POLISH AND NORWEGIAN CITIES
together for climate and energy

FJELL KINDERGARTEN, DRAMMEN
PASSIVE HOUSE KINDERGARTEN WITH GROUND-SOURCE HEAT PUMP

Sector: Geothermal energy, energy efficiency

Timeframe: 2008 – 2010

Location: Fjell, Drammen, Norway

PROJECT BACKGROUND

Fjell kindergarten is situated on a hill near a small stand of trees, with a view over the residential area and Drammen town centre. It accommodates 80 children, with 5.1 m^2 per child. This residential area has integrational and social challenges and positive projects like this one are welcome.

PROJECT DESCRIPTION

The heating requirements of Fjell Kindergarten are reduced through a series of initiatives. The building has only a few, but large, windows. The total glass area is only 18 percent of the floor area. The exterior walls have 250 mm of insulation, with 600 mm of insulation in the roof. Cold bridges are minimised, and the house is built with a high level of airtightness (0.6 air exchanges at 50 pA pressure). The kindergarten has balanced ventilation with a highly efficient heat recovery system (annual efficiency of 83.2%). The cooling needs are reduced through, among other things, good external sun shading, with a total sun factor of 0.55. The building is equipped with central heating, a ground-source heat pump and an electric boiler for peak loads.

Prefabricated solid wood elements are used in the walls and ceiling, forming a robust and precise sandwich-building system. The load-bearing elements are insulated with mineral wool, and also function as an external cladding. The load-bearing elements are all visible internally. All surface treatments, both inside and outside, are moisture permeable, which contributes to a more stable and comfortable indoor air quality.

The ground floor slab and the foundations are mainly constructed using reinforced concrete and Leca and insulated with EPS. The interior slab towards the cellar is concrete with 300 mm insulation, underfloor heating and vinyl flooring. The group rooms have rubber flooring.

PROJECT RESULTS

Gross area: 830 m^2
Heated area: 755 m^2

Greenhouse gas calculations (tons CO2 equivalents)

	Reference	Project	Completed	Operational
Energy	40	16	–	–
Material Use	14	7	–	–
Transport	17	16	–	–

Energy label:	A
Net energy:	66 kWh/m^2/year - passive house
Estimated energy delivered:	51 kWh/m^2/year passive house
Energy sources:	Ground source heat pump (from energy wells)
Room heating:	16.6 kWh/m^2/year
Ventilation heating:	7.3 kWh/m^2/year
Domestic hot water:	10 kWh/m^2/year
Fans:	10.2 kWh/m^2/year
Pumps:	0.7 kWh/m^2/year
Lighting:	15.7 kWh/m^2/year
Technical equipment:	5.2 kWh/m^2/year
Specific fan power	1.47 kW/(m^3/s)
Heat recovery efficiency	83 %

MORE INFORMATION

FutureBuilt web site:
www.futurebuilt.no/prosjektvisning?lcid=1033&projectID=204300

In Asker and Oslo municipalities, two new plus house kindergartens are planned. These projects are not fully developed yet, lacking energy calculations. For more information, see
Asker:
www.futurebuilt.no/prosjektvisning?lcid=1033&projectID=265052
Oslo:
www.futurebuilt.no/prosjektvisning?lcid=1033&projectID=265301