



## Sustainability Case Study Professional Standards Bentley Works, Doncaster, South Yorkshire, UK

### ‘Deep Green’ facilities: creating a new standard

- > 7.5 ha site for engineering, manufacturing & servicing redeveloped into state-of-the-art facility
- > Designed to promote environmental and financial savings throughout lifespan
- > Net zero primary energy, zero waste, zero hazardous materials and net zero water

#### Key Facts

- Use: Commercial
- Total NLA: 5047 m<sup>2</sup>
- Office 1800 m<sup>2</sup>
- Fabrication & workshops 3135 m<sup>2</sup>
- Paint shop 112 m<sup>2</sup>
- Levels: 2

#### Time Frame

- Construction: 2013 - 2015

#### Main stakeholders

- Skanska

### Introduction: Skanska’s most sustainable factory in the UK

Skanska’s engineering and manufacturing workshops at Bentley Works at Doncaster in South Yorkshire have been used for over a century as a regional hub for northern England. The facilities include engineering, manufacturing and servicing and provide a huge range of manufacturing and maintenance services using specialist equipment and precision tooling.

Being over a century in its designated use Skanska decided to redevelop the facility for a total amount of USD 18 million following strict requirements to turn it into the most sustainable factory site of the Skanska Group in the UK.

The Swedish developer used its own expertise in the fields of foundation, isolation, mechanisation and electric devices. The result is an energy neutral operating factory using, amongst others, solar panels and a biomass plant.



### Background: ‘Deep Green’ facilities

Skanska used the redevelopment of the Bentley Works to set the standard for future undertakings. An internal rating system called ‘The Color Palette’ was developed and implemented to ensure projects goals were being achieved. The highest level of the Color Palette is Deep Green, where at least three of the six objectives had to be achieved.

#### Deep Green criteria

(must achieve minimum 3 of 6)

- ✓ Net zero primary energy
- ✓ Zero waste
- Zero unsustainable materials
- ✓ Zero hazardous materials
- Near zero embodied carbon
- ✓ Net zero water

### Project’s Carbon Footprint

Embodied carbon emissions	<b>3229 tCO<sub>2</sub>e</b>
- Building materials	<b>3082 tCO<sub>2</sub>e</b>
- Fuel	<b>141 tCO<sub>2</sub>e</b>
- Electricity	<b>6 tCO<sub>2</sub>e</b>



## Challenge: Flood risk

Bentley Works lies in an environment that had previously been significantly damaged by flooding, placing the focus of the project on minimising flood risks by: landscaping surrounding area, green roofing and creating a grass swale to reduce surface runoff and increase rainwater infiltration.

## Solution: Achieving Deep Green via unique combination of latest technologies

To set the standard for future redevelopments, Skanska made use of its own in-house expertise in mechanisation and construction.

### Net zero primary energy

- Well-insulated building envelopes
- Concrete building structures designed to stabilise internal temperatures
- High performance windows to minimise heat loss, solar shading to reduce cooling
- Evaporative cooling system for workshop with roof fans to blow air onto moist pads
- Ventilation optimised by variable speed

- drives, heat recovery units and demand control via occupancy sensors and carbon dioxide detection
- Installation of a biomass-fuelled district heating system for heating and hot water
- Photoelectric dimming in workshop and occupancy sensors to optimise lighting
- Solar photovoltaic system and two biomass boilers generate on-site energy.

### Zero waste

- Reducing waste generation through off site modular construction
- Off site manufacturing of workshop steel and cladding
- Reuse of piling matt (workshop / office), and refurbishment of paint shop
- No toxic substances were used during redevelopment and no demolition waste ended in landfill

### Zero hazardous materials

- Sole usage of non-toxic substances, natural materials, environmentally certified materials and materials with recycled content
- Replacing PVC flooring with linoleum flooring made from natural pulp
- Sourcing all main construction materials from ISO 14001 suppliers

### Net zero water

- Rainwater harvesting system for toilet flushing, evaporative cooling and jet wash
- Low-flow taps and dual flush toilets
- Harvesting and reuse of water used in the equipment wash areas

**70%**

less water consumption compared to industry benchmark

**41.5/47.0**

kWh/m<sup>2</sup> annually for workshop & office efficiency

**67%**

above UK building regulations

**2.5**

m<sup>3</sup>/hr/m<sup>2</sup> air leakage

**75%**

lower than UK building regulations

**70%**

less energy consumption via evaporative cooling systems to avoid mechanical cooling

## Outcome: Outperforms UK building standards

Skanska's pioneering engineering and combinations of latest technologies resulted in the most sustainable facilities of the Skanska group in the UK.

## Awards and Certifications

### Awards

- Pre-Construction Considerate Constructors Award - Public open discussions with local stakeholders prior construction
- Runners Up Award 2014 in the Considerate Constructors Scheme Site Hoarding Competition - Following an open day at a local primary school

### Certifications

- BREEAM Excellent - Office building
- BREEAM Outstanding - Workshop