SIZING RAINWATER MANAGEMENT ON THE PLOT

HAZARD

RAINFALL AND FLOODS

IMPLEMENTATION STEP

CONSTRUCTION

RENOVATION

BUILDING IN OPERATION

AREA OF ACTION

ENVELOPE

OUTDOORS

GROUND FLOOR

COST

€ € €

low **medium** high

LEVEL OF SKILL

medium

Ensuring good water management means anticipating how water will run off the building and the plot during heavy rainfall. A hydraulic schematic, produced at the time of designing the building, shows how water run offs from collection surfaces and goes through the water management systems, up to final disposal.

IMPACTS

For several decades, public authorities have managed rainwater, so it is no longer really considered an issue by the property industry. Yet in the event of heavy rainfall, drainage systems can quickly become submerged because of **the influx of rainwater and run-off**. An efficient hydraulic schematic makes it possible to manage rainwater on a building scale, avoid **networks over-saturating,** and therefore reduce the risk of flooding in the building and on the plot. This strategy increases the collective resilience of neighbourhoods, towns and regions.

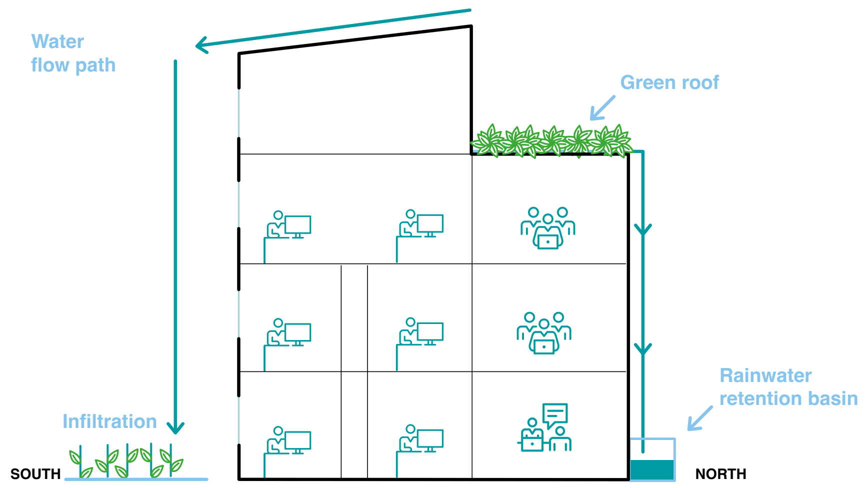
INSTALLATION GUIDE

Run-off water on buildings follows a **hydraulic path defined by the architecture**. The construction industry, which has long been confronted with these problems, has developed expertise in rainwater management systems on building roofs. These systems include elements such as gutters and drainage pipes. These are grouped together in a unified technical document (DTU 40.5), which sets out specific installation standards for each component, thus guiding the execution of rainwater drainage work. The strategy employed today consists mainly of redirecting water to drainage systems and doesn't encourage **an approach based on the plot as a whole**.

Measures such as rainwater harvesting and the installation of a green roof reduce the amount of run-off during heavy rainfall. Water evacuation must be thought out at building scale (inside the building via ventilation and pumping systems), and at plot scale (planting around the building, desealing the soil and creating basins, a sponge plot or a rain garden, etc.), in order to aim for a **low water flow rate at the outlet.** The aim of this overall approach is to limit the influx of water into collective drainage systems. It is advisable to refer to the local authorities for information on the capacity of local drainage systems.

CLICK HERE TO CONSULT THE GUIDE TO ACTION FOR CLIMATE CHANGE ADAPTATION

HYDRAULIC SCHEMATIC OF RAINWATER FLOW AND INFILTRATION POINTS ON THE BUILDING



© OID, 2021

WEAK POINTS AND STRONG POINTS

(+) Local authorities, which are increasingly exposed to periods of heavy rainfall, are beginning to **set flow rate thresholds for new connections** to collective networks. As the number of extreme events increases, these practices are likely to become more widespread.

(+) In **urban areas**, the density of buildings limits the space available for rainwater to infiltrate into the ground. **Strategies for buildings** (green roofs, rainwater harvesting tanks, etc.) can be applied more easily.

(+) In high-rise buildings, the water recovered can be used to **supply fire safety systems using gravity flow** located high up (Example of Tour Evasion 2000, 75015 PARIS).

(−) Water run-off onto the building can **lead to the accumulation of polluting particles** (organic particles, hydrocarbons, heavy metals, asbestos, etc.), which can then end up in the soil. To prevent this, **regular maintenance** of the systems must be carried out on the building, by a clearly identified team.

MALADAPTATION

Maladaptation can result from the following:

Pollution linked to leaching

Rainwater leaching is a process by which rainwater erodes or carries particles, sediments, pollutants and other substances from exposed surfaces into the ground or drainage systems. As a result, when rain falls on surfaces (roofs, roads, car parks, etc.), there is a risk of pollution of the soil, local watercourses, groundwater and the local ecosystem.

Inadequate sizing for climate change

Climate change is likely to increase the frequency and intensity of extreme rainfall events. As a result, it is imperative to take this development into account in the design of stormwater management, as predicted by climate models with the associated uncertainties, in order to guarantee its effectiveness and avoid a transfer of vulnerability over time.

Water diversion

When rainwater management systems on a plot of land are inadequate or inadequately sized, rainwater can be diverted to other parts of the site or to unprotected neighbouring buildings. This can overload local drainage systems, affect surrounding ecosystems and increase the risk of flooding in these areas. This transfer of vulnerability can also have repercussions for buildings (structure, materials construction, etc.), infrastructure, agricultural land and the surrounding equipment. Effective management of these risks requires a comprehensive and integrated approach, including coordination with neighbouring owners and local authorities.

CLICK HERE TO CONSULT THE GUIDE TO ACTION FOR CLIMATE CHANGE ADAPTATION

MONITORING INDICATORS

ESSENTIAL RECOMMENDATIONS WORTH THINKING ABOUT

- DRAW UP A HYDRAULIC SCHEMATIC WHEN DESIGNING THE BUILDING

MONITOR MY ACTIONS FOR CLIMATE CHANGE ADAPTATION

+/– : Quantitative indicator ★ : Qualitative indicator

	INDICATORS OF MEANS	INTERPRETATION
+/–	Soil infiltration capacity (mm/h)	-
+/–	Equivalent waterproofed surface (m^3)	To be minimised
+/–	Waterproofing coefficient for the plot	To be minimised
+/–	Volume of water to be managed (m^3)	-
+/–	Percentage of volume removed by infiltration into the surface soil of the plot (%)	To be maximised, in priority
+/–	Percentage of volume removed by green roofs on the building (%)	To be maximised as a secondary solution
+/–	Percentage of volume removed by storage in retention basins/ catch basins on the plot (%)	To be maximised, as a third solution

	INDICATORS OF RESULTS	INTERPRETATION
+/–	Percentage of stormwater flowing to outlet (%)	To be minimised
+/–	Comparison between the flow rate at the outlet and that authorised by the collective drainage network, during heavy rainfall (L/s)	Flow rate at outlet < Flow rate authorised by collective drainage network
+/–	Comparison between the flow rate at outlet of plot after desealing and a control situation*.	Leakage rate at plot outlet after operation < Leakage rate in control situation*.
+/–	Comparison between the waterproofing coefficient of the plot before and after the waterproofing operation	Waterproofing coefficient after operation < Waterproofing coefficient before operation

**The control situation is defined by the parameters set to isolate the influence of the adaptive action (similar conditions: weather, time of measurement, space, etc.).*

CONCEPT / DEFINITION

- **Soil infiltration capacity:** the rate at which water infiltrates the surface, i.e. the infiltration rate of a soil per unit area. This parameter decreases as the water content of the soil increases until it approaches the value of the hydraulic conductivity of the soil in question.
- **Equivalent waterproofed surface area**: sum of the various built surfaces, weighted by their runoff coefficient (ratio between the height of water runoff and the height of water precipitated).
- **Waterproofing coefficient for the plot:** ratio between the equivalent waterproofed surface and the total surface area of the plot, considering all the waterproofed surfaces (roofs and road, car parks, access and surrounding areas).
- **Volume of water to be managed:** volume of rainfall that runs off impermeable surfaces and must be intercepted to be infiltrated, evapotranspired or discharged at a regulated rate to an outlet.
- **Volume removed:** volume of rainwater applied to a reference surface area that is not discharged into the sewerage system (measured as the cumulative height of water over 24 hours). This volume must be removed, i.e. recovered in full on the land concerned, within a maximum of 24 hours.
- **Leakage rate at the outlet:** quantity of rainwater redirected away from the plot during and after the rainfall event towards the sewerage system.

FIND OUT MORE

CEREMA, DREAL and Agence de l'eau (2017), *Vers la ville perméable - Comment désimperabiliser les sols?*

Guide bâtiment durable Brussels (2013), *Gérer les eaux pluviales sur la parcelle*

Mairie de Paris, Direction de la propreté de l'eau, Service technique de l'eau et de l'assainissement (2018), *Guide d'accompagnement pour la mise en œuvre du zonage pluvial.*

Métropole de Lyon, *PARAPLUIE - Pour un Aménagement RAisonné Permettant L'Utilisation Intelligente de l'Eau*

CLICK HERE TO CONSULT THE GUIDE TO ACTION FOR CLIMATE CHANGE ADAPTATION