The Crystal: one of the most sustainable buildings in the world
What is the Crystal?

The Crystal is an independent global hub for debate on sustainable urban living and development. It hosts the world’s largest exhibition on the future of cities and is the first building in the world to reach both BREEAM® Outstanding and LEED® Platinum status. Sophisticated and integrated active and passive design elements make it one of the most sustainable buildings in the world.
An intelligent building

The Crystal Building Energy Management System is produced by Siemens and controls all electrical and mechanical systems in the building. Information from an outdoor weather station supplements over 3,500 data points within the Crystal. Connected systems include:

- Heating, air-conditioning and ventilation systems
- Weather station
- Lighting controls
- Ground source heat pump
- Solar thermal hot water system
- Black and rainwater systems
- Fire alarm and evacuation systems
- Photovoltaic system

3,500 DATA POINTS
Ground source heat pumps supply virtually all of the building’s heating and most of its cooling. The system works by pumping water through a pipe that loops deep into the ground. There are 199 pipes at the Crystal totaling 17km in length and reaching as deep as 150m.

Two ground source heat pumps then create hot and chilled water and pump it to underfloor pipes for heating or chilled beams for cooling. Cold water is passed through a ceiling mounted beam so when the rising hot air reaches the chilled beam it cools and sinks, bringing chilled air to those below.

Energy is recovered by thermal wheels. Outgoing air passes over a heat-absorbing disc which then rotates into the incoming air stream, warming the fresh air. Around 60% of outgoing heat or cooling energy is recovered.

By using 100% natural heat sources, the Crystal receives no heating bill.
Light and ventilation

The Crystal’s self shading facades use high performance solar glass which allows around 70% of visible light through each window but only about 30% of the solar energy. The glass has three layers and an Argon cavity.

Almost every space in the building has access to natural daylight, meaning minimal artificial light is needed.

The lighting system in the Crystal uses a combination of 65% fluorescent lights and 35% LED lights along with an advanced control system produced by Siemens which automatically adjusts every individual lamp to provide comfortable brightness levels without wasting electricity. Daylight and presence detectors will dim the electric lighting or turn it off when it is not needed.

The Crystal Building Energy Management System senses indoor and outdoor conditions and then controls the most suitable, energy-efficient ventilation mode for each part of the building. At moderate temperatures, natural ventilation is used and the windows open automatically. At low or high temperatures the windows close and a mechanical ventilation system takes over. Natural ventilation can also be used during night time, reducing the cooling demand during the following day.
Rainwater is collected directly from the building’s roof and stored in a 30m³ underground storage tank. Water is treated using filtration and ultraviolet disinfection.

Blackwater receives the highest level of treatment when it is recycled, passing through a biological tank with two treatment zones (anoxic and aerobic) and two filters (a membrane filter and a long life carbon filter). The recycled water is used for irrigation and toilet flushing across the site. 100% of WC flushing is taken from our non-potable sources.

Around 80% of the building’s hot water is heated by a combination of solar thermal water heating from the roof and ground source heat pumps.
The Crystal is a 100% electric building, around 20% of which is generated by the 1580 m² of solar photovoltaic roof panels that cover two-thirds of the roof.

Energy use in the Crystal is monitored so extensively that every kilowatt of electricity used can be measured. This can then be compared with the performance of other buildings across the world to ensure efficiencies are maintained.

CO₂ emissions for the Siemens offices in the Crystal are around 70% lower than in comparable office buildings in the UK.
Outside the building

The Crystal has been built on a brownfield site in an historically industrial area. The ground was treated and reclaimed prior to construction.

Hard surfaces surrounding the site are made from durable, recycled materials. A green roof covering the building’s energy centre provides storm water attenuation and a habitat for a rich variety of plant and animal life.

There are standard electric car charging points on site for 12 cars and one rapid-charging unit.