



## DANISH NATIONAL TRAINING FOR CRAFTSMEN

### 1<sup>ST</sup> MODULE

**Title:** Robotics façade 3D-robot milling of external wall insulation layer

**When:** October 2017

**Duration:** 4 hours

**Type:** Practical training at the construction site

#### **Short description of the module:**

The developed MORE-CONNECT façade prefab renovation technology in Denmark is introducing the use of robots for finishing façade with a 3-D graphical pattern – creating identity for the dwellers of the building. The robot is pre-programmed with the 3-D pattern implemented at the Danish MORE-CONNECT pilot project.

The developers of this technology introduces it to the craftsmen, who are going to work with the actual use of the robots at the construction site - explains how the robot is programmed and how to operate it.

First two hours: Mount the robot on the platform when the façade has been insulated with mineral wool and prepare for the milling with the robot.

Next two hours: Carry out the actual milling of the 3D-design in the Rockwool insulation with suction on the robot by the Robot At Works web interface to the control of the robot.



## 2<sup>ND</sup> MODULE

**Title:** Robotics façade finishing of external wall insulation

**When:** October 2017

**Duration:** 4 hours

**Type:** Practical training on the construction site

### **Short description of the module:**

In this second module of the training session the practical use of robot for finishing façade and gable walls is taught.

The craftsmen get a hands-on experience of using the robot for finishing the wall with a uniform layer of plaster brought on using the robot. After this training course, the craftsmen can continue on their own using the robot for further work and projects.

The first two hours: The robot is placed on the platform and the materials and mixer is prepared.

The next two hours: A reinforced layer of plaster is brought on the 3D-design on the façade using the Robot AT Works web interface. This includes mixing of the plaster material, the actual plastering including the reinforcement. Finally, the robot, nozzles, etc. is dismantled and cleaned.



## 3<sup>RD</sup> MODULE

**Title:** PV-roofing for retrofitting - intro

**When:** April 2017

**Duration:** 4 hours

**Type:** Classroom lecture + onsite visit

### **Short description of the module:**

Introduction course to the implementation of PV-roofs in the course of a renovation project. This module presents an overall introduction to the PV-roofing system of the Danish prefab technology partner: Innogie, which have invented and further developed a PV-roofing system intended to cover the whole roof of a building – either new or for a complete roof renovation. This training module also includes the introduction to installing the PV-roofing system and connecting it electrically. Basic principles for also including battery storage and connecting this is also included.

The final part of the course is a site-visit to an actual installation.



## 4<sup>TH</sup> MODULE

**Title:** Retrofitting Towards nZEB with prefabricated modular elements

**When:** December 2017/January 2018

**Duration:** 4 hours

**Type:** Practical training on the construction site

### **Short description of the module:**

This module is intended for the craftsmen, who is actually going to install the Innogie PV-roofing system at the Danish MORE-CONNECT project.

On this basis this training module is a learning by doing course, where the craftsmen are becoming gradually familiar with the installment and electrical connection of the Innogie PV-roofing system.



## DANISH NATIONAL TRAINING FOR SPECIALISTS

### 1<sup>ST</sup> MODULE

**Title:** LCC calculations in the NZEB-renovation of apartment blocks

**When:** October 2017

**Duration:** 4 hours

**Type:** Webinar training course

**Short description of the module:**

The concept of Life Cycle Cost (LCC) calculations will be presented covering such issues as how Net Present Value (NPV) and IR is calculated. Further the webinar will show the use of the tool ASCOT, which has been developed by the Danish MORE-CONNECT participant – CENERGIA for simultaneous saved energy & LCC calculations. The impact of cost reduction implementing some of the MORE-CONNECT prefab technologies will be presented and the results compared to the simple payback method. The ASCOT tool were also used for the concept development calculations in WP6 of MORE-CONNECT and the results of these actual calculations for a Danish reference building will be presented.



## 2<sup>ND</sup> MODULE

**Title:** LCA calculations in the NZEB-renovation of apartment blocks

**When:** November 2017

**Duration:** 4 hours

**Type:** Webinar training course

### **Short description of the module:**

The concept of Life Cycle Assessment (LCA) of a building energy renovation will be presented. Primary focus is on the Global Warming Potential (WP) - CO<sub>2</sub>-emissions and the non-renewable primary energy (NRPE) consumption, but also the other LCA parameters, such as ODP, Ozone Depletion Potential [kg R11-Equiv.], POCP, Photochemical Ozone Creation Potential [kg Ethene-Equiv.], AP, Acidification Potential [kg SO<sub>2</sub>-Equiv.], EP, Eutrication Potential [kg Phosphate-Equiv.] and ADP, Abiotic Depletion Potential [kg Sb-Equiv.] will be mentioned.

Further LCA calculations using the tool ASCOT will be presented and the results obtained for the concept development calculations in WP6 will be presented and discussed.



## 3<sup>RD</sup> MODULE

**Title:** The importance of sustainable building and the certification of it

**When:** March 2018

**Duration:** 4 hours

**Type:** Webinar

### **Short description of the module:**

The webinar introduces the sustainability principles and explains what environment, social and economic sustainability is for buildings and city areas. The main argument for introducing sustainable principles are that an area is not viable in the long run without being environmentally, social and economic sustainable.

Further the webinar introduces the DGNB-DK certification scheme which has been adapted in Denmark based on the German DGNB scheme. The webinar presents the technical qualities and parameters that are evaluated within the DGNB-DK scheme and explains the difference between the silver, gold and platinum certification levels. The theory is illustrated by real-life examples of certified buildings.



## 4<sup>TH</sup> MODULE

**Title:** Sustainable certification of a NZEB renovation project

**When:** April 2018

**Duration:** 4 hours

**Type:** Webinar

### **Short description of the module:**

This second module webinar on sustainable certification walks through the DGNB-DK sustainable certification of an apartment block being renovated in general and energy wise in particular. The evaluation of each of the parameters within the three sustainability evaluation areas: environment, social and economic is explained and thereby also how the final certification mark (silver, gold or platinum) is reached.