BIP
Blended Intensive Program

EUCLIDES

Co-funded by the Erasmus+ Programme of the European Union

University of Antwerp
Faculty of Applied Engineering

Sustainable and Resilient Infrastructure and Buildings

1 February 2022 – 30 April 2022

15 March 2022

Lecture 6: BIM - the process of intelligent management of the project information

Introduction

Dr Eng. Mariusz Szóstak employed at the Faculty of Civil Engineering, at Wroclaw University of Science and Technology (WUST), Poland.

MSc in Civil Engineering from WUST in 2013.
PhD (Hons) in Civil Engineering in April 2018.

Author of more than 60 scientific papers, including papers on work safety in construction and articles in journals in the Journal Citation Reports database.

I developed several dozens of reviews of articles in journals from the JCR list such as: *Applied Sciences, Buildings, International Journal of Environmental Research and Public Health, Sustainability*.

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen
Universitat de Girona
Escola Politècnica Superior
Universidad del País Vasco
Euskal Herriko Unibertsitatea
POLITÉCNICA
HIGHWAY ENGINEERING LABORATORY A.U.Th.
MANIPAL UNIVERSITY
Universidade do Minho
isep
Instituto Superior de Engenharia do Porto
Wrocław University of Science and Technology

Introduction

Deputy Head of the Department of Building Engineering,
Faculty of Civil Engineering,
Wroclaw University of Science and Technology (WUST).

Project Manager from the WUST of the project Erasmus+ Strategic Partnerships for vocational educational and training innovation "SafeCRobot Virtual Reality Immersive Safety Training Environment for Robotised and Automated Construction Sites" 2020-1-UK01-KA202-079176, 2020-2022

Guest Editor: Applied Sciences, Special Issue: Technology and Management Applied in Construction Engineering Projects

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen
Universitat de Girona
Escola Politècnica Superior
Universidad del País Vasco
Euskal Herriko Unibertsitatea
POLITÉCNICA
HIGHWAY ENGINEERING LABORATORY A.U.Th.
MANIPAL UNIVERSITY
Universidade do Minho
isep
Instituto Superior de Engenharia do Porto
Wrocław University of Science and Technology

Introduction

Scientific interest:

- occupational Health and Safety;
- modeling of the development of accident situations in construction;
- analysis of the causes of occupational accidents at work in construction;
- management of construction projects;
- BIM technology.

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM

and what is this?

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM
(acronym)

BUILDING INFORMATION MODEL

BUILDING INFORMATION MODELLING

BUILDING INFORMATION MANAGEMENT

BIM
(acronym)

BUILDING INFORMATION MODEL

is the DIGITAL REPRESENTATION of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility, forming a reliable basis for decisions during its lifecycle from inception onwards.

BIM
(acronym)

BUILDING INFORMATION MODELLING

is a BUSINESS PROCESS for generating and leveraging building data to design, construct and operate the building during its lifecycle. BIM allows all stakeholders to have access to the same information at the same time through interoperability between technology platforms.

BIM
(acronym)

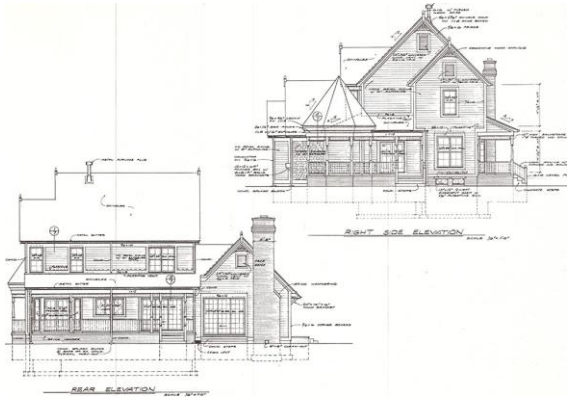
BUILDING INFORMATION MANAGEMENT

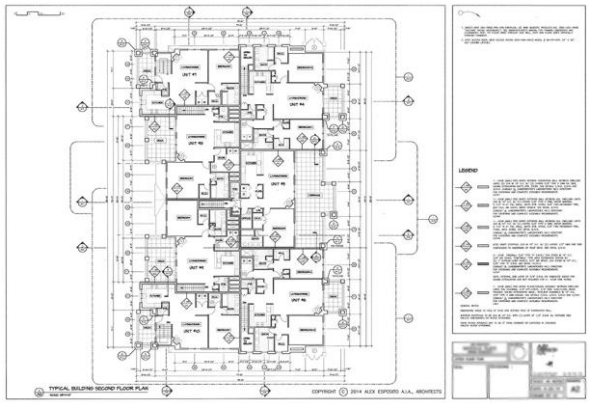
is the ORGANIZATION & CONTROL of the business process by utilizing the information in the digital prototype to effect the sharing of information overt the entire lifecycle of an asset. The benefits include centralized and visual communication, early exploration of options, sustainability, efficient design, integration of disciplines, site control, as built documentation, etc. – effectively developing an asset lifecycle and model from conception to final retirement.

What BIM is definitely not

- BIM is not a 3D model
- BIM is not ….. (*software name*)
- In BIM, everything is self-contained

Levels of BIM Maturity

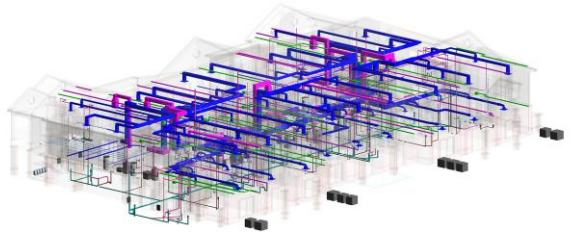




Level 0 BIM
(low collaboration)

Level 1 BIM

(partial collaboration, managed CAD, 2D or 3D)



Level 2 BIM

(full collaboration

4D, 5D)

Level 3 BIM

(full integration,

3D, 4D, 5D, 6D, 7D, …, nD)

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

Multidimensionality of BIM technology
BIM Dimensions

3D	4D	5D	6D	7D
Geometry	**Time**	**Money**	**Sustainability**	**Facility managemnt**
3-dimensional (x,y,z) geographical structure	Timeline Scheduling Duration	Cost Estimation Budget analysis	**Self-sustainable and Energy Efficient**	Facility Management Information

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

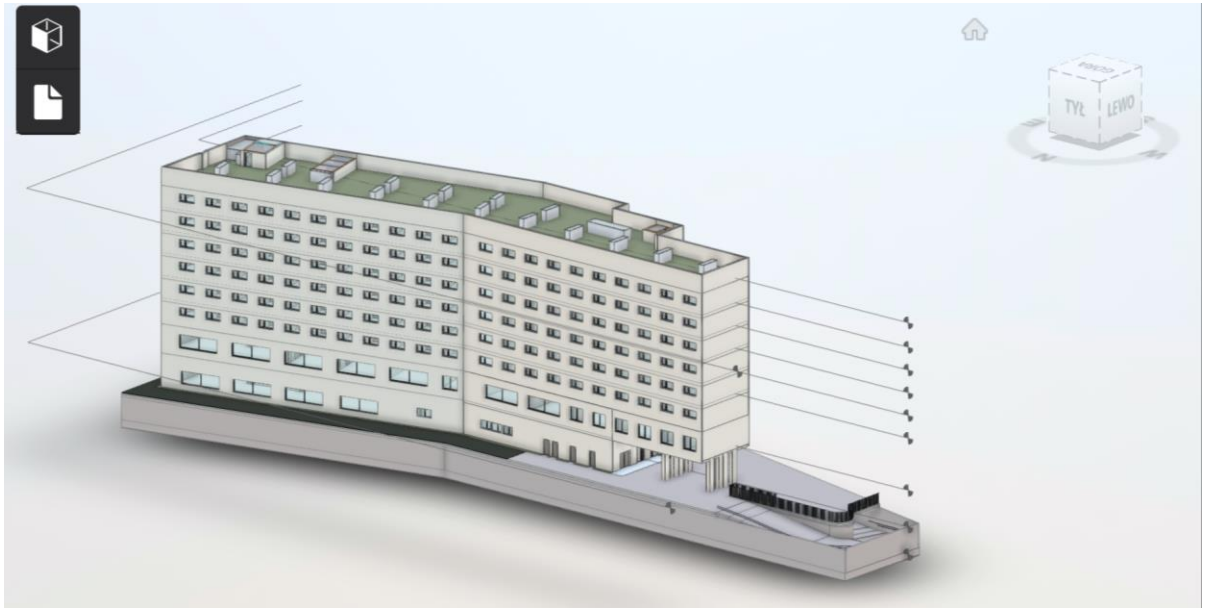
MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
3D – Geometry



hotel building

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
3D – Geometry

Multi-family buidling

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

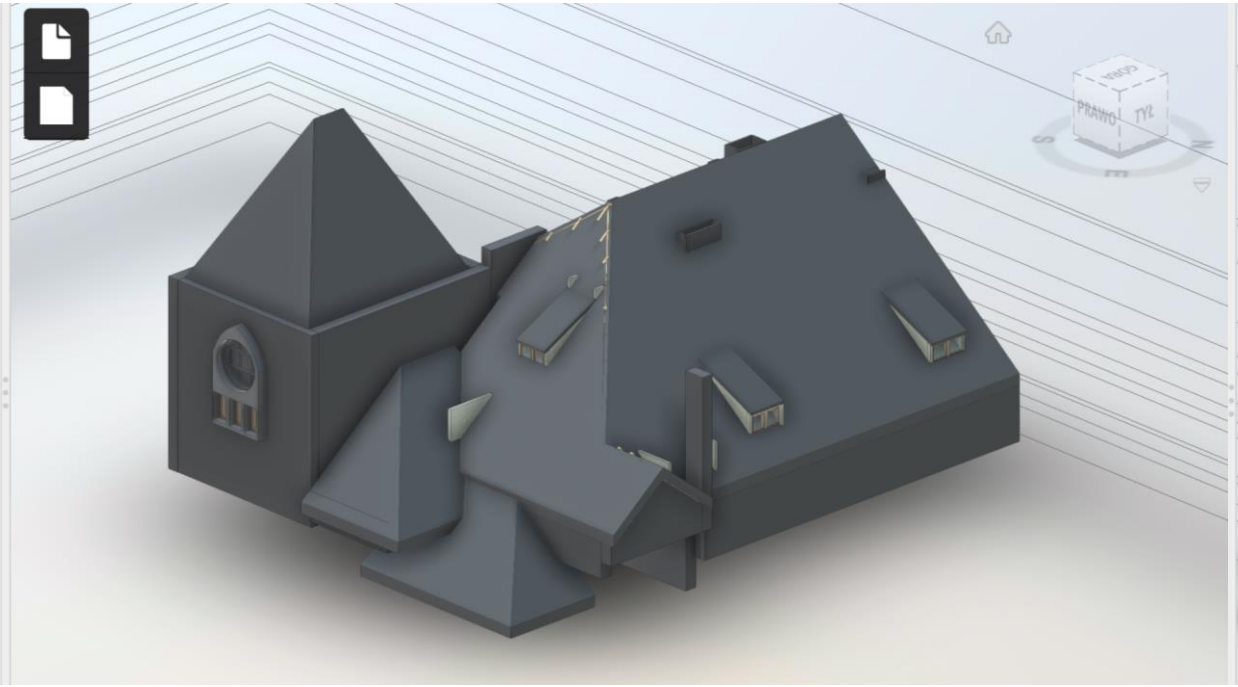
MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
3D – Geometry



attic

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

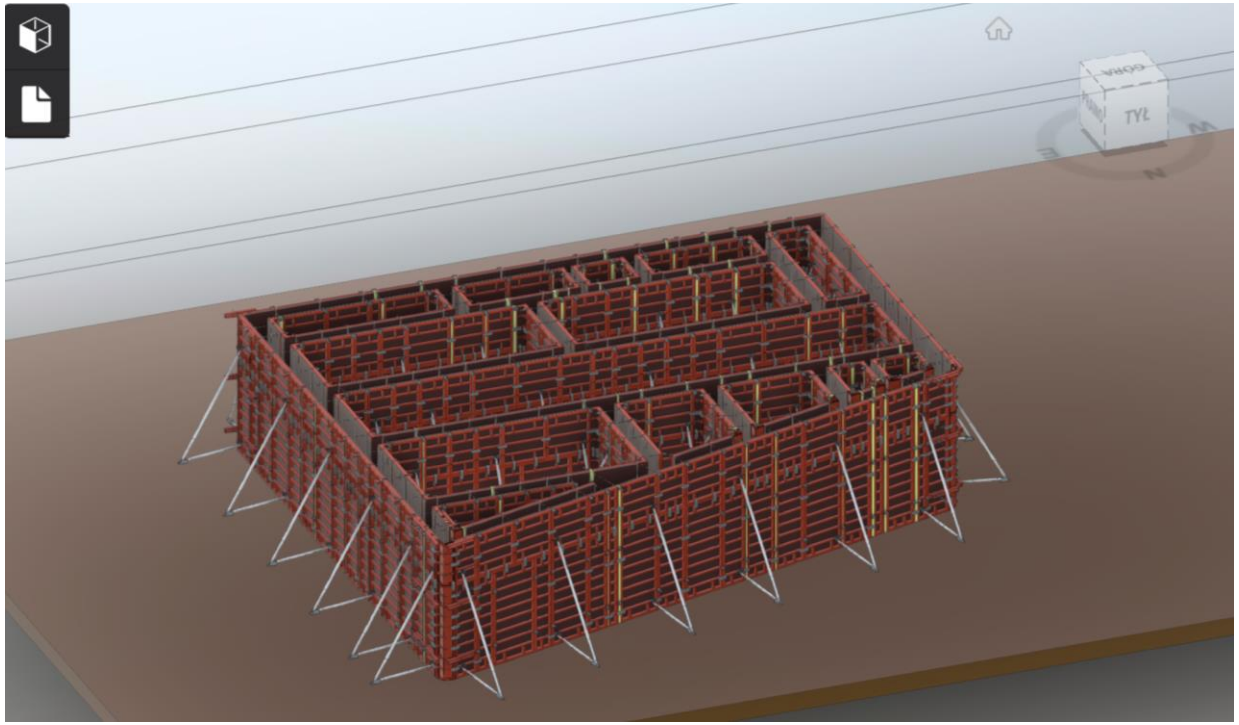
MANIPAL UNIVERSITY

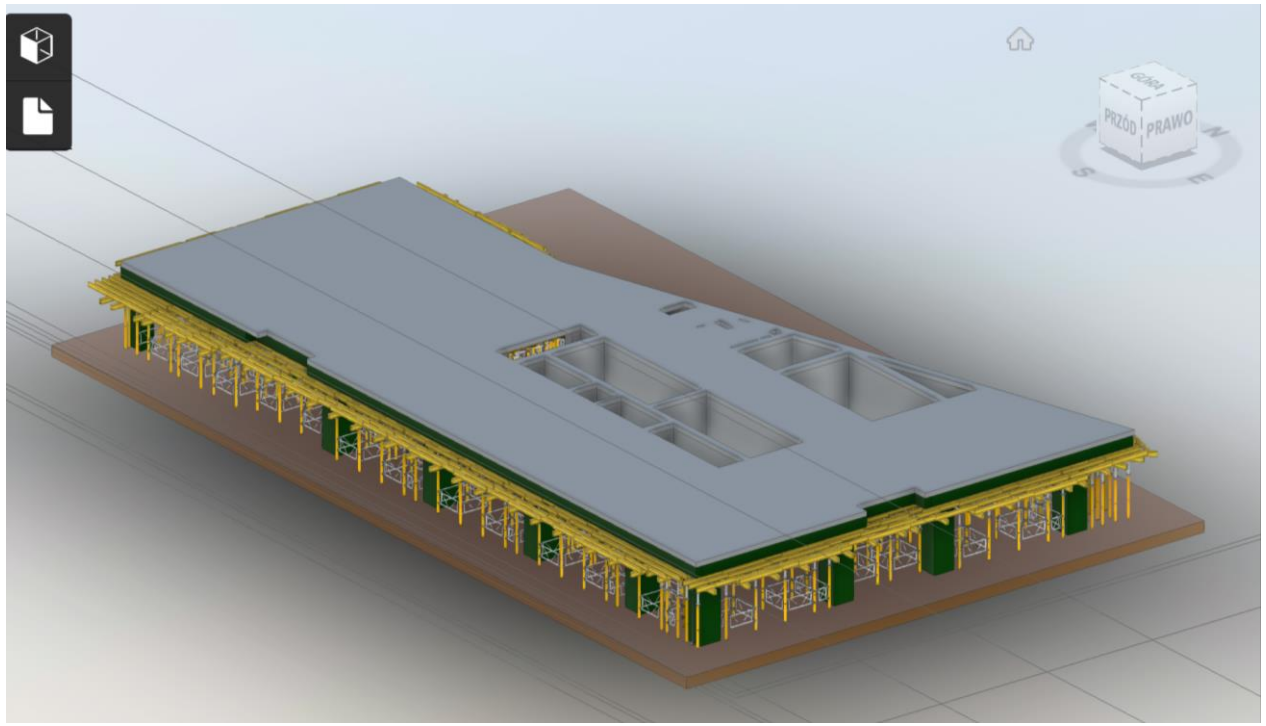
Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
3D – Geometry





formworks

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

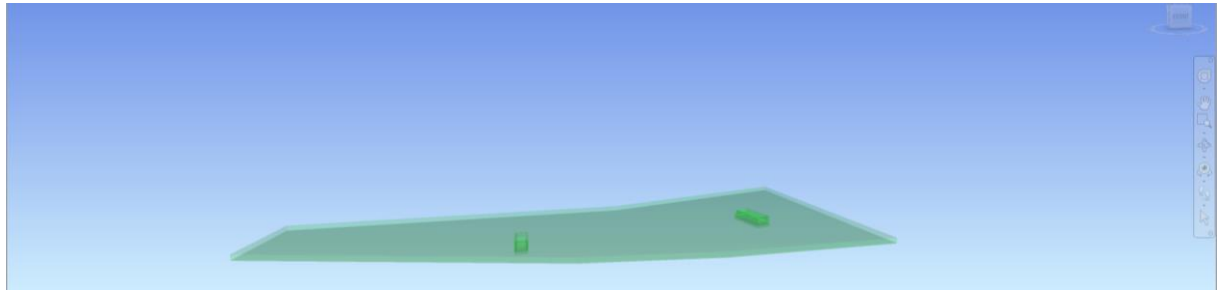
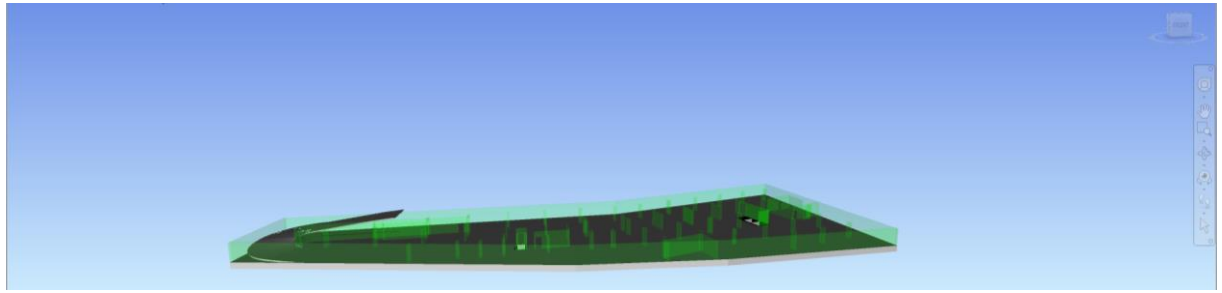
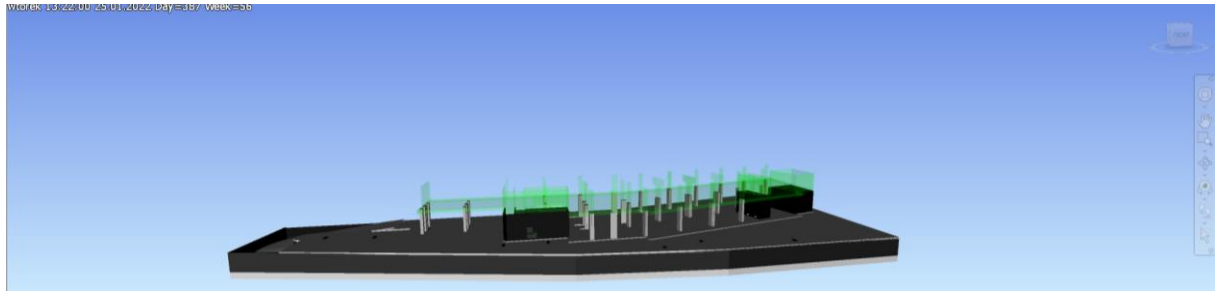
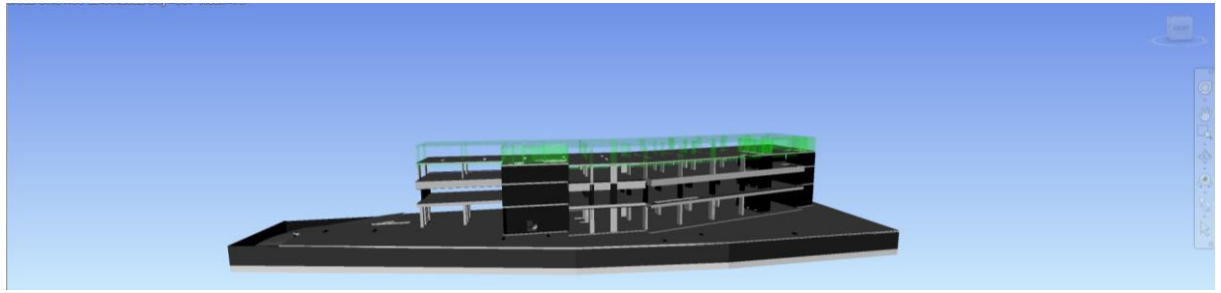
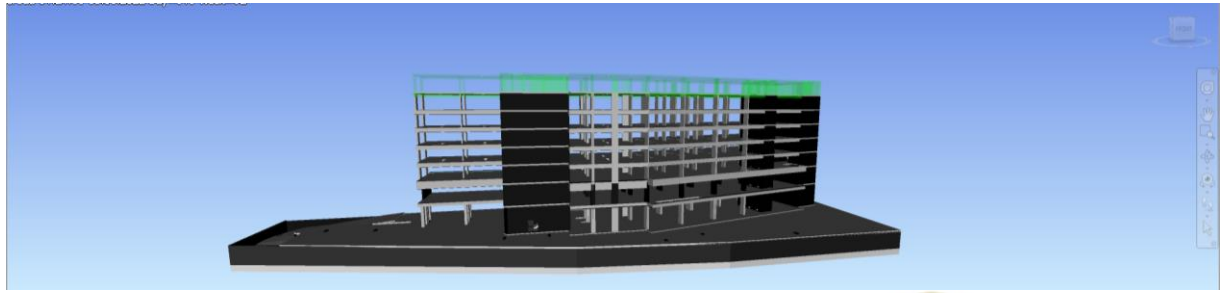
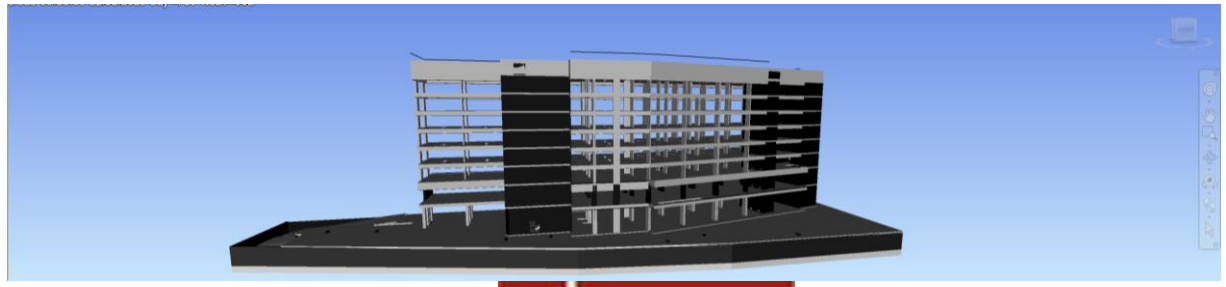
BIM Dimensions
3D – Geometry

BIM Dimensions
3D – Geometry

Benefits of 3D BIM

- Enhanced 3D visualization of the entire project
- Streamlined communication and sharing of design expectations
- Easy collaboration between multiple teams irrespective of their area of expertise
- Reduced instances of rework and revisions due to complete transparency from the beginning

BIM Dimensions
4D – Time

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

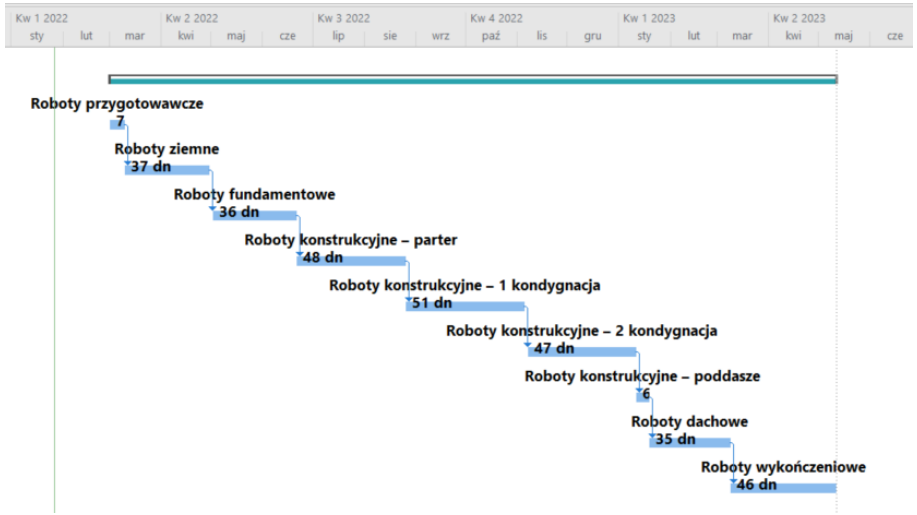
MANIPAL UNIVERSITY

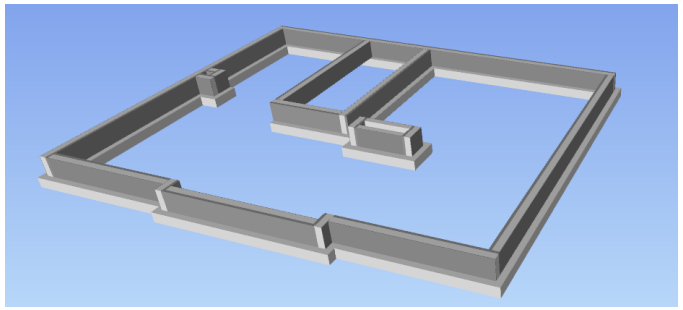
Universidade do Minho

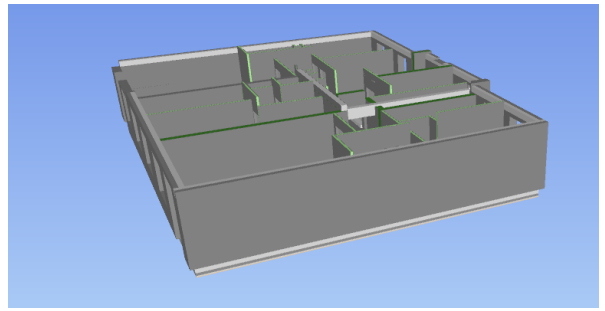
isep
Instituto Superior de Engenharia do Porto

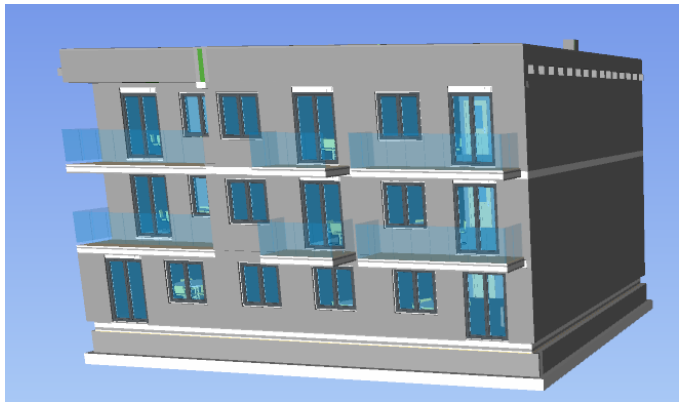
Wrocław University of Science and Technology

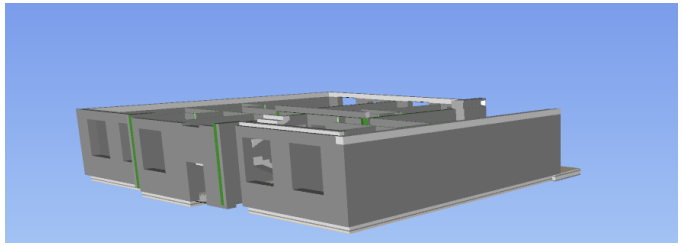
BIM Dimensions
4D – Time

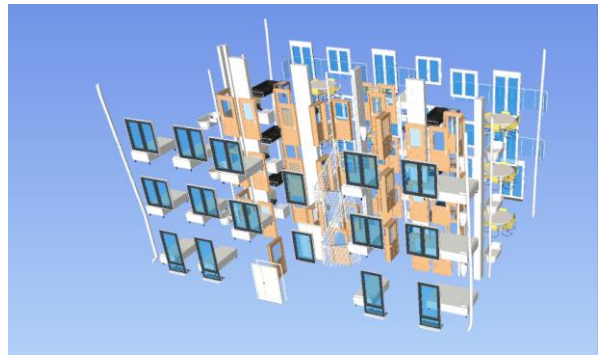












Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

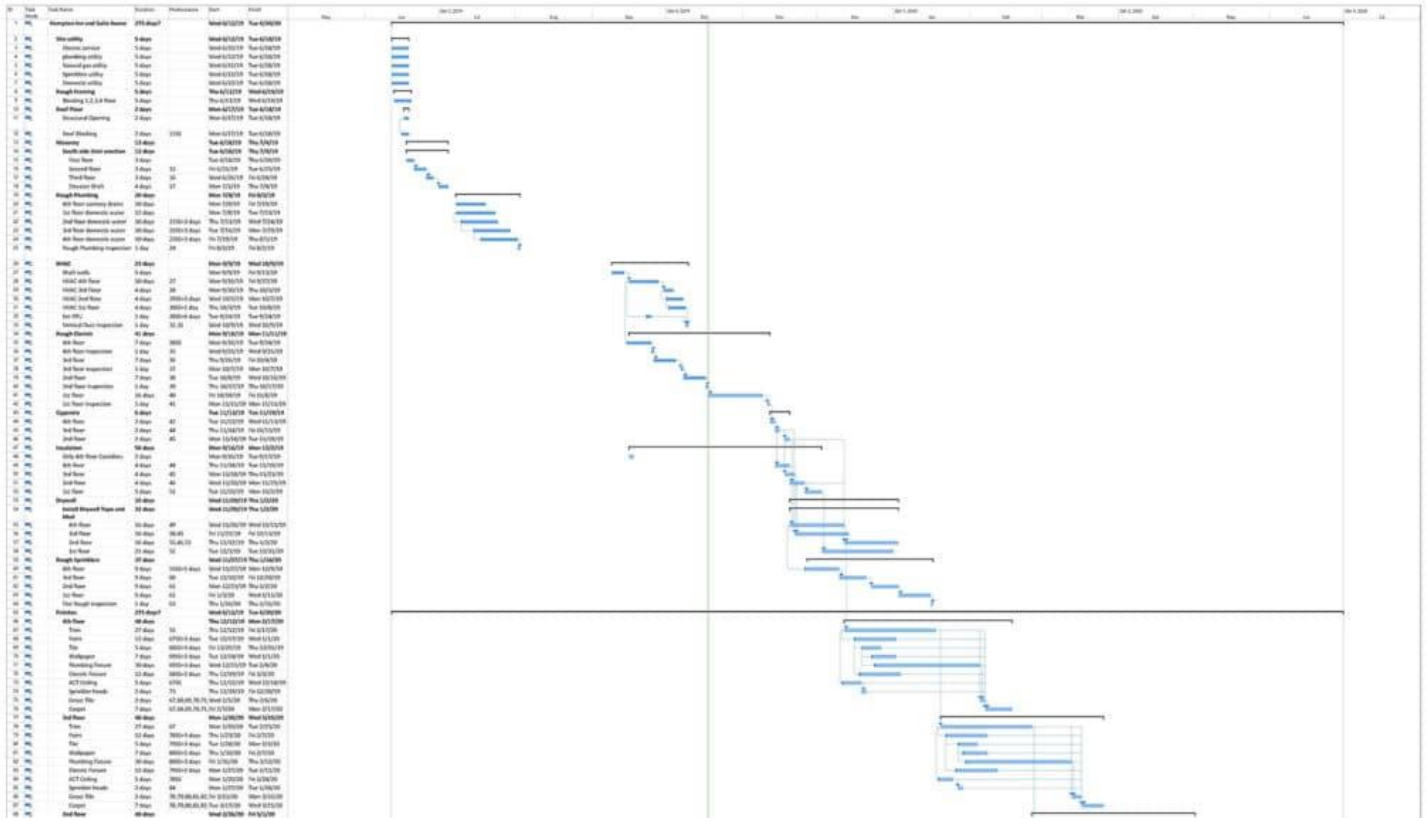
MANIPAL UNIVERSITY

Universidade do Minho

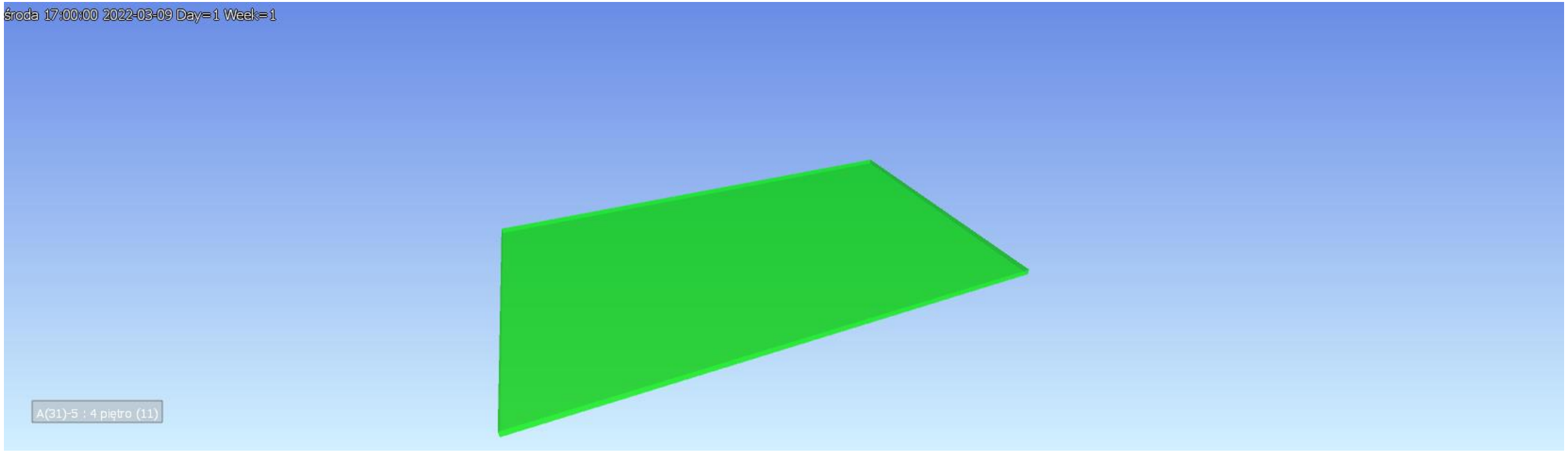
isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

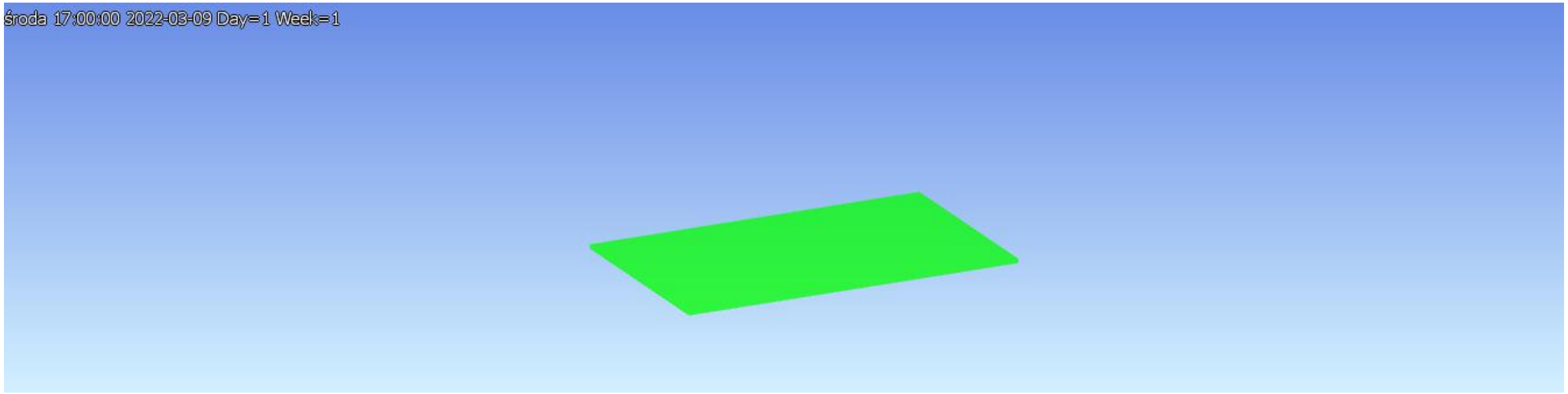
BIM Dimensions
4D – Time



BIM Dimensions
4D – Time



BIM Dimensions
4D – Time

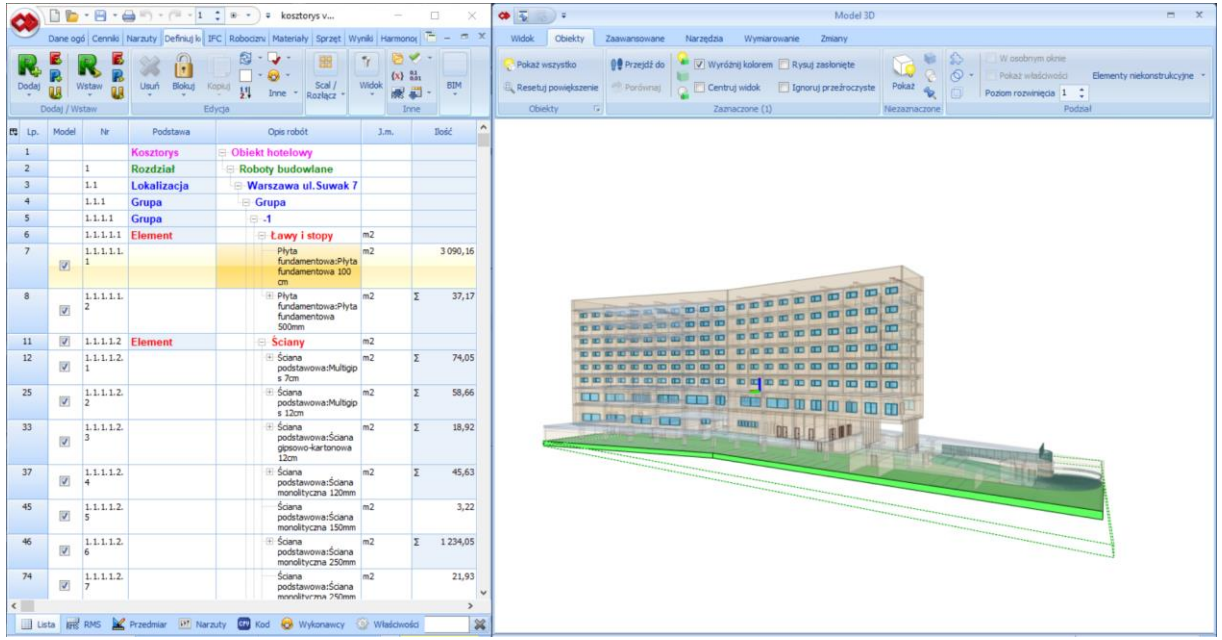


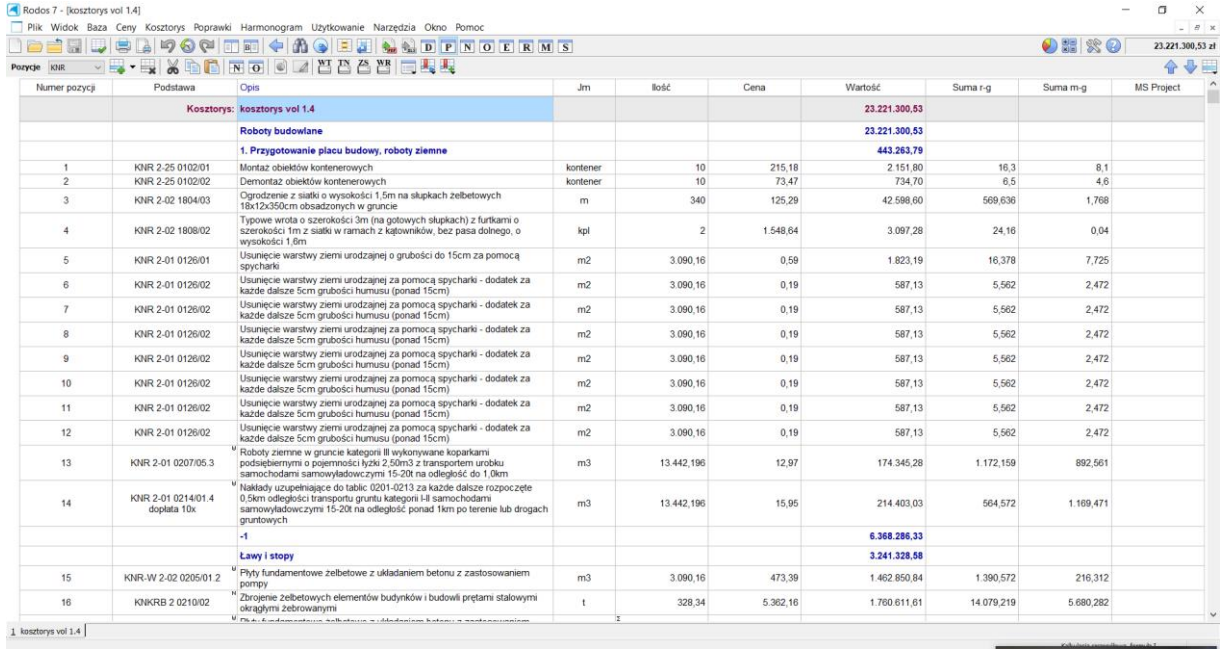
BIM Dimensions
4D – Time

Benefits of 4D BIM

- Improved site planning and scheduling optimization
- Seamless coordination among architects, contractors, and on-site teams
- Better preparedness in terms of next steps during every construction stage
- Enhanced information sharing related to timeline expectations helping to avoid costly delays
- Enhanced safety and efficiency due to documentation of an entire plan with specific timelines

BIM Dimensions
5D – Money





Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

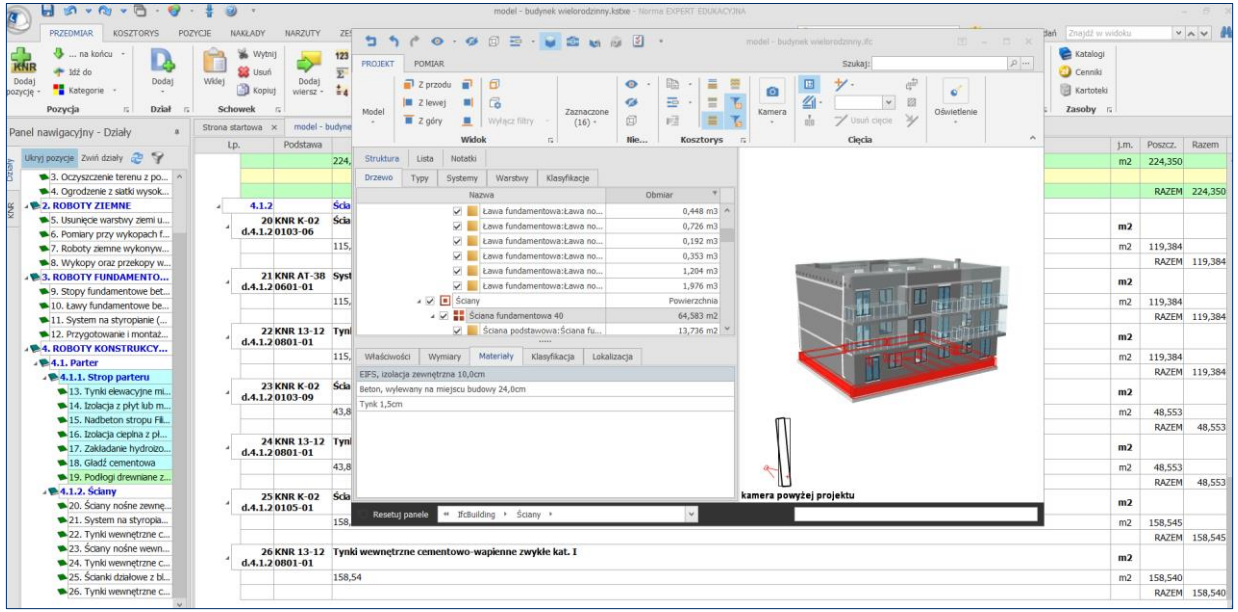
MANIPAL UNIVERSITY

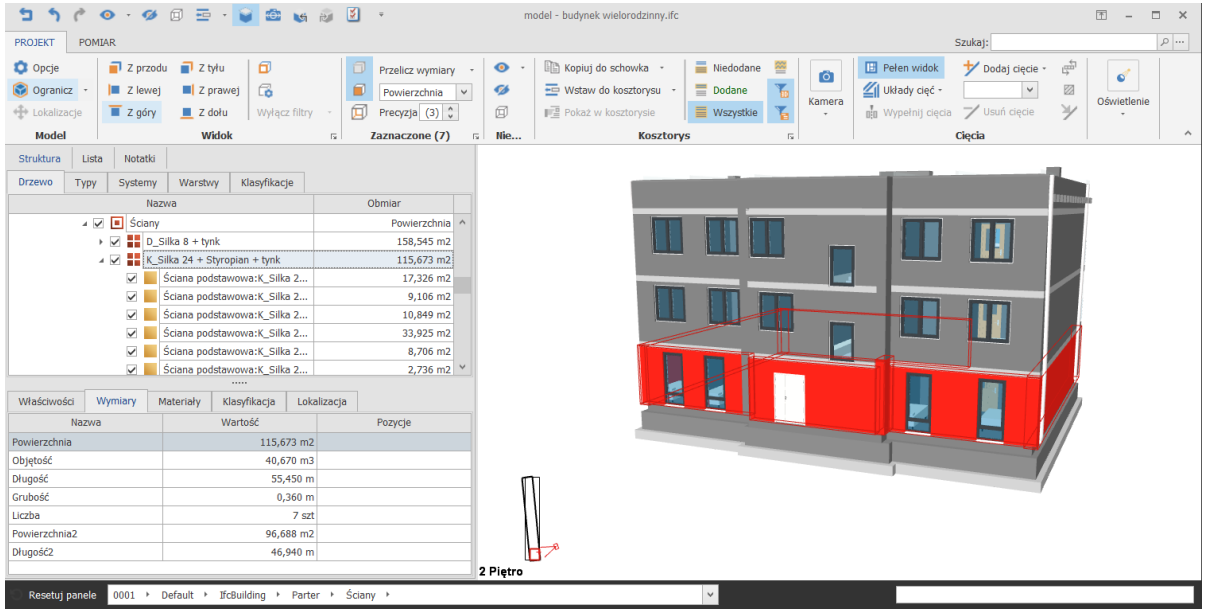
Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
5D – Money





Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

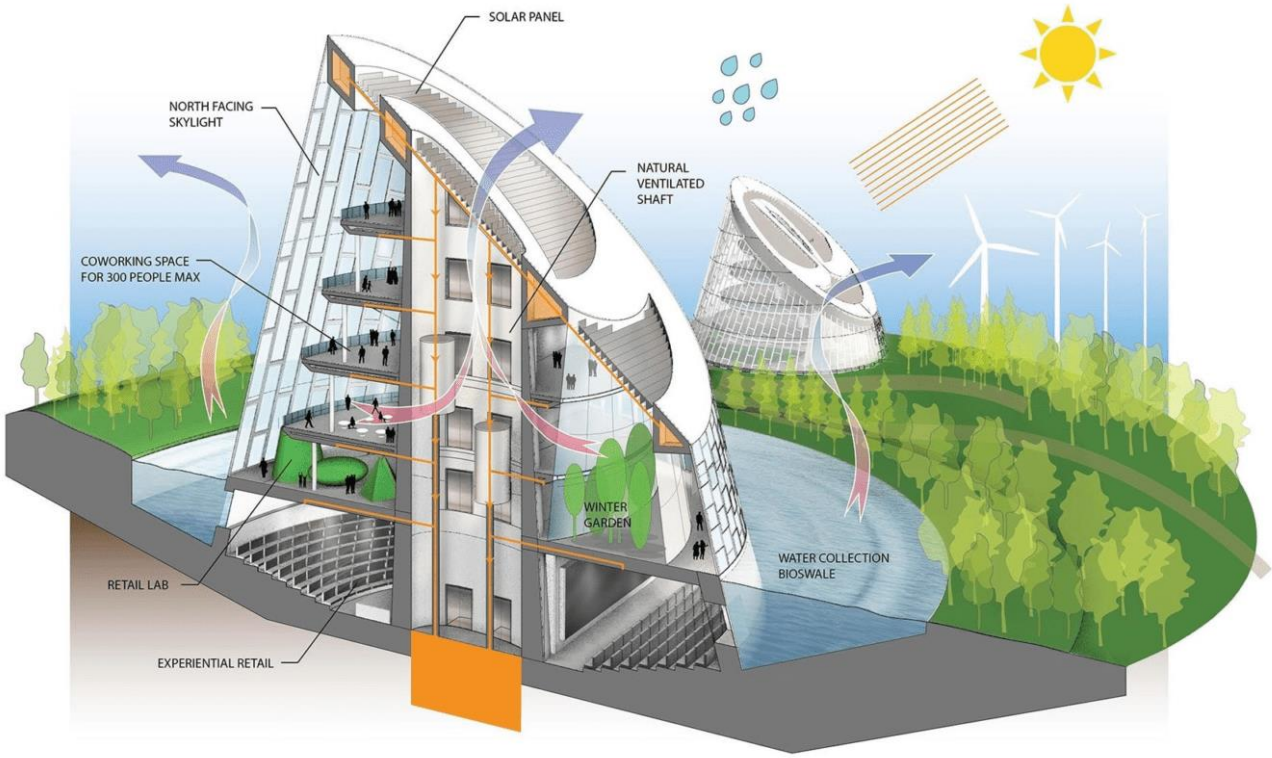
Wrocław University of Science and Technology

BIM Dimensions
5D – Money

Benefits of 5D BIM

- Real-time cost visualization with notification on changes in costs
- Automatic count for components/system/equipment associated with a project
- Simplified cost analysis and budgetary analysis with predicted and actual spends over time
- Minimization of budgetary offshoot due to regular cost reporting and budgeting

BIM Dimensions
6D – Sustainability



Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

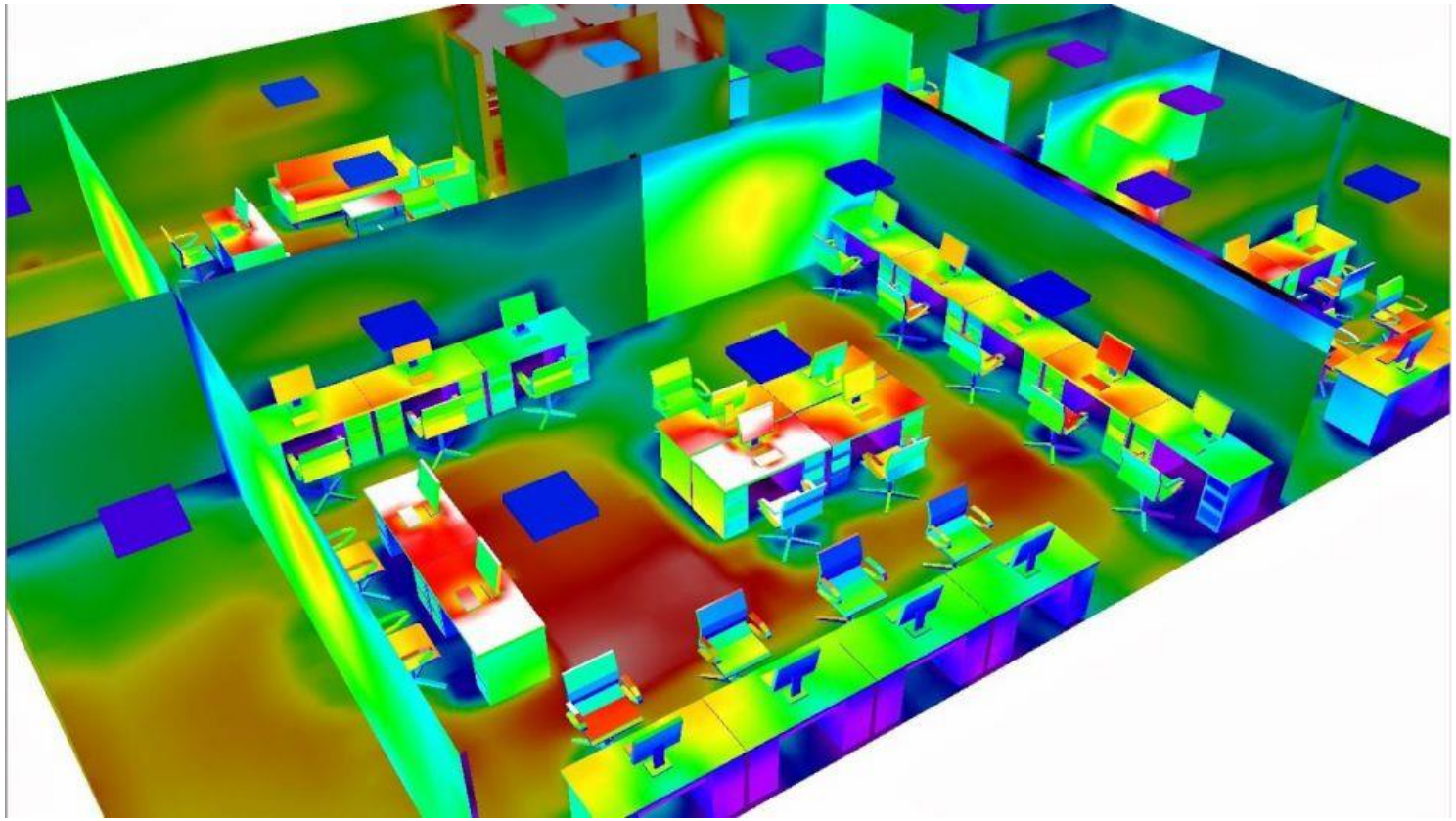
MANIPAL UNIVERSITY

Universidade do Minho

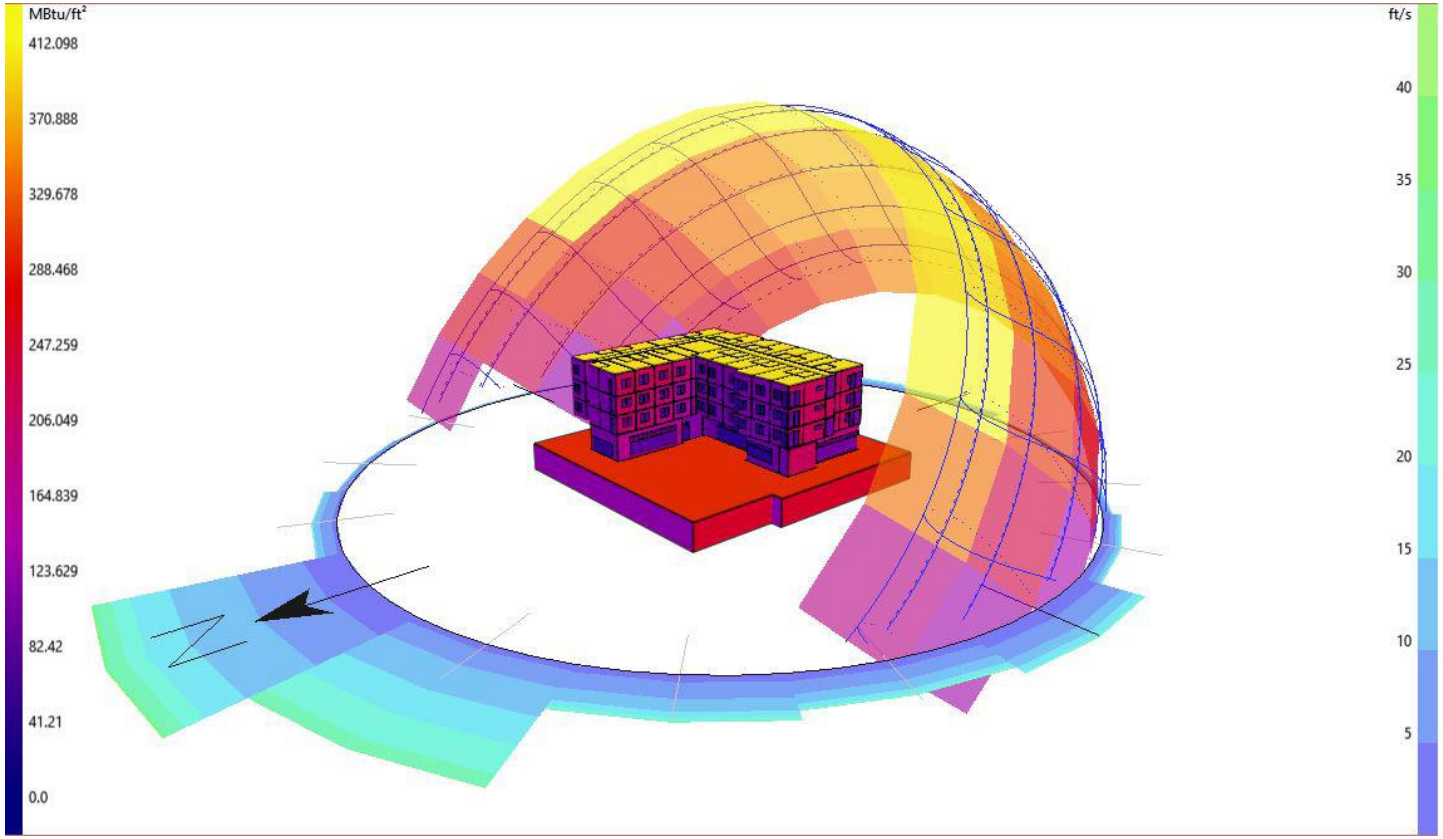
isep
Instituto Superior de Engenharia do Porto

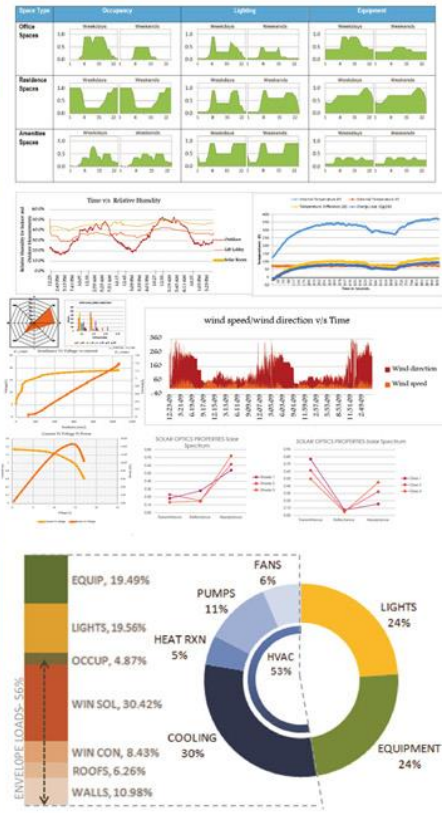
Wrocław University of Science and Technology

BIM Dimensions
6D – Sustainability



BIM Dimensions
6D – Sustainability





Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

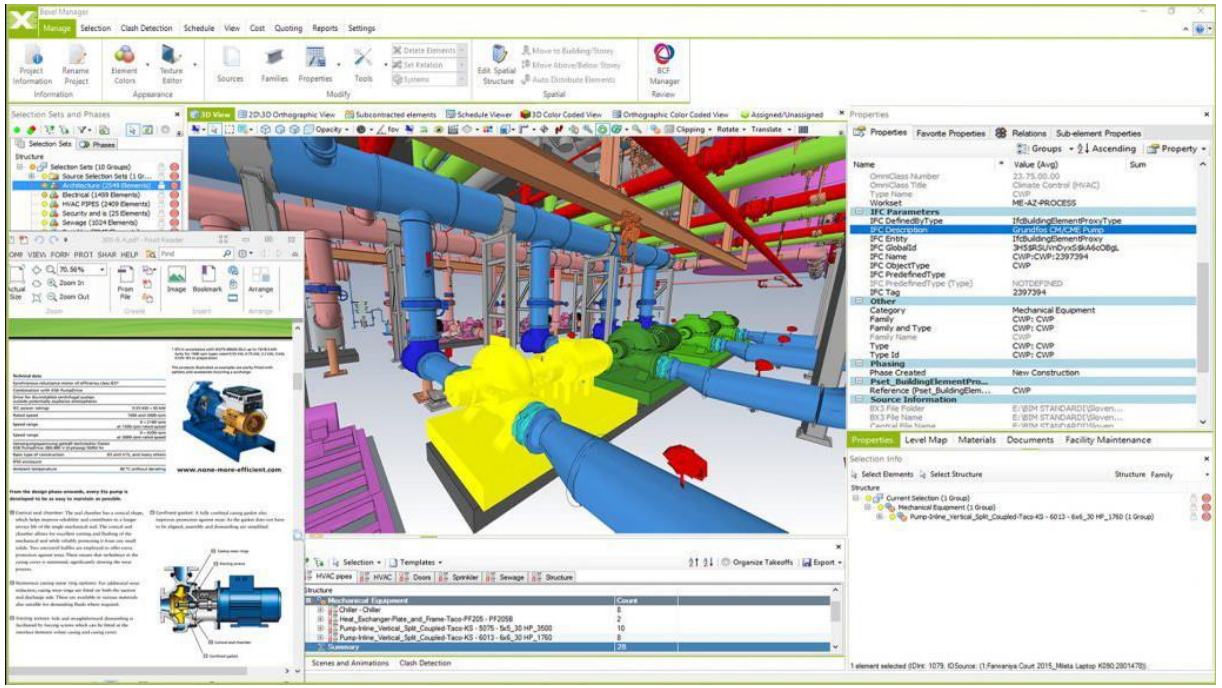
MANIPAL UNIVERSITY

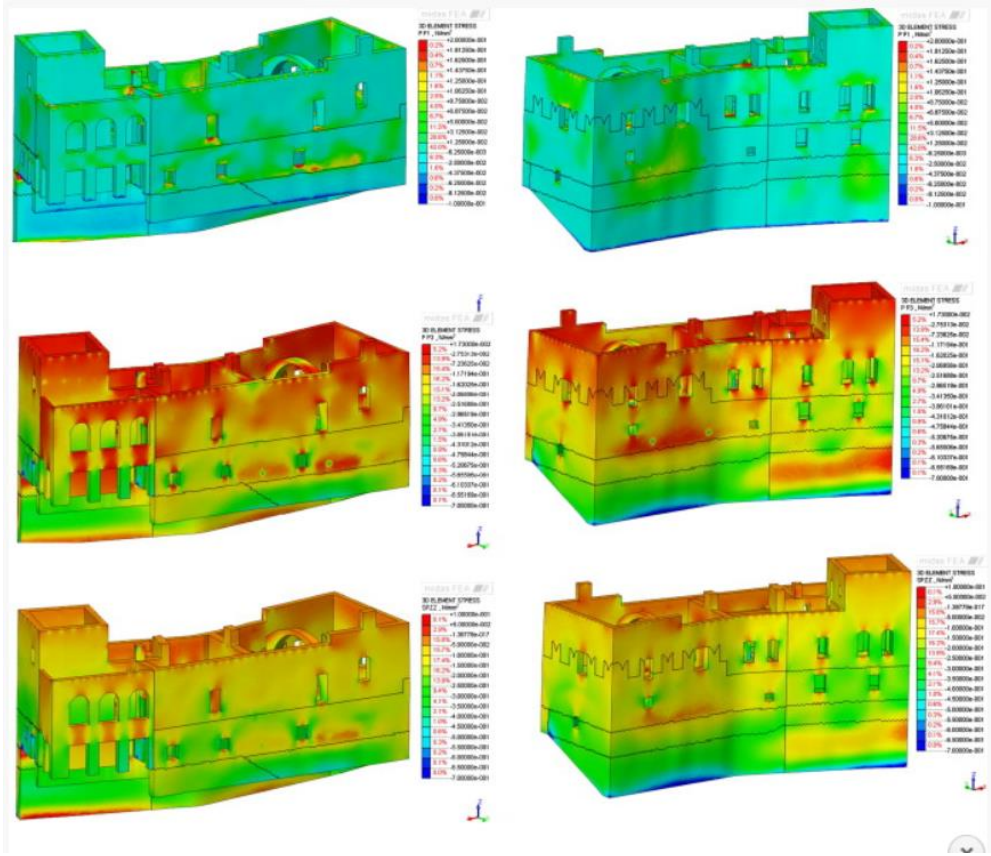
Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
6D – Sustainability





Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

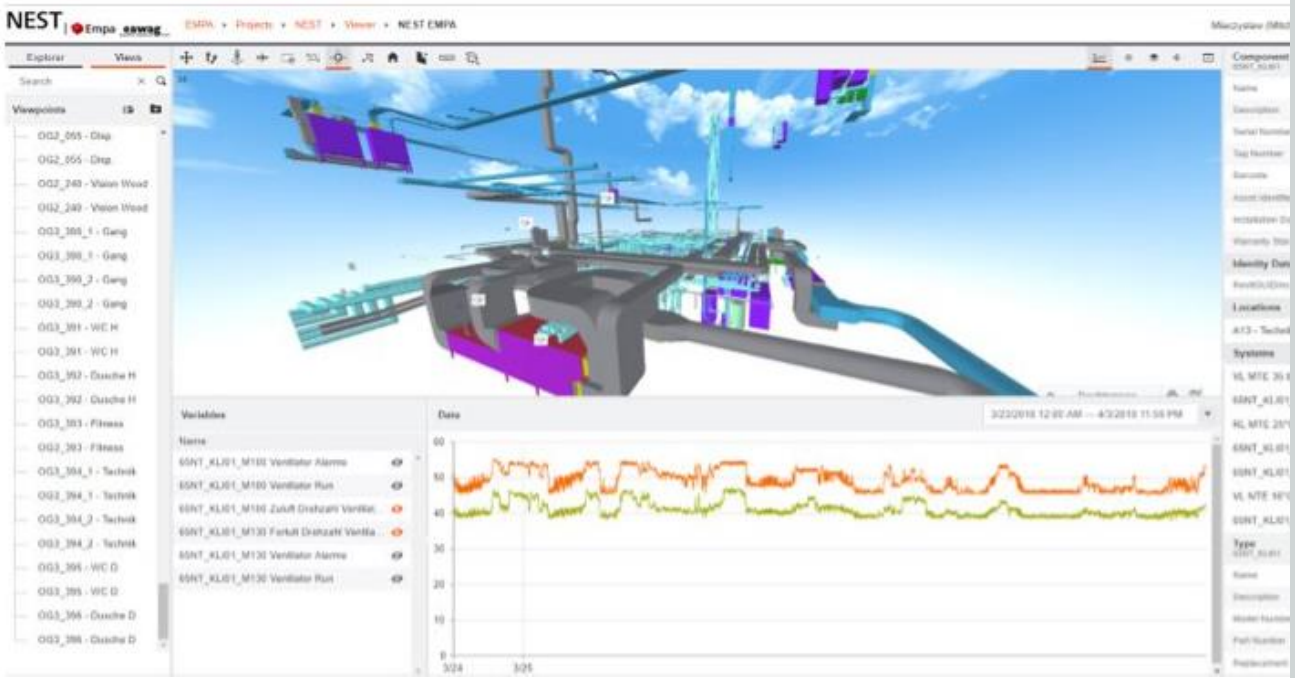
Wrocław University of Science and Technology

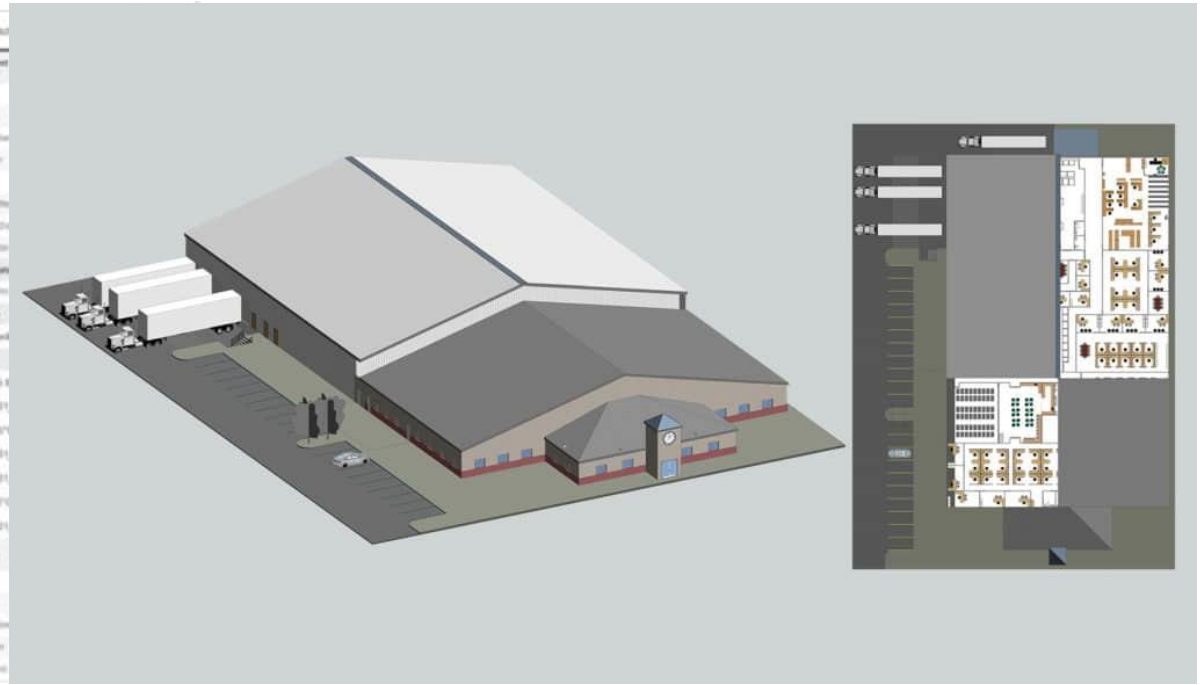
BIM Dimensions
6D – Sustainability

Benefits of 6D BIM

- Reduced energy consumption in the long run
- Faster and more accurate decision making related to component installation during the design process
- Detailed analysis and impact of a decision on economic and operational aspects over the entire lifecycle
- Better operational management of the building or structure after handover

BIM Dimensions
7D – Facility Management





Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

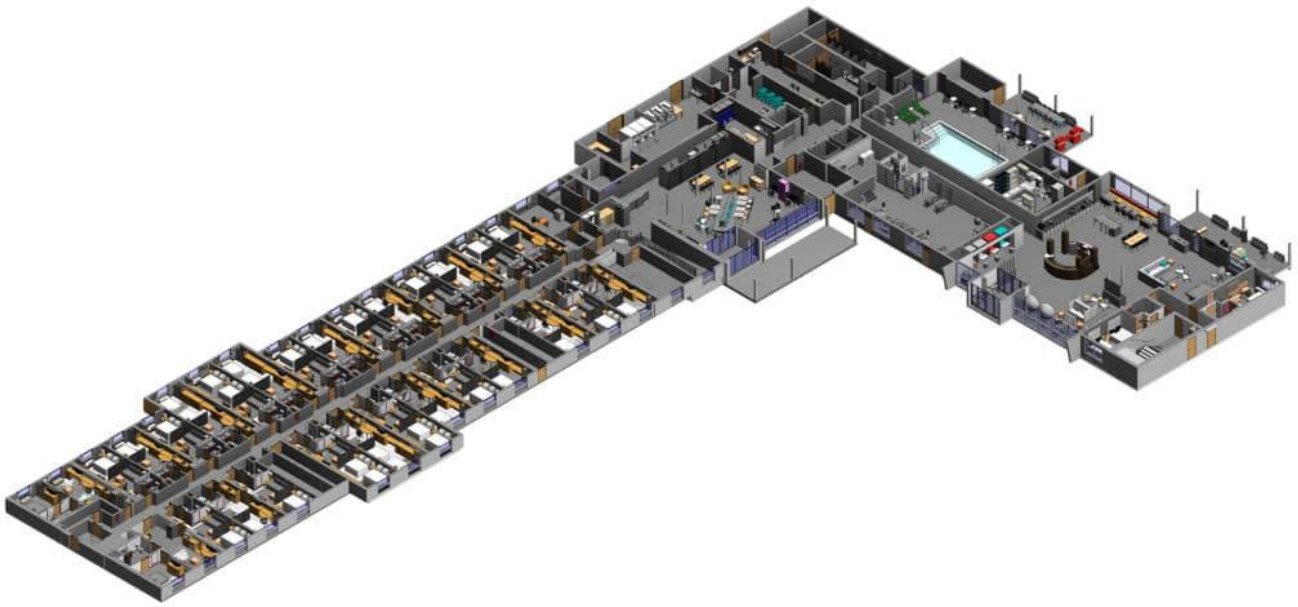
MANIPAL UNIVERSITY

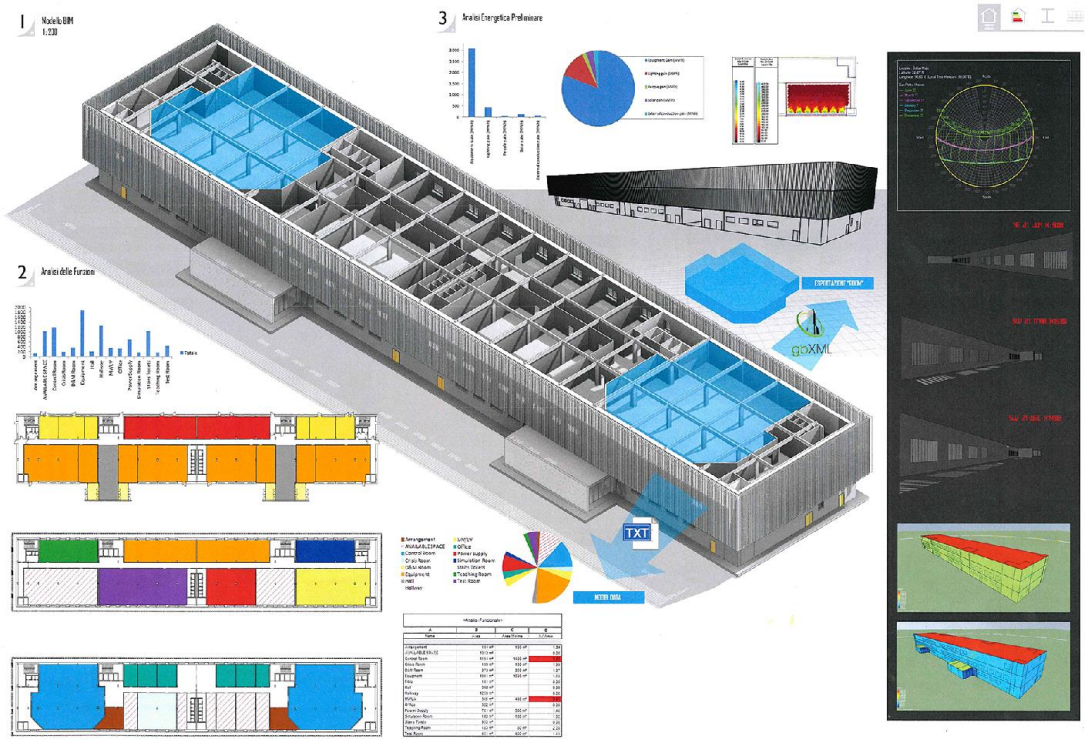
Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
7D – Facility Management





Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

BIM Dimensions
7D – Facility Management

Benefits of 7D BIM

- Optimized asset and facility management from design stage to demolition
- Simplified and easy replacement of parts and repairs anytime during the entire life of a building
- Streamlined maintenance process for contractors and subcontractors

Efficient exchange of information

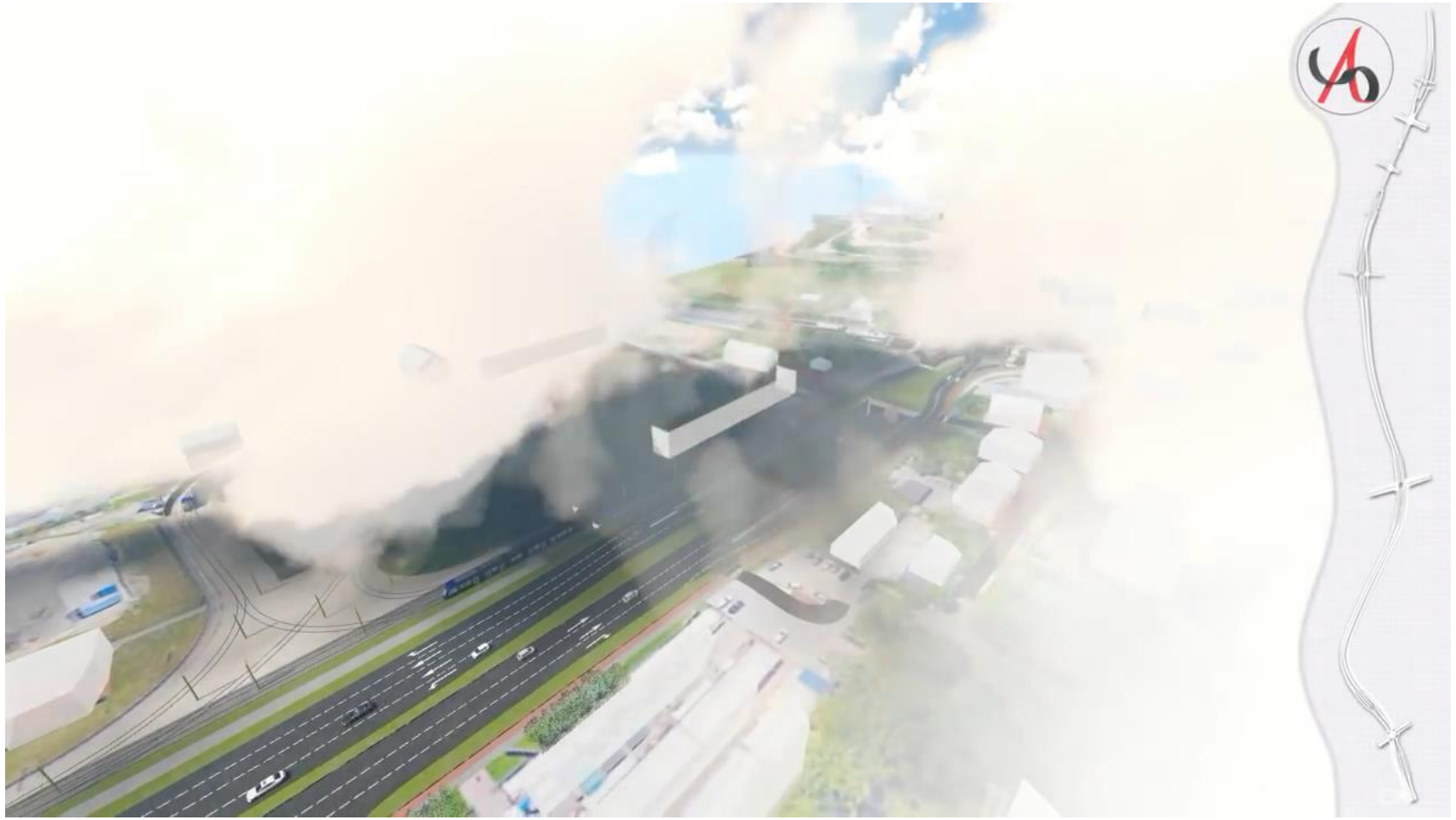
- during the design process, information should be introduced into the model only when it is necessary for the further design process,

- information should be taken from the model in a rational and legible manner.

Features of BIM technology

- interoperability,
- group cooperation,
- communication,
- cross-industry coordination, collision detection,
- 3D modelling, visualization and virtual reality.

Features of BIM technology



Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen

Universitat de Girona
Escola Politècnica Superior

Universidad del País Vasco
Euskal Herriko Unibertsitatea

POLITÉCNICA

HIGHWAY ENGINEERING LABORATORY A.U.Th.

MANIPAL UNIVERSITY

Universidade do Minho

isep
Instituto Superior de Engenharia do Porto

Wrocław University of Science and Technology

Features of BIM technology

SafeCROBOT
Virtual reality immersive safety training environment for robotised and automated construction sites

2020-1-UK01-KA202-079176

01.12.2020 – 30.11.2022

www.safecrobot.pwr.edu.pl

SafeCROBOT

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein

UWE Bristol University of the West of England

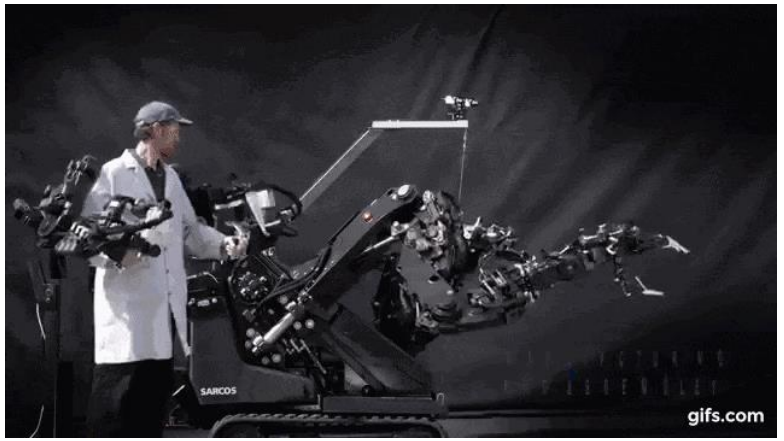
Centro Tecnológico del mármol, piedra y materiales

Politechnika Wrocławska

BZB Bildungszentren des Baugewerbes e.V.

Co-funded by the Erasmus+ Programme of the European Union

SafeCROBOT: Virtual reality immersive safety training environment for robotised and automated construction sites



Co-funded by the Erasmus+ Programme of the European Union

SafeCROBOT: Virtual reality immersive safety training environment for robotised and automated construction sites

Co-funded by the Erasmus+ Programme of the European Union

SafeCROBOT: Virtual reality immersive safety training environment for robotised and automated construction sites

Co-funded by the Erasmus+ Programme of the European Union

SafeCROBOT: Virtual reality immersive safety training environment for robotised and automated construction sites

Co-funded by the Erasmus+ Programme of the European Union

BIM technology, what more?

- levels of model detail,
- platforms for information exchange and cooperation - CDE platforms,
- data exchange standards,
- programs using BIM technology for modeling, planning and management,
- innovative technologies supporting BIM technology: virtual and augmented reality, photogrammetry, laser scanning, drones,
- …
- and many other issues.

Universiteit Antwerpen
Faculteit Toegepaste Ingenieurswetenschappen
Universitat de Girona
Escola Politècnica Superior
Universidad del País Vasco
Euskal Herriko Unibertsitatea
POLITÉCNICA
HIGHWAY ENGINEERING LABORATORY A.U.Th.
MANIPAL UNIVERSITY
Universidade do Minho
isep
Instituto Superior de Engenharia do Porto
Wrocław University of Science and Technology

BIP
Blended Intensive Program

EUCLIDES

Co-funded by the Erasmus+ Programme of the European Union

University of Antwerp
Faculty of Applied Engineering

Sustainable and Resilient Infrastructure and Buildings

1 February 2022 – 30 April 2022

15 March 2022

Lecture 6: BIM - the process of intelligent management of the project information