SKANSKA

The Green Chain

– our philosophy on green building

The Green Chain – Entré Lindhagen

As a major construction company, Skanska has a considerable environmental responsibility. The way we build our properties makes a big difference. We work actively with environmental issues, and promote sustainable business practices. Building green is also building good business, for us and our clients.

Green construction is all about adopting a holistic view – from the choice of building materials and all the way to the management of natural resources. We call this the Green Chain. The Entré Lindhagen building is a good example of how this philosophy is turned into practice. The office building, currently being developed next to the Essingeleden motorway on the island of Kungsholmen in Stockholm, will become one of our most eco-smart projects – with a design and building philosophy based on stringent environmental requirements and a long-term perspective.

The property is being constructed to receive a Platinum environmental rating according to the LEED international certification system, and will meet EU GreenBuilding requirements. In this leaflet you can read more about the smart green solutions used in the Entré Lindhagen office building.

Green Certification

LEED – The certification requires the assessment of a structure's impact on ecosystems, its energy and water efficiency and the use of sustainable building materials, among other criteria. Innovation can give bonus points.

EU GreenBuilding – To achieve this status, the building must have an energy use that is at least 25 percent lower than the Swedish standards for a newly built property of the same type.

To read more about Skanska's environmental strategy and objectives: www.skanska.se/sustainability

En del av vårt Gröna Initiativ
SKANSKA

Entré Lindhagen – Smart and Green Throughout

Several interrelated factors help make Entré Lindhagen a sustainable building and a green workplace. At every step of the process we have chosen climate-effective solutions. The property's energy use will be at least 50 percent below applicable building standards.

Our Green Chain is to remain unbroken throughout, which is why we are in constant consultation with experts to ensure we use best-practice solutions. Just to pick one example, 100 percent of the building's energy supply will come from renewable sources.

1. The green roof absorbs water and carbon dioxide
2. Efficient ventilation, high air quality
3. Environmentally sound building process
4. 100 percent renewable energy
5. Bee hives for biodiversity
6. Energy-efficient lifts
7. Measurement and tracking of energy use
8. Energy-efficient windows
9. Energy-smart building services, including for example ventilation and lighting
10. Airy workplaces with great views and lighting that mimics daylight
11. Skanska Deep Green Cooling
12. Separation at source simplified using separate environmental rooms
13. Bioasphalt reduces carbon dioxide emissions
14. Proximity to public transport
15. Charging points for electric cars
16. High environmental rating and green certification

Taking the Future into Consideration

Skanska's properties must work alongside their environment, with no negative impact on their surroundings – either today or in the future. To accomplish this we need to make wise decisions, in order to minimize the use of primary energy and carbon dioxide emissions.

To achieve a sustainable energy consumption we need to take into account existing global energy use relationships, above all for electricity use. Sweden is part of the European energy market. How we meet our energy demands has consequences that reach far beyond our borders. Analyzing how these relationships work and the impact of our decisions is a challenge. This is why Skanska continuously cultivates its capacity to make smart climate choices, through business intelligence, the development of competencies, and international collaborations. Arguably, regardless of whether carbon dioxide emissions are caused by a building within the immediate environment or by a coal-fired power station somewhere in Europe, it is our shared climate that is affected.

Two Key Concepts

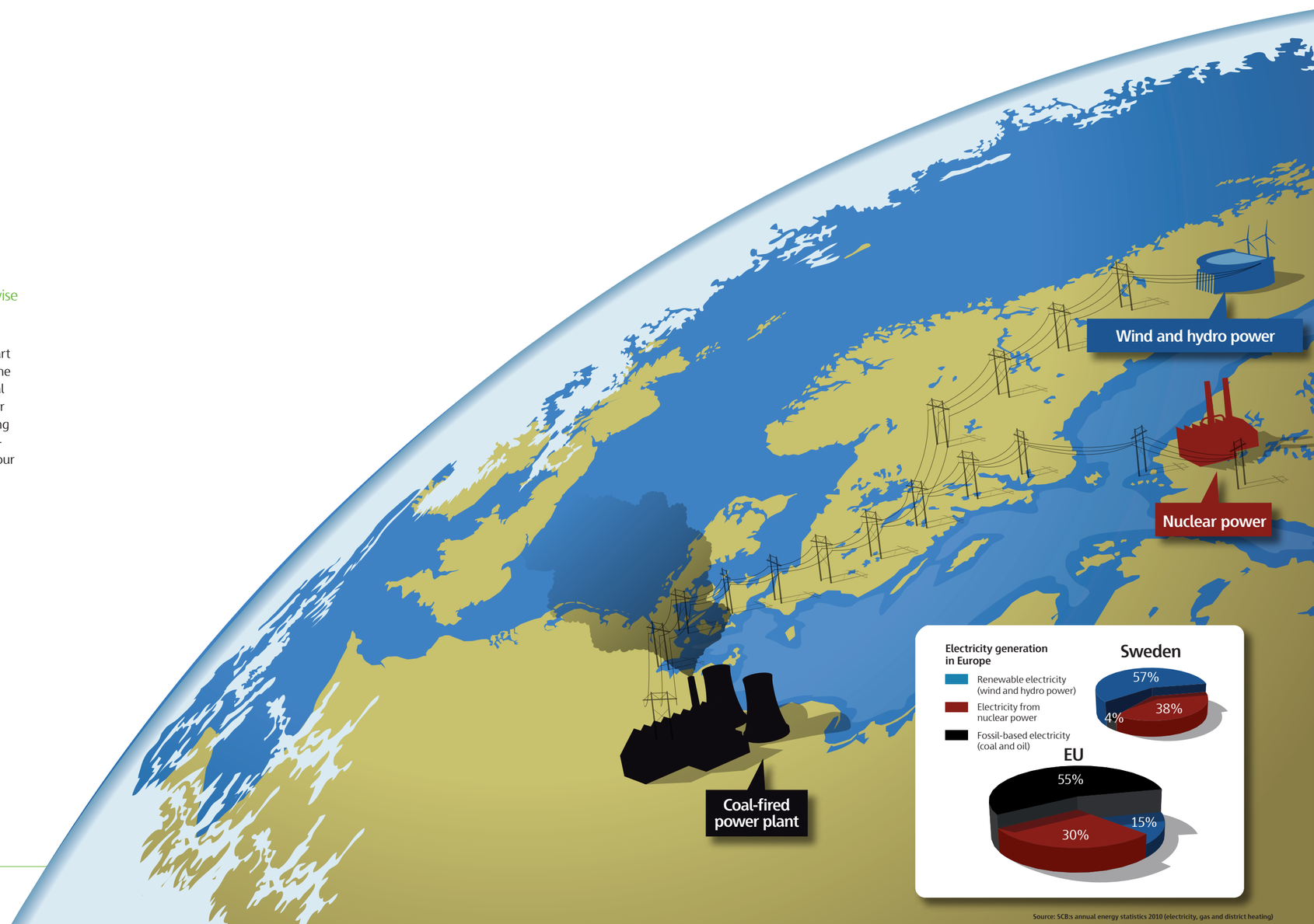
Primary Energy – The concept describes the total amount of resources (for example nuclear fuel, coal and oil) used to produce electricity and district heating for our buildings.
Sustainable Energy Use – Choices that mean we use as little primary energy as possible, reducing our burden on the world's resources.

Green Electricity – a Scarce Commodity

Swedish electricity generation is primarily based on hydroelectric, wind and nuclear power, but this carbon-neutral production of electricity is not adequate. When purchasing more energy it is above all the use of coal that increases. The reason is that Sweden is part of the European energy industry, which uses a large amount of fossil fuels.

Global Electricity Networks

Electricity is distributed between countries through interconnected electricity networks. While Sweden's production of electricity is environmentally friendly, we are still affected by the way that electricity is generated in the rest of Europe. This is why reducing electricity is always justified; every time we save electricity carbon dioxide emissions decrease somewhere in Europe.



Source: SCB:s annual energy statistics 2010 (electricity, gas and district heating)

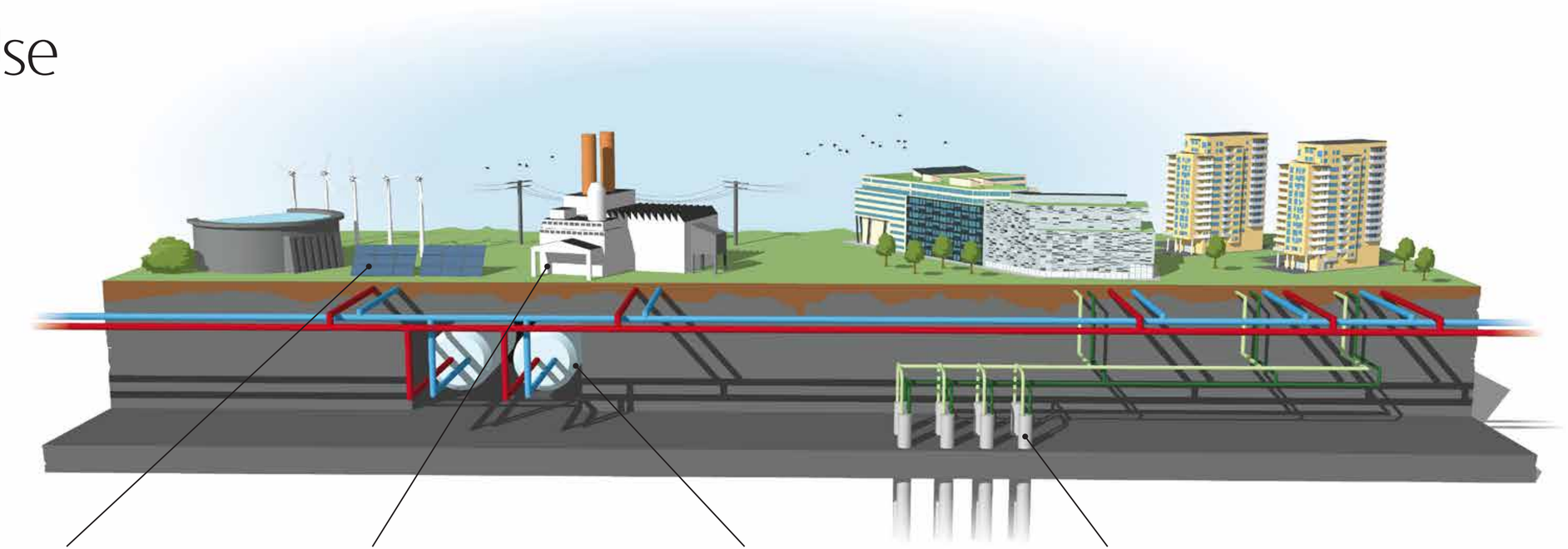
Efficient Energy Use

In order for Entré Lindhagen to form a sustainable link in the Green Chain, we need to make sure that all energy is used as moderately and efficiently as possible. We need to think holistically, taking into account both supply and utilisation, as well as the degree of efficiency throughout the system.

By taking into consideration the primary energy chain from start to finish, we can avoid solutions that appear energy efficient but are not. By calculating all energy flows, from energy source to radiator, we get a better understanding of the efficiency of the resources we consume. This makes it possible to detect, for instance, that a small amount of purchased energy does not necessarily equal a small amount of primary energy or carbon dioxide emissions.

For the Entré Lindhagen building, efficient energy use means that we recycle cogenerated waste heat. We collect summer heat in our seasonal thermal stores and use it in the winter to pre-heat ventilation air; cold from the ground is used to cool the building in the summer. This results in a high degree of energy efficiency. In addition, electricity use is reduced, releasing electricity for other uses.

Furthermore, the infrastructure of Stockholm makes it possible to implement shared energy solutions, providing effective joint use. A district-wide heating network covering an entire urban area is both more cost effective and more environmentally friendly than local heating boilers. This method also makes it possible to use a variety of fuels and take advantage of energy such as waste heat.



Skanska Deep Green Power: The goal is a 100 percent renewable energy supply for Entré Lindhagen. Linking wind power shares to the property allows for electricity to be supplied through the power grid, regardless of where the wind power is generated. Using seasonal thermal stores for solar heat also secures a long-term renewable energy supply.

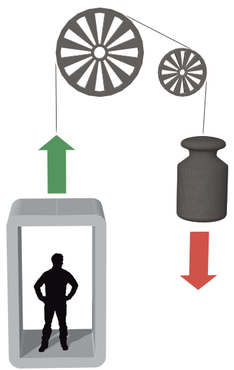
The Cogeneration Plant produces electricity and heat in parallel. Using a high proportion of environmentally-friendly fuel, waste heat is reused as district heating for the Entré Lindhagen building. As waste heat is utilised, the efficiency of the energy supplied is around 85 percent. In the rest of Europe, waste heat is not normally used, with a resulting efficiency of approximately 40 percent.

Skanska Deep Green Heating: Seasonal thermal stores for solar heat are needed if solar energy is to have an environmental benefit in the urban environment. Stored heat from the summer can be used when it is needed most. During the summer months, the incineration of refuse is more than sufficient to supply the district heating system with waste heat. Today the technology is available to construct large, shared seasonal thermal stores that can retain heat for a very long time. Remaining issues are strictly to do with business development, for which Skanska is examining alternative solutions in partnership with the Swedish Royal Institute of Technology in Stockholm, Göteborg University, Fortum, and other property owners.

Skanska Deep Green Cooling makes Entré Lindhagen self-sufficient in cooling, and also provides some of the heat demand for the ventilation system. The system holds enough capacity to contribute heat to the ventilation systems of residential buildings in the vicinity.

Multiple Green Solutions

Our objective is to make future building projects that will have zero environmental impact. The Entré Lindhagen building is set to become one of the most sustainable office buildings in the Nordic region – a giant leap forward in our green endeavours. Here are some of the building's smart climate solutions.



Energy-Efficient Lifts

The lifts have a regenerative drive system. The system takes advantage of the braking energy of the lifts and transfers it to the building's energy network. The lifts are also equipped with a destination control system, which reduces the number of stops and streamlines lift traffic. The result is a lift solution that is up to 75 percent more energy efficient than conventional systems.

Eco Cars and Cycling is Encouraged

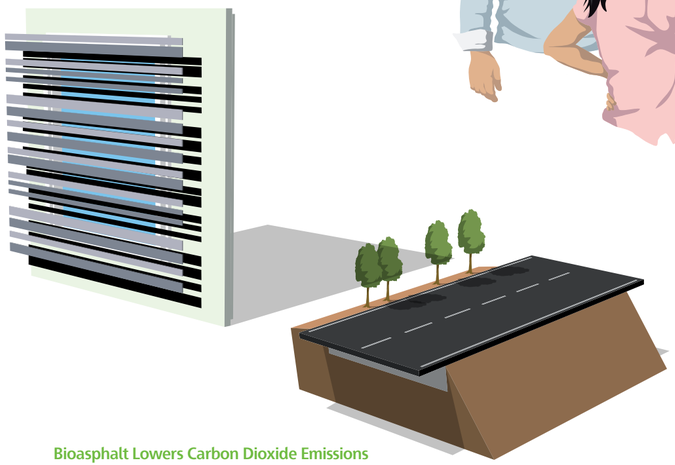
A cycle garage with changing rooms and showers makes it easier for people who cycle or walk to work. Drivers of electric cars are provided with built-in charging points in the garage. The best parking spaces are allotted to eco cars.

Water-Absorbing Sedum Roof

The roof is covered with a sedum carpet that collects rain water while absorbing carbon dioxide. These plants provide great insulation and contribute to biodiversity.

Cladding for a Better Indoor Climate

The outside wall facing the Essingeleden and the Lindhagensgatan will be fitted with an integrated aluminium screen. The effect of this reduces unwanted heat absorption, while still allowing for the admission of light and a view from inside – a functional solution with zero energy consumption.



Better Monitoring Reduces Energy Use

It is possible to measure and follow up energy use in detail. Using the right information and a better understanding of environmental measures, energy use can be reduced. Skanska is relentless in developing ways of reducing its environmental impact, and happy to share our experience. Do not hesitate to contact us to discuss different types of environmental measures and what you can do to raise the environmental awareness among your colleagues.

Bioasphalt Lowers Carbon Dioxide Emissions

Green asphalt is as black as regular asphalt. The major difference is the radically reduced carbon dioxide emissions in production. By using asphalt manufactured with biofuels, climate impact is reduced by 65 percent. Other measures to minimise emissions when laying down asphalt include reclaiming the asphalt and optimizing its surface.

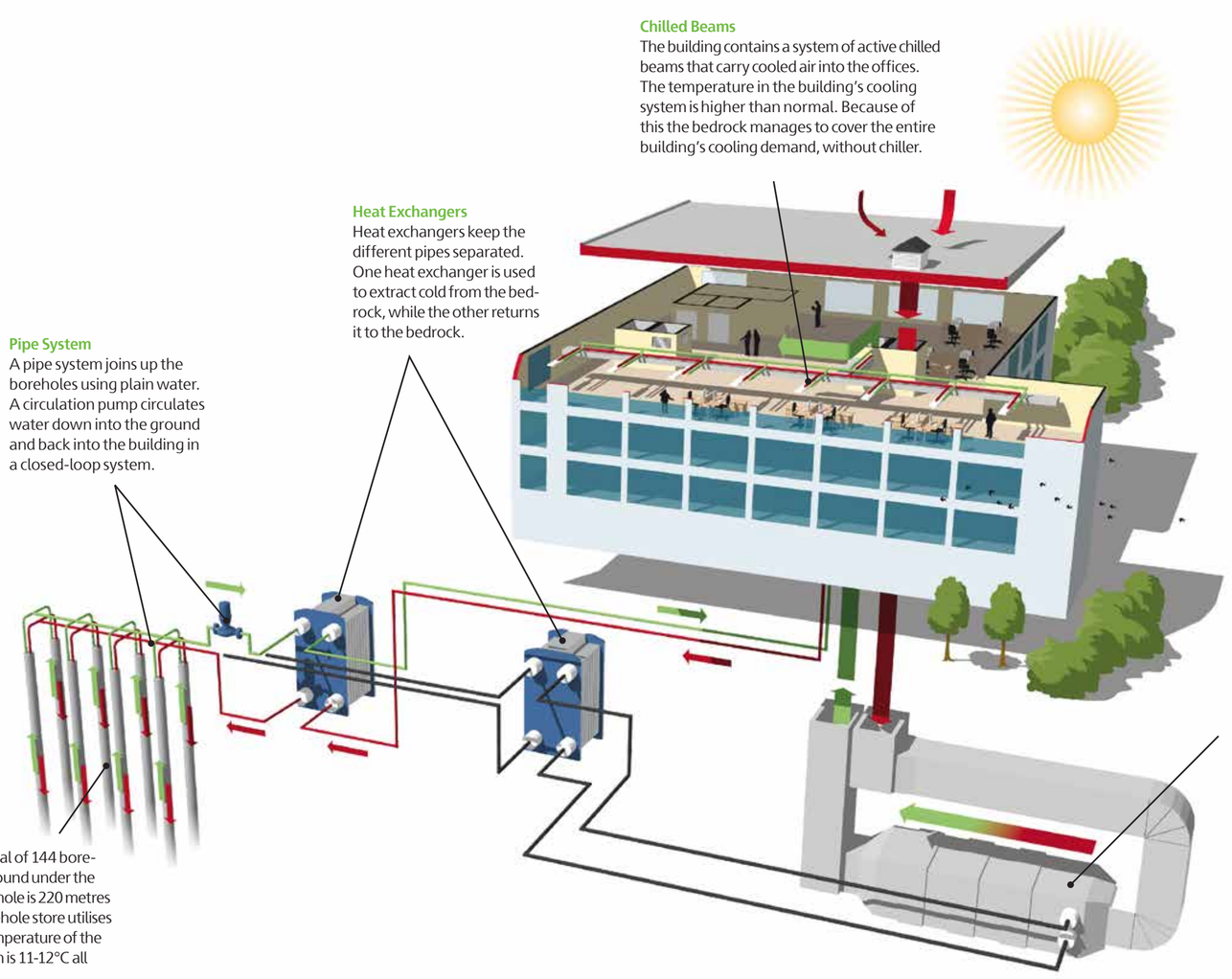
Beehives on the Roof

Putting beehives on the roof helps increase pollination and biodiversity. Bees are highly important to our survival; 76 percent of all that we eat in the EU is pollinated by honeybees. In recent years an alarming number of bee colonies have disappeared or died.

The Right Indoor Climate Using Deep Green Cooling

Skanska's "Deep Green Cooling" solution makes the Entré Lindhagen building self-sufficient when it comes to cooling. The system is based on storing heat from the summer until winter and use cold from the winter in summer.

The innovative technology resembles a ground source heat pump, but on a much larger scale. A number of boreholes connect into a borehole store that utilises the natural temperature of the bedrock. In summer, the bedrock covers the entire building's cooling demand. In winter, when the building needs to be heated, the bedrock heat contributes to its heating. This cools the bedrock down to its normal temperature. The following summer the stored cold is retrieved again, in a repetition of the process. In this way the energy is reused several times. This climate control system not only conserves energy but also replaces installations that require electricity, such as chillers and heat pumps. The system also covers to an extent the heat demand of the ventilation system, with the remaining heat demand being covered in the traditional way using district heating produced by environmentally-friendly waste heat.



Ventilation for a Healthier Workplace

The energy-efficient ventilation system in the Entré Lindhagen building results in an even indoor climate and a draught-free environment. In addition, the good airflow contributes to a decrease in sick leave and better performance at work.

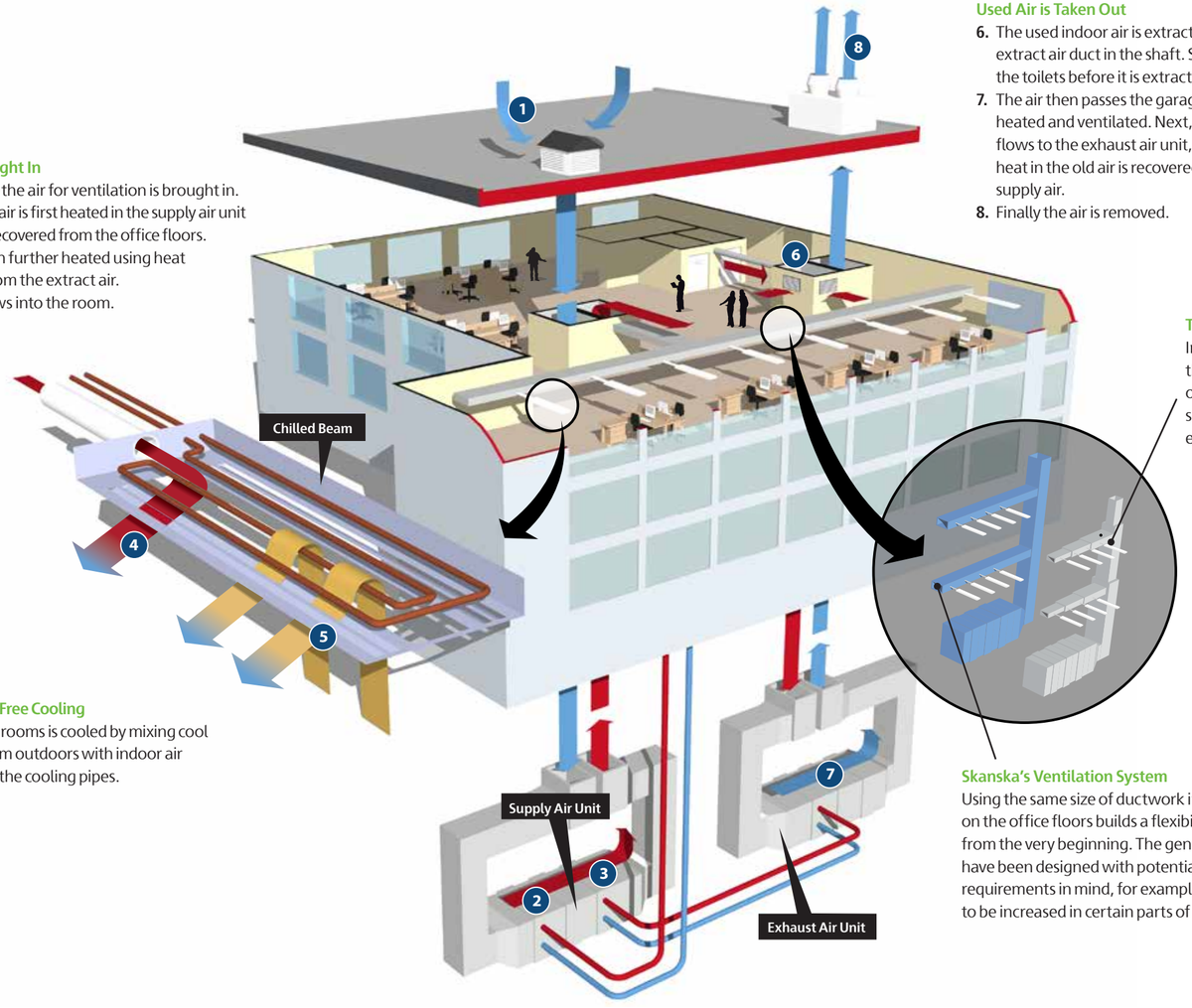
The ventilation system uses only a quarter of the energy of traditional systems. The air is distributed throughout the building using large low-speed (1.0 m/s) air handling units and evenly-sized ventilation ducts, which reduce the need for large, energy-hungry fan motors.

New Air is Brought In

1. This is where the air for ventilation is brought in.
2. The outdoor air is first heated in the supply air unit by the heat recovered from the office floors.
3. The air is then further heated using heat recovered from the extract air.
4. Clean air flows into the room.

Preheating and Free Cooling

5. The air in the rooms is cooled by mixing cool supply air from outdoors with indoor air flowing past the cooling pipes.



Used Air is Taken Out

6. The used indoor air is extracted through an extract air duct in the shaft. Some air passes the toilets before it is extracted.
7. The air then passes the garage, which is heated and ventilated. Next, the air flows to the exhaust air unit, where the heat in the old air is recovered to heat the supply air.
8. Finally the air is removed.

Traditional Ventilation Systems

In a traditional ventilation system the ducts become more narrow as one passes further into the office space. This considerably reduces its efficiency and flexibility.

Skanska's Ventilation System

Using the same size of ductwork in the shafts and on the office floors builds a flexibility into the system from the very beginning. The generously-sized ducts have been designed with potential future ventilation requirements in mind, for example if the airflow needs to be increased in certain parts of the premises.

Lighting That Mimics Daylight

Workplaces are provided with modern lighting that meets the body's biological needs much better than traditional lamps. Light that promotes wakefulness makes it easier to follow the rhythms of nature – one is energetic during the day and calmer in the evening.

Current research shows that daylight has a major effect on the body's ability to perform. We now know that daylight is beneficial for the uptake of vitamin D and for the immune system. It is also very important for the body's diurnal rhythm – the colours in the light influence the biological systems that control the body's production of hormones, including melatonin and serotonin.

It is the temperature of the colour that determines how the human eye perceives white. This is measured in degrees Kelvin (K). Lower the colour temperature of a lamp, and we start perceiving the light as being warmer and more yellow (and vice versa). A higher colour temperature produces a colder and bluer light that promotes wakefulness.

For vitality, lighting with a high colour temperature (4,000K) is being installed in all workspaces of Entré Lindhagen. Informal areas such as breakout spaces will have a more yellow light. LED is a technology often used to create a blue light. However, we have chosen instead to use normal fluorescent light tubes that are more energy efficient. Lighting will also be controlled by occupancy sensors.

There are three types of light colour:
1. Warm tone: <3,000 K
2. Blue white: 3,000–5,000 K
3. Daylight: >5,000–20,000 K

Skanska's work on environmental issues is under constant development. As an influential player within the construction market, we have a great deal of responsibility, and we are always looking for new solutions to make our buildings greener and smarter. Some solutions we develop on our own. Other challenges that are more complex and involve several different parts of society must be undertaken in consultation with other actors, including universities, energy suppliers, and other property owners.

Our objective is to construct new buildings in a way that makes the least possible impact on the environment and is economical with the world's resources – anything to protect our climate in the future.

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