flexibility thanks to the various jointing methods, such as butt-welding and electrofusion.



# IN COMPARISON WITH CONVENTIONAL SYSTEMS

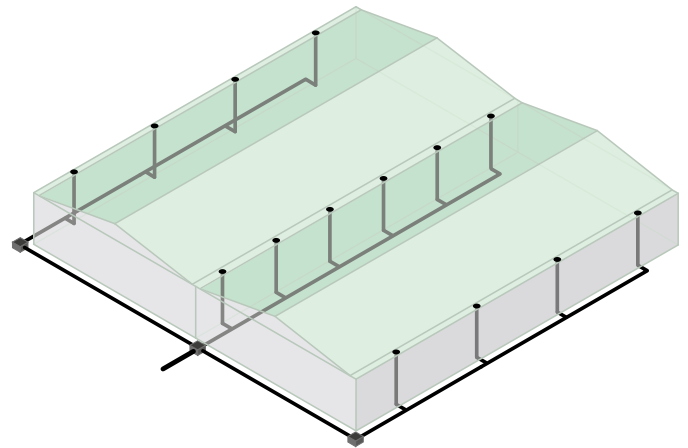
There are two types of rainwater drainage systems: conventional systems that are incorrectly called gravity systems, and the Rainplus® siphonic system, which is also known as vacuum system or full section system.

Both use the force of gravity but in a decidedly different manner, resulting in differences in performance, design and calculation.

A **conventional drainage system** can be designed for large surfaces but does not cut off air flow into the pipe. For this reason pipes are sized for filling ratios of 20% or 33% (depending on national or local standards and regulations) allowing considerable amounts of air into the pipes up to 80% or 67% of the pipe section.

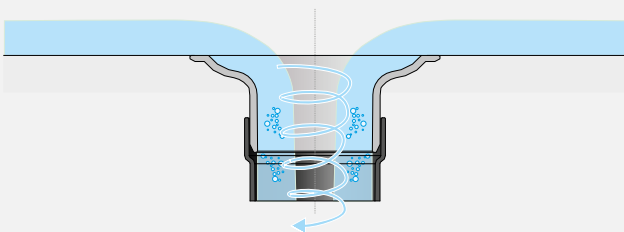
In conventional roof drainage, outlets are simple “funnels” installed on the roof covering and connected to the downpipes which are as high as the building and water collectors, which require a gradient of at least 1%, are dimensioned for a maximum filling factor of 70%.

When water collectors are very long and it is not possible to provide the minimum slope necessary due to the limited space available, the only solution is to increase the size of the pipes with a consequent rise in installation costs.



## Flow in a conventional outlet

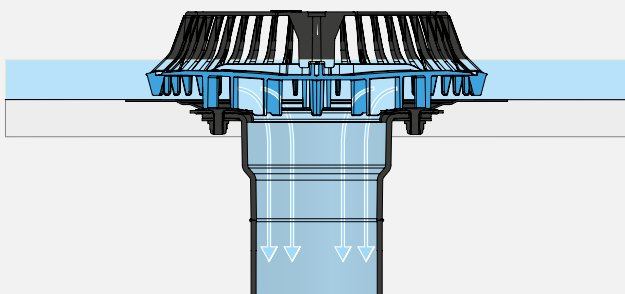
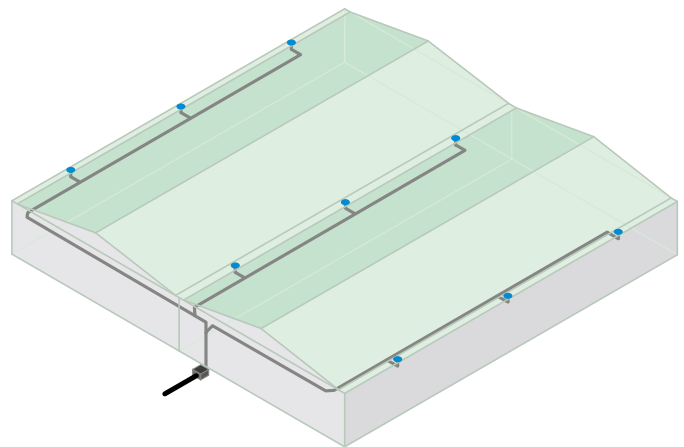
In conventional roof drainage systems, the outlet does not incorporate any sort of insert or device, hence the flow entering the system is characterized by a vortex pulling air into the pipes.



The **Rainplus® siphonic drainage system** is made up of special outlets incorporating an anti-vortex plate that prevents air from entering the pipes. The outlets are connected through short pipes of relatively small diameters to the horizontal water collector which is located just under the building roof.

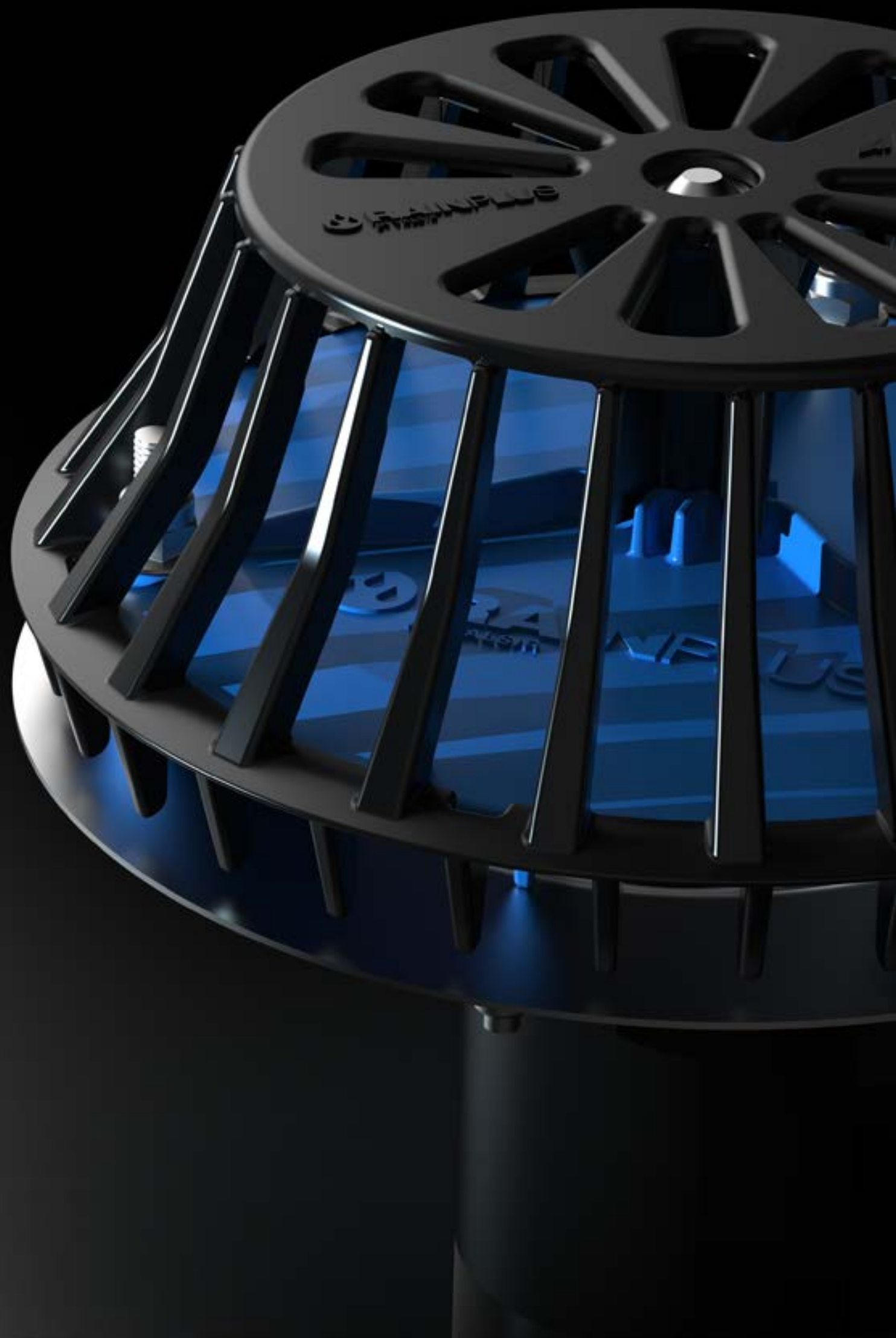
The collector pipe, generally installed at the highest possible position, runs horizontally (no fall angle is required) until it is connected to the downpipe. The downpipe drops into the drainage line which is buried in the ground and conveys the water straight into a collection tank or into the municipal stormwater mains.

The absence of air in the system allows it to work 100% full of water, making use of the entire pipe section and vastly increasing flows, that are 10 times faster when compared to conventional drainage systems.



### Flow in a Rainplus® outlet

With the Rainplus® siphonic drainage system, at design flow values, the roof outlets prevent air from entering and forming vortex, thus ensuring the system works at full capacity; in such conditions design can be based on the equations of fully developed flow rates operating at positive or negative pressures (Bernoulli's energy conservation principle).





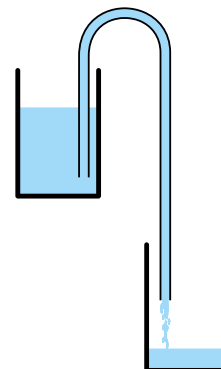
# RAINPLUS<sup>®</sup>, HOW DOES IT WORK?

Rainplus<sup>®</sup> is defined as a siphonic rainwater drainage system because it is based on the same principle as a siphon. The siphon is in general a reversed U shaped pipe used to pour a fluid from one container to another located in a lower position.

When the pipe is full, the fluid contained in the longer stretch of pipe tends to fall due to its weight causing the suction of the liquid in the shorter section, which is lighter in weight.

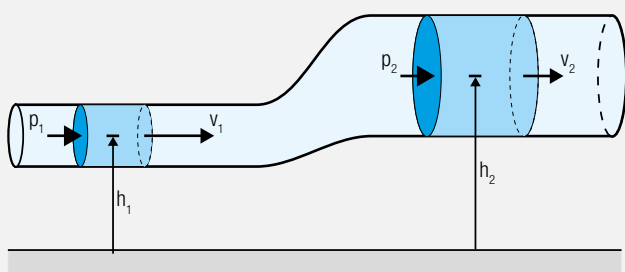
This process only starts when the pipe is completely full and continues until a balance between the two containers is reached: either when the two containers reach the same level or when the fluid level in the higher container goes below the pipe inlet section.

The driving force that causes this effect is a result of the difference in height of the two containers: the bigger the difference, the stronger the driving force and, as a consequence, the greater the flow speed in the pipe.



The performances of the Rainplus<sup>®</sup> siphonic drainage system are therefore decidedly better than those of a conventional system where the driving force is generated exclusively by the amount of water that accumulates on the roof. When the siphonic drainage system works at full capacity, the “siphon effect” is triggered resulting in a driving force that is proportionate to the height of the roof and the end of the circuit, which is typically located at ground level.

Such power generates levels of positive and negative pressures in specific points of the circuit in this way the speed and, as a consequence, the flow rates of the system (Bernoulli's principle) are rapidly increased.



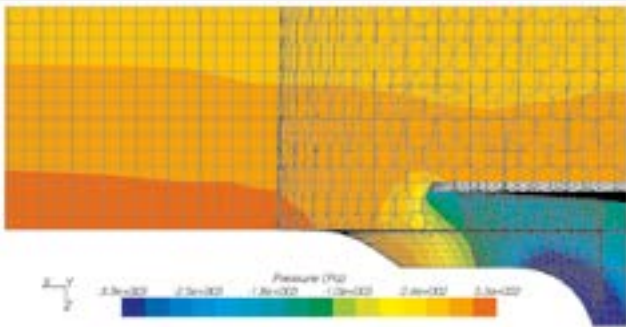
## Bernoulli's principle

In fluid dynamics, Bernoulli's principle states that for an inviscid flow, an increase in the speed of the fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid potential energy. Bernoulli's principle is named after the Dutch-Swiss mathematician Daniel Bernoulli who published his principle in his book *Hydrodynamica* in 1738.

$$\frac{1}{2} \cdot \rho \cdot v_1^2 + \rho \cdot g \cdot h_1 + p_1 = \frac{1}{2} \cdot \rho \cdot v_2^2 + \rho \cdot g \cdot h_2 + p_2 + \Delta p_{loss}$$

# FLOW STAGES

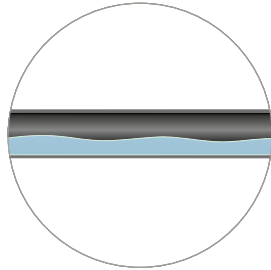
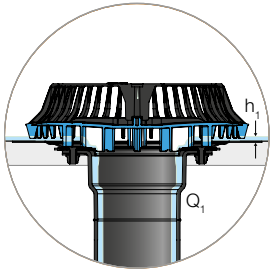
EN 1253-2 and ASME A112.6.9 technical standards are used to evaluate the performances of a siphonic system and, as they define the measurement method of the flow rates as a function of the water depth on the roof, they allow the flow regime phases to be analyzed.



## Rainplus®, integrated engineering

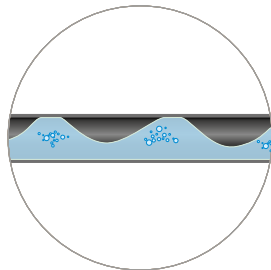
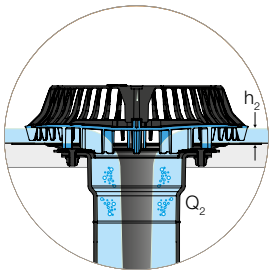
A high degree of understanding of the Rainplus® operating rules and system flow regime is required to design and construct correctly performing siphonic systems.

Unlike conventional gravity systems, a high degree of engineering and expertise is necessary, both in the design and construction phase.



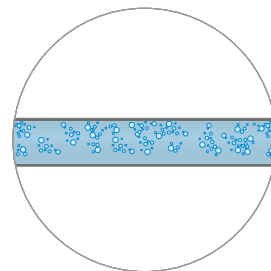
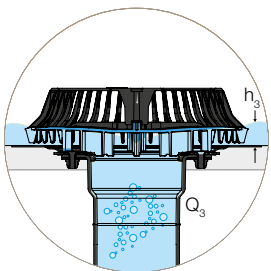
**Phase 1.** For reduced flow rates up to 10÷15% of the design rainfall intensity value, the water head  $h_1$  is very limited; in this case the operating phase is defined as “**gravity flow**”.

It is so called because the system works like a traditional system, with pipes filled mainly with air and a low flow speed.

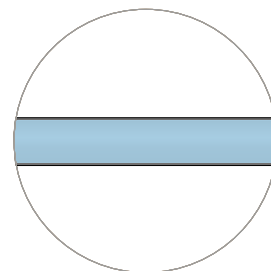
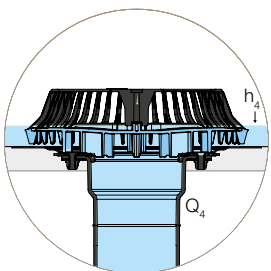


**Phase 2.** If the rainfall intensity is between 15% and 60% of the design value, the water head  $h_2$  increases, thereby preventing air from entering the pipes. This generates the siphonic effect that fills the pipe section almost completely with water, resulting in an increase flow speed and of flow rate of discharged water. This quickly reduces the water head  $h_2$  and the system returns to operating as in phase 1. The system is therefore characterised by an intermittent flow, as gravity-type operation is alternated with short periods of siphonic flow.

This is called “**plug flow**”.



**Phase 3.** As the rainfall intensity increases, up to about 95% of the design value, there is a phase called “**bubble flow**”. All the typical characteristics of a siphonic operation can already be found in this phase. The water head  $h_3$  has almost reached the maximum value defined during the design phase, the flow speed and flow rate are very high and the pipe section is full, except for some air bubbles.



**Phase 4.** With flow rates above 95% of the design rainfall intensity value, the siphonic effect develops fully, reaching the maximum flow rate with no air; this phase is referred to as “**full flow**”.

The water head  $h_4$  is the one established during the design phase and the flow speed is very high, with values even higher than 6 m/s.

# THE COMPONENTS: OUTLETS

## High performances and safety

One of the key elements of the system is the Rainplus® outlet that has been designed and manufactured to meet the requirements and testing criteria set by the international standards EN 1253-2, and ASME A112.6.9.

Not to mention the fact that the main components of Rainplus® collectors are made of stainless steel or glass-fibre and anti-UV additives reinforced polypropylene, making them resistant to the weather and unchanged over time.

These are the main features.

- Wide range of drainage flows (**up to 65 l/s with Rainplus® 110-S and up to 16 l/s with Rainplus® 56-S**).
- **Reduced roof water levels** required to trigger the siphonic action.
- No swirls thanks to the special profile of the antivortex disk and **reduced pressure losses at the inlet**.
- Low noise levels and **maximum operation stability**.
- **Easy installation** thanks to the reduced number of components and compact size. For example, Rainplus® 56-S, in the version with horizontal connection, can be installed inside the roof slab thanks to a height of just 104 mm.
- Connection with the Valsir HDPE system is **extremely reliable**.
- Suitable for installation **in gutters**, even of small dimensions, or on roofs covered with **any type of waterproofing material**.

## Vapour barrier kit

- With this kit, Rainplus® 110-S can be used on insulated and vapour barrier roofs.
- It can be used with thermal insulation thickness values up to 250 mm.
- It ensures a drainage flow rate up to 65 l/s.
- AISI 304 stainless steel metal plate.



## Green roof kit

- With this kit, Rainplus® 56-S and Rainplus® 110-S system can be used on green roofs.
- The system prevents the entrance of debris or soil in the vicinity of the roof outlet.
- Filter pipe Ø 315 mm allowing a large collection area.
- It provides excellent drainage flow rates; 30 l/s when working together with Rainplus 110-S and 12 l/s with Rainplus 56-S.
- Height adjustable, from 100 mm to 300 mm.



## Rainplus® Overflow Kit

Local regulations or standards on the design of rainwater systems may require emergency systems (also known as overflow systems) able to drain unexpectedly intense rainfall exceeding the design rainfall level.

Valsir supplies a patented product that allows a Rainplus® siphonic outlet to be transformed into an emergency siphonic outlet by simply adding an Overflow Kit that is adjustable in height and capable of maintaining the same drainage performance.



# THE COMPONENTS: BRACKETING SYSTEMS

## Bracketing systems

Valsir offers a wide range of **bracketing systems** and accessories to install the entire drainage network. The Rainplus® bracketing system, composed of special clips as well as support rails and relative accessories, **is designed to resist the forces of heat contraction and expansion in the drainage network** and is available in diameter 40 mm up to diameter 315 mm.

The Rainplus® system also includes clips with M10 expansion anchors, clips for M10 threaded rods for mounting on support rails, clips for 1/2" and 1" threaded rods for wall and ceiling mounting.

The bracketing system range allows:

- Easy **pre-fabrication**.
- **Rapid and simple ceiling mounting** of long stretches of collector pipes.
- Mounting of the entire drainage network using a **reduced number of bracketing pieces**.
- Alignment of clips and Valsir HDPE pipes with the support rail.
- **Capacity of absorbing heat expansion and contraction** of the drainage network.
- Installation without special tools;
- The clips are anchored to the pipes and support rail using **high resistance bolts**.





Ø32 Ø40 Ø50 Ø56 Ø63 Ø75 Ø90 Ø110 Ø125 Ø160 Ø200 Ø250 Ø315



# THE COMPONENTS: PIPES AND FITTINGS

The advantages of using the Valsir HDPE system

- Wide range of **diameters from Ø 32 mm to Ø 315 mm**, available in **SDR 26 and SDR 33**.
- The pipes are **stabilized** to reduce dimensional variations and contain carbon black for **UV light resistance**.
- Possibility of **prefabrication** to reduce assembly time on site and possibility of creating **special pieces** for particular applications and solutions.
- **High chemical resistance** to substances dissolved in civil and industrial waste waters.
- Resistance to intermittent discharges at **temperatures as high as 95°C**.
- High resistance to extremely rigid temperatures **as low as -40°C**.
- **Excellent abrasion resistance** and mechanical strength.
- **Highly versatile and easy to install** thanks to its light weight and numerous connection methods that allow wastage to be reduced to a minimum.
- Wide range of transition fittings for connection to other waste systems such as cast iron, PE, PP, PVC.
- The completely recyclable product and the production processes used are all based on the Green Building principles, respecting the environment and conserving resources.

## High density polyethylene

The pipes and fittings are made of high density UV light resistant polyethylene that guarantees high mechanical resistance, excellent abrasion resistance, extremely smooth surfaces and high resistance to chemical agents.





# THE WELDING PROCESS



Watch the video



## Manual butt-welding

Thanks to the extremely light weight of polyethylene, pipes and/or fittings up to a 63 mm diameter can be butt-welded using a manual process which involves the use of a heating plate only. It's an extremely convenient jointing method on site.



## Machine butt-welding

Valsir supplies butt-welding machines that weld up to 315 mm diameters. This process is extremely useful for the prefabrication of system parts that are then installed and connected on site using other jointing methods, such as welding through electrofusion sleeves.



## Electrofusion couplings

By means of the electrofusion couplers that are available in 40 mm diameters to 315 mm diameters, all system parts can be prepared. Valsir supplies two types of welding machines that guarantee rapid, easy and extremely reliable welding.



Stadio El Sadar - Pamplona (Spain)

# REFERENCES



Da Vinci Tower - Tel Aviv (Israel)



Icon - Vaxjo (Sweden)



Amazon logistics hub - Madrid (Spain)



# CUSTOMER SERVICE

## Technical support

Valsir provides complete support during design and on site, thanks to a high-level technical department that consists of a team of engineers with international experience that are capable of providing solutions to all installation needs.



## Valsir Academy

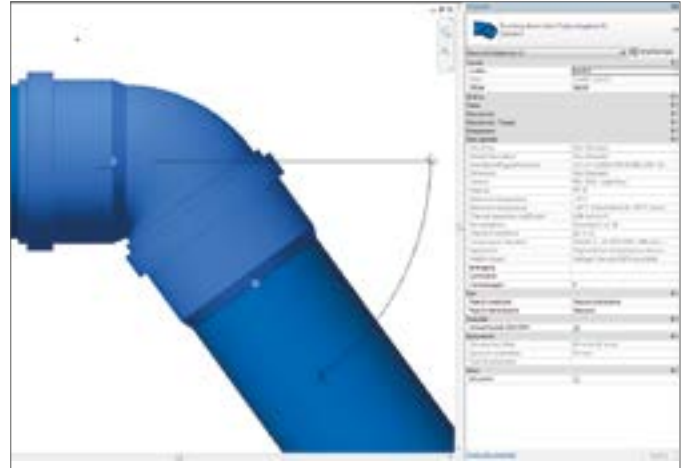
Valsir has an important training facility - **Valsir Academy** - dedicated to clients, distributors, plumbers and planners that provides perfectly equipped courses, both theoretical and practical on the use and the design of plumbing and heating systems. Courses are provided both inside the training facility and on customers' premises.

# VALSIR IS BIM-READY

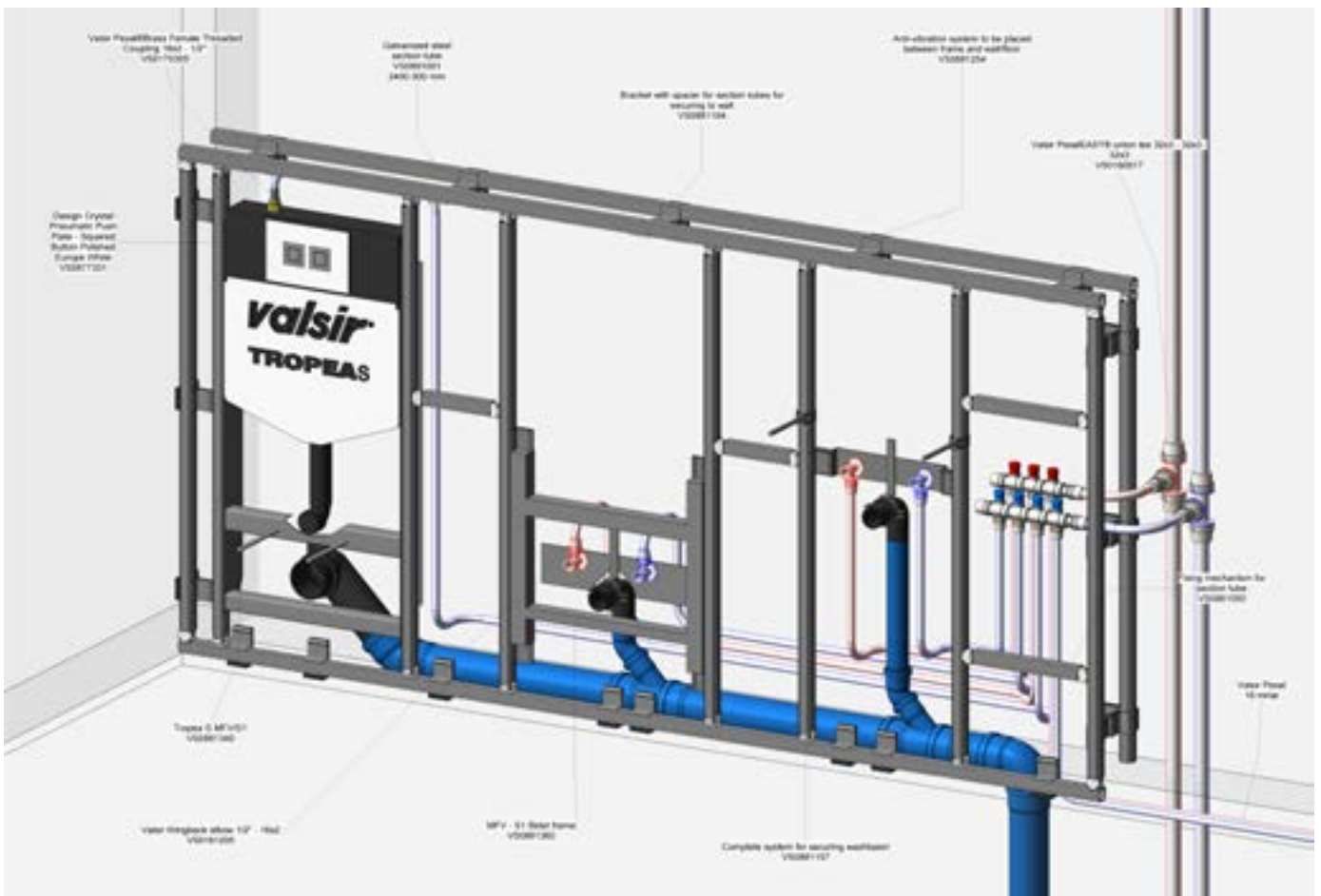
Valsir has adopted the BIM philosophy, the modelling process that allows to improve planning, design, construction and management of buildings, aligning with the industry transition to digital building modelling.

A “BIM-oriented” design offers outstanding competitive advantages: more efficiency and productivity, less errors, less downtime, less costs, greater interoperability, maximum information sharing, more timely and consistent project control.

Valsir captures the essence of this system with a set of Revit models and applications designed for quick and easy use.



[www.valsir.it/u/revit](http://www.valsir.it/u/revit)





# QUALITY AND ENVIRONMENT

## Quality

The constant commitment of Valsir in the production of quality products is attested by over **300 product approvals** obtained throughout the world by the most stringent certification bodies (data updated to 01/09/2023), by a Management System of the Quality (QMS) certified in compliance with the **UNI EN ISO 9001:2015** standard and the Energy Management System (SGE) certified according to the international standard **UNI EN ISO 50001:2018**. Valsir S.p.A. has further demonstrated its commitment to the environment by obtaining certification **ISO 14001:2015** on the Vestone production site.

Since 2019 an innovative and modern plant has also been built that, integrated with the already installed photovoltaic park, will be able to produce over 30% of the electricity needed for all Valsir plants. This is a Trigenerator powered by methane gas capable of producing electricity, steam and cooling energy.



## Sustainability

Efficient processes and reliable products are no longer the only parameters used to perform an assessment of the quality of a company's conduct: the capacity of the company and its management to design and implement production process that are sustainable from an environmental point of view is of equal importance.

Valsir has started a project of Corporate Social Responsibility and has published its Sustainability Report that gathers facts and figures relating to the daily commitment of Valsir in terms of social, economic and environmental responsibility.



Download  
[www.valsir.it/u/sostenibilita-en](http://www.valsir.it/u/sostenibilita-en)

Lined writing area with horizontal lines and a vertical column of blue icons on the right side. The icons include symbols for a horizontal line, a vertical line, a flame, a water drop, a swirl, a hand, a gear, a triangle, a vertical line, and a curved line.

Lined writing area with 20 horizontal lines and a vertical column of 10 blue icons on the right side. The icons, from top to bottom, are: a circle with a horizontal line, a circle with a vertical line, a circle with a flame, a circle with a water drop, a circle with a swirl, a circle with a stylized 'S', a circle with a stylized 'U', a circle with a water drop, a circle with a swirl, and a circle with a stylized 'A'.



WASTE SYSTEMS



SUPPLY SYSTEMS



GAS SYSTEMS



FLUSHING SYSTEMS



BATHROOM SYSTEMS



TRAPS



RADIANT SYSTEMS



DRAINAGE SYSTEMS



HRV SYSTEM



ACADEMY



SEWER SYSTEMS



WATER TREATMENT



**valsir**<sup>®</sup>  
QUALITY FOR PLUMBING

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