

environmental engineering

Introduction to BIM concept

Jarosław Müller Nina Szczepanik-Ścisło



Kraków 2020

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This text was published as a part of the project 'Excellence programming – PK XXI 2.0 Cracow University of Technology Development Program for the years 2018–2022'.

Funding from EU: 18,048,774.96 PLN

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https://creativecommons.org/licenses/by-sa/4.0/ eISBN 978-83-66531-20-8 Online edition 6,5 publisher's sheets





European Union European Social Fund



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Table of Contents

Part 1 Introduction (p. 5)

Part 2 Building information model (p. 44)

Part 3 Energy analysis (p. 77)

Part 4 Modeling the HVAC instalation (p. 95)

Part 5 Modeling instalation (p. 165)

References (p. 194)



Introduction

BIM (**Building Information Modeling**) is a process based on an intelligent 3D model. The model enables access to accurate and always up-to-date **project data**, and, consequently, facilitates making decisions based on information throughout the project life cycle.



BIM – Building Information Modeling

Building Information Management

Building Information Model

Big BIM – integrated design process

Little bim – tools, software (technology)



Source: Finith E. Jernigan AIA – BIG BIM little bim, 2nd Edition, 4Site Press, 2008

BIM digital model

It is a database that should contain all the information describing a given building: geometric data, physical features, functional features, cost data, technical parameters, data necessary to ensure the maintenance of equipment, data on the demand for utilities.

BIM as process

It is a process by which a virtual model of a planned or existing building object is created in the computer. This model is used already at the design stage for various analyzes, construction simulations (for new objects) or repair assessments (for existing facilities).



ISO 19650 Replaced national standards since 2018

Building

Building:

- A building structure (residential buildings, office buildings, hospitals)
- Linear object (roads, motorways, railway lines, underground and ground transmission networks)
- Industrial facility (installations and technological lines with infrastructure)
- Bridges, viaducts, airports









Source: www.buildinginformationmanagement.worldpress.com

Building information management framework – BIMF



Source: www.buildinginformationmanagement.worldpress.com

Benefits of BIM process



Source: lideshare.net



Information:

- Complete
- Current
- Legible
- Available
- Easy to modify
- Protected

PRODUCTION	
DIRECTOR	
DATE	TIME



Productivity



Source: Kasznia D., Magiera J., Wierzowiecki P., BIM w praktyce. Standardy. Wdrożenie. Case Study, PWN, Warszawa 2018

Global increase in work efficiency

Global productivity growth in building industry is lower than in the global economy



Source: Kasznia D., Magiera J., Wierzowiecki P., BIM w praktyce. Standardy. Wdrożenie. Case Study, PWN, Warszawa 2018

Benefits

Using the BIM-compliant model, optimal construction, technological and logistics solutions can be chosen. Costs and implementation schedules can be analyzed, and project collisions and assembly collisions can be captured.

It is estimated that the costs resulting from collisions range between 4–10% of the investment value.



Analysis of investment costs

CAPEX (Capital Expenditure) is capital expenditure needed to complete a specific investment (purchase, construction). This term is used not only in construction, but in the entire economy as well as in everyday life (buying a new car, flat or washing machine is CAPEX for the household budget). This is the basic, and often unfortunately the only indicator of the assessment of the effectiveness of a construction investment

OPEX (Operating Expenditure) is operational expenses related to the current maintenance of the object. This term also applies not only to construction but to the entire economy and everyday life (e.g. OPEX for the home budget is the purchase of gasoline for a private car). OPEX costs are often **neglected** or **are not analyzed** at the investment planning stage, although in the life cycle of the facility, these expenses often exceed the cost of the investment itself. In the BIM methodology, the OPEX analysis is one of the most important elements in assessing the effectiveness of a construction investment.

Analysis of investment costs

TOTEX (Total Expenditure) is the total investment cost in the entire life cycle. All expenses related to the implementation of the project and maintenance of the facility until its technical death. TOTEX is the sum of CAPEX and OPEX costs. Due to the mutual dependence of CAPEX and OPEX (reduction of CAPEX construction costs often results in increased OPEX operating costs and vice versa), TOTEX gives the simplest picture of the total construction investment costs in the whole life cycle of the facility.





Description of abbreviations:

CAD – Computer Aided Design

2D – two-dimensional modeling, documentation in the form of flat drawings

3D - three-dimensional modeling, spatial digital models

of the designed / existing object

SIM – Structure Information Model

AIM – Architecture Information Model

FIM – Facilities Information Model

BSIM – Building Services Information Model

BrIM – Bridge Information Model

iBIM – Interoperable Building Information Model

Source: https://www.designingbuildings.co.uk

BIM Level 0

This is the level on which construction has been in place for many years. The basic communication medium are **paper** documents containing flat drawings, tables and descriptions. Partial source information is often stored by process participants in CAD files, while the main database is paper documentation. There are **no common standards** for the representation, storage and management of information. The standards previously developed for paper documentation are used.

BIM level 1

It is primarily a change in the way of creating a project in which 3D design appears. The 3D model begins to be introduced at the concept stage and is used primarily by architects to create visualizations, and thus to improve communication with the investor. At this level of BIM, only a small percentage of the possibilities offered by 3D modelling are used. There is no information exchange between participants in the design process. The 3D model is treated as being under the "ownership" of the creator of the model and is not shared with other entities. Designers of other specialties (especially construction engineers) create their own 3D models. BIM on level 1 is often called Lonely BIM.

BIM level 1

3D models are sometimes used to generate 2D documentation, but the basis of the process is paper 2D documentation. The design uses the elements of parameterization, which speeds up the design work and facilitates the introduction of changes, information exchange can be made in electronic form, but the data is not integrated in the model.

In large British infrastructure investments, the 3D model at level 1 was used to support design processes and solve problems at the design stage, which often appeared on previous construction sites and generated losses (mainly due to excessive material consumption).

BIM level 1

An important feature of level 1 is the introduction of project documentation management systems, i.e. CAD files, which are still the basic source of creating paper documentation that is the basis for information exchange.

At level 1, the first elements of standardization of information management and cooperation of participants in the construction process are introduced.

BIM level 2



BIM level 2

This is the next step in information modelling. The integrated 3D model becomes the basic information bank about the object. "Integrated" means containing information covering various issues (architecture, design, installations). Importantly, this model does not have to be placed in one file. Many files are used that are related to each other and contain data created according to specific rules and standards (e.g. at the beginning of the project, the exact location of all reference points for individual project industries, colours assigned to different types and classes of objects, etc.) is defined. The 3D model contains geometric and non-geometric data describing the complete object at the implementation and use stage. The "logic" of the creation of the project, the required levels of information detail for individual investment stages and for the indicated process participants are defined.

BIM level 2

The integrated 3D model is a source of information, and appropriate programs allow to automatically generate 2D documentation based on the data contained in the model.

The 3D model is the basis of the implementation and coordination process. In using it, the process of building the object can be simulated, and, hence, at the design stage many dangerous or undesirable situations that could occur at the construction stage can be eliminated.

BIM level 2 – Dimensions

At level 2, the 3D model begins to be extended with new information that allows the drafting of a delivery and implementation **schedule (4D)** as well as a cost estimate and budget, also in the **time aspect (5D)**.

Using the BIM model, it is possible to carry out analyzes of the object's **impact on the environment (6D)**.

The model can contain data that can then be manually or automatically added to the systems supporting the **management** of the finished object **(7D)**. Because the history of BIM – at all times "is being written", so most likely in the coming years, a "xD" describing the subsequent applications of BIM, or the next "dimensions of BIM" will appear.

BIM level 2

The integrated information model includes data that cover many areas, including:

- Structure SIM (Structure Information Model)
- Architecture AIM (Architecture Information Model)
- Equipment and management FIM (Facility Information Model)
- **BSIM** (Building Services Information Model) services
- And information specific to bridge objects **BrIM** (Bridge Information Model).

National standards and other documents should bring into line most elements of the process, and the use of standardized bases of components facilitates design and assembly.

In the design and implementation process, CDE information management systems with full standardization of electronic information exchange are used. Paper documentation is no longer necessary because it is perfectly replaced by mobile devices with access to project data.

BIM level 2

At this level, the organization of work changes and BIM ceases to be "lonely". Teams work closely together, and an effective exchange of information becomes an important element.

Participants of the process realize their tasks while taking into account a wider perspective: "how does what I do affect the work of others and the end result?"

In design and construction companies, there are **completely new positions**, or even professions, very important for the whole process, e.g. BIM manager, information manager or model manager that now exist due to BIM level 2.

AA AA

BIM level 3

This is the biggest challenge. In British literature, level 3 BIM is considered the "Holy Grail of construction".

The core of this BIM level is a model containing complete data about the object (3D, 4D, 5D, 6D, ...), based on one centralised data base with possible active links to external data that allows for bi-directional information exchange. This model is referred to as an iBIM (interoperable Building Information Model), i.e. an interoperable digital object model. The term "interoperable" here means that it enables full cooperation of all participants in the process, using the data contained in the model and introducing new data to it.

In this way, the model is updated in a continuous mode and the derived result is shared by all process participants.

BIM level 3

The implementation of level 3 allows for **a precise reflection** of a real – existing or planned – building object, in the form of a digital model.

Thanks to this, at the concept and design stage, the design team can:

- Carry out multiple iterations of the model in order to obtain the expected indicators related to ecology and environmental protection, construction time, operating costs or other elements relevant to a given project.
- Simulate the construction process taking into account the aspects of safety, costs, time.
- Carry out simulations of the facility's use and examine related aspects of health, ecology, environmental protection and safety.

The model containing all data corresponding to the actual object will be used to manage the object **throughout its life cycle**.

BIM level 3

The core of level 3 activation is basing the design, implementation and management processes on **Internet** services integrated with BIM, as well as placing data in the cloud with the possibility of having access to them from any authorized device.

The definition of BIM level 3 is constantly changing. In the United Kingdom, for some time, there has been talk about the need to establish sublevels within it. This would allow a better definition of the subsequent steps that will allow users to reach the full level 3 maturity. It should be noted that at such a high level of data and process integration, it is necessary to introduce a number of new provisions regarding, for example, copyright or professional liability.

The implementation of BIM at level 3 requires advanced IT infrastructure, fast networks, access to high-speed wireless data transmission, as well as secure and effective data storage systems equipped with advanced information management tools based on cloud solutions.

Level 3 BIM will completely change the degree of the digitization of the construction industry, which is why it is one of the elements of the long-term development strategy of the United Kingdom – deemed "Digital Built Britain".

It is worth to be aware that level 3 has not been defined as the final level of BIM development.

The BIM Curve



Source: Keysoftsolutions.co.uk

The BIM savings



Source: Iodplanner.com

BIM beneficiaries

The most important users of information contained in BIM

- Investors
- Designers and specialists in various industries
- Companies that build or modernize an object or its surroundings
- Owners
- Managers
- Tenants
- Users and customers
- Companies involved in the maintenance of equipment of the facility
- Emergency services
- Public administration and local governments
- Companies providing media
- Demolition companies

BIM beneficiaries – designers

At various stages of investment implementation, the investor obtains diverse added values resulting from the use of BIM.

At the design stage:

- The possibility of active participation in the design process.
- Easy variant analysis for various design and technical solutions, particularly useful in the aspect of ecology and environmental protection.
- Facilitated social consultations, especially for large or controversial investments.
- Taking into account many criteria and their impact on the investment cost (good example: scaffolding).
- A much more accurate estimation of the budget and schedule.
- Obtaining an object of greater value (better use of the plot area, more effective design of the layout of rooms or passageways, better technical parameters of the facility).
BIM beneficiaries – designers

At various stages of investment implementation, the investor obtains various added values resulting from the use of BIM

At the design stage (cont.):

- It is easier to pre-determine the impact of construction time on the environment, e.g. excluding road sections, railway lines, viaducts, traffic congestion around the site, increased demand for utilities, etc.).
- Lower cost of making changes to the project.
- Easy communication with designers based on 3D model visualization.
- Better mutual understanding of the process participants.
- Clear definition of the scope of responsibility.
- Accurate estimation of maintenance costs of the finished object.

BIM beneficiaries – contractors

Contractor selection stage:

- Easy verification of offers due to the price.
- Easy verification of offers due to the schedule.
- Easier comparison of the quality of offers.
- A clearer definition of the investor's requirements towards the contractor.

Construction stage:

- Lower construction price.
- Ongoing cost control.
- Ongoing inspection of work progress.
- Easy communication with the contractor using a 3D model.
- Using the 3D model to start selling space in a non-existent object, especially when applying virtual and augmented reality technology.
- Addressing ecological concerns (less waste, green technologies, easier estimation of the impact of building construction on the natural environment).
- New possibilities of control and evaluation of the quality of performed works.

BIM beneficiaries - investors

Sales stage:

- High quality of the object.
- Compliance of as-built documentation with reality.
- Easy preparation of attractive offers based on the 3D model.
- Easy customization of the offer and arrangement.
- Easiness of estimating the costs and time of possible changes and arrangements.
- Opportunity to sell added value (ecology, low maintenance costs, access to data reducing management and maintenance costs).
- Enabling an increase of the object's worth by offering added value digital data that can be used directly in FM systems.

Ways of implementing a construction project

Three basic ways to implement a construction project:

- Traditional DBB (Design-Bid-Build), the most commonly used in our country, e.g. Design, select a contractor and build, consisting of independent carrying out three processes: order preparation, project execution and construction completion. These processes are enacted by various entities that are linked by independent contracts.
- Popular in developed countries DB (Design and Build), in which design and construction are treated as one process implemented by one main entity that is also a party to the contract with the investor (most often it is a general contractor, less often, an architectural company).
- Increasingly better known in the context of the use of BIM, IPD (Integrated Project Delivery),
 i.e. an integrated investment process in which ordering, design and construction are one process implemented jointly by all participants.

Ways of implementing a construction project



It is worth extending investment in the design stage. Money spent on the project here, can reduce total investment costs (to some extent)



Source: Kasznia D., Magiera J., Wierzowiecki P., BIM w praktyce. Standardy. Wdrożenie. Case Study, PWN, Warszawa 2018

3D models of the building

Architecture

Construction

Installations







Thanks to the use of BIM, designers are now able to develop designs for the most complex buildings. BIM is used in the field of planning, design, management and construction. By working in this standard, designers easily collect and exchange data, by collaborating and sharing the necessary information. BIM technology is already used at the stage of creation (creation) of most projects. As a result, both architects and other participants of the investment process working on a 3D model are able to check virtually all technical aspects of the planned implementation before heavy equipment begins to work. Because the cooperation is based on 3D models, changes made by one of the parties can be immediately captured automatically by the others, so the time is saved that was previously spent on painstaking coordination of compliance and adaptation of all documentation to the introduced changes in 2D. The collaboration of specialists is thus smoother, and project data and information are used in a completely new way.

BIM





Building Information Model

Building Information Modelling is a process based on an intelligent 3D model. The model enables access to accurate and always up-to-date project data, and, consequently, making decisions based on information throughout the project life cycle.

It is a database that should contain all the information describing a given building: geometric data, physical features, functional features, cost data, technical parameters, data necessary to ensure the maintenance of equipment, data on the demand for utilities.

It is a process by which a virtual model of a planned or existing building object is created in the computer. Even at the design stage, this model is used for various analyzes, construction simulations (for new objects) or repairs (for existing facilities).

Revit

Revit is not a CAD program

- Autodesk Revit is a BIM application that uses parametric 3D modelling to generate projections, sections, elevations, visualizations, details and combinations of all the necessary instruments needed to document a construction project.
- Drawings created using Revit are not a sum of 2D lines and shapes that are interpreted as a building; these are real views from the virtual model.
- The created elements retain a bidirectional relation if the elements are changed in one view, e.g. a projection, these changes are automatically updated in the remaining views.
- In addition, all properties and information about each element are collected in the element itself, thanks to which the description of the element does not play such a significant role as it is in CAD applications.

Revit tutorials

- Revit Tutorial for Beginners https://www.youtube.com/watch?v=F322Jvs24Do
- Revit MEP Lesson 1: User Interface: https://www.youtube.com/watch?v=ZSXN-7mRSvM
- Plumbing in Revit MEP Beginner Tutorial: https://www.youtube.com/watch?v=Mvb-lu6ivq0
- Simple Mechanical System in Revit Tutorial https://www.youtube.com/watch?v=PJLHu_Yke0A

Revit Interface



Important!

- Always open the file from within Revit, not by double clicking on the file in the browser. In this way, while working as a group, we open the current file;
- Revit files are not backward compatible, e.g. a file of Revit 2019 will not open in 2016;
- Opening the 2016 file in Revit 2019 will automatically convert to version 2019. (it will stay like this forever)

Previously open projects



Previously open or created families







Important options

General	Notifications
User Interface	Save reminder interval: 30 minutes
Graphics	Synchronize with Central reminder interval: 30 minutes
Hardware	
File Locations	Username
Rendering	Jmuller_pk You are currently not signed in When you sign in your Autodesk ID will be use
Check Spelling	as your username.
SteeringWheels	Sign In
ViewCube	Journal file cleanup
Macros	When number of journals exceeds: 10
	then Delete journals older than (days): 10
	Worksharing update frequency
	Less Frequent More Frequent
	Every 5 seconds
	View options
	Default view discipline: Coordination

Choice of Template "Mechanical Template"







Customize

- You can match several elements to your own needs and habits;
- "Quick access bar" can be extended to frequently used commands (right click) or reduced (arrow);
- Bookmarks can be arranged in any order (ctrl);
- Panels can be moved, even to the work area or the second screen;
- Properties and browser are individual for each user;
- You can use keyboard shortcuts (mouse over or alt);
- Abbreviations run without "enter".

Graphics visibility

Model Categories Annotation Categories Analytical Model Categories Imported Categories Filters Revit Links If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit Filter list: Show all> If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a category is unchecked, it will not be visit If a categories is a term of overvisit Projection/Surface Cut is unchecked, it will not be visit If a categories is that are not		Visibi	ility/Graphic	Overrides fo	r 3D View:				
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Projects, templates families

- Template extension .rte;
- While working in Revit, we create (or use a predefined) template;
- Families are components we use to build our model, such as equipment, ducts, diffusers, walls, windows, etc. Each family can have multiple types, such as different size, parameter variables materials, etc.;
- The .rft family template file extension;
- The family is closely related to the template;
- .rfa family file extension;
- The family can be loaded into the project file.



- Views are selected from "project browser";
- Each selected view is opened all the time;
- The view currently in use is highlighted (bold) in "project browser";
- Each command is performed in each view;
- Optimization disabling unused views (close inactive) "quick access" or "view ribbon".

Link



Positioning



Interface

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Opening



Zoom to fit (right click)



Click and pin

Block link





Levels

Levels can be created:

- From architectural layout (from the elevation view);
- Import from other model's links;
- Manually;
- Through line selection.

Levels manually Line copying as level, offset, ordinates

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Levels – copying

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Click on layout

Levels – copying



Select levels Click on finish Find copy/monitor – bookmark Click again on finish (if it was "multiple")


Grids – copying

Plan view
Copy/monitor, click on plan
Select all
Filter
Select "grids"
Finish, finish

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Project data



Project data

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Angle from Project North to True North :

East

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Help



Energy analysis

Creating volumes

Select the level and click on "Type properties"



Creating volumes

Mark "Room Bounding"

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Creating spaces

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Creating spaces

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Closing inactive views

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Tiling views



Tiling views



Volume edition



Automatically placing spaces



Room parameters definition



Creating zones – volumes of the same properties



Creating zones – volumes of the same properties



Right click (or F9)

Creating zones – volumes of the same properties



System browser

Entire zone parameters



Generating a report





Generating a report



Generating a report

R test krk - Report: Loads Report (1)

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Project Summary	
Location and Weather	
Project	Project Name
Address	## Street City, State Zip
Calculation Time	3 marca 2019 01:05
Report Type	Standard
Latitude	42.36°
Longitude	-71.06°
Summer Dry Bulb	34 °C
Summer Wet Bulb	25 ℃
Winter Dry Bulb	-14 °C
Mean Daily Range	9°C

Building Summary

-	
Inputs	
Building Type	Office
Area (m²)	693
Volume (m³)	2,522.13
Calculated Results	
Peak Cooling Total Load (W)	34,584
Peak Cooling Month and Hour	July 16:00
Peak Cooling Sensible Load (W)	27,633
Peak Cooling Latent Load (W)	6,951
Maximum Cooling Capacity (W)	34,584
Peak Cooling Airflow (L/s)	1,822.9
Peak Heating Load (W)	29,031
Peak Heating Airflow (L/s)	957.9
Checksums	
Cooling Load Density (W/m²)	49.87
Cooling Flow Density (L/(s·m²))	2.63
Cooling Flow / Load (L/(s·kW))	52.71
Cooling Area / Load (m²/kW)	20.05
Heating Load Density (W/m²)	41.86
Heating Flow Density (L/(s·m²))	1.38

Zone Summary - Default

Inputs		
Area (m²)	605	
Volume (m ³)	2,242.07	
I		



MODELING the HVAC installation



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View templates	View properties			
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Hidden lines



Hidden lines








Duct placeholder



Duct placeholder

Properties

Dimensions

Offset



Duct placeholder



Duct placeholder

Modification – effect of stretching



- Duct placeholder
- Select the entire run of ducts
- Change into the full size ducts



- Duct placeholder
- Change into the full size ducts
- Results
- Caution! Irreversible process



Drawing and

connecting

🦹 🗁 🗟 🎧 - 🖘 - 🛱 - 🖨 🚔 - 💉 😥 🗛 🔹 Project class - R... 🕽 Type a keyword or phrase 🛛 🕮 🖄 🏠 🔔 : File Architecture Structure Steel Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify | Place Duct 💽 • Architecture Structure Steel Systems Insert Annotate Analyze Massing & Site Collaborate View Manage e Pi Pi 👷 * * 💥 💽 Cope 🔹 🍙 🟹 60 (8 B \longleftrightarrow 2° R Ø ď. Ł Ø 1 👌 Cut 🔹 🚆 🥲 🖲 🔐 🔂 🕬 🖌 - 🔫 4 Duct Flex Air Fabrication Multi-Point Duct Terminal Part Routing Modify Justification Automatically Modify Duct P&ID Modeler Mechanical Plumbi... Electrical 07 Ò 😼 🏉 Join 👻 🐇 🔍 🧻 🖽 🗶 📎 Due Placeholder Connect Equipment Tag HVAC angular, or oval &uctworEabrication ¥ P&ID Collaboration ¥ Mechanical ¥ Select v Properties Clipboard Geometry Modify View Measure Create Placement Tools Select 🔻 ✓ Height: 300 ✓ Offset: 4000.0 mm ✓ Apply Modify | Place Duct Width: 300 X 🗋 1 - Plumbing 👘 1 - Mech 🛗 1 - Ceiling Mech X 🛗 1 - Ceiling Mech X X 🖹 1 - Plumbing 📄 1 - Mech Properties Project Browser - Project class 0 ···· ??? **Fh** ---- Sections (Building Sect Rectangular Duct Ceiling Plan Mitered Elbows / Tees Section 1 ř. HVAC Ceiling Plan: 1 - Ceili 👻 🗄 Edit Type New Ducts E--- Floor Plans --- 1 - Mech Graphics Constraints 8 0 View Scale 1:100 Horizontal Jus... Center 3 -Mech Scale Value Vertical Justifi... Middle Display Model Normal ---- 4 - Mech Reference Level Level 1 Detail Level Medium Ceiling Plans - - - -Offset 4000.0 Parts Visibility Show Original 1 - Ceiling Mech Start Offset 4000.0 Visibility/Grap... Edit... Horizontal 2 - Ceiling Mech End Offset 4000.0 Graphic Displ... Edit... 🖮 3D Views 0.0000% Orientation Project North 3D HVAC Wall Join Disp... Clean all wall j (3D) Discipline Mechanical Elevations (Building Ele Width 300.0 Show Hidden ... By Discipline East - Mech 300.0 Height Default Analy... None - North - Mech 304.8 Length Sub-Discipline HVAC ... South - Mech Mechanical Sun Path West - Mech System Classif... Return Ai Underlay 🛓 --- Plumbing System Type Return Air Range: Base L... None 🛓 --- Plumbing - Floor Plans Underlay Orie... Look up 1 - Plumbing Bottom Elevat... 3850.0 Extents 2 - Plumbing Crop View Crop Region .. 3D Plumbing Annotation Cr... Size Lock - Elevations (Building Ele View Range Edit... V Loss Coefficient 0.000000 🦹 🗁 🖶 🎲 + 🖘 - 🗇 - 🖨 🖴 - 🖋 😰 🗛 🗰 Project class - R... + Type a keyword or phrase --- East - Plumbing 99 Hydraulic Dia... 0.0 North - Plumbing Properties help 1:100 🖾 🗇 🄕 🙀 🕼 🖓 🖓 9 📾 📾 🖬 🗸 Architecture Structure Steel Systems Insert Annotate Analyze Massing & Site Collaborate View Apply > .: < $\mathbb{K}^{\mathsf{cope}} \cdot \mathbb{P} = \mathbb{P}$ 🖉 :0 🛛 🔚 🚛 Main Model HORIZONTAL D. 🖯 Cut + 🖕 🐑 -맮 🖬 🛪 🖌 - 🔫 H Modify Clipboard ✓ Offset: 4000.0 mm ✓ Apply Width: 300 ✓ Height 300 Modify | Place Duct X 🗋 1 - Plumbing 📄 1 - Mech 🛗 1 - Ceiling Mech X gular Duct ed Elbows / Tees ✓ E Edit Type New Ducts Constraints Horizontal Jus., Center Vertical Justifi., Middle Reference Level 1 Offset 4000.0 Start Offset 4000.0 The End Offset 4000.0 0.0000% Dimensions Size Width 300.0 Height 300.0 Length 304.8 connection Mechanical is created System Type Return Air

The same system

Different system e.g. "return air"

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Drawing and connecting

Adding insulation



Editing insulation



Insulated duct dimensions



Insulated duct dimensions



Changing type



Changing type

Selecting only one duct and changing its type – Revit will change the type of the entire run



Moving ducts

Moving one duct in the run – Revit will stretch the connected ones



Moving ducts

Moving one duct in the run – Revit will stretch the connected ones



Changing duct type of one part



Changing duct type of one part – Revit will add the transition



Accessories



Accessories –

Fire damper put into the duct run

When moved – the cut in the duct will move as well

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Placing air terminals



Placing air terminals



Placing Air Handling Unit



Placing Air Handling Unit



Creating a system

Select AHU and air terminals, next



Creating a system





Editting a system



Right click

and select

"type properties"

Editing a system

Project class - R... > Type a keyword or phrase 🕮 😂 🕁 🚨 Sign In • 😓 🕐 – 🗗 🗙 * A 0, × Systems Insert Annotate Analyze Massing&Site Collaborate View Manage Add-Ins Modify 💽 ▾ Type Properties Air ~ Family: System Family: Duct System Load... minal ы Exhaust Air \checkmark Type: Duplicate... Rename... Type Parameters Parameter Value Graphics Graphic Overrides Edit... ____ **Materials and Finishes** Material <By Category> Mechanical Calculations All System Classification Exhaust Air **Identity Data** Type Image Abbreviation Type Comments URL Description Rise / Drop Rise / Drop Symbol Slash _ What do these properties do? OK << Preview Cancel Apply Pattern Pipe Fittings Pipe Insulations :100 🔄 🗇 🌭 🕵 🚓 🔊 📎 🤉 🖽 🍘 🖼 < > ... < > 20 🖂 🔁 👩 📄 🛃 Main Model \sim

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Offers different layout solutions for adding selected equipment and fixtures to HVAC and piping systems.							
If prompted, select the system into which the component will be connecting. Add and remove other system components and bases as needed.							
Select a solution type and step through the possible solutions by clicking the arrows on the Options Bar.							
Press F1 for more help							

Creating a system

Arrows show solutions, next "finish"

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Adding to system



Flex



Flex







3D View


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Detail level – medium



Start a new duct at some point of the run



Revit will create an accessory



Changing orientation of accessories by using "+" or "-"







Click on a duct



Changing the offset

Move to "offset", enter the height





AHU

AHU – all the connectors are marked



• ◆ 🏂 🐘 • ₹ Project1 - Floor	Plan: 1 - Mech	a keyword or phrase	🖣 😫 🕁 🚨 Sign In	• 🛱 🕘 • 🗕 🗗 🗙
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MODELING installation

Select correct level in plumbing section



Select "Systems" and "Plumbing fixture"



Select the fixture

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Create the system



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Generate layout



Place base



Solutions



Solutions

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Creating cold water piping



Creating cold water piping – settings

Main or branch offset



Creating cold water piping – manually



Creating cold water piping – manually



Creating cold water piping – manually

Connect into


Select system



Select pipe



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By category





Change of annotation type



Change of annotation type



Change of annotation type







Tag All



Select system



Select system



References

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eISBN 978-83-66531-20-8