

The BIMplement training pack

The main objective of the BIMplement training courses is to give SME's the basic competencies to use BIM technologies on construction or renovation work places for low energy consumption buildings. The trainees are the company manager and white and blue collar workers.

This note describes how to prepare the training courses, and how to implement them. It also explains the rationale of the courses.

1- Preparing the training courses

1.1 Selecting the workplace site (renovation or construction)

The workplace site is identified by the BIMplement coaches, and is selected to become the location (and the support) of BIMplement training courses. This selection is done on the basis of criteria among which are:

- ✓ The agreement of the customer (contractor) and of the architect
- ✓ And the fact that there is at least one BIM model (structure, MEP, electrical ...)

1.2 Selecting and training the BIMplement trainers

Two types of trainers have to be selected:

- « BIMplement master trainers »: one by Country (or, in France, by Pilot field lab)
- « BIMplement workplace trainers » : as much as needed

(See below their respective tasks)

ASTUS (Philippe Perreau) is responsible for the training of these "master trainers" (BIMplement project - Task 4.5)

Training of trainers will be performed on the Pilot field labs.

The criteria for selecting these trainers are (see BIMplement project):

- ✓ *Knowledge of building construction*
- ✓ *Experience with training of craftsmen*
- ✓ *Capacity to develop this project in a creative and stimulating environment*
- ✓ *Clear understanding of the BIM workflow, ability to manipulate BIM models*

In addition to these criteria, the « BIMplement master trainers » shall be able to fulfill the specific tasks which are described here below. If necessary, they will get an additional training.

They will also be invited to share their practices, especially during meetings organised every 6 months by ASTUS.

1.3 Organisation of meetings to inform the contracting authority (client) and the project manager

If and when useful, meetings with potential contractors and architects will be organised by the BIMplement coaches.

a) The objectives are :

- ✓ Share a common « BIM culture » and increase the on-site use of the 3D-model : how to bring the companies and their salaries , craftsmen ... to use 3D model all along the construction, going from the initial meeting with the client and project manager to the on-site training and coaching (to be specified on a case-by-case basis)
- ✓ Demonstrate the interest of using BIM on work places
- ✓ Bring the client to introduce a precise BIM process on site
- ✓ Make a presentation of the BIMplement training pack

The key speaker in these meetings is the « BIMplement master trainer »

b) Elements of contents¹

- Explain the necessity to use a BIM process with BIM models on the construction site
 - For the different site work meetings,
 - with all the building construction stakeholders
 - to better understand what they have to realize in collaboration (Lean management ?)
 - For the everyday work of all site work stakeholders
 - with the reading of the BIM model and its data : Assembly, quality, security and so on...
 - With a special focus on ventilation implementation and airtightness result
- to achieve the first goal, it is compulsory for the project manager, and his engineering design offices to
 - Accept to better design and organize the different BIM models that includes information, memos, documents ..., in order for all the construction site stakeholders to use the models more efficiently
 - Accept the feedback of the construction site stakeholders (construction companies, craftsmen, ...)
- Offer the possibility to all actors of the construction site :
 - to communicate directly with the engineering design office with the help of the BIM models : For example, with the use of BCF notes
 - to participate and enrich the final return of the as-built BIM model for the facility management

This goal is technical, but also aims at a social enrichment and recognition of the different workers on the site.
- Thanks to a BIM model, the on-site general layout of the building, as well as h systems will/can necessarily change:
 - First - implement layout with a laser
 - Second – verify layout and realisation with the same type of tools

c) possible additional training for the client

The objectives will be to accompany the client in the implementation of a BIM process for his project :

- draft/adapt BIM specifications, and export a table of BIM objects with their properties

1 These elements will also be addressed in the different session of the BIMplement training pack.

- specify/draft a facility management oriented strategy, which include to also take into account the execution phase

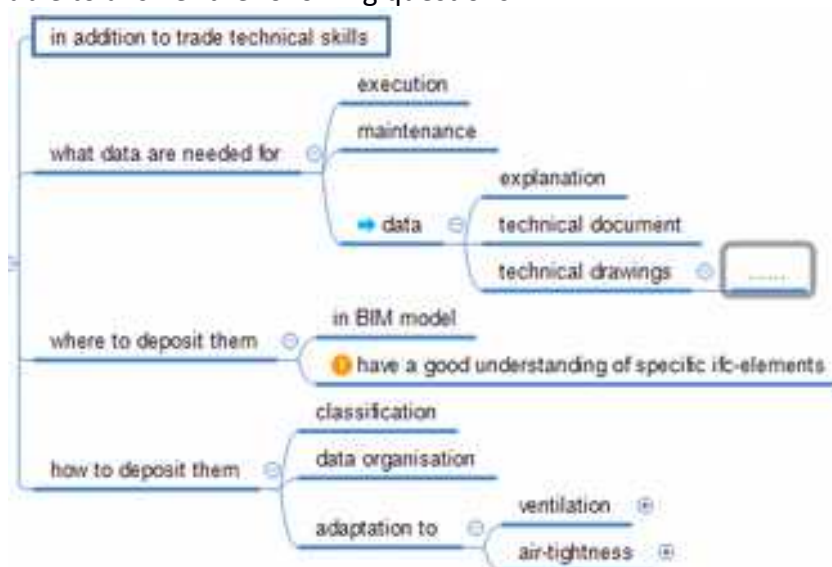
d) possible additional training for the project manager (architect, design office...)

The objectives will be to help the project manager and his team to develop a BIM model that can be efficiently used on site, and by all stakeholders, including blue collars :

- explain how to design 3D model typology so to stimulate their use by the on-site stakeholders and building companies
- explain the different work processes depending of the types of models, for exemple :
 - the architect design a generic MEP-ventilation model with ARCHICAD ou ALLPLAN
 - the HVAC technical design office realize regulatory compliant model (up to which detailed level ? What links with the other models ? Blockout ?)
 - the construction company design office make the final design, with industrial product , and makes modifications along with the foreman feedback,
 - the foreman and workers on site have
 - to find informations in a BIM model for all trades, and be able to ask question to the design office
 - search for weak point with attached documents or memos,
 - improve quality through on-site pictures of these specific points.
 - as-built (final) model. Who makes it ?
- present example of different MEP HVAC model realisation processes to understand what can be expected of this trade model
- apply this process to ventilation and airtightness

In addition to the need be sure the design office has « best practices » in terms of BIM design (quality of the model), the design and implementation of such a BIM model request new technical and cultural skills :

- explain how to organize/implement a airtightness BIM model ?
 - Be able to answer the following questions :



- understand how this airtightness model can be used by the general foreman to manage his staff personal skills, and by the blue workers themselves

- How to adapt a HVAC BIM model to the construction site stakeholders needs
 - because HVAC includes plumbing, ventilation, heating, electricity, branch pipe, ..., be sure that all these possible BIM trade models will be able to use/get good information (blockout, branch pipe, ...)
 - Reminder : BIM models may also include implementation of : Acoustic, fire protection, indoor air quality (for example : cap for ventilation air duct during construction) ...

1.4 Diagnosis of the project to be implemented (construction or renovation)

The « BIMplement master trainer » performs a diagnosis of the construction or renovation works before its start, in order to « tailor make » as much as possible the training sessions .

To realize this diagnosis, the trainer has to:

- ✓ Get the BIM models (with the agreement of the client and of the project manager)
- ✓ Analyse these models, in order to see how they will be used for the training sessions on the work site.
- ✓ Collect and analyse all the technical documents with a special attention paid to the air tightness and ventilation issues.
- ✓ A special focus will be given to ventilation and air-tightness issues : detect and identify the possible “weak points”, and the solutions proposed at the design phase (attached documents, technical instruction, ...)
- ✓ Plan to use a 4D planning with the « Navisworks » software directly made from the models; or with the use of the existing planning made from « MS-project ».

Models

All models should be exported in IFC, and therefore be open and read with a free viewer. But if some models are realised with REVIT software(RVT), they may be directly integrated in the Navisworks Manage software (freeware for trainers), to be used in Navisworks Freedom by all the stakeholders of the project.

The choice of Navisworks Manage is due to the possibility to achieve a 4D planning by using the work done in MS-project, and by making it visible to all with Navisworks Freedom (which is a freeware). Several types of model scan be imported in Navisworks Manage (IFC ; RVT ...)

4D Planning

The implementation of a 4D planning is easy and can be done after a short training.

The objectives is :

- make explicit the results expected by the on-site training
- propose a BIM model organisation
- explicit how to choose between viewers and collaborative platform
- explain how to communicate with BIM models

2- Before the on-site work starts : training the contractors (one day)

The workplace site has been selected, the trainers have been trained, the diagnosis of the project has been done, the models and the 3D planning are available.

The next step is a one-day training for the managers of the selected bidder construction companies.

This one day training is given by the « BIMplement master trainer »

a) The objectives are :

- Make sure the BIM model will be used on site
 - Give the trainees (who need it) the BIM backgrounds and bases
 - Convince the trainees of the interest for using BIM models and 4D planning to manage the project and to improve coordination between the trade bodies.
 - Have the company understand the importance to master the ventilation and airtightness issues for the project implementation success.
 - Share the project diagnosis, which has been done by the « BIMplement master trainer »
- organise the BIM training sessions
 - Make a presentation of the training sessions that will be organised on the work site.
 - Organise the planning (and financing) of the training and coaching sessions on the work site
 - Select the white and blue collar workers who have to be trained (if not all of them).
- Organize the BIM environment on site
 - install a “BIM barrack/place/container” on the construction site, including a minimum equipment : video projector, dedicated computer, tablets, ...
 - develop the use of the project BIM model during the work site meeting, during site visits, and – by the blue workers – during product and system implementation
- Show the other possibilities for using BIM
 - on-site security : installation of scaffolding, transportation of equipment on the construction site
 - use of the BIM model for the site management, through table export
 - communication between the design offices and the construction site
 - participation of the construction site stakeholders to realization of the as-built model

Remark : All companies are concerned by the BIM process, but some are more concerned than others : there is a difference between the companies that are only « BIM users » and those who have to build and provide « Execution » models.

3- During project realization, on the construction site.

The trainer is the « workplace trainer »

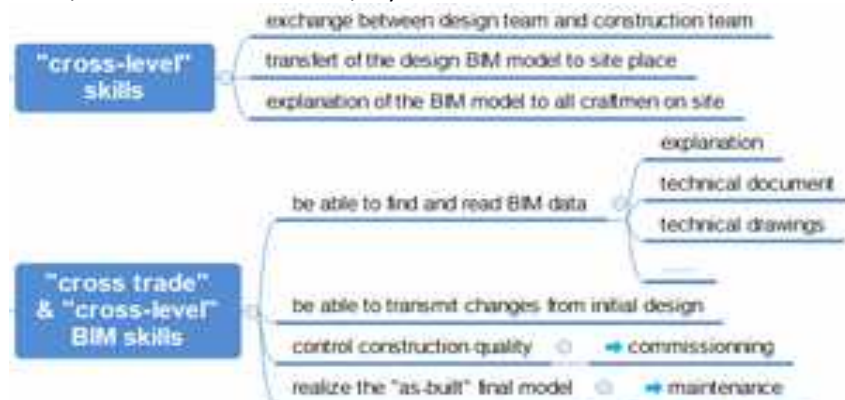
The training course combines

- half a day training sessions with groups of 10 trainees maximum, with a mix of trade bodies.
- and individual or collective coaching

3.1 The first half day training

a) Objectives

- Learn how to manipulate the project BIM models with a viewer and a tablet.
- Learn how to find information and data in these models
- Understand how BIM can be useful to achieve operations on site.
- In particular, the focus will be given to ventilation and airtightness and how to obtain the expected level of quality : the BIM model will be used to detect and identify the possible “weak points”, and the solutions proposed at the design phase (attached documents, technical instruction, ...)



A detailed skills-and-knowledge mind map is given in annex 1

b) Equipment needed

- One tablet for two trainees
- A training meeting room on site

3.2 Coaching

After the first half day training, the « BIMplement work place trainer » will be on the site half a day per week, as long as it has been estimated by the diagnosis done by the « BIMplement master trainer ».

Each half day is divided into 2 sessions:

a) Session 1

Objectives

- ✓ Learn how to use BIM full time as a tool for sharing information and cooperate in order to :
 - Prepare and coordinate the works on the site
 - Anticipate the « hot points » between the craft bodies
 - implement the project safely
 - Check the quality of the work done.
- ✓ Train the participants to the use of the 4D planning

Target groups

- ✓ The white and blue collar workers trained during the first half-day
- ✓ The foremen

Equipment

- ✓ Computer with a « 4D planning software »
- ✓ Tablets
- ✓ Video projector and screen

This equipment is stored in the « BIM barrack » which can be secured in the meeting room of the construction site. It is also where the training sessions will take place.

In France, this equipment could be financed by the shared « pro rata account » financed by the selected bidder companies.

b) Session 2

Objectives

- ✓ Continue the training given during the first half-day
- ✓ Collect remarks and advices from the white and blue collar workers regarding the models, in order to communicate them to those who have created them.

Target group

- ✓ All the trainees trained during the first half-day.

Method

The « BIMplement work place trainer » meets individually or in small groups all the trainees to collect their comments and their questions, and to answer them.

3.3 Half day debriefing with the trainees

At the end of the training process, all the trainees and the managers of the companies involved in the project are invited to share a half-day debriefing.

Objectives

- ✓ Get from the trainees their feedback on their experiences
- ✓ Collect from the participants their requests for improvements of the BIM models and their data

Target group

The trainees.

4- Assessment after the end of the training courses

4.1 BIMplement assessment process

a) The assessment stages

- 1) Test of the training pack during the French pilots projects
- 2) Comparison of the use of the BIMplement training pack in the different pilot-project in partner countries
- 3) draft a synthesis to specify a training pack with alternate per country

b) Assessment criterion

- Acceptance of BIMplement management of pilot projects, companies and blue workers
- Availability of the pilot project BIM models
- available and detailed documents for the procedure implemented for each pilot project
- visit procedure for the ASTUS technical manager

4.2 Half-day on-site shared assessment

This half-day is animated by the BIMplement master trainer

a) Objectives

- Draw the lessons of the BIMplement training courses
- Collect remarks and comments, useful for the stakeholders, related to the models and their data
- Check and validate the use of the BIM process in the management of the works
- Explore the opportunity to improve the process by writing a reviewed « Stakeholders agreement »

b) Target groups

- Clients
- project manager
- Companies' managers, and craftsmen
- Workplace trainer