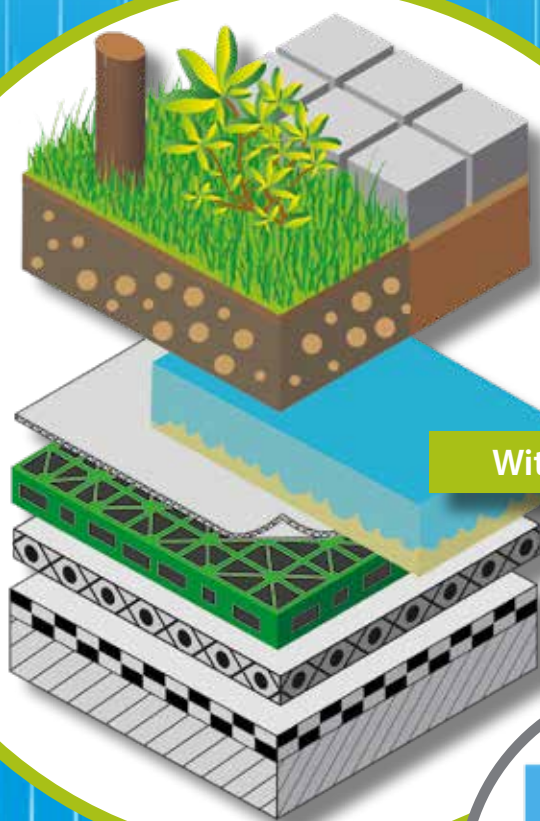


## Nophadrain Water Retention Systems for intensive green roofs



With extra water buffer



## Water retention systems for sustainable and climate-proof cities

### Why use water retention systems?

The consequences of the climate change are and will be the challenge for our and our next generation. On the one hand we face temperature increase. On the other hand, we have to cope with heavy and unforeseen rainfalls, causing flooding and severe overloads of the storm water systems in cities. This combined with the trend towards urbanization and the increasing wish towards "green, more biodiverse living space" to fulfill our basic needs, challenges our society.

The reclaiming of land and subsequent sealing of natural soil by urbanization, is seen as one key drivers for the flooding issues. Since rainwater cannot percolate anymore into the ground, water runs off straight into the storm water system, causing overload of the storm water system, potentially combined with flooding. The small water cycle is more and more disturbed as there is no time for water to evaporate.

Basic green roofs already help to overcome this challenging situation by delaying the flow of the precipitation into the storm water system and enhancing transpiration and evaporation by its vegetation. When equipping a basic green roof with defined water storage elements in combination with an adjustable flow control system the basic green roof transforms into a water retention and water management system. Based on rainfall runoff models, such systems can be designed to store calculated water volumes over a specific period (e.g. 24 hours) and to relieve calculated water volumes into the storm water system.

Nophadrain has developed a specific system for intensive greens roofs based on the ND WSE It Water Retention Element. The water storage capacity of this system varies between 48 and 143 l/m<sup>2</sup> (depending on the height of the element chosen – 50 to 150 mm). Combined with the adjustable ND AFC-200 Adjustable Flow


Control (adjustable to reduce the water flow down to 0.04 l/s), this system builds the best base for any water retention system for intensive green roofs.

### Combine water retention and water buffering in one

To distress the storm water system, typical water retention systems are designed to store a defined capacity of water (l/m<sup>2</sup>) combined with a calculated water flow rate to relieve the entire and temporarily stored water over a certain period (e.g. 24 hours) underneath the vegetation and substrate. By this, the water is not available for the vegetation. Therefore, Nophadrain recommends combining all water retention systems with special ND WSM-25 or ND WSM-50 Water Reservoir Panels. These panels allow an additional water storage of 20 or 40 l/m<sup>2</sup> and are installed on top of the water retention element. They buffer water up to the saturation point. The water is made avail-


### This is how the system works\*

1.



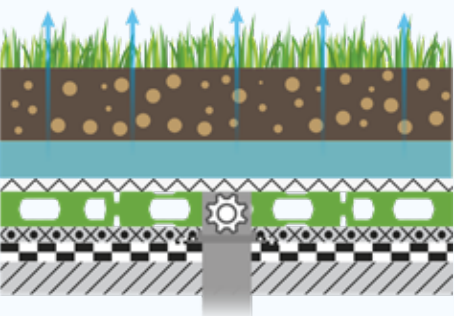
When entirely empty and dry, the total water retention and buffer volume (excluding substrate and vegetation) amounts 135 l/m<sup>2</sup>. The ND AFC-200 Adjustable Flow Control is set manually to the right runoff coefficient.

2.



Rain shower occurs and flows through the substrate and is buffered into the ND WSM-50 Water Reservoir Panel until saturation.

3.



When fully saturated, the ND WSM-50 Water Reservoir Panel buffers 40 l/m<sup>2</sup> water.

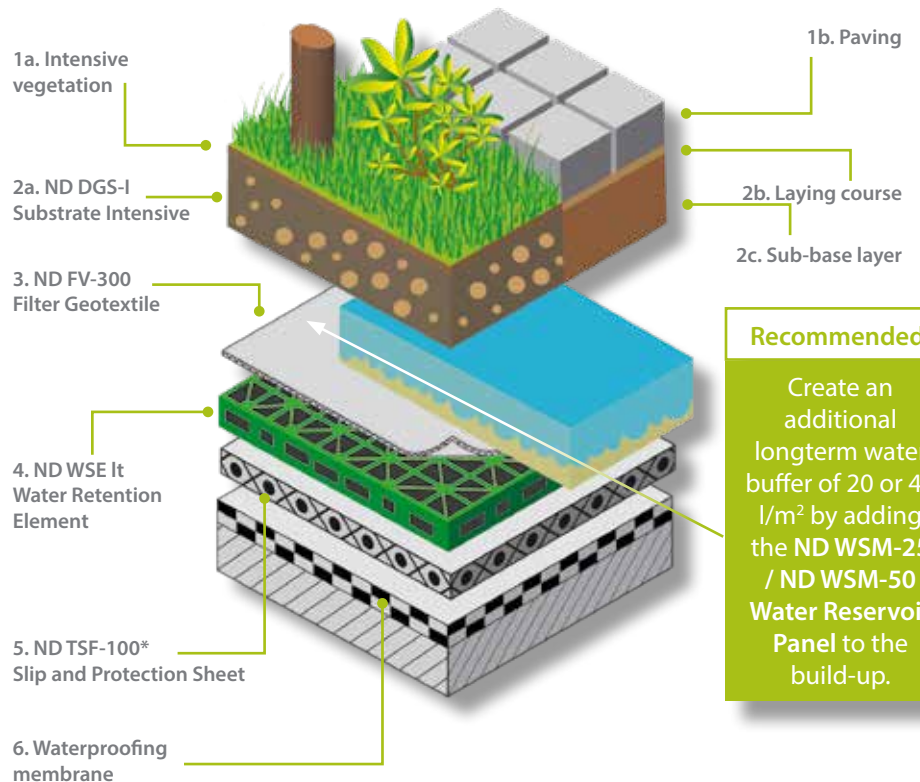
\*This example shows the option with the ND WSE-100lt Water Retention Element and the ND WSM-50 Water Reservoir Panel.



## Typical build-up: Nophadrain Water Retention System for intensive green roofs

able for the vegetation and by this the important evapotranspiration is being fostered. Only excess water will flow into the retention layer.

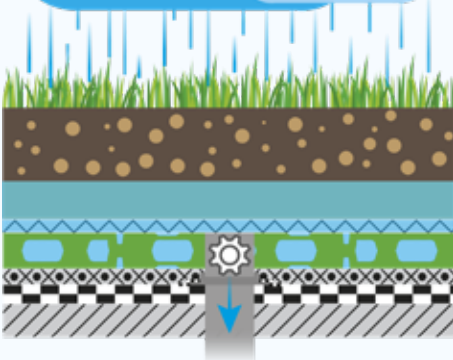
By adding the extra water buffer, not only the water management on the roof gets improved to the next level – the water reservoir panels also function as an additional 'filter layer'. This allows the use of substrates with higher organic content, enabling an even more biodiverse vegetation with increased transpiration and evaporation.



\*In case of an inverted roof construction the ND TSF-100 Protection and Slip Sheet has to be exchanged by the ND 100sv Drainage System.

4

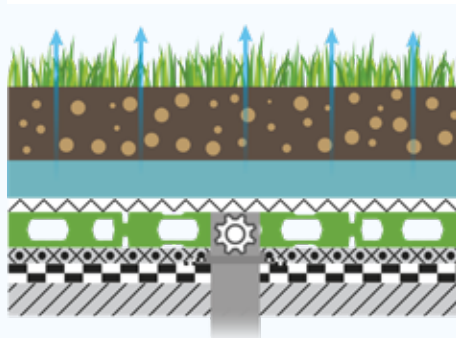
Only when exceeding the storage capacity of the ND WSM-50, due to ongoing rainfalls, the water flows into the ND WSE-100lt Water Retention Element with a retention volume of 95 l/m<sup>2</sup>. The water is stored here temporarily for a period that is set by the calculated flow rate of the ND AFC-200 Adjustable Flow Control.



5

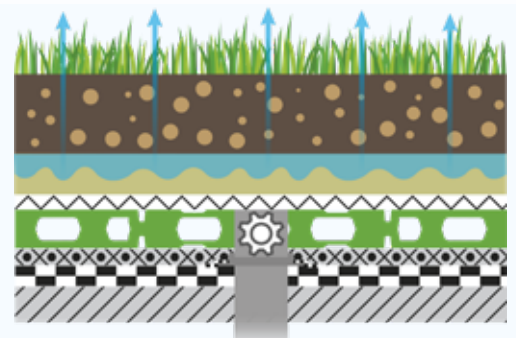
After the rain has stopped the water retained in the ND WSE-100lt Water Retention Element, continues to flow at the set flow rate into the storm water system.

40 l/m<sup>2</sup> are still safely buffered in the ND WSM-50 Water Reservoir Panel and available for the vegetation.



6

Depending on the intensity and frequency of rainfalls, the main amount of the water will be retained in the vegetation layer and ND WSM-50 Water Reservoir Panel. Only during extreme rainfall, the ND WSE-100lt Water Retention Element will have a retention function. Generally, the water fully contributes to the evaporation and transpiration, enhancing the small water cycles by returning the water to its surroundings.



## Benefits of the system

### High compressive strength

Due to its high compressive strength all ND WSE-It Water Retention Elements are perfectly suited for the use in intensive green roof constructions.

### Calculated runoff through adjustable flow control system

Every water retention system is to be combined with an adjustable flow control system (ND AFC-200 Adjustable Flow Control). The project specific flow rate is adjusted to the calculated runoff values by turning and fixing the adjustable flow control to the required position in line with the flow control table.

### Relieving the storm water system

For intensive green roof applications, the ND WSE-100lt Water Retention Element is recommended with a build-up height of 100 mm – other heights are available. The ND WSE-100lt can store water up to 95 l/m<sup>2</sup>. By adding the ND WSM products, an additional 20 or 40 l/m<sup>2</sup> water can be buffered on the roof.

### Healthier vegetation and reduction of the urban heath island effect

By adding an extra, long-term water buffer, the vegetation has a water supply during dry periods. More and healthier green means more evaporation and transpiration, which helps to reduce the temperatures in urban areas. This contributes to a healthier and more livable city climate.

Technical properties			
Product name	Height	Compressive strength	Water retention capacity
ND WSE-100lt*	approx. 100 mm	> 400 kN/m <sup>2</sup>	approx. 95 l/m <sup>2</sup>
ND WSM-25	approx. 25 mm	-	approx. 20 l/m <sup>2</sup>
ND WSM-50	approx. 50 mm	-	approx. 40 l/m <sup>2</sup>

\*Upon request also available in heights: 50, 80 and 150 mm.




**nophadrain®**  
SMART GREEN ROOF SYSTEMS

**Nophadrain BV**

**Visiting address**  
Mercuriusstraat 10  
6468 ER Kerkrade  
Netherlands

**Postal address**  
Postbus 3016  
6460 HA Kerkrade  
Netherlands

 +31 (0)45 535 50 30

 [info@nophadrain.com](mailto:info@nophadrain.com)

 [www.nophadrain.com](http://www.nophadrain.com)