WATER ON WORLD STAGE IN LONDON

Innovative building services systems, designed by engineering, environment and design consultancy Sweco UK Limited, have contributed to the design of Bloomberg's new European headquarters being named as the world's highest BREEAM-rated office building as Kris Wojcik, Project Engineer at Sweco reports.

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The construction industry aspires to develop buildings that use less energy and make more effective use of the world's resources. Reducing our water consumption and better overall use of water has become increasingly important as supplies become more stressed and the water industry faces a challenge in meeting future demands.

Buildings cannot be considered sustainable if they waste large quantities of potable water just for flushing toilets.

The design brief that Sweco received from Bloomberg was to make its new European headquarters in London sustainable in all aspects, including water saving. Sweco evaluated numerous well-established technologies like water recycling systems, ultra-low flush toilets and water-saving showers. Emerging or out-of-context technologies were also explored, including water desalination, black water treatment and re-use for toilet flushing, solar-powered devices, extracting water from air and vacuum drainage. The latter came out as viable and offered distinct benefits.

BREEAM EVALUATION

BREEAM is the world's leading sustainability assessment method and was developed by the Building Research Establishment (BRE) in the UK. Its evaluation range includes many elements associated with building construction and use, such as energy consumption, waste and pollution generation, ecology and water use. The water consumption credits are awarded based on a calculator, which compares a benchmark building's performance against the estimated water efficiency of the proposed building design, including its specified fittings and water saving systems. The improvement is compared with the baseline and credits awarded accordingly. Some technologies provide a greater opportunity to reduce water consumption than others and therefore perform better in water audits.

Bloomberg exterior

A combination of well-established water recycling systems and innovative vacuum toilets were selected for the Bloomberg building. Harvested rainwater, together with water recycled from cooling tower bleed-off and grey water recovered from basins and showers, is recycled and treated to flush vacuum toilets.

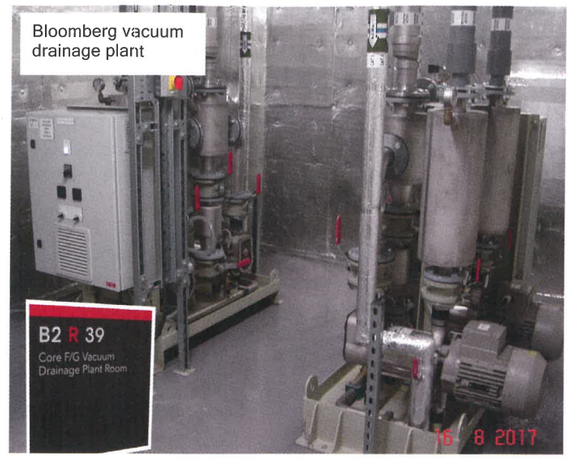
VACUUM TOILETS

Before the vacuum system was selected, many aspects of the delivery were considered including the WC pan range, which is limited when compared to those available for traditional gravity drainage. The Norwegian manufacturer, JETS, expressed willingness to collaborate with the design team on WC pan design development and selection.

Vacuum toilets are common on trains, aeroplanes and ships etc, but in order to understand how this pioneering solution would perform in a project-specific setting, a mock-up installation with multiple toilet cubicles was set up in a London warehouse. Collaboration with the manufacturer and its representative (Otter Vacuum) at an early stage allowed the design team to experiment with a prototype noise-reducing device. As a result, a silencer device was developed and featured in the final installation.

The mock-up installation also played a key role in spatial coordination, which resulted in an optimised arrangement and satisfactory maintenance access.

The design and 3D modelling of the vacuum drainage system involved some adjustments to accommodate different design parameters when compared to the traditional gravity approach. The limitations of gravity drainage systems no longer apply, allowing a more flexible approach to be adopted including multiple up and down routing and smaller pipe diameters. As the position of appliances is no longer dictated by the distance from the stack, the number of vertical stacks and slab penetrations can also be significantly reduced. That additional flexibility proved to have major benefits when coordinating competing services in a highly serviced environment.



Bloomberg vacuum drainage plant

Working with small diameter pipework was an added benefit and a lightweight push-fit stainless steel pipework system was selected for robustness and ease of installation.

The Bloomberg building contains more than 500 toilets and urinals, served by multiple vacuum generation stations. To increase the general system resilience, some strategically located disabled toilets are connected to a separate gravity drainage system.

Due to the nature of the vacuum system operation, odours are drawn into the drainage system which provides a supplementary air extract system while the risk of flush water atomisation is greatly reduced, providing positive health benefits.

Vacuum toilets use less than one litre of water per flush against 4.5 or six litres used for traditional toilets. The overall water conservation systems implemented in Bloomberg's London office will save 25 million litres of water in the first year of operation, with a net zero mains water usage for toilet flushing. This solution attracted additional BREEAM credits for innovation.

Bloomberg toilet mockup

OUTSTANDING

Bloomberg's new European headquarters has been rated as Outstanding under BREEAM UK New Construction 2014: Offices (Fully Fitted). A credit score of 98.5 percent was awarded. This is the highest score achieved at design stage by any major office development globally.

Alan Yates, Technical Director of BRE Global's Sustainability Group said: "What sets the Bloomberg building apart is its relentless focus on innovation and its holistic, integrated approach to sustainable construction and design. Projects like these are really important in giving confidence to the industry to experiment."

INTERESTING FACTS

- Bespoke integrated ceiling panels combine heating, cooling, lighting and acoustic functions in an innovative petal-leaf design. The system with 500,000 LED lights, uses 40 percent less energy than a typical fluorescent office lighting system.
- Rainwater from the roof, cooling tower bleed-off water and grey water from basins and showers, is captured, treated and re-used to flush vacuum toilets.
- Natural ventilation: When ambient weather conditions are temperate, the building's bronze blades can open and close, allowing the building to operate in a 'breathable' natural ventilation mode, reducing mechanical ventilation and cooling equipment energy consumption.
- Smart CO_2-sensing controls allow air to be distributed according to the approximate number of people occupying each zone of the building at any given time. The ability to dynamically adjust airflow in response to occupancy patterns is expected to reduce CO_2 emissions by approximately 300 metric tonnes each year.
- On-site combined heat and power (CHP) generation centre supplies heat and power in a single, efficient system with reduced carbon emissions. Waste heat generated from this process is recycled for cooling and heating and is expected to save 500-750 metric tonnes of CO_2 each year.