

## Project information

Project type:	Eco rehabilitation
Address:	Tonstad Trondheim
End construction year:	
Building type:	Row houses
Units:	144
Floors:	2-3
Persons in building:	-
Gross area BTA:	15 212 m <sup>2</sup>
Net heated area:	n.a.
Additional cost for eco-application:	50 €/m <sup>2</sup>
Total building cost:	€/m <sup>2</sup>

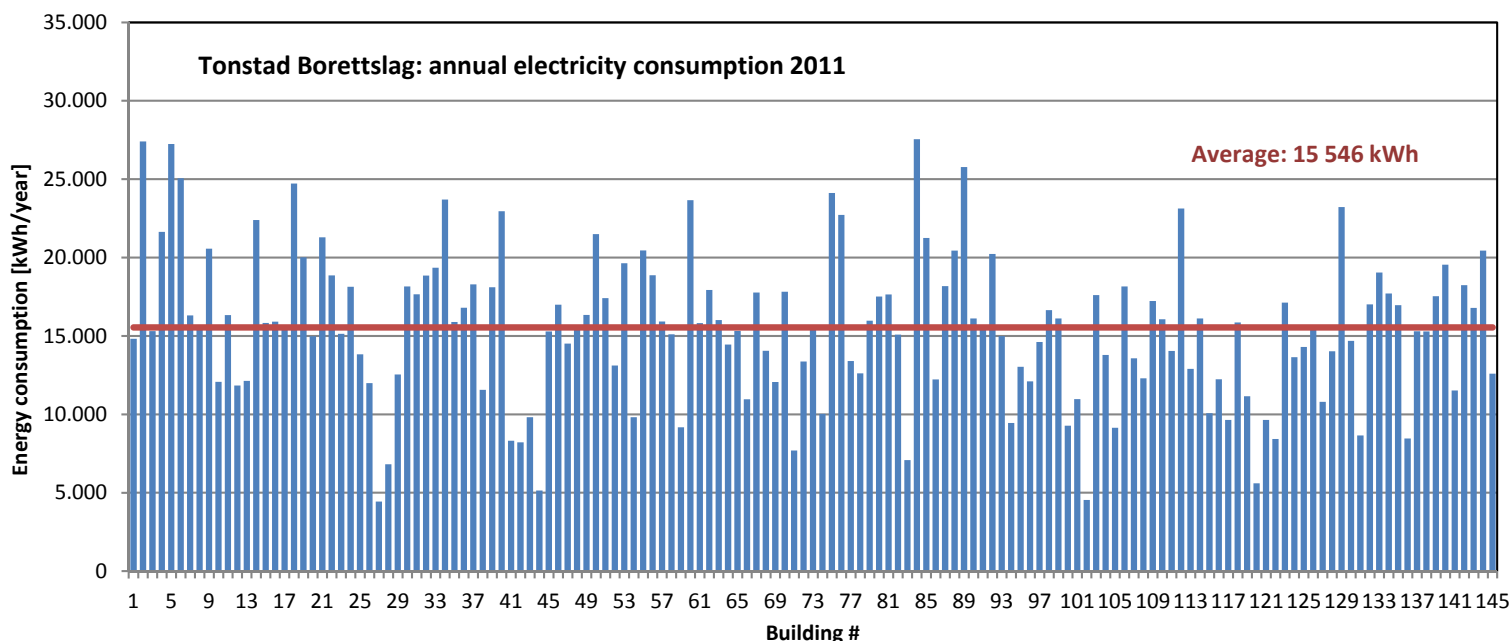


## Special ECO-technologies used:

- Wooden bindings works
- After insulation of facades, 10cm Rockwool flex wall
- Extra air sealing
- New cladding of facades
- New windows and doors, u-value 1.2
- After isolation of loft, 15 cm blowing insulation cellulose
- Isolation of thermal bridging in the transition towards basement
- Installation of balanced ventilation with individual unit per apartment.
- Flexit SL4 with rotating recovers, 83%
- Replacement of outdoor lighting to LED with sensor control



## Energy consumption



## ECO-City project partners

### What has been done:

On Tonstad has been implemented a façade rehabilitation where walls from excess foundation to roof is insulated by 10 cm compact insulation (Rockwool System Flex), and where all doors and windows have been replaced with new aluminum-clad windows with U-value of 1.2 W/m<sup>2</sup>K. In the same operation, it was added a new barge board about ensuring that we increase the density of the structure (the part we touch) possible. On the attic is added 15 cm of insulation (cellulose insulation) that is blown into to get the best degree of insulation around the ventilation ducts and against the wood trusses and similar. Beyond this, it is mounted balanced ventilation per unit to ensure both adequate supply of houses, and we get the energy recovered from the "used" air.

### Why it has been done:

The basis for action was a combination between the wishes of residents who reported very drafty and cold house and a state review that stated windows and cladding were ripe for replacement (decay, missing feature). In view of this, TOBB engaged to conduct a pilot project with the architect where put forward suggestions as to what should be done. In parallel with this, the occupant involved in relation to the wishes they had with such a process. Based on this interaction (and three general meetings) came housings until the project was completed.

### How it was done:

Residents currently sits again with a good impression of the project, the main goal of getting a good house to live in has made it possible. Always a lot of noise around this by completing such projects in terms of completion and claims but also that we have carried out good now. Some challenges / thoughts about the results we have. Since we windproof over multiple devices will be able to measure a lot of internal air leak between devices, allowing leakage number from measurement of a device becomes higher than what is actually against an external climate. Since we do not touch the roof structure is both a challenge regarding aeration and possibly increased thermal bridges.



## Key figures

### U-values (ECO-rehab)

W/m <sup>2</sup> K	Before rehab	Concerto Specification	Actual
Facade wall	0.5	0.2	
Roof	0.4	0.35	
Ground Floor	0.4	0.4	
Window	2.8	1.1	
Glazing	2.8	1.1	
Shading			
Doors	2.8	1.1	
Infiltration (n50)	4	2.5	

### ENERGY

[kWh/m <sup>2</sup> ]	Before rehab	CONCERTO specification	Actual 2011
<b>Heat</b>	175	116	
space heating	84	49	
ventilation	46	32	
pipe loss	10	9	
DHW	35	26	
<b>Electricity</b>	56	46	160.8
lighting	25	22	
cooling	0	0	
equipment	5	4	
other	26	20	
<b>Total</b>	<b>231</b>	<b>162</b>	<b>160.8</b>

## ECO-City project partners