

## **ANNEX 5-B**

### **Case study**

# **MODULAR CONSTRUCTION OPENHOUSE**

The aim of the OpenHouse Production is to provide *Better housing for more people at a lower cost with an industrialized building process* and is a cost-effective way to build apartments with 3D-modules. The system provides an industrialised building process

## MODULAR CONSTRUCTION - OPENHOUSE



Annestad in Malmö, Sweden, is a very large development as to Swedish standards. A total of 1500 apartments will be built during a period of four years. The development is divided into medium sized 2 1/2 to 5 storey blocks. The project will be completed in 2006.

The development uses the OpenHouse system for framing and modules. The size of the apartments varies from one room plus kitchen to four rooms plus kitchen. Façade materials used in this project have been a combination of bricks, boards, insulated render and wood. Modules are positioned in an off-set configuration to create a variable façade line.

The development is a combination of rental apartments and tenant-ownership apartments. The rental cost of an apartment is approximately € 110 per m<sup>2</sup>/year.

Fully equipped modules in light gauge steel have been used and complemented at site with

roofs and facades. Initially the prefabrication rate was 40% but this will be increased by integrating facades in the modules and by using separate roof modules.

The modules use light gauge steel framing; light gauge steel profiles in combination with mineral wool and gypsum boards. Exterior walls have slotted light gauge steel studs, mineral wool and gypsum boards, providing a good thermal performance of the walls. The roof and floor of the module use light gauge steel beams, mineral wool, gypsum board and trapezoidal steel sheets. The module carries its own weight.

The OpenHouse system provides an industrialised building process and has been used in several projects. Presently a large number of small apartments for students are being planned for the Stockholm-Uppsala area.

**Application Benefits:**

- Adaptability by both flexibility and generality
- Sustainability by recycling and reuse of material, low use of materials, a generous life cycle and adaptation to local environmental conditions
- Risk minimizing by industrialization, dry construction and planning principles
- Good quality is provided by secure performance, dry construction, excellent dismantling properties, good occupational health and safety conditions
- Can be used up to eight floors with cladding and roof of the client's choice
- The largest modular housing project in Europe currently.

**Project Team:**

<b>Client:</b>	Hyreshem Malmö /OpenHouse Production
<b>Architect:</b>	Landskronagruppen /OpenHouse Production
<b>Main Contractor:</b>	OpenHouse Production
<b>Supplier of Modules:</b>	OpenHouse Production



*The façades are adapted to local conditions*



**Construction Details:**

The modules are arranged in a framing system with steel columns. The weight of overlying modules is taken in SHS columns with space 3,9 m. Each module rests on six columns.

The inner measurements of the modules are 3,6 m by up to 11 m. The modules can cantilever 1,7 m from the exterior frame column. Typical weight of a module is 5 to 8 tonnes.

The modules are constructed to transmit the horizontal loads to stabilising elements e.g. staircases using steel or concrete. The system has a possibility to build up to eight or ten storey buildings.

The modules are almost fully equipped as delivered from the production plant. At site

only some additional work is performed; connections of installations, completion of flooring and completion of insulation and boarding between modules. As for the previous buildings also facades, roofs and balconies have been constructed at site. The more recent buildings have prefabricated roof elements, and the goal is to integrate façades in the modules.