

# RAINPLUS



**Siphonic rainwater  
drainage system**



MADE IN ITALY

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



BBVA - Madrid (Spain)

## Rainplus®, the ultimate solution in case of rain

**Rainplus®** is a siphonic rainwater drainage system designed to reach maximum drainage performance with the lowest levels of water accumulation on the roof.

Valsir Rainplus® **fully meets the demands of increasing rainfall levels being registered and guarantees the drainage of rainwater** from medium to large size buildings in total safety.

The system uses the **building height as the driving force** to generate high speed flow rates thus maximizing drainage efficiency.

Rainplus® allows the entire quantity of rainwater to be directed to any part of the building whatsoever thus enabling the implementation of the most modern rainwater harvesting systems. The harvesting and conservation of water are parameters that are taken into consideration and contribute to obtainment of **Green Building** marks.

The advantages of this technology are numerous; such as the significant reduction in costs and installation times, as well as an increase in the performance of the entire drainage system.

The Rainplus® siphonic system is made up of special roof outlets that are designed and tested according to **American Standard ASME A112.6.9 and European Standard EN 1253**.

These outlets are connected to Valsir HDPE pipes and fittings, which are sized in order to work under negative pressures, at high flow rates and with a full bore. This is possible thanks to the special configuration of the **Rainplus®** roof outlets, which **prevent air from entering the pipes** when the design rainfall intensity value is reached. In this way, **the “hydraulic engine” of the system is given by the height of the roof** in relation to the drainage point and not by the amount of water that has accumulated on the roof.



Watch the Rainplus video  
[valsir.it/u/rainplus](https://valsir.it/u/rainplus)

The hydraulic principles of Rainplus® are therefore different from those of conventional drainage systems thus requiring a decidedly more advanced technical preparation in design and calculation as well as in system installation, in that the accurate and proper design and installation of the hydraulic circuits has a direct influence on the performance of the entire siphonic system.



**MADE IN ITALY**



# CHARACTERISTICS OF EXCELLENCE

## The advantages of Rainplus®

- **Economical.** When compared to conventional systems, Rainplus® requires a lesser number of roof outlets and allows a substantial reduction in pipe diameters, in the number of fittings required and the number of downpipes: this results in savings of up to 80% on vertical pipes and from 20% to 30% across the entire system.
- **Space saving.** The roof outlets are connected to single horizontal collector pipes that are fitted without fall and the downpipes are positioned anywhere along the building perimeter thus avoiding interference.
- **High performance.** When in operation drainage pipes flow at 100% full over the entire system, draining velocity is therefore greater resulting in the self cleaning action of the pipework.
- **Eco sustainability.** The ease in directing the pipes to storage tanks makes the collection of rainwater easier for reuse in irrigation systems, fire ponds and tanks for non-potable uses in general.
- **Time and labour saving.** Construction programmes are accelerated due to reduced installation times and less groundwork is required due to the reduced number of embedded pipes.
- **Increased design flexibility.** Complete control over downpipe location and absence of embedded pipes gives increased design flexibility of the siphonic system.
- The Valsir Rainplus® system and HDPE are produced with completely recyclable materials which, at the end of their useful life can be recovered. The production processes employed are energy efficient and of reduced impact. Valsir has adopted the Green Building principles in terms of respect for the environment and conservation of resources, **pipes and fittings are in fact certified by the prestigious Singapore Green Building.**



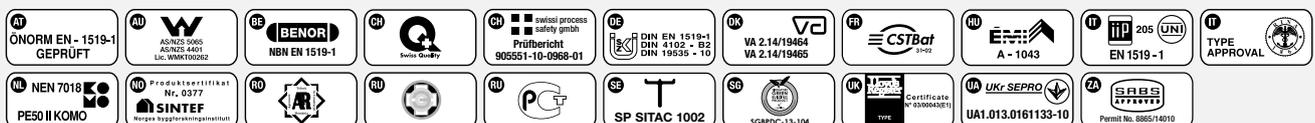
SGBPDC-13-104

## A quality made 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 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

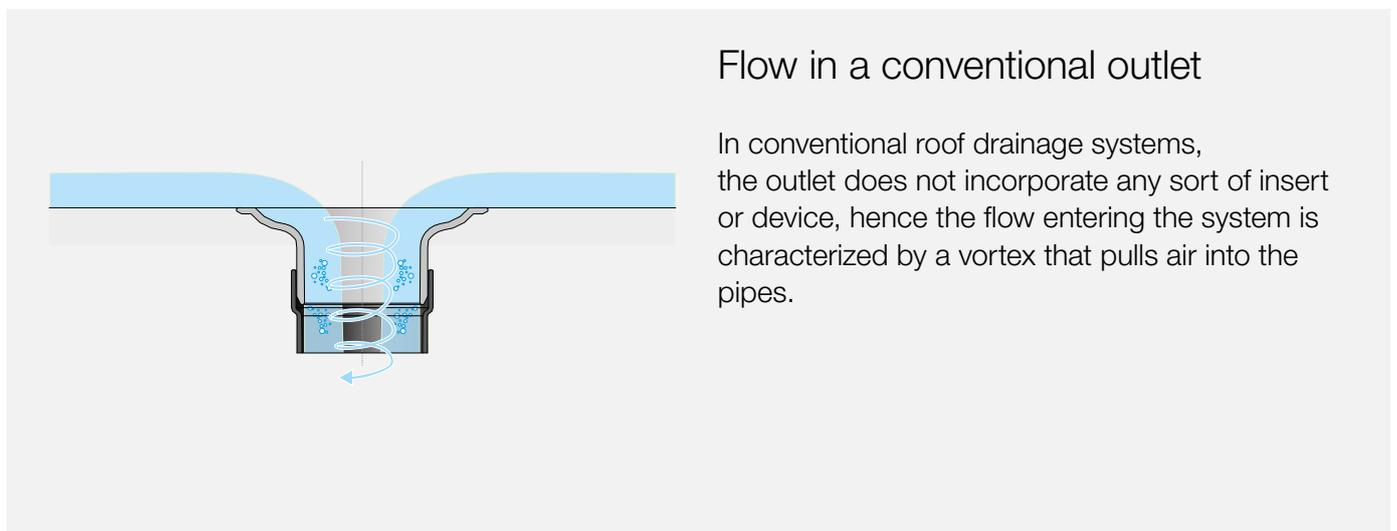
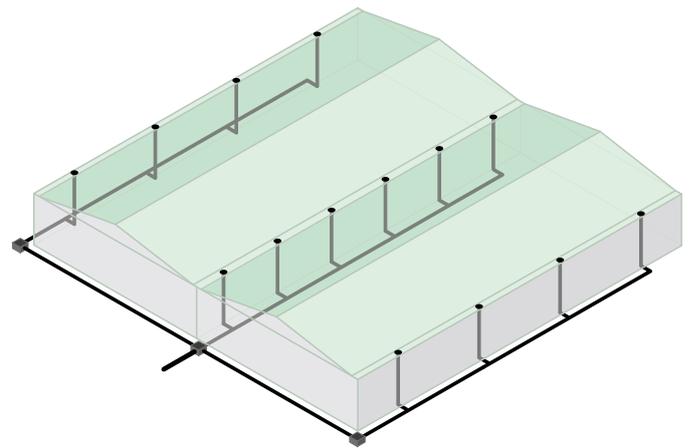
There are two types of rainwater drainage systems: conventional systems that are incorrectly called gravity systems, and the Rainplus® siphonic system, which is also known as a vacuum system or full section system.

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 surface areas 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 of 80% or 67% of the pipe section.

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

When the 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.



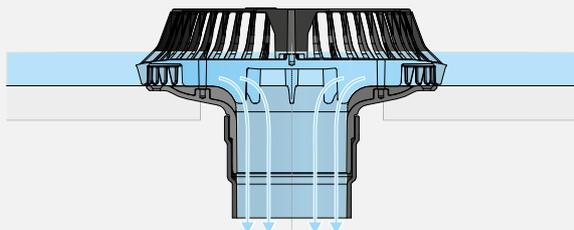
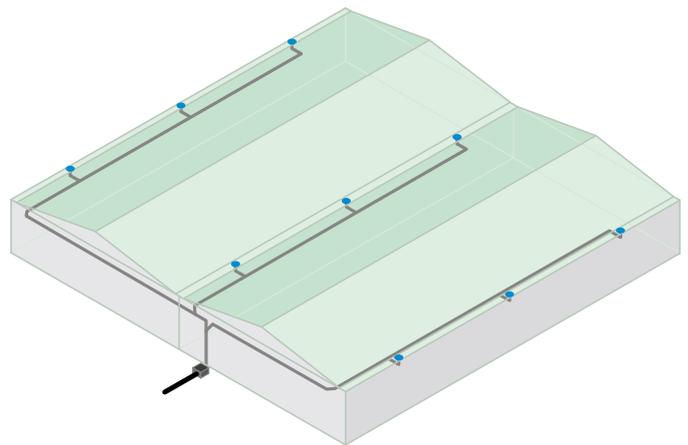
## Flow in a conventional outlet

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 that pulls air into the pipes.

The **Rainplus® siphonic drainage system** is made up of special outlets that incorporate an anti-vortex plate that prevents air entering into the pipes. The outlets are connected via 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 reaches connection with 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 the municipal stormwater mains.

The absence of air in the system allows it to run 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 a 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).



IKEA - Tempe - Sydney (Australia)

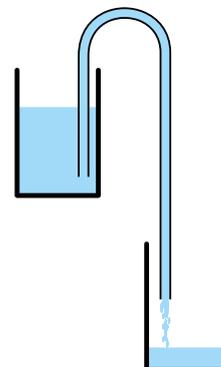
# RAINPLUS®, HOW DOES IT WORK?

Rainplus® 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.

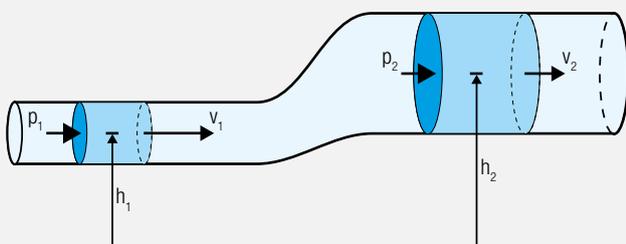
This process only starts when the pipe is completely full and continues until a balance between the two containers is reached: either when the two containers reach the same level or when the fluid level in the higher container goes below the pipe inlet section.

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 velocity in the pipe.



The performance of the Rainplus® siphonic drainage system is therefore decidedly better than 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 runs 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 such as to rapidly increase the velocity and, as a consequence, the flow rates of the system (Bernoulli's principle).



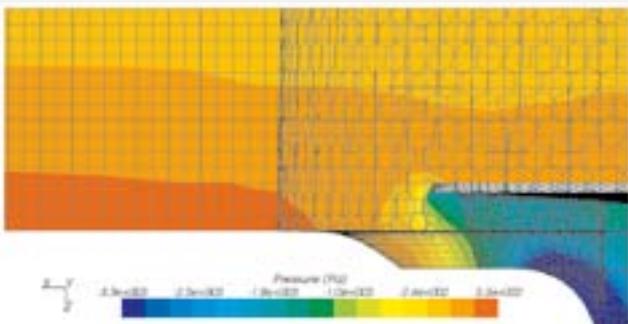
## Bernoulli's principle

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's potential energy. Bernoulli's principle is named after the Dutch-Swiss mathematician Daniel Bernoulli who published his principle in his book *Hydrodynamica* in 1738.

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

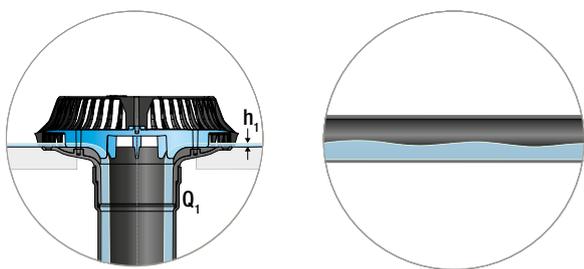
# FLOW STAGES

EN 1253 and ASME A112.6.9 technical standards are used to evaluate the performance 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.

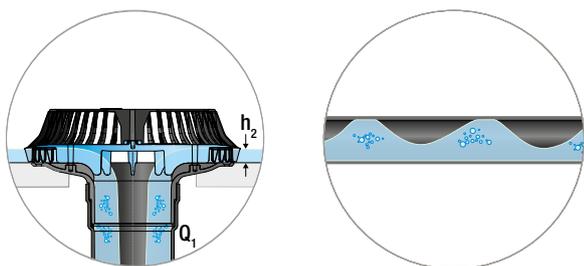


## Rainplus®, integrated engineering

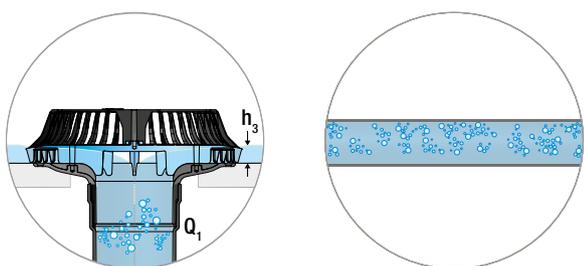
A high degree of understanding of the Rainplus® operating rules and system flow regime is required to design and construct correctly performing and safe siphonic systems. Unlike conventional gravity systems, a high degree of engineering and expertise is necessary, both in the design and construction phase.



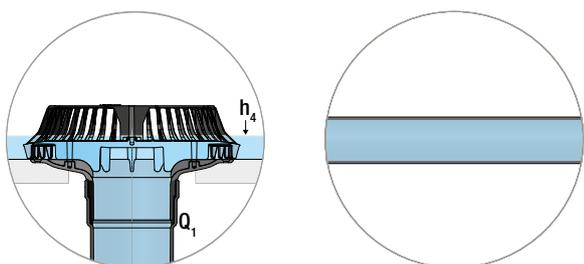
**Stage 1.** With a moderate flow, of 10 or 15% of the design rainfall intensity value, the roof outlet works as it would in a conventional system and the flow is defined “gravity flow”, in that air content in the pipes is elevated.



**Stage 2.** When the water discharged from the roof is between 10 to 15% and 60% of the full bore flow condition, water flow is discontinuous and the system therefore fluctuates from a gravitational flow regime to a full siphonic action. At these rainfall values the water that accumulates on the roof fills the outlet, cutting off air flow into the pipe and triggering the siphonic action. The velocity of water discharged therefore increases which results in falling water levels, allowing air to be drawn into the piping network and breaking the siphon; for this reason this stage is called “plug flow”.



**Stage 3.** When the water discharged is between 60% and 95% of the design rainfall intensity value, the pipes are completely full of water although many air bubbles are still present. This stage is called “bubble flow” and features high flow velocities thanks to the siphonic effect.



**Stage 4.** When the flow is over 95% of the design rainfall intensity value, the siphonic effect operates at full capacity reaching maximum velocity with no air entering the pipes. This stage is called “full flow” and does not produce noise or vibrations.

# SYSTEM COMPONENTS

## Outlets and accessories

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 and ASME A112.6.9.

The main components of the Rainplus® outlets are made of stainless steel or molded aluminium alloy, protected by a special resin that makes them long-lasting.

The main features are as follows.

- wide range of drainage flows (**up to 65 l/s with Rainplus® 110 and up to 14 l/s with Rainplus® 56**);
- **reduced roof water levels** required to trigger the siphonic action;
- no swirls thanks to the special profile of the anti-vortex 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, 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**.

## Rainplus® Overflow Kit

Local regulations or standards on the design of rainwater systems may require emergency systems (also known as overflow systems) to be provided that are capable of draining unexpectedly intense rainfall that exceeds 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.



## Bracketing systems

Valsir offers a wide range of **bracketing systems** and accessories for installing the entire drainage network. The Rainplus® bracketing system, composed of special clips together with 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 also 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 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 the use of special tools;
- the clips are anchored to the pipes and support rail using **high resistance bolts**.

## Pipes and fittings

The Valsir HDPE product line for the creation of siphonic drainage systems is available in diameters 40 mm up to diameter 315 mm and is characterised by a wide range of fittings such as access pipes, elbows, reducers and reduced branches.

The use of Valsir HDPE pipes and fittings offers numerous advantages:

- **possibility of pre-fabricating system parts** and mounting them on site thanks to the light weight of the components;
- savings in labour costs thanks to **rapid installation times;**

- possibility of choosing from the different connection types such as **butt-welding** or **electrofusion couplings;**
- **no material wastage** makes it more economical;
- increased safety of the systems thanks to the excellent mechanical characteristics of Valsir HDPE.





Renault - Novo Mesto (Slovenia)

# REFERENCES



Blue Route Mall - Capetown (South Africa)



The Villa Mall - Pretoria (South Africa)



Claudelands - Hamilton (New Zealand)



Theater Daoiz e Velarde - Madrid (Spain)



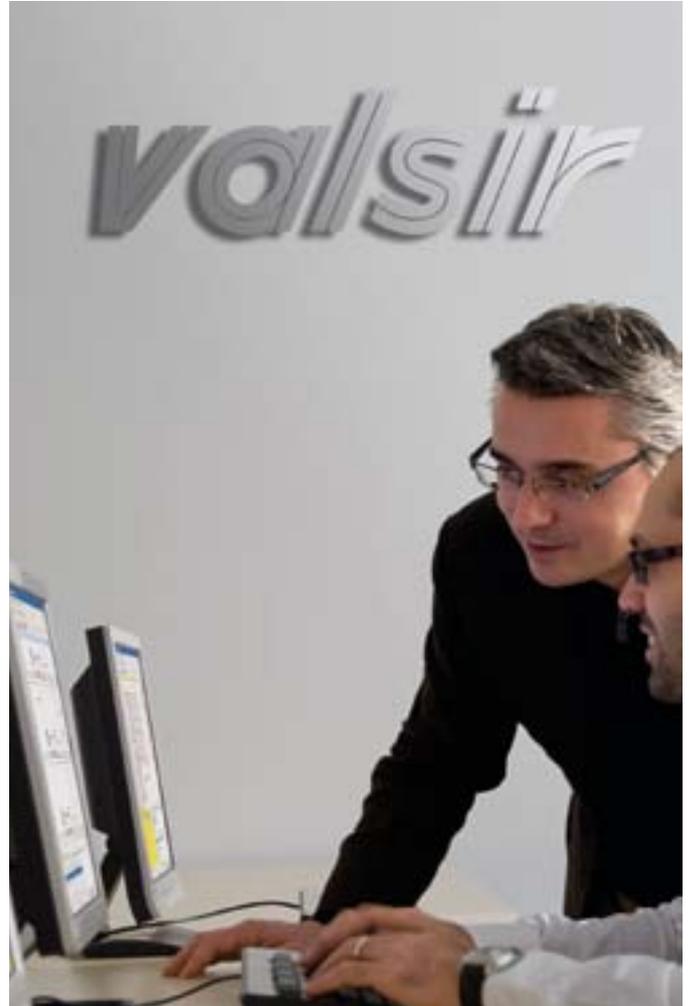
General Electric Oil & Gas - Perth (Australia)



# TECHNICAL SUPPORT AND ASSISTANCE

Valsir provides complete support both during the planning phase and on site, thanks to a first-class technical office made up of a team of highly experienced engineers, capable of dealing with the most complex system requirements.

Valsir also boasts an important training centre called **Valsir Academy** catering for clients, distributors, plumbers and planners. Two highly equipped halls are available where theoretical and practical courses are organized on the use and design of water supply systems using the Silvestro software, a program that was developed specifically within Valsir.

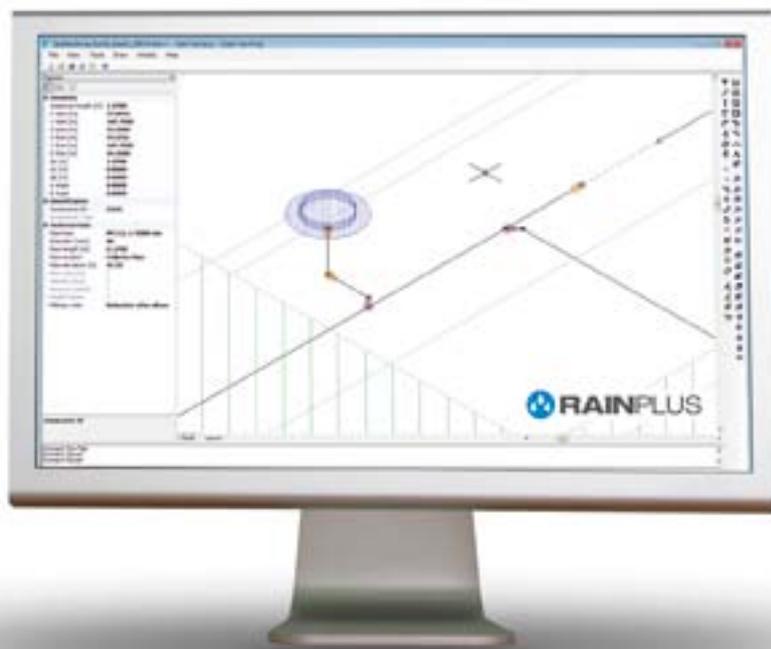
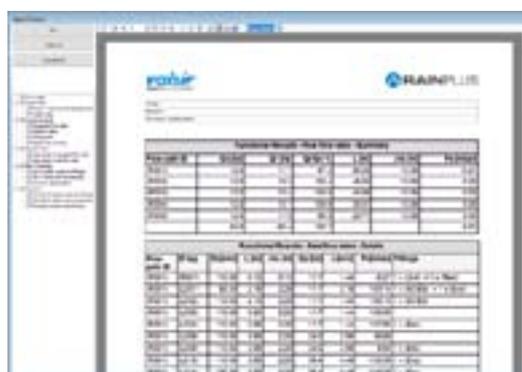
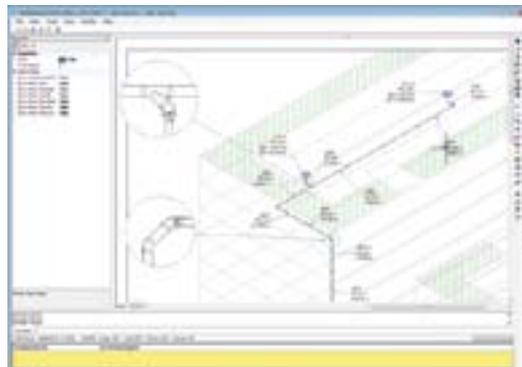


# THE RAINPLUS® SOFTWARE

Siphonic drainage systems are designed with the use of the advanced Rainplus® software that is capable of calculating and sizing in compliance with technical Standards VDI 3806 and BS 8490.

This software has many strong points:

- import of 2D or 3D drawings of the building;
- circuit observation point variation with three-dimensional rotation;
- numerous drawing commands including automatic generation of inlet branches and 45° double elbows;
- calculation and verification of dimensional limits imposed by technical standards with diagnostics window;
- automatic flow optimization for system balancing;
- complete calculation of materials list and necessary welding operations;
- export of results and drawings.



# QUALITY AND ENVIRONMENT



Efficient processes and reliable products are not the only parameters used to evaluate a company's conduct: today, in fact, the capacity of the company and its management team **to design and implement production processes that are sustainable from an environmental point of view** are of equal importance.

Valsir has always been committed to the manufacture of **recyclable products** and the implementation of **sustainable processes**, in line with the most advanced **Green Building** principles (green building and environmentally friendly project design), and today boasts highly sustainable production plants which, thanks to the use of renewable energy and planning that aim at the conservation of resources, have obtained a **Class A energy certificate**.

The consistency of Valsir's commitment is demonstrated by its **product approvals** which amount to **150** in total, obtained around the world from the most severe certification bodies (figure updated on 04/11/2013), and by the **certified quality system** in compliance with the European Standard **UNI EN ISO 9001:2008**.



Production processes and management systems that are verified, monitored and certified.



Sustainable production plants and processes, use of renewable energies, sustainability of resources.



Products that are verified, monitored and certified by recognized certification bodies.



Recyclable products and production processes with a low environmental impact.

# THE VALSIR RANGE



WASTE SYSTEMS



SUPPLY SYSTEMS



GAS SYSTEMS



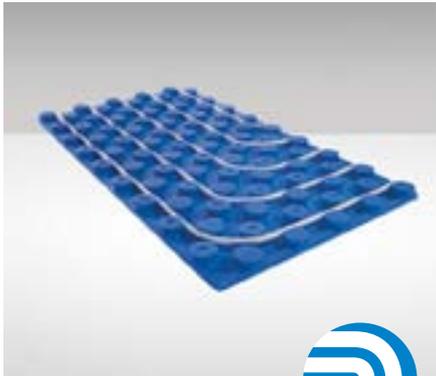
FLUSHING SYSTEMS



BATHROOM SYSTEMS



TRAPS



RADIANT SYSTEMS



DRAINAGE SYSTEMS



ACADEMY



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