

KWS Infra bv  
P.O. Kok

## Biedingsbericht

Berlin, 23rd of April 2018

Project: Amsterdam, Valkenburgerstraat  
Object(s): CityTree – innovative bio filter for air pollution reduction  
Time: June 2018 (estimated calendar weeks 24/25)  
Partners: City of Amsterdam  
Green City Solutions GmbH (Berlin) (GCS)



The product:

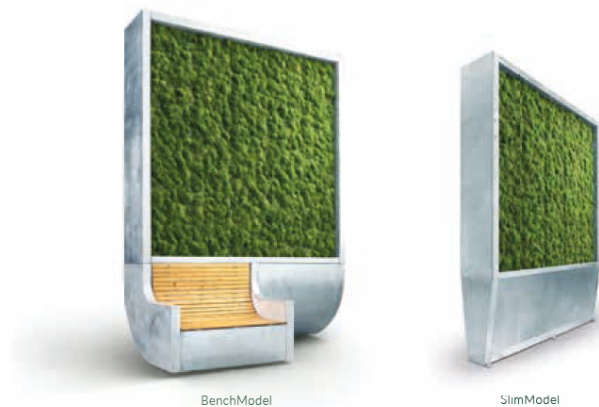


Figure 1: Visualization of CityTrees Slim in urban environment



## Comprehensive range of performance

Thanks to its environmental benefit, the CityTree can help to reduce the risk of disease, among other things.



BenchModel

SlimModel

### Environmental performance

Features	Performance	Benefits
Binding of particulate matter	2-5% average particulate matter filter performance or up to 23%* for permanent binding of up to 12.2 kg per year at selected locations	In the immediate surroundings, reduction of particulate matter that causes respiratory and vascular diseases
Binding of NO <sub>2</sub>	Up to 8% of harmful nitrogen oxides are bound by moss varieties used under laboratory conditions	Reduction of respiratory diseases; reduced risk of dying of cardiovascular diseases
Binding of CO <sub>2</sub>	Binding of fine particles includes location-dependent quantities of soot, which can be drawn on for CO <sub>2</sub> equivalent calculations	Direct CO <sub>2</sub> compensation for buildings, work processes and projects
Cooling performance	Up to 17° C/Kelvin (on the surface of the moss, 35° C, sunshine)	Natural cooling for interior spaces as well as to combat urban heat islands outside
Rainwater use and harvesting	Up to 1,100 litres (basis: Ø annual precipitation/Berlin) and/or up to 10,000 litres with suitable supply lines (for example from roof surfaces)	Lower running costs and tax breaks for use of rainwater; water harvesting reduces the risk of flooding and the effects of heavy rain

\* with active ventilation: particulate matter with fraction value 10 µm, 2.5 µm and 0.1 µm

Figure 2: Product description

## Proof of performance from independent experts

Intensive cooperation with international research, technology, funding and certification partners

Partners	Expertise	Cooperation
<b>Funding</b>		
European Union Brussels, Belgium	"Horizon 2020" is an investment instrument, an excellent flagship initiative that supports EU competitiveness at an international level through innovation	Financing of development projects from Europe with a technological approach and high innovation potential, here the measuring of air filtering performance
Climate KIC Berlin, Germany	Europe's largest public-private network for innovations to prevent climate change, consisting of companies, institutes and the public sector	Financial support for CityTree tests and certification projects in urban environments as part of a Europe-wide funding project („Scaler Project")
ODINE Brussels, Belgium	Leading European open data incubator for supporting new digital business models of mainly younger companies	Financial support in the development of a software application (AirCare) for visualising air quality data
<b>Research laboratory   field</b>		
Fiatic Mainleus, Germany	Laboratory specialising in air filter inspections and the development of international inspection standards for air filtering	Execution and analysis of comprehensive measurements with regard to the particulate matter filter performance of various types of moss
Institute of Air Handling and Refrigeration Dresden, Germany	Expert contact for research and development questions in the fields of air handling and refrigeration and their areas of application	Execution, analysis and documentation of laboratory tests to measure the filter capacity of mosses with regard to nitrogen oxides
TROPOS Leipzig, Germany	Leading institute for interdisciplinary and application-oriented basic research into the relationships between health and climate	Execution, analysis and documentation of measurements of the particulate matter filter performance of the CityTree under real test conditions
Karlsruher Institut of Technology Karlsruhe, Germany	Internationally leading scientific institution for basic research in the context of society and environment	Development, execution and analysis of test procedures for measuring the CityTree's take-up of nitrogen dioxide in a real-life environment
<b>Measurements &amp; simulations</b>		
Grimm Aerosol Technic GmbH Ainring, Germany	World leader in the development and manufacture of high-precision optical particulate matter measuring devices including cutting-edge software applications	Delivery and implementation of high-tech measuring devices for the precise measurement of the particulate matter filtering performance of mosses
Max Planck Institute for Chemistry Mainz, Germany	Aims to convey an integrated understanding of the chemical processes in the earth system from the molecular to the global scale	Use of the "particle loss calculator" developed by the Institute to meet complex test requirements for measuring the CityTree's environmental performance
ENVI MET Essen, Germany	Developer of software to simulate micro-climates and measure the effects of sustainable measures based on objective scientific methods	Simulations to determine the most effective locations for CityTrees and their potential effect on the environment in the immediate surrounding area
<b>Certification</b>		
TÜV Nord Hannover, Germany	Evaluates, inspects and certifies in safety matters in private and commercial areas, which leads to the awarding of an internationally highly regarded test seal	Creates evaluations and plans certification for testing under laboratory conditions and in the real urban environment

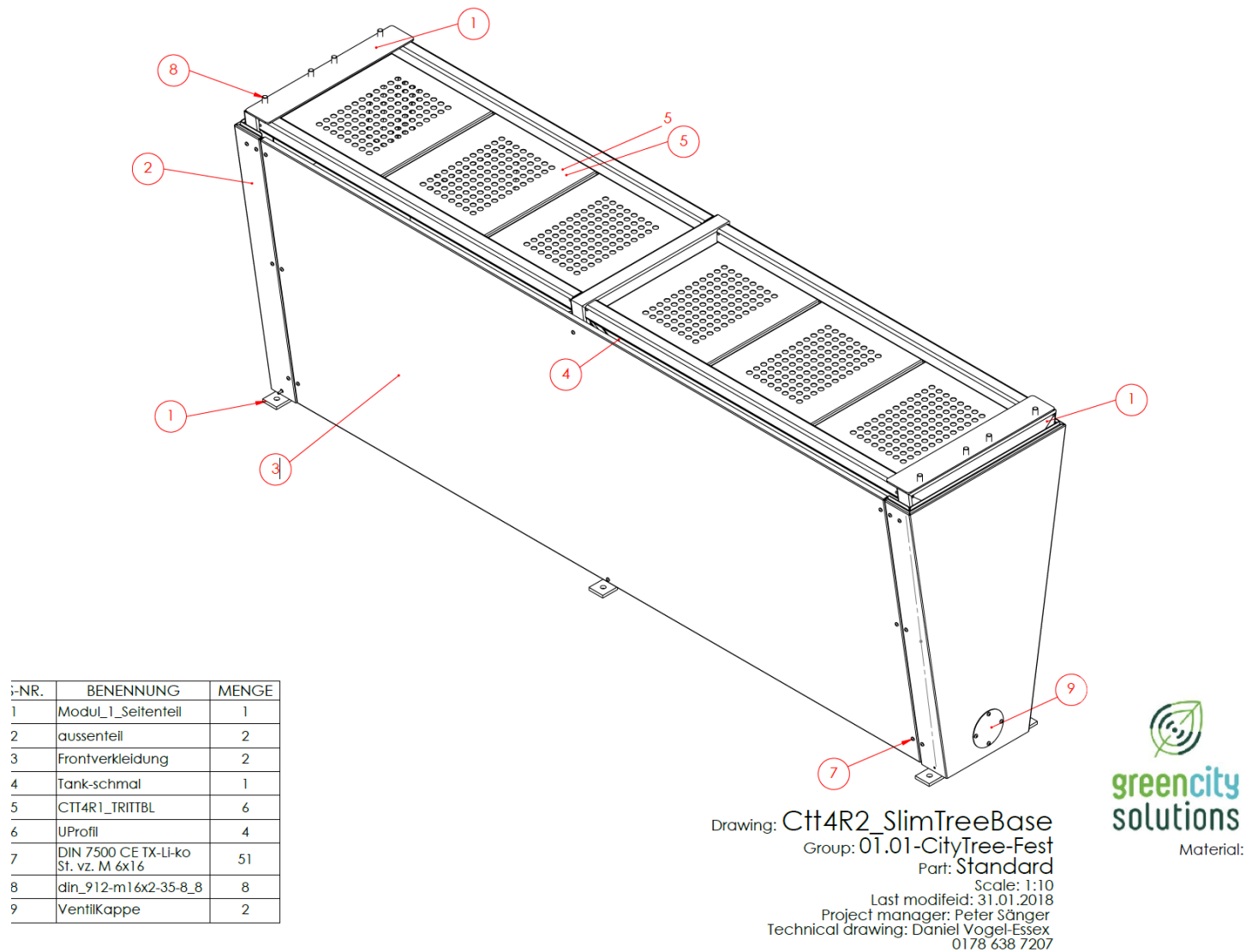


Figure 3: Lower part (Base) of CityTree Slim

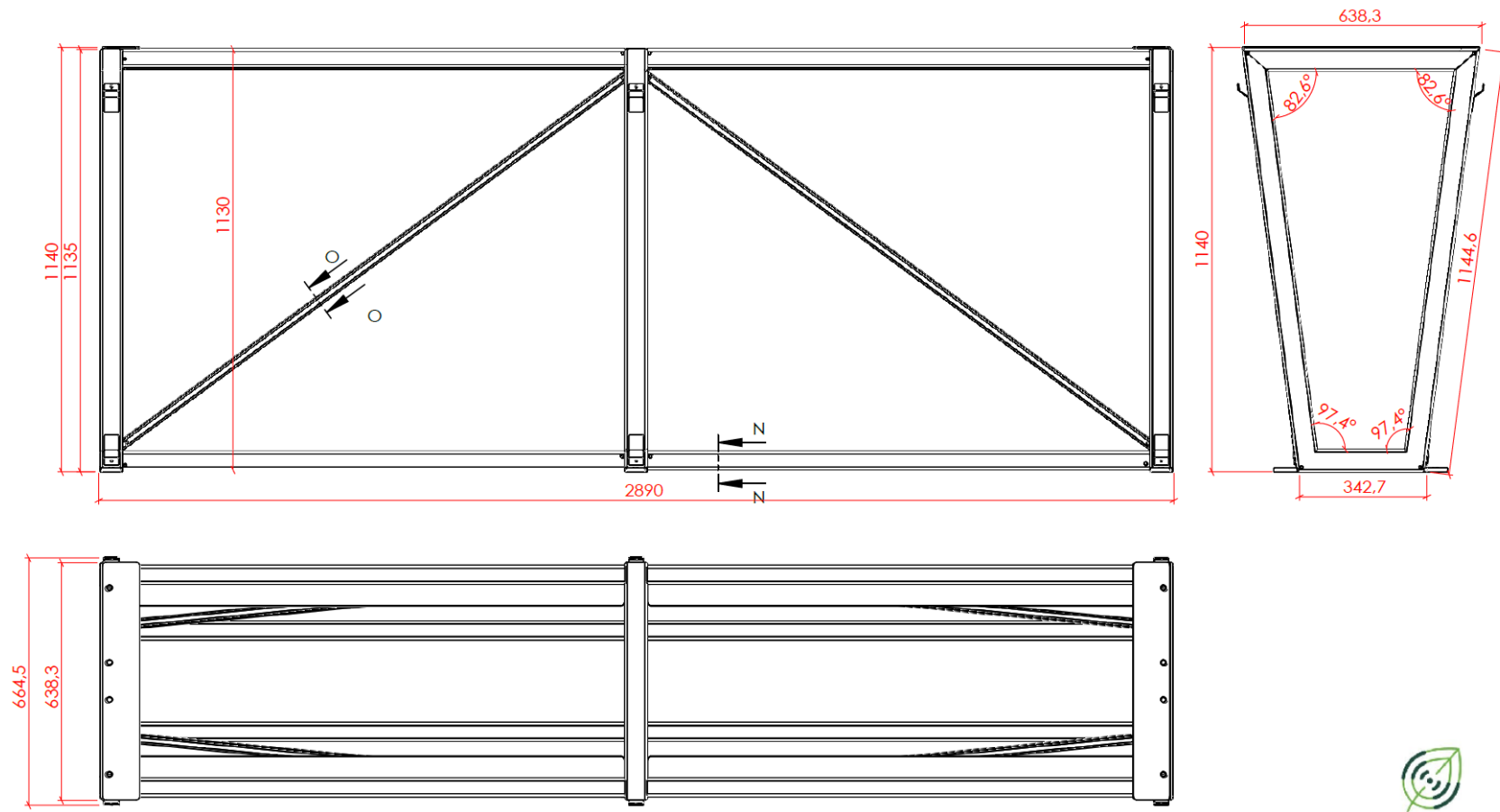


Figure 4: Measures of CityTree Slim Base





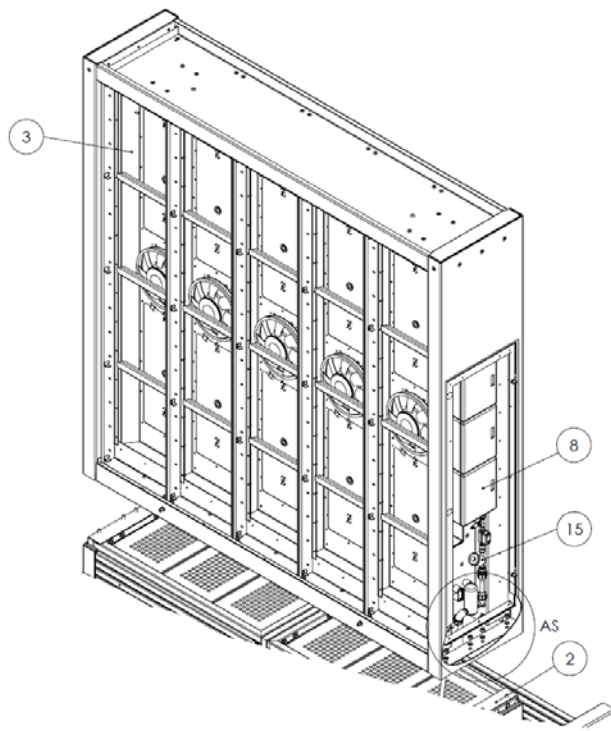


Figure 5: CityTree upper part (Top)

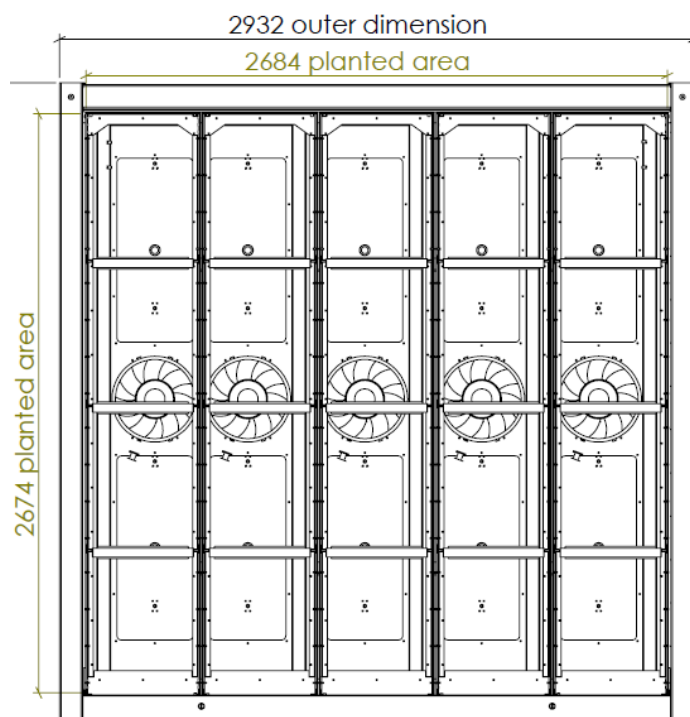


Figure 6: Measures of Top

Weight:  
approx. 1300, 00 kg

# 1) Delivery of goods from GCS

- Parts coming with MEGA trailer truck (40 tons – inner units: 13,60×2,48×3,00m)



Figure 7: Truck version

- Three (CityTree basic) to four (CityTree Slim) units/ truck



Figure 8: Loading while open ceiling

- Can be unloaded with crane, fork lift, wheel loader or wheel excavator (minimum lift height of eight meters)

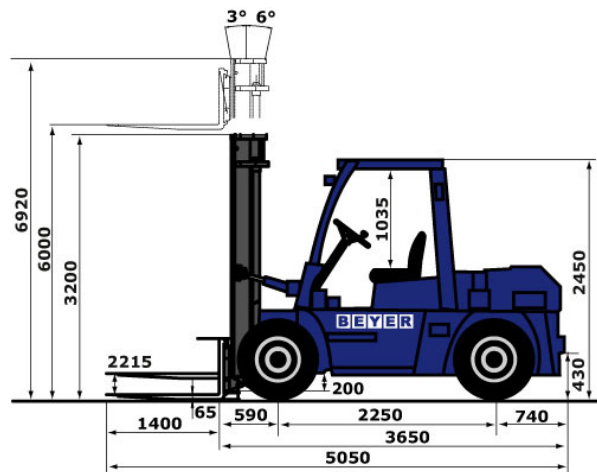


Figure 9: Fork lift ( long forks required)



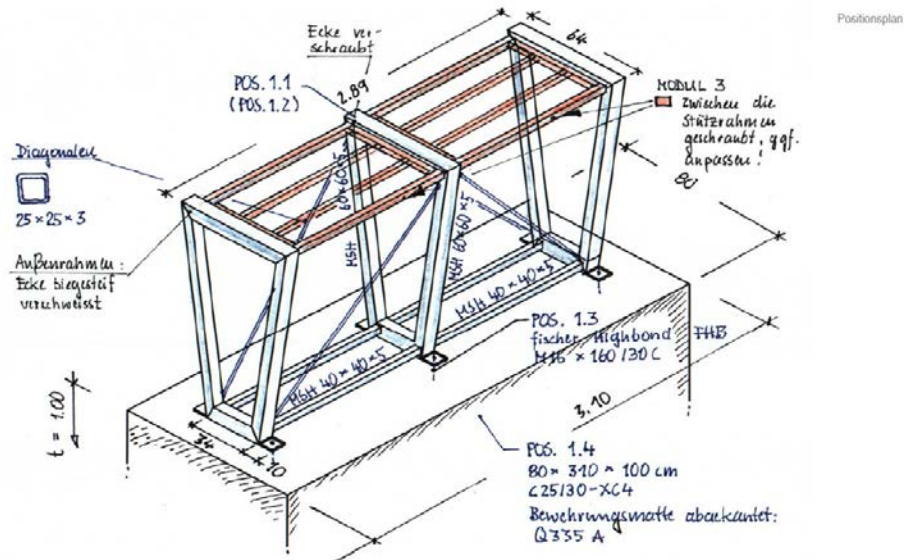
Figure 10: Truck with loading crane



Figure 11: Mobile crane



## 2) Prepare the foundations



planundbau  
Tragwerk + Statik

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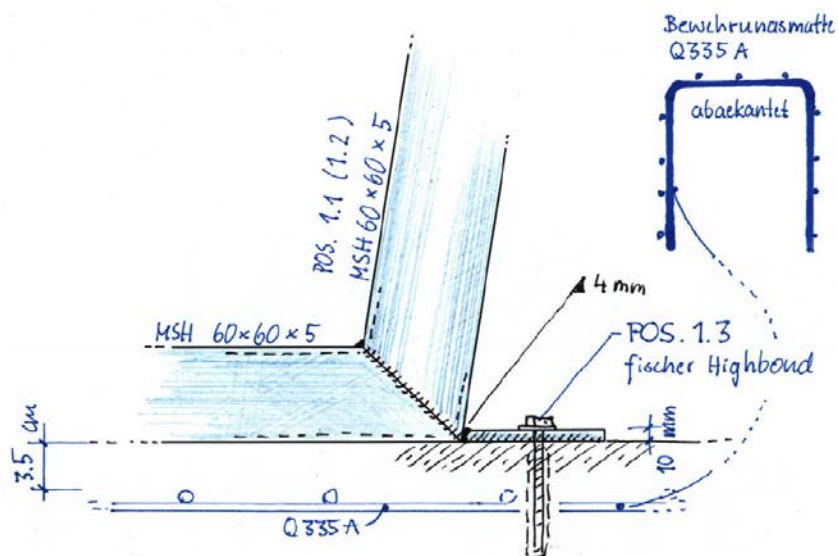


Figure 13: Fixation in ground



*Figure 14: Foundations placed in Reutlingen (D)*

### 3) Placement of the units

The same technical equipment from the unloading process can be used for the placement. It is possible that we have to use a lifting structure like in the picture below to avoid statically damage.



*Figure 15: Lifting with fork lift and special structure*



*Figure 16: Connecting top with base*



*Figure 17: Side view of installed unit (Reutlingen- Germany)*

Ask from GCS to potential installation partner:

- Agreements with the City for installing (including permits and safety regulations)
- Place eight foundations in Valkenburgerstraat
- Unload the goods delivered from GCS with required technical equipment (preferred crane)  
(2 hours per truck)
- Store the goods till installation date (max. two weeks)  
(watering the plants two times a week)
- Load and transport the goods to Valkenburgerstraat with technical equipment which fits to City limits
- Install eight units