SKILLS
INSTRUCT
INSTRUMENTS
CONSTRUCTION

BIM training material and modules

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D4.2 Demo 2
BIM for Energy Efficiency and Standard

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Glossary

Acronym	Full name
CA	Consortium Agreement
EC	European Commission
EASME	The Executive Agency for Small and Medium-sized Enterprises
GA	Grant Agreement
PC	Project Coordinator
WP	Work Package
TL	Task Leader
DoA	Description of Action
PSC	Project Steering Committee
SQM	Scientific and Quality Manager
DEC	Dissemination and Exploitation Committee
KOM	Kick-off meeting
ASM	ASM – Market Research and Analysis Centre
VTT	Technical Research Centre of Finland
LIST	Luxembourg Institute of Science and Technology
RIL	Finnish Association of Civil Engineers
CU	Cardiff University
R2M	Research to Market Solution France
DTTN	Distretto Tecnologico Trentino
ENEFFECT	Center for Energy Efficiency EnEffect
GER	General Exploitable Result
AB	Advisory Board
PM	Person month
M	Month

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1. Demo target objective

1.1 Introduction

Focus:

The focus of INSTRUCT demo 2 is BIM Training with a particular attention on the uses of BIM for Energy Efficiency. As reported in this deliverable, this focus is to be considered broadly, with BIM often considered as a component of 'digital tools'. Moreover, with INSTRUCT project progressing forward, the consideration for energy efficiency in the construction sector often coupled with resource efficiency (in a circular economy view). The training activities considered in demo 2 reflect this.

Activities:

The aim is to further organise and develop training material (incl. e-learning material) and modules for Luxembourg, the United Kingdom and Finland, based on the initiatives undertaken within BIMEET project.

Training targets are the design teams (including the consultants in charge of the calculation for EPC), construction stakeholders including blue collar workers (BIM and digital tools for construction SMEs) and owners (in particular with regards the selection of BIM professionals for their projects based on BIM maturity evaluation (BIM4VET)).

Outcomes:
Validated matrix of Learning outcome, extending BIMEET towards INSTRUCT matrix.
Certification schemes and courses delivery.
Certified professionals, based on the extension of BIMEET labelling scheme.

1.2 List of activities

Table 1 presents is a list of modules dedicated to this demo and structured information about them. This demo aims to reach around 500 current or future experts, achieving an estimated energy savings of 185 GWh/year. The modules are numbered and detailed (methodologies, event, course content) in the next sections.

Table 1: Training modules of INSTRUCT demo 2

	Onsite modules name	Country	Associated partners	Target audience	Nb of Participants
1	BIM for EPC, ArchiCad and Revit workflows with LESOSAI	Luxembourg	House of Training	Architects, engineers, EPC assessors	40
2	Dynamic simulation of buildings with BIM	Luxembourg / Finland	CRTI-B, House of Training, METRO	Architects, engineers	0
3	Applied product modelling (Master degree program course)	Finland	METRO	Msc students	84
4	BIM basics course (different engineering degree program courses – Building services,	Finland	METRO	Bsc students, Professionals	250

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	electrical engineering; BIM basics course for professionals and building permit)				
5	BIM Coordinator course (Building construction) BIM use in building services (lecture)	Finland	METRO	Professionals	13
	BIM Coordinator course (Building permit) BIM use in building services (lecture)	Finland	METRO	Building permit professionals (digital permit)	21
6	Energy Efficient Renovation of a Heritage Building	UK	Cardiff University	Msc students	110
7	Energy efficient and sustainable hospital design at MSc Level (BIM)	UK	Cardiff University	Msc students	40
8	Energy efficient and sustainable hospital design at MSc Level (multi-disciplinary)	UK	Cardiff University	Msc students	105
9	Resilient cooling of buildings: impact, modelling approach and case studies	Luxembourg	House of Training, LIST	Architects, engineers	22
10	Digital Deconstruction of buildings	Luxembourg	House of Training, LIST	Architects, engineers	21
11	Studio Digital Collaboratif - Course on Collaboration	Belgium	Université de Liège, LIST	Architects, engineers	20
				Count	***726***
	Elearning Module name	**Web site**		**Target audience**	
12	BIM for EPC	https://eksergia.fi/en/introduction-of-bim-enabled-epc-assessments/	Eksergia	Architects, engineers	130
				Count	***130***

1.3 Deliverable structure

The modules are numbered in the previous table and detailed in the next paragraphs. Firstly the methodology is drawn for each module, then the process is described and finally the results and impact are shown. The end date for impact calculation is 30th November 2022. Moreover, a paragraph dedicated to further development where some keys for future modules are given. The modules content and other important data is given in annex.

1.4 Connection to other tasks

The demo 2 is clearly linked to WP2 by extending Learning Outcomes matrix with associated trainings. The Learning outcomes matrix associated with demo 2 trainings can be found in Annex 1.

2. Description of the INSTRUCT Training modules

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This section details the methodologies used for each training module developed in the frame of demo 2. The main description of the training is given as well as details on training organisation. As mentioned in the Table 1, the partners involved are cited. The key data for the training can be found in Annex 1.

2.1. BIM for EPC, ArchiCad and Revit workflows with LESOSAI

The context of this module is the establishment of EPC (Energy Performance Certificate) in Luxembourg. One of the software used is Lesosai, it allows a smooth integration of BIM data. The training covers the establishment of EPC in Lesosai with BIM model made by two software systems used in Luxembourg: ArchiCad and Revit. **This is mainly a practical training** that lasts 5 hours and involves real **use of simulation and BIM software.** The classrooms are limited to 12 people to facilitate the interactions with the **trainer**, lecturer at **University of Luxembourg**. The **partner "House of Training"** oversees the **global organisation**: subscription, room, catering, Software installations. Partner **OAI** (Chamber of Engineers and Architects) is **the scientific supervisor** of this training scheme whom **public** is **engineers, architects, and EPC assessors.** Moreover, this partner is aware of the companies' training needs. OAI can select adequately the trainings to be done and push for new trainings if the companies need them.

Official description : "This training will show you how the BIM model can provide considerable assistance for thermal and environmental simulations throughout the development of a project: from the design of the thermal envelope, to the generation of the energy passport (EPC) required for building authorisation and the Luxembourg sustainability certificate (LENOZ), through the encoding of materials in the modelling software and the monitoring of energy performance during the execution of the building site with the EPC as-built".

Based on a theoretical part describing the software and the EPC required data, a test case is developed. Each trainee has a computer to investigate connections between the BIM model and the EPC. There is no trainee evaluation for this training.

The training and the course materials are in **French language**. This is one of the official languages in Luxembourg. In addition to the Luxembourgish context, an extension is made to the European level with Finnish example emphasized. This enlarges the trainees' point of view and remind the European context of EPC. Finally a demo of 3D scan has been done on the last training in place in 2022.

The training material is available in Annex 2.

Training name	ArchiCad and Revit workflows with LESOSAI, BIM for EPC
Organisation	Practical on site training with real software use on a case study
Country	Luxembourg
Duration	5h
Partners	University of Luxembourg : trainer OAI: technical & scientific supervisor House of Training : practical organisation
Public	Architects, Engineers, EPC assessors

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Language	French
Occurrences	4 times between 2020-2022 ; 10 trainees (professionals) per training

2.2. Dynamic simulation of buildings with BIM

This training should normally have had the same process as the first one detailed hereabove. During the scientific committee meetings of OAI/HoT, the motivation to give such a course has been emphasised by LIST. However, in the Luxembourgish context, this training was not set as a priority. Besides, the idea of a contest involving various software users has been considered as too time consuming. The presentation of the course to the OAI can be found in annex 3.

This course has therefore not been delivered.

2.3. Applied Product Modelling

BIM for EPC course program was introduced as a lecture as well as a part of existing BIM courses at Metropolia's CPD BIM courses as well as both national and international degree program courses. The applied product modelling course is a part of international joint degree program called construction and real estate management (ConREM) that is organized with HTW-Berlin. The course focuses on the content related with theoretical and practical aspects of model-based construction approaches particularly BIM. The target audience of the courses are in general architects, civil engineers and real estate professionals with the background of construction engineering. The BIM for EPC course was embedded as a 1 credit component in the existing course for two groups of students in two different years. The students were introduced with the course content and presentations were made to showcase the key principles of how BIM and EPC are related. The participating students had to go through all the course content and complete the final exam available in the course. The students were requested to submit the completion screenshot along with a short report of around 3 pages in the topic of "the importance and benefits of BIM integration for EPC". The students found the course to be very useful and the interest related to BIM and EPC was increased along with some of the students selecting the topic as a part of their final thesis project. The total number of students participating in the course were 49 in year 1 and 35 in year 2.

2.4. BIM basics courses

Metropolia provides 5ECTS BIM basics CPD course for the professionals as well as are a part of different bachelor degree programs in the school of real estate and construction. The BIM for EPC course was presented to the CPD course participants and were embedded as a 1ECTS module for different degree program students. The CPD course participants were the professionals from the industry and building permit professionals. The degree program students needed to study all the course content and were required to perform the final quiz along with the submission of a short summary with the topic of BIM and EPC and the key aspects of the course content.

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2.5. BIM Coordinator course

Metroplia has been organizing CPD BIM coordinator courses for different professionals related with building construction, infrastructure and digital permit for building permit professionals. Each individual BIM coordinator course is in total a 15ECTS module that focuses on various aspects of BIM based coordination for engineering projects. The BIM for EPC course content was presented as a part of the lecture for the professionals in an ongoing BIM coordinator courses of building construction and digital permit. The course content open discussions were carried out at the end of the lectures and the participants found the topic and the content of the course to be useful for the professionals.

2.6. Energy Efficient Renovation of a Heritage Building

The training was aimed at academic students and took the form of lectures and workshops and was assessed via coursework. Three courses were delivered over two academic years, namely 2020 – 2021 and 2021 – 2022.

Training name	Energy Efficient Renovation of a Heritage Building
Organisation	Combination of lectures and workshops. The coursework involved the use of a variety of tools, including Blender to develop a 3D model of a heritage building.
Country	UK
Duration	18h
Partners	Cardiff University
Public	Architectural Engineering and Civil Engineering students
Language	English
Occurrences	Weekly basis over a semester (10 sessions on average)

The students are taught on how to approach the energy efficient renovation of a heritage building. Students are first taught on how to conduct a formal analysis of a heritage building. The training focusses on issues such as spatial patterns and adjacencies, typology, stylistic treatments of facades and interiors as well as documentation of compositional principles, rhythms, materials, and textures. Students are then given an inventory of passive and active solutions to renovate a heritage building while preserving the original character of the building. The students are then requested to draft an essay to explain their energy efficient renovation strategy. This is then evaluated, and feedback given to students. Out of the 110 students who took the module over the two academic years 2020-2021 and 2021-2022, only one failed the module. The remaining students have in their large majority provided a convincing argumentation of their renovation strategy, demonstrating a good understanding of the taught energy efficiency intervention principles. An example of an evaluation form is given in Annex ??.

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2.7. Energy efficient and sustainable hospital design at MSc Level (BIM)

Training name	Energy efficient and sustainable hospital design
Organisation	Combination of lectures and workshops. The coursework involved the use of a variety of tools, including BIM (Revit), Energy Modelling (INSIGHT 360, Energy+, IES), BREEAM Assessment tool, etc.
Country	UK
Duration	30h
Partners	Cardiff University
Public	MSc Building Information Modelling
Language	English
Occurrences	Weekly basis over a semester (10 sessions on average)

The students are requested to design an energy efficient hospital that meets the UK National Health Service to meet the Net Zero target by 2030. The module involves lectures on sustainability, energy modelling, and lifecycle assessment. The students are also expected to maximise the passive attributes of their design taking into account the site / terrain constraints. All the design is BIM-based and supported by a wide range of engineering analysis tools, including in the field of enery efficiency. The design is evaluated by an inter-disciplinary panel of experts. The evaluation involves a presentation supported by technical documents. All 40 students enrolled on the module over the 2020-2021 and 2021 – 2022 cohorts have produced a convincing design that demonstrates embodiement of energy efficient interventions as taught during the module. All have passed the module. An example of an evaluation form is given in Annex ??.

2.8. Energy efficient and sustainable hospital design at MSc Level (multi-disciplinary)

Training name	Energy efficient and sustainable hospital design
Organisation	Combination of lectures and workshops. The coursework involved the use of a variety of tools, including BIM (Revit), Energy Modelling (INSIGHT 360, Energy+, IES), BREEAM Assessment tool, etc.
Country	UK
Duration	30h
Partners	Cardiff University
Public	MEng Architectural Engineering, Civil Engineering, Mechanical Engineering, Electrical Engineering, Medical Engineering students
Language	English
Occurrences	Weekly basis over a semester (10 sessions on average)

The students are requested to design an energy efficient hospital that meets the UK National Health Service to meet the Net Zero target by 2030. The module involves lectures on sustainability, energy modelling, and lifecycle assessment. The students are also expected to maximise the passive attributes of their design taking into account the site / terrain constraints. All the design is BIM-based and supported by a wide range of engineering analysis tools, including in the field of enery efficiency. The

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design is evaluated by an inter-disciplinary panel of experts. The evaluation involves a presentation supported by technical documents. All 105 students enrolled on the module over the 2020-2021 and 2021 – 2022 cohorts have produced a convincing design that demonstrates embodiement of energy efficient interventions as taught during the module. All have passed the module. An example of an evaluation form is given in Annex ??.

2.9. Resilient cooling of buildings training

The so called "Resilient cooling of buildings: impact, modelling approach and case studies" course has been delivered on October 2022. Thermal comfort inside buildings in hot weather is sometimes difficult to achieve. Resilient buildings can ensure this comfort while limiting the environmental impact. **The course focuses on comfort characterisation and the implementation of resilient cooling concepts**. It proposes an overview of the building design approaches for lowering cooling energy use and increasing summer comfort. The solutions are presented in an innovative way for merging point of views of architects, developers, service engineer and design engineers.

The course is given at House of Training premises in Luxembourg city. This 4-hour training allows interactions between trainer and trainees and is **largely based on theoretical aspects.** Some case studies are presented to illustrate the theory. There is no trainee evaluation for this training.

The partnerships are for Scientific coordination and for organisation are the same as for training *Archicad and Revit workflows with Lesosai, BIM for EPC* detailed in §3.1

The training material is available in Annex 4.

Training name	Resilient cooling buildings
Organisation	On site theoretical course
Country	Luxembourg
Duration	4h
Partners	LIST : trainer OAI: technical & scientific supervisor House of Training : practical organisation
Public	Architects, Engineers
Language	French
Occurrences	October 2022; 22 trainees

2.10 Digital Deconstruction of buildings

The construction sector is responsible for one third of the waste in the European Union. Only a small percentage of this waste is currently considered for reuse or high-value recycling. The construction sector presents a huge potential for the circular economy, but above all a real challenge for the next years. The training " Selective deconstruction - Digital tools supporting the reuse of materials coming from the deconstruction " proposes to focus on the way the construction sector is currently adapting

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itself/innovating to meet the principles of the circular economy. The training mainly focuses on new tools and technologies supporting reuse and will present first experiments and feedback.

The course was given at the House of Training premises in Luxembourg on November 9th, 2022. This 4-hour training allowed interactions between trainer and trainees and was an introduction to several concepts regarding circular economy (CE) and the digital tools supporting CE in the construction industry. Some case studies were presented in order to generate interactions based on concrete examples. There was no trainee evaluation for this training.

The training material is available in Annex xx.

Training name	Selective deconstruction - Digital tools supporting the reuse of materials coming from the deconstruction
Organisation	House of Training / Ordres des Architectes et Ingénieurs-Conseil (OAI)
Country	Luxembourg
Duration	4h
Partners	LIST, BIM-Y, Schroeder & Associés: trainers OAI: technical & scientific supervisor House of Training: practical organisation
Public	Architect, Engineer, Construction firm
Language	French
Occurrences	November 2022; 21 trainees

2.11 Studio Digital Collaboratif - Course on Trust in Collaboration

Coordination of the collective activity and trust in the AEC sector are key notions when considering the collaboration in the construction industry. This course provides a theoretical view of these concepts based on theory coming from human and management science. Then the specific case of the construction industry is discussed, and the theoretical concepts are instantiated. This course aims at providing a theoretical framework for students who must collaborate during a collaborative architectural project, but also analyse the collaboration process inside the team.
The course was given on March 11th, 2022 online to students from Liège's University in Belgium. This one-hour training allowed to understand the notions of coordination and trust in the construction industry. There was no direct student evaluation for this training, but the students were assessed at the end of the collaborative project.

The training material is available in Annex xx.

Table 5: Studio Digital Collaboratif

Training name	Studio Digital Collaboratif BIM
Organisation	Online theoretical course
Country	Belgium / Online

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Duration	1h
Partners	LIST: trainer ULg: Université de Liège
Public	Student Engineer
Language	French
Occurrences	March 2022; 20 trainees

2.12 BIM for EPC - elearning

An online course dedicated to the use of BIM for EPC (Energy Performance Certificates). It was firstly set up in frame of the BIMEET[1] project. Than, some updates have been made to the course. The three following paragraphs picked up online from course presentation (annex 11):

The course helps the learner to **understand the benefits and importance of BIM in** enhanced and accurate **EPC assessments**. (S)he also learns what needs to be considered in the information modelling to unleash its potential as the data source for the analysis. (S)he also learns why developing the modelling and assessment skills are important for sustainable buildings building projects.

Assessing EPC (Energy Performance Certificate) is mandatory for most buildings in the EU. EPC has the potential to direct construction projects towards sustainable solutions. The traditional way of generating EPC manually with a variety of different information sources can be time consuming. Utilizing BIM (Building Information Modeling) is gaining popularity in building projects. It has the potential to excessively enhance different processes of a building during its life-cycle, including the EPC-assessments. Each country in the EU has their own approach to EPC and BIM-procedures. In this course a general perspective of the topic is introduced.

A closer look is also taken into a selection of **different country perspectives** (Finland, Luxembourg, United Kingdom). **Course consists of slideshows, lecture-videos, review-questions, tutorials, extra-materials and final exam**. Representing different use cases helps the learner to understand the benefits and challenges of current BIM and EPC -related tools and procedures.

The course lasts approximately 1 hour, it has been set online on Eksergia.fi, a Wiki e-learning platform dedicated to Energy Efficient Buildings. The **partnership** implies **Eksergia platform Eksergia platform** for course management, **VTT Finland, CU and LIST** for content preparation.

Since its beginning in May 2020, this course had **400 unique trainees**, among whom **130 passed the online exam**.

Training name	**BIM for EPC online course**
Organisation	Online
Country	Europe with focus on Finland, Luxembourg, and United Kingdom.

[1] http://www.bimeet.eu/ accesssed on 12th December 2022

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Duration	1h
Partners	Hosting : Eksergia.fi - Wiki e-learning materials of Energy Efficient Buildings Content : VTT Finland, CU, LIST, Eksergia.fi
Public	Architects, Engineers, students
Language	French
Occurrences	Online since May 2020, 130 people have achieved the quiz, 400 unique page viewers.

3. Results

For onsite demo 2 trainings in Luxembourg (see §3.1 §3.2 §3.9 §3.10), the attendance was high. The training on Resilient Cooling (§3.9) and on Digital Deconstruction (§3.10) were full. There is generally a big interest for the trainings related to BIM despite a few projects are fully developed in BIM in the country. For some content tackled in these trainings there is

- a lack of easy to use tool to take advantage of BIM to speed up process of EPC development and energy calculation (especially seen in Resilient Cooling §3.10 and BIM for EPC §3.1)
- an added value to have a common approach at the European level for EPC integration in BIM.
- Sufficient awareness on BIM and his strengths (easier coordination, data centralisation…). For energy efficiency, it is quite hard for the trainees to see the advantages of BIM as they spend a lot of time for learning and do not see a direct significant positive impact on building design.
- *Certification scheme for competences does not seem to be useful in Luxembourg because of the low maturity of BIM*. Moreover, nowadays a lack of architects and engineers is encountered in Luxembourgish companies, thus the white collar professionals find already a job whatever they are BIM trained or not. Finally, some workflows and processes are nationally centered (building permit, EPC, construction standards…), this decrease the recognition of international competences certification schemes.

On a more organisational point of view, the partnerships are very important. For each module of demo 2, some partners are chosen to spread the training at the adequate audience. For university students, the universities or high schools are the most valuable partners. For professional trainings, a trusted training institute/centre/organisation (e.g. for Luxembourg: House of Training) is employed. A scientific committee (e.g. for Luxembourg: OAI) and a partner aware of the real market needs is also crucial. The success of training depends largely on the partner choice. It allows a great number of attendees, an adequate public, a reliable trainer, and potentially excellent organisational features.

4. Further development

In this paragraph, improvements identified while delivering the training modules is provided.

For training *ArchiCad and Revit workflows with LESOSAI, BIM for EPC* §3.1 the main improvement could be the Lesosai software. Due to the national implementation of EPC, a dedicated EPC software is used

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for Luxembourg. It has a BIM plugin is developed for converting data to EPC software. Luxembourg, as a small country, has not pushed forward the maintenance and development of this plugin. This means the link between BIM and EPC software is made only for residential buildings and is not user friendly at all. These two items are really drawback discussed in the frame of this training. An improvement of this plugin is required to deploy the use of BIM with EPC at a bigger level.

For online training BIM & EPC, a free short and well-structured course with exam is a real benefit for raising awareness on this topic. Adding other countries BIM&EPC approaches is probably a good way to improve the training. Now, only Finland, Luxembourg and United Kingdom (who will probably no transpose next version of EPBD) have a dedicated presentation.

The training *Resilient cooling of buildings* has been developed and given only once to architects, engineers, developers. The trainees have been satisfied by the content, but the interdisciplinary approach carried on necessitates more interactions between people. The course is currently mainly theoretical. A project based (or case study based) methodology could be useful to have even more well-trained people. This requires a longer training time.

5. Impact

To compute the energy/environmental/investment impact of the demo 2 and in particular its trainings, the methodology presented in Technical annex of INSTRUCT project proposal is chosen. The complete methodology can be found in Annex 11. The trainings detailed here above reached in total. These number of trainees is spread into several categories. The impact is given as follows, with the specific indexes defined in methodology: **energy savings, renewable energy production and investment in sustainable energy.** It should be mentioned that trainees in the 'Building owners' category are complicated to separate from the other trainees, therefore the total number of attendees was considered as 'Designers & Construction' for commercial buildings. The evaluation provided in the Table 2 relies solely on the methodology defined in annex 11.

Table 2: Impact of Demo 2 on key indicators

Type of attendees	**Number of professional**	**Number of project**	**Energy saved(MWh/year/build)**	**Energy saving (GWh/year)**
Designers (commercial) & Construction (commercial)	856	5		
			Renewable energy production (MWh/year/build)	**Renewable energy production (GWh/year)**
			investment €/project	**Investment** (M€)

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6. Annexes

Annex 1: Learning outcomes and training key data

The Figure 1 below illustrates how the mapping amongst INSTRUCT training modules and the targeted roles and Learning Outcomes has been executed.
This constant monitoring during the preparation of training activities as part of the demo 2 allowed the team to constantly report and update the INSTRUCT Learning Outcomes matrix (WP2).

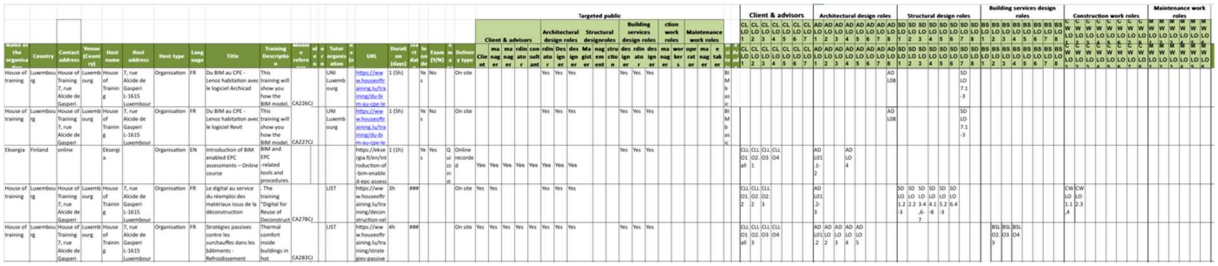
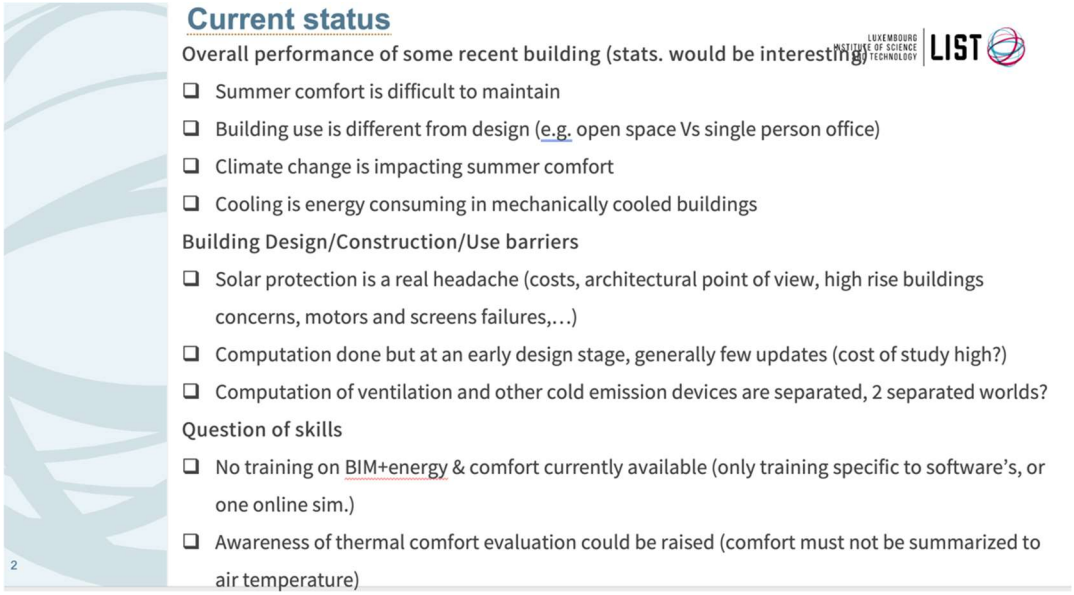


Figure 1: Illustration of the mapping of INSTRUCT training modules, roles and Learning Outcomes

Annex 2: Motivation for organising the course Dynamic simulation of buildings with BIM

The figures below summarize the rationale behind organising a training module on Dynamic simulation of buildings with BIM, as presented to training institution partners in Luxembourg. As mentioned the module was not delivered as part of INSTRUCT project.



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Challenges

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY LIST

Use of thermal dynamic simulation not only to compute loads:
ventilation,
thermal+visual comfort,
energy cons.,
climate change impact,
IAQ
different uses of thermal dynamic simulation
https://www.cibsejournal.com/cpd/modules/2018-07-dts/

Use of BIM to simplify and systemize comfort & energy calculation of buildings

- ❑ Easy, low resources consuming and comprehensive simulation
- ❑ Run it for each proposed option (materials, space planning, …)
- ❑ Improve coordination between designer, installer and facility manager

3

Training clue?

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY LIST

Contest of simulation tools to have the most energy efficient & comfortable & cost effective building.

Non exhaustive list of thermal dynamic simulation tools: calculation engine energy+, Virtual Environment, IDA ICE, Pleiades comfie, Sefaira with Sketchup, Trnsys, Design Builder, Linear, MH software, EDSL-TAS , Blast, Climawin, Lesosai,…

Other key points :

Practical : IFC & interoperability (e.g. Thermal properties of wall layers), standards(DIN2078, ISO52016, ISO52017), proprietary tools Vs Open tools (e.g. Autodesk Revit + Green building studio), online Vs offline courses, bug of softwares, software updates, initiatives in other countries (e.g. mandatory comfort evaluation in Finland) , interoperability

How to involve the software developers & resellers to the training?

Build a case study closed to Luxembourgish building sector

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Similar existing courses

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY LIST

https://energybimcert.eu/

Based on Autodesk solution, online, free, from 2019, EU funded project

Course : Intro to BIM tools for Low Energy Building Construction
https://platform.energybimcert.eu/course/view.php?id=46

Set of slides, courses, video to run an energy simulation based on BIM model
https://www.youtube.com/watch?v=Ka8zlXxcGGo

belfast met · CITB · EIHP · DUBLIN · TÉCNICO LISBOA · IECE · Future Analytics

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Annex 3: Course content: Resilient cooling of buildings

The table of contents of this training module (4h) is as followed:

1. Confort des occupants (principalement le confort hygrothermique et visuel) : revue normative
2. Gains thermiques internes et gains solaires : influence de l'environnement sur le confort
3. Refroidissement résilient : concept et revue des systèmes
4. Exemples concrets de stratégies de froid résilientes
5. Références : livres et ouvrages sur le sujet

Annex 4: Introduction of BIM enabled EPC assessments – Online course

Link to access the course content: https://eksergia.fi/en/introduction-of-bim-enabled-epc-assessments/

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Annex 5 – Heritage Building Energy Efficient Renovation Evaluation Form

Student Number:		**Student Name:**			
Extent of Descriptive Information Regarding the Building (5 %)					
70 - 100%		**60 - 69%**	**50 - 59%**	**40 - 49%**	**0 - 39%**
Excellent background information about		Sound description of the background	Satisfactory background	Shortfalls in the background	Provided very little background
Mark					
Description and explanation of the functional considerations of the refurbishment proposal (25 %)					
70 - 100%		**60 - 69%**	**50 - 59%**	**40 - 49%**	**0 - 39%**
Excellent understanding of the functional considerations of the refurbishment proposal.		Sound grasp of the functional considerations of the refurbishment proposal.	Satisfactory grasp of the functional considerations of the refurbishment proposal.	Shortfalls in the understanding of the functional considerations of the refurbishment proposal.	Demonstrated very little understanding of the functional considerations of the refurbishment proposal.
Mark	**60**				
Description and explanation of the aesthetic/expressive considerations of the refurbishment proposal (25 %)					
70 - 100%		**60 - 69%**	**50 - 59%**	**40 - 49%**	**0 - 39%**
Excellent understanding of the aesthetic expressive considerations of the refurbishment proposal.		Sound understanding of the aesthetic expressive considerations of the refurbishment proposal.	Satisfactory understanding of the aesthetic expressive considerations of the refurbishment proposal.	Shortfalls in the understanding of the aesthetic expressive considerations of the refurbishment proposal.	Demonstrated very little understanding of the aesthetic expressive considerations of the refurbishment
Mark	**50**				
Description and explanation of the sustainability considerations of the refurbishment proposal (25 %)					
70 - 100%		**60 - 69%**	**50 - 59%**	**40 - 49%**	**0 - 39%**
Excellent supporting documentation, including visuals.		Sound supporting documentation, including visuals.	Satisfactory supporting documentation, including visuals.	Shortfalls in the supporting documentation, including visuals.	Demonstrated very little supporting documentation, including visuals.
Mark	**78**				
Supporting Documentation, including visuals (10 %)					
70 - 100%		**60 - 69%**	**50 - 59%**	**40 - 49%**	**0 - 39%**
Excellent supporting documentation, including visuals.		Sound supporting documentation, including visuals.	Satisfactory supporting documentation, including visuals.	Shortfalls in the supporting documentation, including visuals.	Demonstrated very little supporting documentation, including visuals.
Mark	**70**				
Layout, structure & referencing (10 %)					
70 - 100%		**60 - 69%**	**50 - 59%**	**40 - 49%**	**0 - 39%**
Excellent layout, structure & referencing.		Sound layout, structure & referencing.	Satisfactory layout, structure & referencing.	Shortfalls in the layout, structure & referencing.	Demonstrated very little understanding of the layout, structure & referencing.
Mark	**55**				
Final Mark and Feedback (100%): 62.7					
70 - 100%		**60 - 69%**	**50 - 59%**	**40 - 49%**	**0 - 39%**
Outstanding achievement and Excellent work.		Good quality work with sound outcomes.	Satisfactory work and outcomes.	Unconvincing outcomes and poor achievement.	Achieved almost nothing of value.

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Annex 6 – Example of an evaluation form for the Hospital Design Assignment

EN4102 - MARKING PROFORMA

Group:

Assessor: **ALL**

Category	Mark		%	Total	Comments
Presentation, Visual Aids and Q/As	71.2	/100	10.00%	7.12	Very good visual aids with balanced text covering needed information. Reasonable quality on the renders. Too many slides.Good presentation, good introduction and good collaboration among members. Excellent diagrams that show solutions. Clear, concise and delivered with confidence. The slides were richly illustrated with diagrams and images of the structure and key details. The design philosophy was set out, with reference to the appropriate governing standards. Could be more energised for the presentation, felt a bit dry, more eye contact with audience was encouraged. Clear and simplified. Good timing. Answered questions well.
Poster	72.8	/100	5.00%	3.64	Very good information and communication. Layered model was useful but too large. Priority needed in space use, i. e. mechanical section. Overall good coverage of information. Excellent work. Professional layout, well balance of text and visuals, and engaging. The font should be increased and there should be a list of references and captions to the images. Excellent use of the BIM model, the exploded view is very nice. Level of text is well judged. The exploded drawings are incredible efficient in terms of information/poster space, which allows you to add much more content onto the poster without it becoming too cluttered. Well designed poster with a high level summary of electrical service. Would be better to include some detailed numbers/figures about designed services such as power rating. A lot of detail in the poster but the overall appearance was quite cluttered.
10 page summary	72.25	/100	5.00%	3.61	Good coverage with sensible infrormation flow but low quality visualizations. More relevant technical diagrams\details needed while proposing. Overall good summary. The section of integration and therapeutic section, however needed to be further analysed. The visuals needed to be of larger size. Nicely designed report. Good use of the BIM. As with the poster, you 10-page report is well illustrated, clear, concise and captures the main aspects of your design in sufficient detail. Some diagrams, however, are too small to read the text. The analysis was thorough, with some good detail. Layout was good.
Architecture: Project brief; response to site constraints; Developed and Detailed design, including Structural and M&E integration	68	/100	15.00%	10.20	Informed design philosophy with proactive proposals. Design development showing good quality data analysis. Early examination for the structural approach with verification. Soil analysis and remediation noted. Very good slide on the construction details. Good design philosophy, good orientation considerations, good site analysis. Excellent section, well thought out, great visuals. Thorough presentation with visuals and explanations of the design process, site analysis and decisions. However, we were missing sections and sections for the 1:50 technical drawing. The drawings and renders were of good quality. One observation: Avoid showing foundations, in the elevations. In terms of design, one question mark is concerning the glass atrium: this space is in danger of becoming overheated, when the sun is out, contributing to a greenhouse effect and glare problems, and therefore affecting comfort qualities of the building. The concept was well set-out and the philospohy of the design was clear.

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Structural design and analysis	68.3	/100	15.00%	10.25	Good analysis and justification for the use of steel beams rather than timber. More clarity needed on grid sizing. Design Philosophy: Mixture of materials and forms of construction to suit the requirements of the brief. Stability: You have provided a stability pack in which you have provided a number of diagrams showing the lateral deflection of the building. Sheet 4 indicates that you don't have an even deflection across your column heads, meaning that differential movement across your structure which you have not picked up on. Also, I have not identified any calculations for the design of your shear walls. Drawings and Details: Generally, where you provide drawings with gridlines, it is important to indicate the dimensions between each gridline, so that you get a sense of scale. As noted in my comments to your presentation, with section and elevation drawings, you don't typically mixed up architectural drawings and structural drawings, unless you are showing a key relations (such as structure and M+E zones). You have provided an extensive number of details where you have tried to demonstrate how this building would physically fit together. Whilst this is to be commended, I don't necessarily agree with the suitability of said details! Notable the Timber-Beam-To-Timber-Column Connection. Here, your connection detail sees your 540mm deep glulam beam sat on a 12mm thk plate that cantilevers from a plate that is fixed to the column. This is entirely inadequate and you'd find that the cantilever plate would quickly deform under bending. In addition, the beam is insufficiently tied to the column. A fin-plate connection that you see in steel construction would be far more appropriate. Pile and Pile Cap Design: End-bearing CFA are the most appropriate solution for this project, especially with 450mm diameter piles. However, you haven't picked up on the horizontal load components. Regarding the pile caps, my main concern is support under the cores. Ideally, these should be on a solid piled-raft. Putting large 4No. pile caps under their corners means that the wall has to arch between supports, inducing additional stresses which have not been considered. Evidence of standards followed. Methods of analysis are clearly laid out and followed.
Mechanical Services	68	/100	15.00%	10.20	Presented values of air velocity needed justification, especially with the low rates. Good extract strategy at wet rooms but needed more reflection on internal pressure and relevant issues. Very good approach on the DHW & DCW systems considerations. AHU needed more clarity in sharing. Overall, good work. Noted the domestics drawing in the shared drive, which was good but slight scaling issues, disappointing there are no other similar drawings produced. Ventilation valcs are very detailed, well done. As are the thermal calculations. Domestic calcs are generally present though I am unsure if the pipe sizing is complete. Overall this is a very good attempt at a comprehensive strategy, the startegy itself is quite unique, well done on this. Water source heat pump is a confusing inclusion. Impressive level of detail shown when considering mech services. Solutions is versatile and appears robust.
Electrical Services	65.25	/100	15.00%	9.79	Good work. Noted the electrical load calculation and the lighting calculations were appreciated, though I did not see a switchboard sizing calculation, cable sizing could also have elevated this. In terms of drawings I could only locate a schematic, with a main drawing, distribution, lighting and sensor drawings missing. Evidence of calculations and some layouts shown. More detail would help.

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Sustainability, including environmental impact and energy modelling	65.5	/100	5.00%	3.28	Interesting consideration for the IStructE Carbon tool showing the embodied Co2 for the structural frame. BREEAM assessment noted but little analysis and conclusion. Some good suggestions but no information on their approaches. Presentation: Ok, and some tangible good steps presented. A question was asked about the parking, and it ws confirmed that the parking is only for staff. The sustainability section in the report is fairly short, with no supplementary report. The main report only touches on a 93.5% BREEAM rating, carbon scors and a waste management policy. The achieved BREEAM rating is incredibly high, I am unsure if there is enough supporting evidence to justify the rating, though the waste anagement is an example of this. I did not note an EIA nor was there any mention of energy modelling which was most disappointing. This section did not do enough to highlight cross discipline tie in. Strategy was not fully clear, but sustainability has been mentioned.
Integration, including BIM (Information delivery strategy) and lifecycle costing	60	/100	5.00%	3.00	Little information on the delivery strategy. Some collaboration methods suggested but more relevance needed. Some breakdown for costing with references but further details needed. Presentation: OK. More detail was expected, in the shared drive. Logical.
Resilience, incuding Fire Engineering and Risk Management	64.5	/100	5.00%	3.23	Very good hazard classification and MEP fire consideration. Detailed fire evacuation routes. Fireproof on vertical services needs more clarity. Little information on fire load, resisting materials, etc... Detailed risk registers with sensible action planning. Some consideration of fire analysis including cost analysis.
Therapeutic environ., including Acoustics, Comfort considerations, and Infection Control	66	/100	5.00%	3.30	Good analysis for the acoustics and design strategy noted. Information on ventilation, infection control, and possible cross-contamination needed. Presentation: Very good section. Shared drive: Good section and rigorously backed up by references, which support the argument. We needed a list of references. Some visuals would have benefited the section. Design ideas proposed and details given, but more depth needed in places.

Total Mark:	**67.61 / 100**	**Signature:**	

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