Global Expertise in Siphonic Drainage

Weather patterns across the world are changing. Storms previously expected to happen only once in a century are now occurring far more often. Heavy rainfall is becoming more intense, falling in shorter periods of time, and placing greater pressure on buildings and infrastructure.

HydroStorm

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Introduction

HydroStorm

Global Expertise in Siphonic Drainage

Advanced Roof Drainage for a Changing Climate

Weather patterns across the world are changing. Storms previously expected to happen only once in a century are now occurring far more often. Heavy rainfall is becoming more intense, falling in shorter periods of time, and placing greater pressure on buildings and infrastructure.

As global temperatures rise, the atmosphere holds more moisture. When that moisture is released, it often comes as sudden, intense rainfall. From tropical regions and coastal zones to temperate climates and major cities, extreme rain events are becoming a worldwide challenge.

Buildings with large roof areas are especially vulnerable during these storms. Without an effective drainage system, water can build up quickly, increasing structural stress and the risk of damage.

HydroStorm provides high-performance siphonic roof drainage systems designed to remove large volumes of rainwater quickly and efficiently. Our solutions are built to perform during intense rainfall, helping protect buildings in all climates and regions around the globe.

As weather patterns continue to evolve, HydroStorm ensures your roof drainage system is made to withstand increased rainfall and extreme rain events.

This technical guide has been created to provide a clear, practical and fully integrated overview of our siphonic roof drainage systems. It brings together design principles, system layout, roof outlet construction and installation guidance into one cohesive resource, supporting consultants, contractors and partners at every stage of a project. Rather than addressing these elements separately, the guide presents them as part of a complete approach to delivering reliable, high-performing drainage solutions.

Within the document, you will find straightforward guidance on installation procedures, overflow considerations and bracketry systems, alongside an introduction to our advanced design software and calculation tools. These tools form the foundation of accurate planning and efficient system design, enabling the production of full hydraulic layouts, detailed material take-offs, production and fabrication drawings, and comprehensive tender-stage documentation. From early concept development through to installation and final handover, our systems are engineered to deliver consistent performance and long-term reliability in every rainfall event.

HydroStorm is supported by proprietary design software that is BBA approved and independently tested by TÜV Rheinland in Germany, providing assurance of quality and technical integrity. With considerable experience in siphonic drainage dating back to the late 1980s, our design technicians have also contributed to the development of the latest British Standard for siphonic drainage, reinforcing our long-standing commitment to industry-best practice.

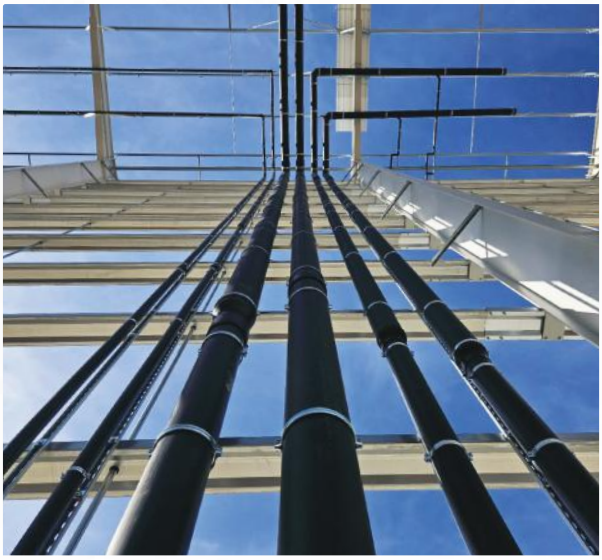
We work closely with global partners, offering either complete in-house design services or technical support for those undertaking their own system designs

In addition, we provide comprehensive installation and inspection training, recognising that correct implementation is essential to achieving optimal system performance.

Our aim is to build strong, collaborative partnerships and to support projects from initial design development through to completion and handover. Through this proactive and hands-on approach, we add measurable value, strengthen project outcomes and create sustainable, long-term commercial opportunities.

We provide comprehensive installation and inspection training

Effective rainwater management is essential to protecting buildings from structural stress and water damage. In many smaller structures, rainwater is collected by perimeter gutters positioned along the roof edge and directed into vertical downpipes. These systems typically operate using gravity and are well suited to residential or modest roof areas.

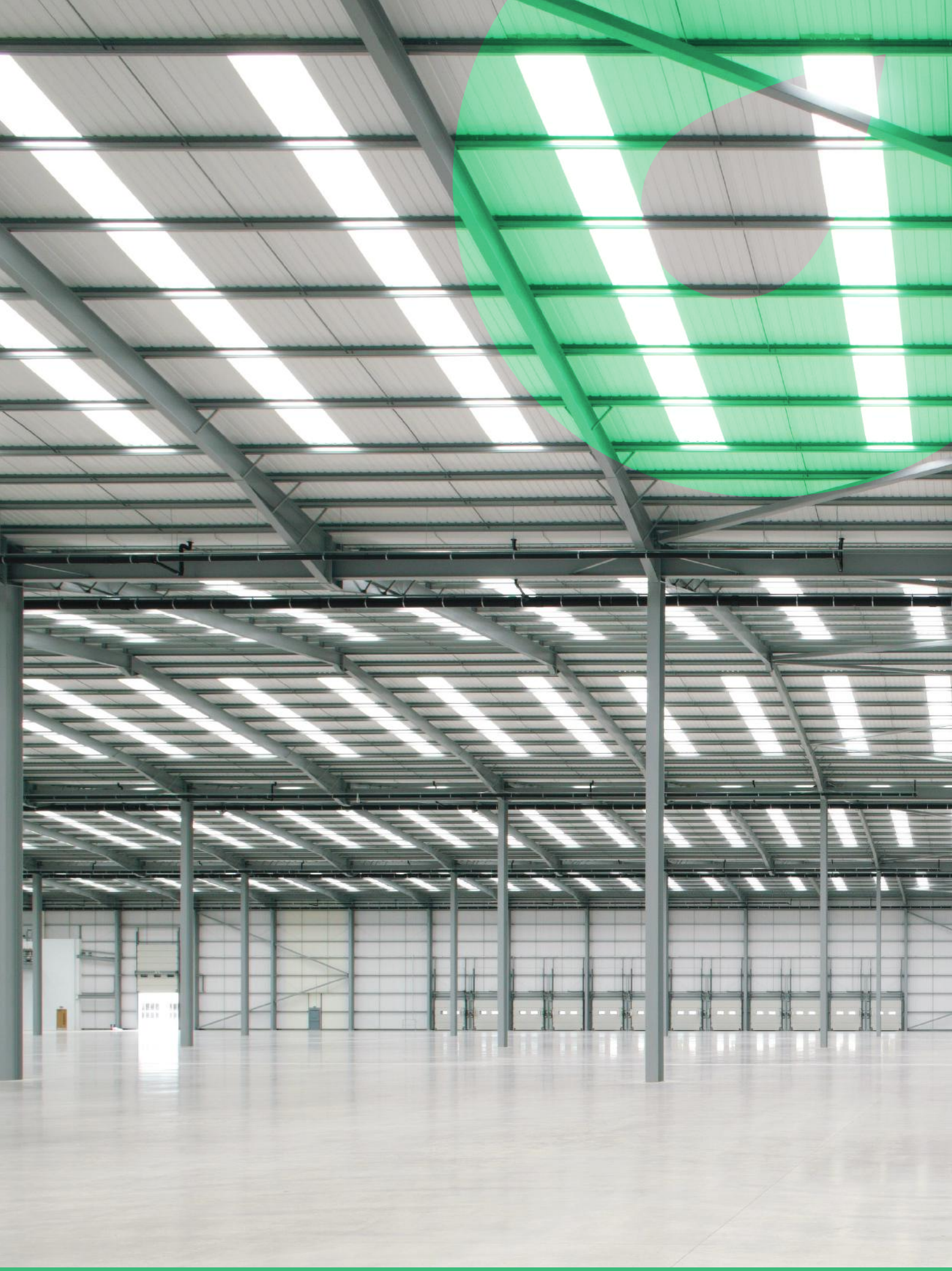


For larger commercial and industrial buildings, however, internal roof drainage systems provide a more efficient and robust solution. In these applications, dedicated roof outlets are connected to either gravity or siphonic pipe networks to remove rainwater directly from the roof surface.

As roof areas increase in size, the performance advantages of siphonic systems become increasingly significant. On developments exceeding approximately 1,000 square metres of roof area, siphonic drainage systems offer superior hydraulic performance.

By allowing the pipework to operate at full capacity during heavy rainfall, these systems can rapidly discharge large volumes of water, helping to minimise ponding and reduce structural loading. As building height and roof span increase, the efficiency gains become even more pronounced, often enabling fewer downpipes, smaller pipe diameters and greater flexibility in system layout.

Siphonic drainage is commonly specified for large-scale projects such as distribution centres, airports, retail parks, manufacturing facilities and logistics hubs.
The following section introduces the operating principles behind full-bore siphonic flow and outlines the key features and benefits of modern engineered drainage systems, demonstrating how they provide safe, efficient and dependable roof water management for today's large and complex structures.



The HydroStorm Operating Concept: Performance Without Compromise

At the core of every HydroStorm siphonic system is the principle of full-bore flow

In any roof drainage system, water must generate sufficient energy to overcome resistance within the pipework, including friction and directional changes. In traditional gravity systems, this energy is created solely by pipe gradients, meaning the flow rate is limited by the fall of the pipe.

HydroStorm siphonic systems operate differently. Instead of relying exclusively on pipe slope, they utilise the vertical distance between the roof outlets and the discharge point to create additional driving force. During the early stages of rainfall, the system behaves like a gravity system. As rainfall intensity increases, water builds up around the specially engineered roof outlets. These outlets are designed to restrict air entry while allowing only water to enter the system. As the rainfall intensifies, air is expelled from the pipe network and prevented from re-entering. Once the pipework becomes fully filled with water, the system is said to be 'primed'.

When primed, the full height difference between the roof and the discharge level generates a powerful negative pressure within the pipework. This significantly increases flow velocity and maximises the carrying capacity of the system. By eliminating air and increasing water speed, HydroStorm systems achieve a much higher discharge rate than conventional gravity drainage. The result is dramatically increased discharge capacity without increasing pipe size. This means fewer downpipes, smaller pipe diameters, shorter pipe runs, fewer discharge points and reduced underground drainage, all whilst maintaining an optimised drainage system designed to withstand even the most extreme of rainfall events.

The following section will further explore the plethora of benefits which accompany a HydroStorm siphonic drainage system, including how they are designed to suit modern infrastructure, reduced costs during installation and the lightweight nature of the systems.

Benefits of HydroStorm: Efficient Drainage Solutions for the Future

Designed for Modern Infrastructure

Because HydroStorm siphonic systems do not require pipe gradients, horizontal pipework can run level beneath the roof structure. This creates major advantages:

- **Improved coordination with structural steel and building services**
- **Cleaner ceiling void layouts**
- **Greater use of available internal space**
- **Simpler, faster installation**

In many projects, underground pipework within the building footprint can be virtually eliminated, significantly reducing trenching and groundwork costs.

HydroStorm systems provide designers with flexibility that gravity systems cannot match, improving their suitability to ever-changing modern infrastructure.

- **Pipework routed through structural steel zones**
- **Vertical stacks concealed within columns**
- **Reduced external pipe exposure**
- **Improved protection against accidental damage or vandalism**

And the taller the building, the greater the siphonic advantage, making HydroStorm the ideal solution for modern large-scale and high-rise developments.

Roof drainage is not a secondary consideration it is a critical structural and waterproofing safeguard.

As rainfall intensities increase globally and roof spans continue to expand, drainage systems must be engineered with precision, foresight and full integration into the building envelope.

HydroStorm develops advanced siphonic drainage solutions tailored to the geometry, scale and risk profile of each structure.

Our approach combines hydraulic modelling, architectural coordination and practical construction knowledge to ensure long-term operational resilience in modern buildings.

Faster Installation, Lower Total Cost

With fewer vertical stacks and simplified routing, installation becomes quicker and more economical. Reduced material quantities and labour time deliver measurable cost savings without compromising performance.

Why Partner with HydroStorm?

More Than a Supplier: A Strategic Technical Partner

In complex construction environments, drainage performance cannot be left to chance. It demands precision engineering, digital accuracy and experienced technical oversight.

HydroStorm delivers all three supported by a level of partnership that sets us apart.

We do not operate as a product distributor. We provide integrated engineering support from concept to completion as a trusted technical advisor.

HydroStorm provides direct access to experienced technical professionals - not automated systems or remote call centres. When you partner with HydroStorm, you gain immediate support from engineers who understand your project.

We remain engaged:

- **Installation guidance**
- **Final commissioning**
- **Concept development**
- **Design coordination**
- **Tender support**

A True Collaborative Relationship

HydroStorm believes partnership is built on shared responsibility and long-term commitment. We work alongside consultants, contractors and developers to ensure systems perform exactly as designed - not just on paper, but in operation.

Our objective is simple:

- **To strengthen your project**
- **To reduce your risk**
- **To enhance your reputation**

We succeed when our partners succeed.

Roof Variation

Flat and Low-Slope Roofs

Large-format commercial roofs are typically designed as flat or low-gradient surfaces. While subtle falls may guide water toward collection points, these structures remain highly sensitive to ponding during peak rainfall events. In contemporary applications surfaces are often intentionally designed with minimal or zero slope. In such cases, drainage performance cannot rely on gravity gradients alone.

HydroStorm siphonic systems are engineered to rapidly evacuate water from extensive flat catchments without dependence on pipe falls.

This enables:

- **To strengthen your project**
- **To reduce your risk**
- **To enhance your reputation**

Pitched, Multi-Level and Complex Roof Forms

Where roof planes intersect or step across elevations, water converges at concentrated collection zones. Valley lines, parapet perimeters and boundary interfaces introduce localised hydraulic intensities that demand accurate calculation and strategic outlet positioning.

HydroStorm systems are designed to respond to these dynamic flow conditions. Each catchment area is modelled to ensure balanced discharge, preventing uneven loading and safeguarding structural performance.

Gutter Integration Strategy

Gutter Variation

A building's gutter configuration significantly influences drainage design. HydroStorm systems integrate with all primary gutter arrangements while accounting for overflow risk and waterproofing interface integrity.

Perimeter (Eaves) Gutters
Externally mounted systems designed to discharge clear of the façade. Hydraulic sizing ensures outward overflow occurs safely under exceedance conditions.

Parapet Gutters
Located behind raised edge details or façade elements. As overflow cannot freely discharge away from the building, these configurations require enhanced capacity planning and controlled emergency overflow provisions.

Boundary-Wall Gutters
Installed across structural or dividing walls, these require coordinated detailing to prevent cross-building risk and ensure controlled water transfer.

Valley Gutters
Positioned internally at roof intersections, valley gutters collect concentrated runoff from multiple slopes. These zones demand particular attention to flow intensity, debris management and discharge efficiency.

Waterproofing Interface Awareness

In extreme rainfall conditions, the junction between roof membrane and gutter cannot be assumed to provide absolute watertight protection. Effective drainage design must therefore prioritise:

- **Controlled water depth limits**
- **Redundancy through overflow planning**
- **Secure and stable outlet integration**
- **Structural load awareness**

HydroStorm incorporates these considerations into every hydraulic model, ensuring that drainage performance protects not only the pipe network but the entire building envelope.

Design

Digitally Modelled, Practically Delivered

All HydroStorm Primary and Secondary systems are developed using advanced hydraulic simulation and BIM-integrated design coordination.

This ensures:

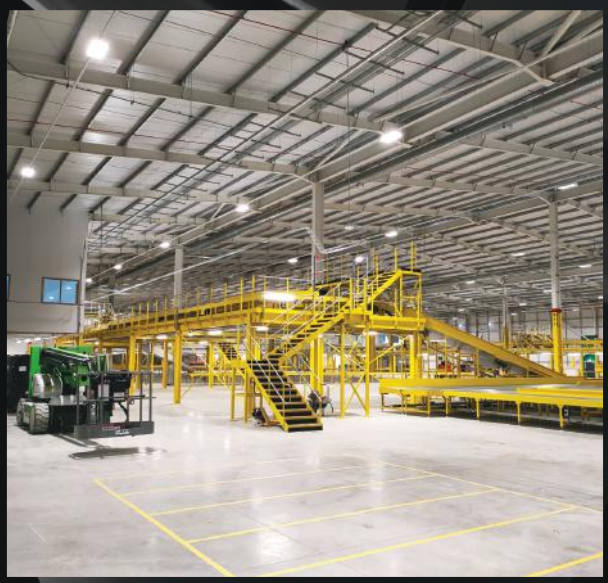
- **Accurate catchment analysis**
- **Balanced system performance**
- **Clash-free routing within structural zones**
- **Installation clarity on site**
- **Verified performance under peak design storms**

Our role extends beyond design. We provide technical collaboration from concept development through construction and commissioning, ensuring the installed system performs precisely as engineered.

HydroStorm systems are fully BIM-compatible and seamlessly integrated into coordinated project models. From early-stage concept planning through to construction, we support clear technical communication and clash-free design integration.

This digital accuracy reduces delays, improves procurement efficiency and strengthens overall project coordination.

The result is not only superior hydraulic performance - but improved commercial performance for our partners.



Design Calculations

Effective roof drainage begins with accurate design rainfall analysis. HydroStorm Primary and Secondary systems are engineered using project-specific rainfall intensity data, ensuring performance is aligned with regional climate conditions and peak storm events.

Our design process evaluates:

- **Local design rainfall intensity**
- **Effective roof catchment areas**
- **Building geometry and height**
- **Time of concentration**
- **Surface runoff characteristics**

Each roof zone is carefully assessed to determine the true effective drainage area, accounting for slope, wind influence and flow convergence. Runoff coefficients are applied in accordance with recognised international standards to ensure realistic and conservative hydraulic modelling. Using advanced HydroStorm calculation software, every system is digitally verified to manage peak discharge volumes safely and efficiently. The result is a precisely balanced siphonic network engineered to perform with confidence under design storm conditions.

System Design Integrity

HydroStorm systems are engineered to maintain controlled pressure levels and precise hydraulic balance across the entire network.

Every design verifies:

- **Maximum allowable head losses**
- **Positive and negative pressure limits**
- **Available discharge height**
- **System imbalance tolerances**

Accurate calculation of the theoretical and actual available height ensures reliable performance, even in challenging site conditions such as high-rise buildings or restricted discharge levels.

Cavitation Protection

In taller structures, excessive negative pressure can approach the vapour pressure of water, potentially causing cavitation a phenomenon that can generate severe turbulence and structural stress within pipework.

HydroStorm design software continuously monitors negative pressure levels to ensure they remain safely within engineered limits. Automatic validation prevents designs from exceeding safe operating thresholds, maintaining a built-in safety margin under all design conditions.

Automatic System Verification

HydroStorm software performs real-time validation of:

- **Maximum system imbalance**
- **Downpipe sizing for correct priming**
- **Pressure compliance**
- **Full system priming capability**

If parameters fall outside acceptable limits, the system will not approve the design - ensuring only fully compliant, balanced and safe solutions proceed to installation.

Engineered for Stability

Correct vertical height, collector pipe efficiency and down-pipe sizing are critical to achieving full system priming. HydroStorm modelling ensures sufficient driving force within the vertical stack to initiate and sustain full-bore operation. The result is a hydraulically stable system, protected against pressure risk and engineered for consistent peak performance.

HydroStorm modelling ensures sufficient driving force within the vertical stack

HydroStorm Components

Pipe

HydroStorm SDR 26 EN 1519 polyethylene pipework is fundamental to the reliable performance of HydroStorm siphonic drainage systems worldwide. Engineered to deliver the structural strength required to withstand sustained negative pressure conditions, the specified wall thickness ensures exceptional durability, hydraulic stability, and long-term operational performance.

For complete project confidence, SDR 26 EN 1519 polyethylene pipework is readily available through our global network of approved stockists, ensuring consistent quality and dependable supply wherever your project is located.

HydroStorm Roof Outlets

HydroStorm roof outlets and baffles are engineered for performance and available worldwide to our approved partners. Our proven 75mm and 110mm outlet range is specifically designed to deliver maximum hydraulic efficiency across all siphonic applications. Intermediate sizes provide no additional performance benefit, ensuring our streamlined range offers the optimal balance of power, reliability, and design simplicity.

Full technical support and detailed performance data are available to registered HydroStorm partners, with bespoke manufacturing options to meet unique project demands.

Designed for complete versatility, HydroStorm outlets integrate seamlessly with all roof structures and waterproofing membranes. A comprehensive selection of ancillary components and secondary guarding solutions ensures compatibility with any roof build-up giving you total confidence from specification through to installation.

Full technical support and detailed performance data are available to registered HydroStorm partners, with bespoke manufacturing options to meet your unique project demands

Fixing Methods

HydroStorm siphonic drainage systems shall be installed using a fully engineered bracketry and support assembly designed in accordance with calculated hydraulic loads, dynamic flow conditions, thermal movement allowances, and imposed structural stresses specific to the operational design of the system. Bracket spacing, rod diameters, channel profiles, clamp types, and fixing methods are determined through project-specific engineering calculations to ensure structural integrity, load distribution compliance, and long-term performance under full-bore siphonic flow conditions.

All dimensional criteria, material specifications, load tables, installation tolerances, and fixing requirements are formally documented and issued exclusively to approved HydroStorm partners. Installation must be carried out strictly in accordance with HydroStorm technical documentation to maintain system certification, hydraulic performance validation, and warranty compliance.

Jointing Methods

- **Factory joints are completed using the butt fusion process**
- **Site joints are completed using the electrofusion method**

Prefabrication Service

HydroStorm offer a prefabrication service if required. This reduces the number of site joints and speeds up the installation process. This is not a necessity, but it is available as an option. Technical data sheets and detailed engineering write-ups for all ancillary components forming part of the HydroStorm siphonic drainage system are made available exclusively to approved HydroStorm partners.

These documents include performance specifications, material classifications, dimensional data, installation methodology, compliance references, and maintenance requirements for each component. Ancillary components include, but are not limited to, secondary system accessories such as vermin guards, overflow components, debris exclusion devices and proprietary connection assemblies.

For example, the HydroStorm vermin guard for secondary drainage systems is engineered to provide effective pest ingress prevention without compromising hydraulic performance or discharge capacity. Full technical specifications, including aperture sizing, material grade, corrosion resistance classification, fixing method, and compatibility limitations, are provided within the relevant technical documentation.
All ancillary components must be installed strictly in accordance with HydroStorm issued documentation to ensure continued compliance with system performance criteria, certification requirements, and warranty conditions. If required, this can also be drafted as a specification clause suitable for inclusion in tender or consultant documentation.

Electrofusion Welding Equipment

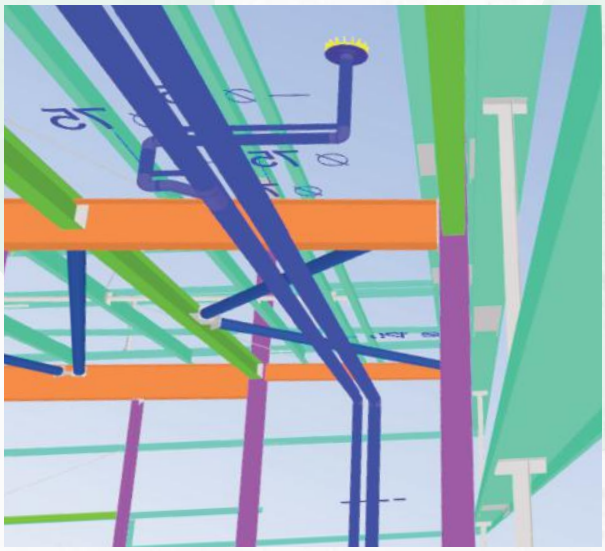
Electrofusion welding equipment is available exclusively to approved HydroStorm partners and is fully compatible with all major electrofusion fitting manufacturers.

The equipment is designed for the welding of electrofusion fittings for low-pressure polyethylene (PE) pipework systems ranging from 32 mm to 315 mm diameter. It is suitable for pipe systems utilised within siphonic rainwater and wastewater drainage applications.

Technical Specification

- **Welding Output Current: Controlled 5A or 10A**
- **Welding Output Voltage: Controlled 220V**
- **Input Supply Requirement: 230V AC**
- **Application Range: PE electrofusion fittings (32 mm – 315 mm diameter)**
- **System Compatibility: Compatible with major electrofusion fitting manufacturers**

The unit provides a regulated and controlled welding cycle to ensure consistent joint integrity and repeatable weld quality in accordance with manufacturer requirements.



Construction & Site Suitability

The equipment is housed within a durable, handheld plastic casing designed for ease of handling and transportation. For protection against harsh construction site environments, the unit is supplied within a robust steel carrying case to safeguard against impact, dust, and general site conditions.

The equipment is suitable for welding fittings commonly used in siphonic rainwater drainage and wastewater systems, ensuring reliable joint performance within HydroStorm installations.

Global Expertise in Siphonic Drainage

If you'd like to know more about our products and services, please don't hesitate to get in touch.

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