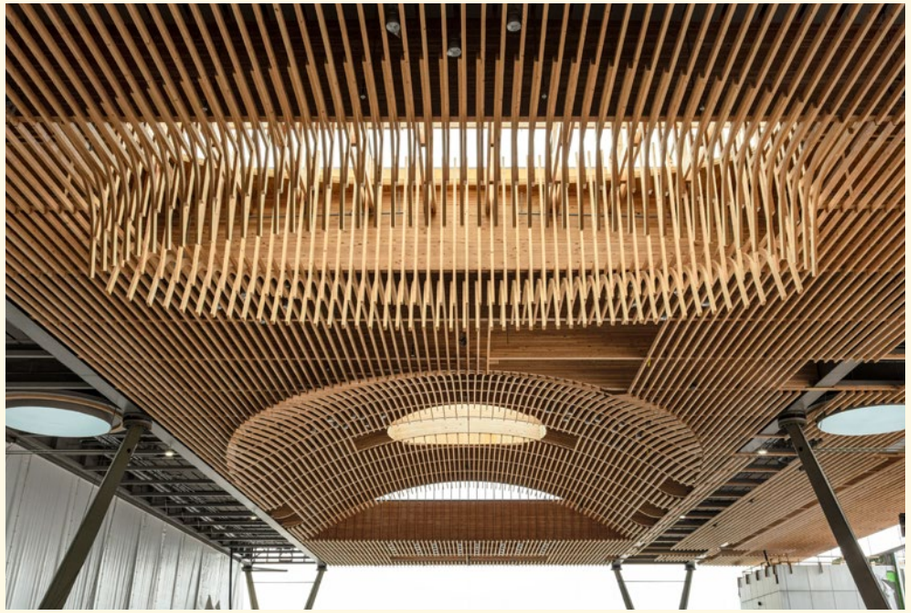
IN FOCUS Portland International Airport, Oregon, USA

A mass-timber marvel



Airports can be stressful. But travelers passing through the soon-to-be-completed Portland International Airport upgrade in Oregon, USA, can expect a different experience. An extraordinary mass-timber roof produced by a Skanska joint venture delivers a sense of tranquility using locally sourced timber.

Portland International Airport authorities had a challenge. With passenger numbers trending upwards, they needed to create more space within the airport's core for activities such as security, ticketing and retail. However, with millions of passengers passing through annually, disrupting day-to-day operations wasn't an option.

A solution came in the form of an ambitious concept to build a huge 37,000 square meter (almost 400,000 square foot) roof over the existing facilities, doubling floor space while allowing airport activities to continue uninterrupted during construction.

Early on in the timeline, a Skanska joint venture with Portland firm Hoffman was appointed general contractor/construction manager on the project, known as TCORE. Under the project model, we contributed to the discussion around roof materials and how we could carry out the extraordinary logistics operation required. The decision was taken to build the roof structure predominantly from mass timber, a material that would result in lower carbon emissions than steel and pay tribute to the timber industry around Portland.

Extraordinary structure

Under a plan devised by our joint venture, the roof was prefabricated at a site about 1.5 kilometer (one mile) away, on the far side of the runway, and transferred carefully in sections. Some 790,000 meter of timber board (2.6 million feet) was converted to glued, laminated timber products, known as glulam, which were used to create 27 meter-long curved members. These were used to form 18 roof modules, which were successfully installed over the existing airport core. This extraordinary structure is supported by 34 steel columns, with the roof designed to move in one fixed plane in the event of a major seismic event. The project has been delivered without major disruption to airport operation.

A reduction in carbon emissions was a key aspect of the approach. By limiting the use of steel only to where necessary and selecting mass timber as the principal material, the embodied carbon was reduced by 3,900 metric tons compared with calculations for an all-steel structure.

Locally sourced timber

All the timber used was sourced from either Portland's home state of Oregon or nearby Washington State. A lot of effort went into ensuring the wood used in the roof, predominantly Douglas fir, came from a diverse range of working (commercial) forests, including family-owned forests, publicly owned lands and indigenous-owned lands. Timbers from the different sources were kept separate at the sawmill so that provenance could be tracked.

We also used an innovative form of sheathing, known as mass plywood, on top of the roof. Developed in Oregon, the product is made from 2 millimeter thick veneers which are formed into 63 millimeter thick plywood panels that can be cut and shaped to fit curved surfaces.

Once we complete the final stages of the airport's new core, it won't just be the outstanding timber roof that provides travelers with a sense of calm. 'Biophilic' design features that mimic nature, such as living groves of trees, are intended to give people the feeling they are walking through a forest rather than rushing for a plane.

IN FOCUS L300: Lynnwood Link Extension, Seattle, USA

A smoother journey for commuters – and fish

Nobody likes sitting in traffic jams. In Seattle, Washington State in the USA, we're helping to deliver a light rail extension that will take cars off the road with benefits for both commuters and the environment.

When residents of urban centers on Seattle's northern fringe need to travel downtown, the trip typically involves a car journey on congested highways. Growing populations and limited public transport options mean that going to work, school, a ball game, or even the supermarket in Seattle can be a frustrating hour-long crawl in traffic.

That's all about to change when a new light rail extension, completed in part by Skanska, opens in 2024. Linking to the city's existing light rail network at the Northgate Transit Center, the project promises to deliver passengers from Lynnwood in the north to Westlake in Seattle's downtown in around 28 minutes.

We are responsible for a section of the project delivering 6 kilometers (3.8 miles) of light rail guideway that will link the cities of Shoreline, Mountlake Terrace and Lynnwood to the north of Seattle. The project, for customer Sound Transit, is known as the L300: Lynnwood Link Extension and is being delivered jointly by Skanska USA Civil and Skanska USA Building under a general contractor/construction manager model. Although we are not responsible for the overall design, the model empowered us to participate as an adviser from early in the design process.

Navigating challenges

In addition to constructing 3.7 kilometers of elevated guideway and 2.3 kilometers at ground level, we built two elevated stations and a five-story parking garage at the Lynnwood Transit Center.

Work on the L300 project commenced in 2019 and substantial completion was achieved in late 2023. The project is remarkable for the logistical challenges solved, the close collaboration with the customer and the focus on the environment. One of the biggest logistical challenges was constructing a section of the guideway over the extremely busy Interstate 5 highway running north from Seattle.

Through careful pre-planning and engineering, we were able to erect the required supporting framework over two weekend closures. Once work was completed, the framework was removed over the same period – far less time than had been allocated by the customer.

Working closely with the customer also led to many positive environmental outcomes for biodiversity. Washington State is known for its fishing and streams, but development of the road network over the years had led to many fish habitats being choked off.

Part of our remit was to rehabilitate and open waterways, and enlarge passages under the rails that allow salmon to spawn upstream.

Smaller footprint

Additionally, the customer's designer originally proposed using a temporary embankment to construct the light rail guideway through the sensitive McAleer Creek wetland. Looking to reduce impacts, we devised a soldier pile method that allowed work to be carried out efficiently with a much smaller environmental footprint.

The L300: Lynnwood Link Extension created a state-of-the-art public transit solution for the greater Puget Sound region, with collaborative construction solutions to get the job done safely, on-time and within budget.

IN FOCUS Powerhouse Lade, Trondheim, Norway

Turning homes into Powerhouses

Just 300 kilometers south of the Arctic Circle, Trondheim in Norway is at the forefront of an energy revolution. With Powerhouse Lade, we are expanding the successful Powerhouse concept into energy-positive homes.

Phase 1 of the development features 97 energy-positive apartments, which will produce more energy than they consume over their expected lifetime of 60 years. "Applying a carbon budget during construction keeps their carbon footprints to a minimum," says Kim Bundgård, Residential Project Manager with Skanska Norway.

Powerhouse began in 2011 as a collaboration between five companies including Skanska. The four Powerhouse buildings produced since then have been commercial, and include the landmark Powerhouse Brattørkaia in Trondheim. By the end of 2023, 82 percent of the apartments at Powerhouse Lade were sold, ahead of completion in spring 2024.

Careful selection of materials

The carbon budget includes emissions from materials, construction, the complex's operating life, and eventual demolition and disposal. Emissions are tied closely to energy consumption, and the project uses innovative features and approaches to reduce both.

To cut carbon in construction, less steel has been used, and roof and wall insulation has been selected to minimize the carbon footprint. Low-carbon concrete has been used throughout, including one type with emissions 60 percent lower than the Norwegian industry reference standard. Overall, the target is a 65 percent reduction in carbon emissions compared with the reference standard.

On the energy side, the complex has been designed both to generate electricity and to be as energy-efficient as possible. It uses heat pumps and energy sources including thermal wells, which extract natural thermal energy from the ground, and both solar and solar-hybrid panels. As well as generating electricity, solar-hybrid panels also warm water for use in the heating system.

The cool climate in Trondheim actually improves the utilization of solar energy, with lower temperatures increasing thermal efficiency. Most of the year, the solar panels generate electricity, with the surplus sold back to the grid. The complex is forecast to generate an excess of 5-6 kWh per square meter over a year, improving predictability in energy costs.

Optimizing every part of the system

In winter, heat is fed from the thermal wells to the heat pumps. LowEx, an innovative system stemming from Skanska-led research, provides a high-efficiency thermal energy supply. It does this by optimizing every part of the system, from the thermal wells to underfloor heating, to provide the necessary warmth using water at as low a temperature as possible. Wood flooring with lower-than-normal thermal resistance is glued to the concrete below, to allow heat to radiate more easily.

Other features encourage energy saving: an app shows residents how much they are using, while a switch near the front door turns off all lighting and sets the ventilation to minimum. A monitor at the entrance to each building also displays production and consumption levels.

Why has it taken so long to develop Powerhouse homes, when the offices have been a success for years? Because it is harder to predict how people use energy at home: how often they open the fridge, what temperature they want in the shower, whether they turn off the lights. By encouraging better use of energy, and with their energy-efficient design and features, these new Powerhouse homes set a new standard in residential development, and are guiding the way to net-zero living.

IN FOCUS Hyllie Terrass, Malmö, Sweden

Combining forces to cut climate impact

To deliver our industry-leading office building Hyllie Terrass in Sweden, we sought out individuals and businesses who shared our vision for creating more sustainable and livable commercial spaces.

How do you create one of the most sustainable office buildings in Sweden? For the Skanska team behind the Hyllie Terrass development in Malmö, a key part of the process was analyzing the materials needed for construction – and pinpointing the contributors to embodied carbon. They then sourced cost-effective, low-carbon alternatives.

The approach has paid off. The EU taxonomy-aligned development is aiming for LEED Platinum certification and has received pre-certification – and is aiming for full certification – under the Sweden Green Building Council's pioneering NollCO2 scheme. NollCO2 certification requires that the climate impact of a building's entire life cycle be accounted for and balanced with production of renewable energy over the building's lifetime.

Opened in 2023, Hyllie Terrass features 14,000 square meters (150,000 square feet) of leasable space over 12 floors. The upper levels gradually step back to create a series of attractive green terraces facing south, where tenants can relax and enjoy the view.

A standout feature of the building is the way it manages heavy rainfall. Rather than going directly to the local wastewater system, rainwater is channeled down from one terrace to the next in a series of hidden waterfalls. On the way down, it passes through biochar and vegetation, which cleanses it, before finally entering the waste system on the lowest terrace. This reduces peak flows to the wastewater system, removes impurities and provides an attractive feature for tenants and biodiversity.

Collaboration at every level

By the end of 2023, the development was 85-percent leased, with tenants including the local Skanska office.

Collaboration played a critical role in Hyllie Terrass achieving its aims. To improve energy efficiency, a key to lowering climate impact, our team worked with energy company E.ON to source 100-percent renewable energy for the building. This is supplemented by rooftop solar panels and a storage battery.

The overall design for the building was provided by Danish architecture firm Cobe, which shares our vision for developing spaces that improve lives and reduce climate impact.

After scoping out many concrete-sourcing options, we worked closely with concrete provider UPB to help them fabricate low-carbon precast concrete façade elements for the project. The foundations were created using Skanska-produced low-carbon concrete. And by replacing a high-carbon coloring agent with micro silica, we were able to significantly reduce embodied carbon in the façade.

Total carbon savings were around 3,000 metric tons, compared with the design before the many emissions-reduction measures.

We also collaborated with Swedish furniture firm Swedese and interior designer Louise Hederström to make use of on-site waste materials to produce furniture and fittings for the lobby. Waste from Swedese's furniture manufacturing business was combined with elements such as discarded protective wooden coverings and beams to create items including sofas, tables and a reception desk.

In November, Hyllie Terrass was aquired by Skanska Investment Properties, the fifth property in our growing portfolio of high-quality office properties in Sweden.