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BIM qualification training module

Effective coordination and clash-detection processes in pre-construction phase

Tomáš Funtík
STU Bratislava

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Module outline

1. Building Information Modeling Principles
2. The role of the BIM manager
3. BIM coordination / Clash detection

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1. Building Information Modeling Principles

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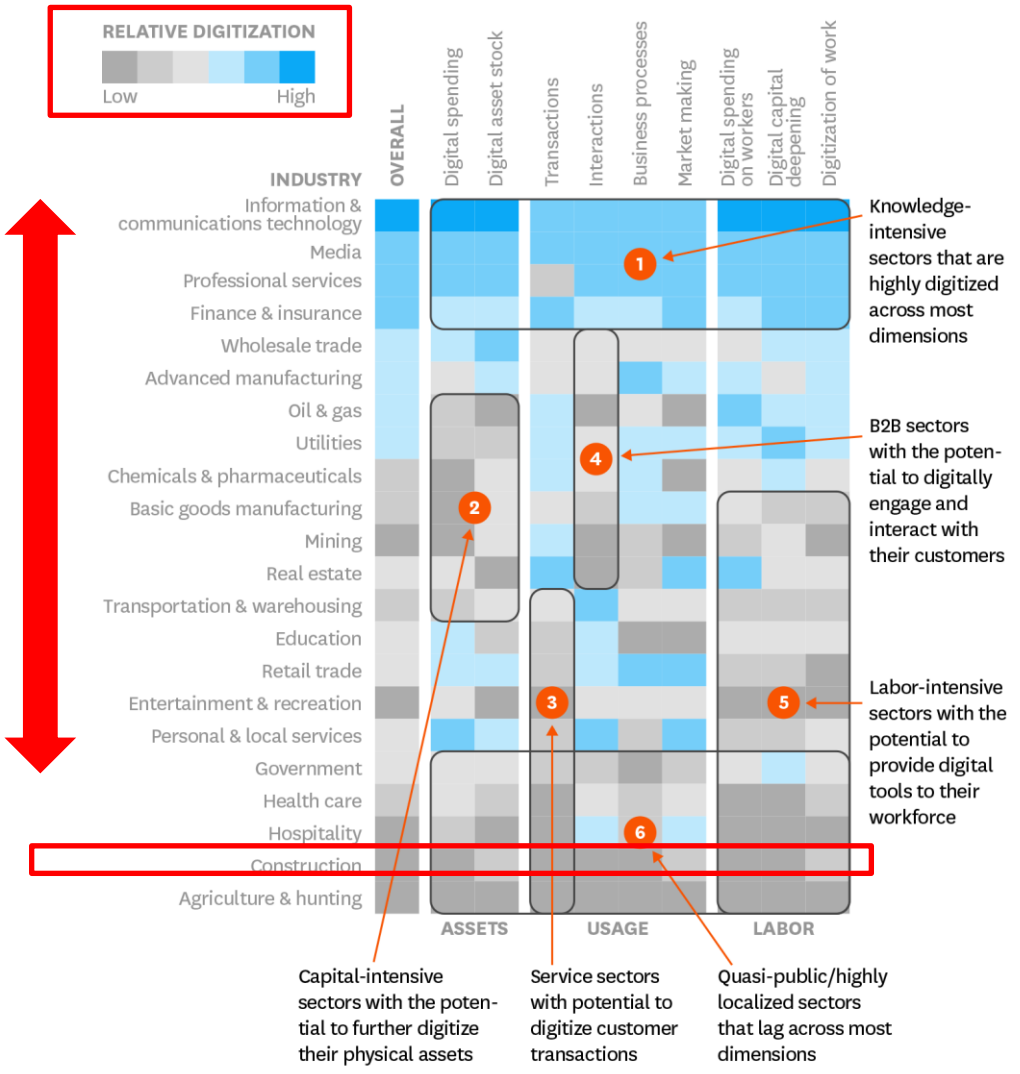
Bim asociácia Slovensko

How Digitally Advanced Is Your Sector?

An analysis of digital assets, usage, and labor.



SOURCE DATA ANALYSIS AND EXPERT INTERVIEWS CONDUCTED BY THE MCKINSEY GLOBAL INSTITUTE © HBR.ORG

WHY?

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BIM potential

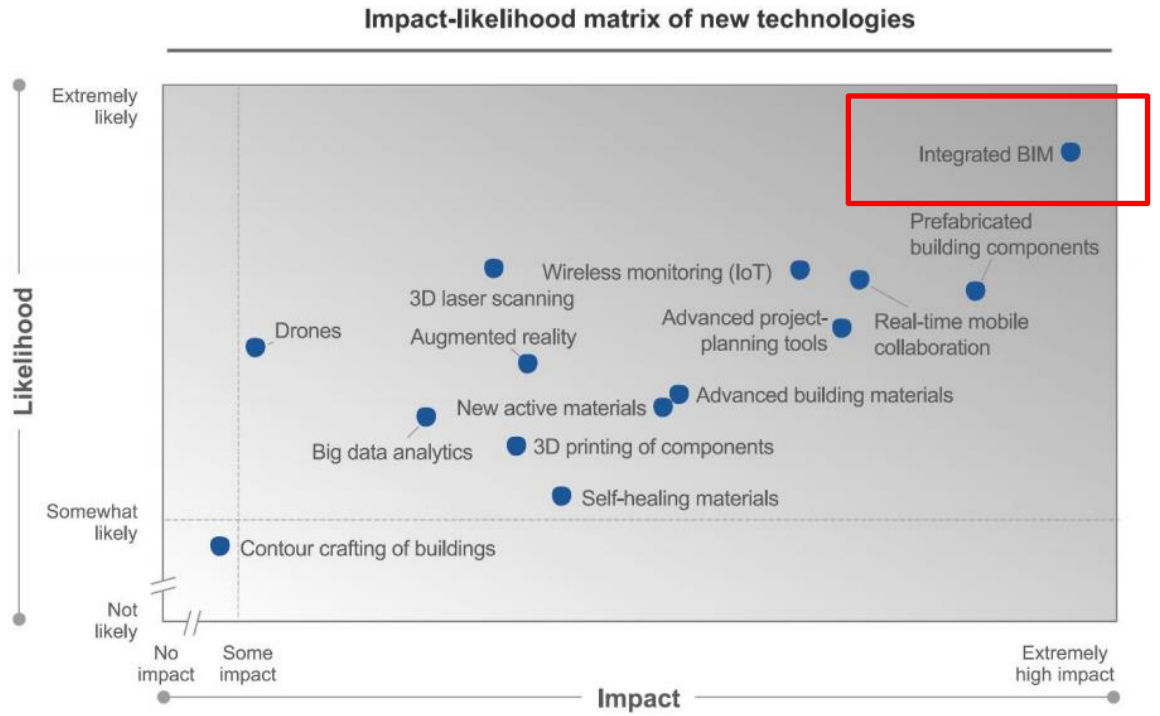

Figure 1: Future impact and likelihood of technologies (Source: Shaping the Future of Construction)

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DIRECTIVE 2014/24/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 26 February 2014
on public procurement and repealing Directive 2004/18/EC

CHAPTER II ***General rules***
Article 22 **Rules applicable to communication**

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of the European Union

ISSN 1977-0677
L 94

English edition
Legislation

Volume 57
28 March 2014

(c) the use of electronic means of communication would require specialised office equipment that is not generally available to contracting authorities;

(d) the procurement documents require the submission of physical or scale models which cannot be transmitted using electronic means.

In respect of communications for which electronic means of communication are not used pursuant to the second subparagraph, communication shall be carried out by post or other suitable carrier or by a combination of post or other suitable carrier and electronic means.

requests to participate are preserved. They shall examine the content of tenders and requests to participate only after the time limit set for submitting them has expired.

4. For public works contracts and design contests, Member States may require the use of specific electronic tools, such as of building information electronic modelling tools or similar. In such cases the contracting authorities shall offer alternative means of access, as provided for in paragraph 5, until such time as those tools become generally available within the meaning of the second sentence of the first subparagraph of paragraph 1.

5. Contracting authorities may, where necessary, require the use of tools and devices which are not generally available, provided that the contracting authorities offer alternative means of access.

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BIM transforms the construction sector

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HOW WOULD YOU FIND ANY INFORMATION?

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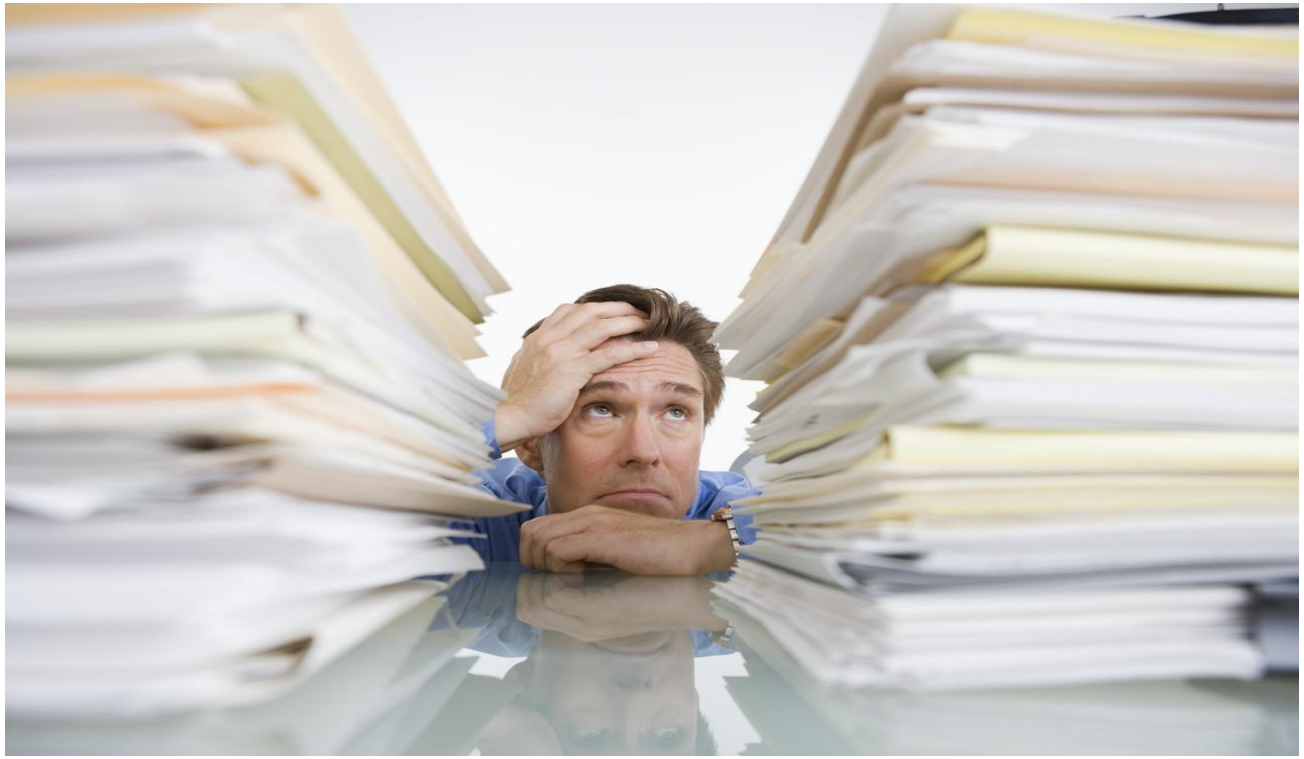
...ANY PROJECT RELATED INFORMATION?



Dalux

build.dalux.com/client/247950/location/default

SvF_Team 5

Pavol Mayer

Dashboard

Locations

Field 1

Box Pro 13

Handover

Tender

Company Profile

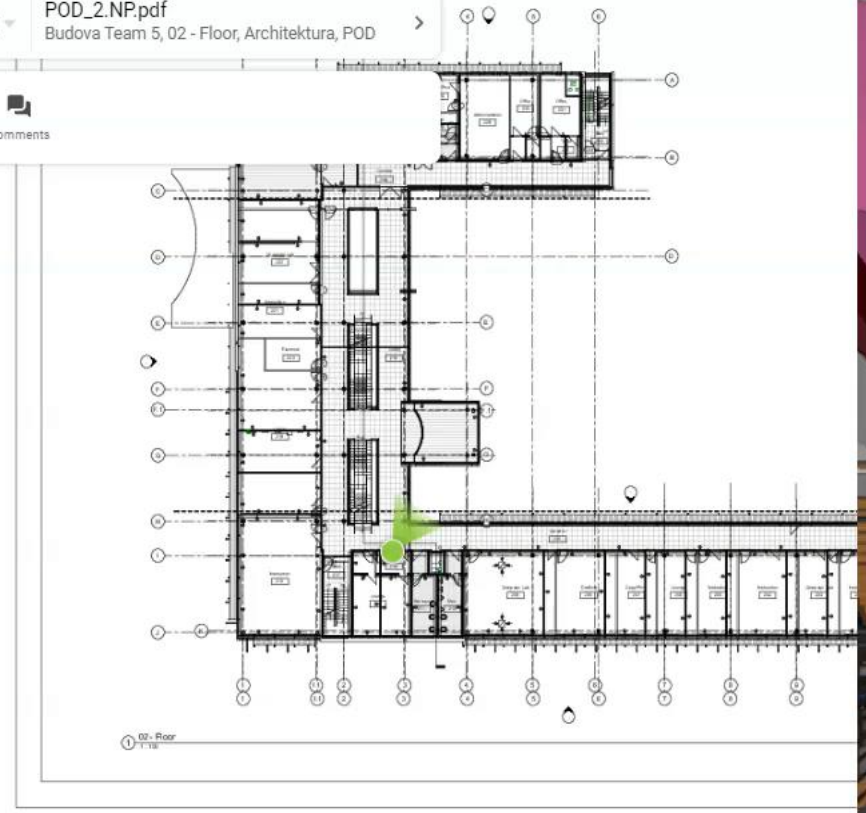
Settings

Help

POD_2.NP.pdf

Budova Team 5, 02 - Floor, Architektura, POD

Comments



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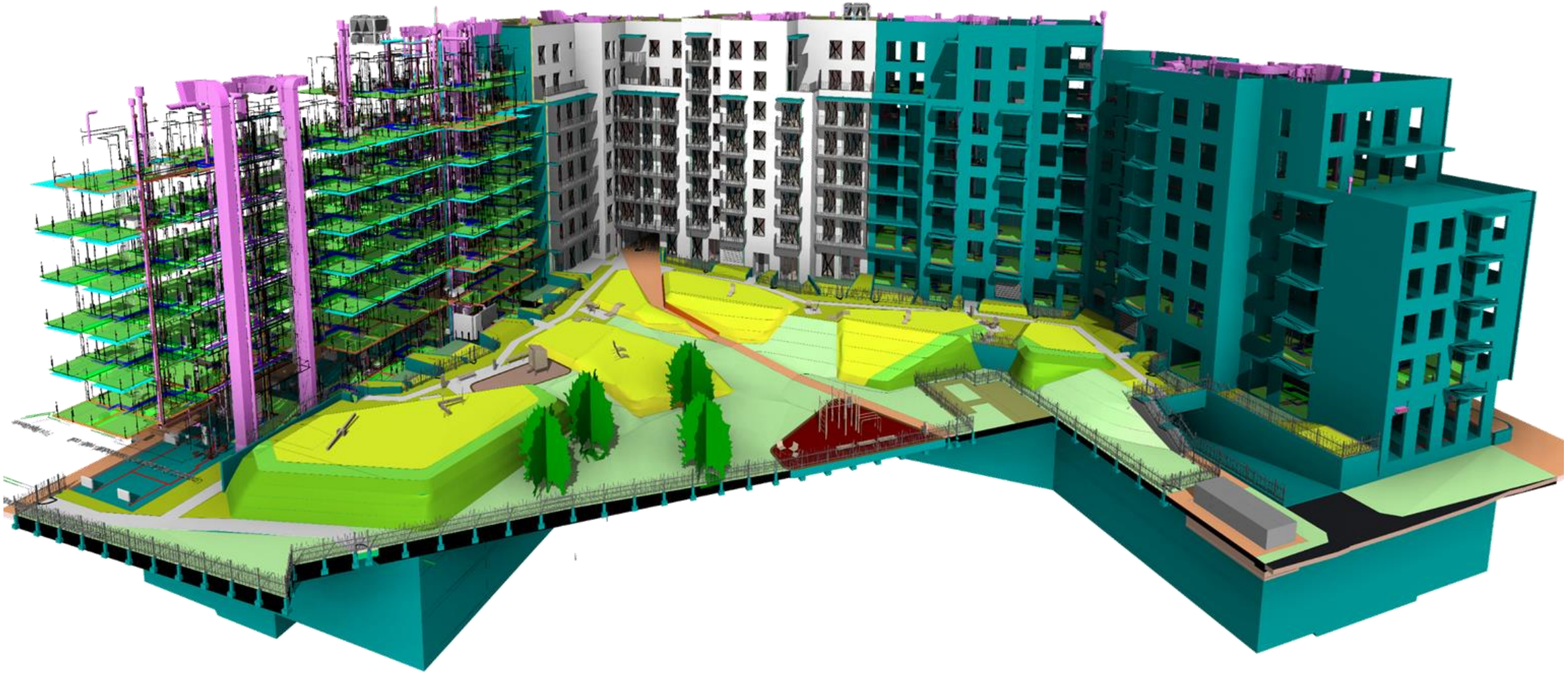

Source: **PROMA, YIT Slovakia**

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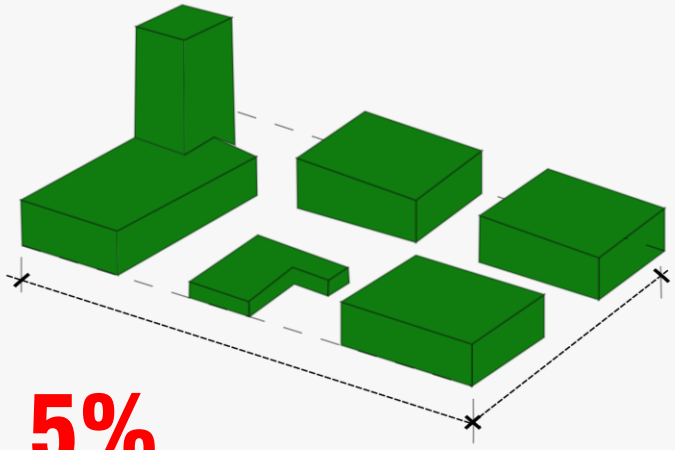
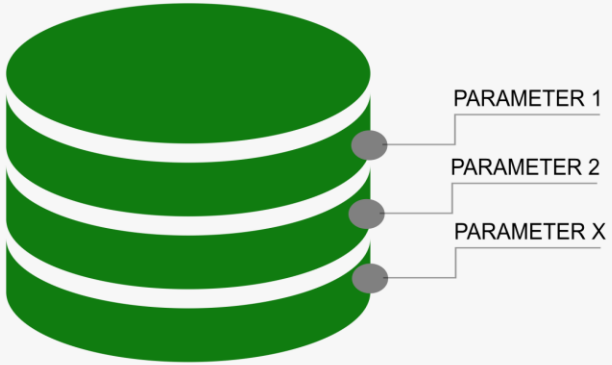
BUILDING INFORMATION MODEL

GRAPHICAL INFORMATION

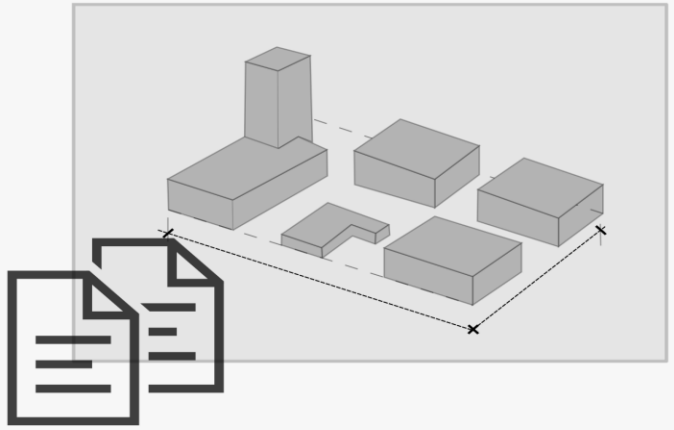


5%

NON-GRAPHICAL INFORMATION



DOCUMENTATION



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STN EN ISO series 19650

LEVEL OF INFORMATION NEED

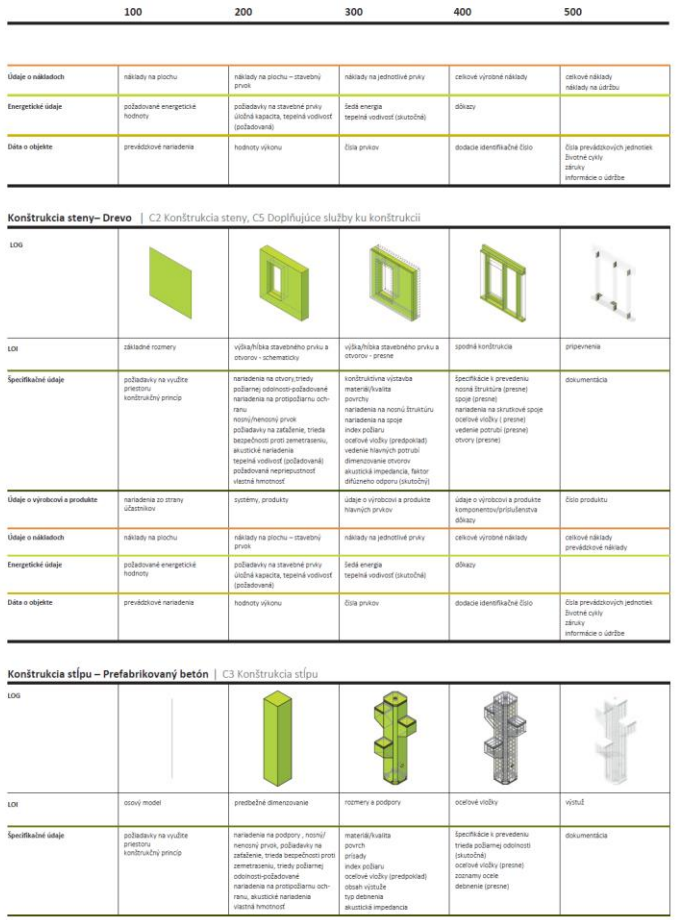
Requires to use minimalistic appraoch based on use cases to meet requirements

LEVEL OF GEOMETRY (LOG)

Reasonable level of geometry

LEVEL OF INFORMATION (LOI)

Meaningfull information



	100	200	300	400	500
Údaje o nákladoch	náklady na plochu	náklady na plochu – stavebný prvok	náklady na jednotlivé prvky	celkové výrobné náklady	celkové náklady náklady na údržbu
Energetické údaje	požadované energetické hodnoty	požiadavky na stavebné prvky úložná kapacita, tepelná vodivosť (požadovaná)	šedá energia tepelná vodivosť (skutočná)	dôkazy	
Dáta o objekte	prevádzkové nariadenia	hodnoty výkonu	čísla prvkov	dodacie identifikačné číslo	čísla prevádzkových jednotiek životné cykly záruky informácie o údržbe

Konštrukcia steny– Drevo | C2 Konštrukcia steny, C5 Doplňujúce služby ku konštrukcii

LOG					
LOI	základné rozmery	výška/hĺbka stavebného prvku a otvorov - schematicky	výška/hĺbka stavebného prvku a otvorov - presne	spodná konštrukcia	pripevnenia
Špecifikačné údaje	požiadavky na využitie priestoru konštrukčný princíp	nariadenia na otvory,triedy požiarnej odolnosti-požadované nariadenia na protipožiarnu och-ranu nosný/nenosný prvok požiadavky na zaťaženie, trieda bezpečnosti proti zemetraseniu, akustické nariadenia tepelná vodivosť (požadovaná) požadované nepriepustnosť vlastná hmotnosť	konštruktívna výstavba materiál/kvalita povrchy nariadenia na nosnú štruktúru nariadenia na spoje index požiaru oceľové vložky (predpoklad) vedenie hlavných potrubí dimenzovanie otvorov akustická impedancia, faktor dlhšieho odporu (skutočný)	špecifikácie k prevedeniu nosná štruktúra (presne) spoje (presne) nariadenia na skrutkové spoje oceľové vložky (presne) vedenie potrubí (presne) otvory (presne)	dokumentácia
Údaje o výrobcovi a produkte	nariadenia zo strany účastníkov	systémy, produkty	údaje o výrobcovi a produkte hlavných prvkov	údaje o výrobcovi a produkte komponentov/príslušenstva dôkazy	číslo produktu
Údaje o nákladoch	náklady na plochu	náklady na plochu – stavebný prvok	náklady na jednotlivé prvky	celkové výrobné náklady	celkové náklady prevádzkové náklady
Energetické údaje	požadované energetické hodnoty	požiadavky na stavebné prvky úložná kapacita, tepelná vodivosť (požadovaná)	šedá energia tepelná vodivosť (skutočná)	dôkazy	
Dáta o objekte	prevádzkové nariadenia	hodnoty výkonu	čísla prvkov	dodacie identifikačné číslo	čísla prevádzkových jednotiek životné cykly záruky informácie o údržbe

Konštrukcia stĺpu – Prefabrikovaný betón | C3 Konštrukcia stĺpu

LOG					
LOI	osový model	predbežné dimenzovanie	rozmery a podpory	oceľové vložky	výstuž
Špecifikačné údaje	požiadavky na využitie priestoru konštrukčný princíp	nariadenia na podpory , nosný/nenosný prvok, požiadavky na zaťaženie, trieda bezpečnosti proti zemetraseniu, triedy požiarnej odolnosti-požadované nariadenia na protipožiarnu och-ranu, akustické nariadenia vlastná hmotnosť	materiál/kvalita povrch prísady index požiaru oceľové vložky (predpoklad) obsah výstuže typ debnenia akustická impedancia	špecifikácie k prevedeniu trieda požiarnej odolnosti (skutočná) oceľové vložky (presne) zoznamy ocele debnenie (presne)	dokumentácia

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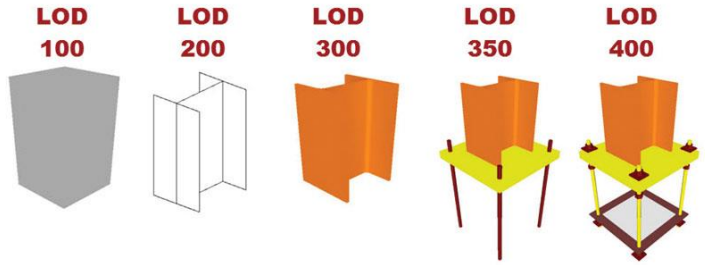
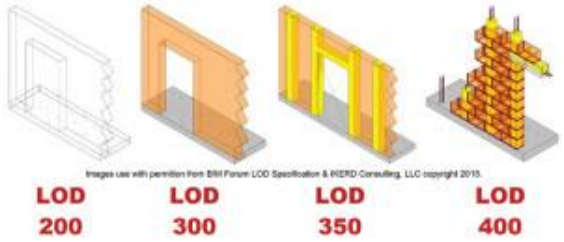
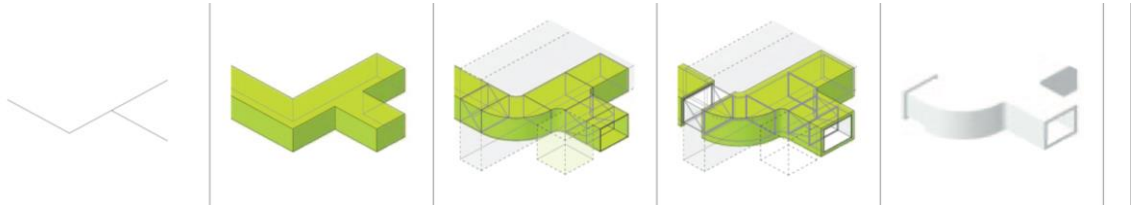
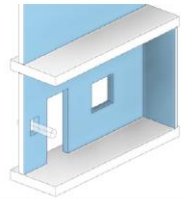
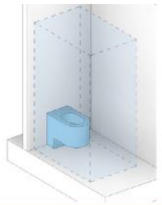
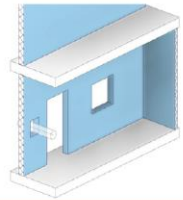
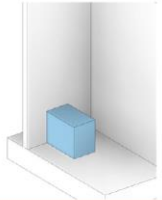
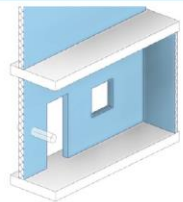
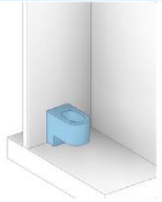
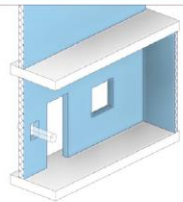
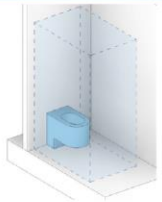
GEOMETRY







Level of Information Need	Geometrická reprezentácia - stena	Geometrická reprezentácia - koncové prvky TZB
Účel A: Koordinácia		
Účel B: výpočet výmer		
Účel C: Výkresová dokumen-tácia		
Výsledná reprezen-tácia		

REASONABLE LEVEL OF DETAIL

based on eventual use in the future

PARAMETRIC OBJECTS

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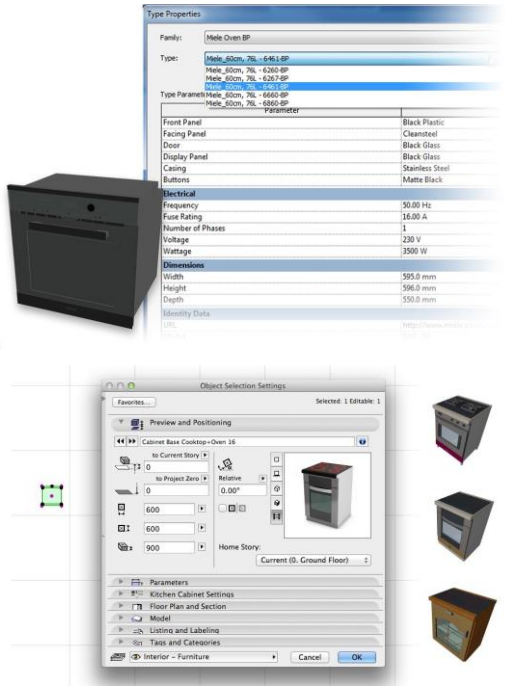

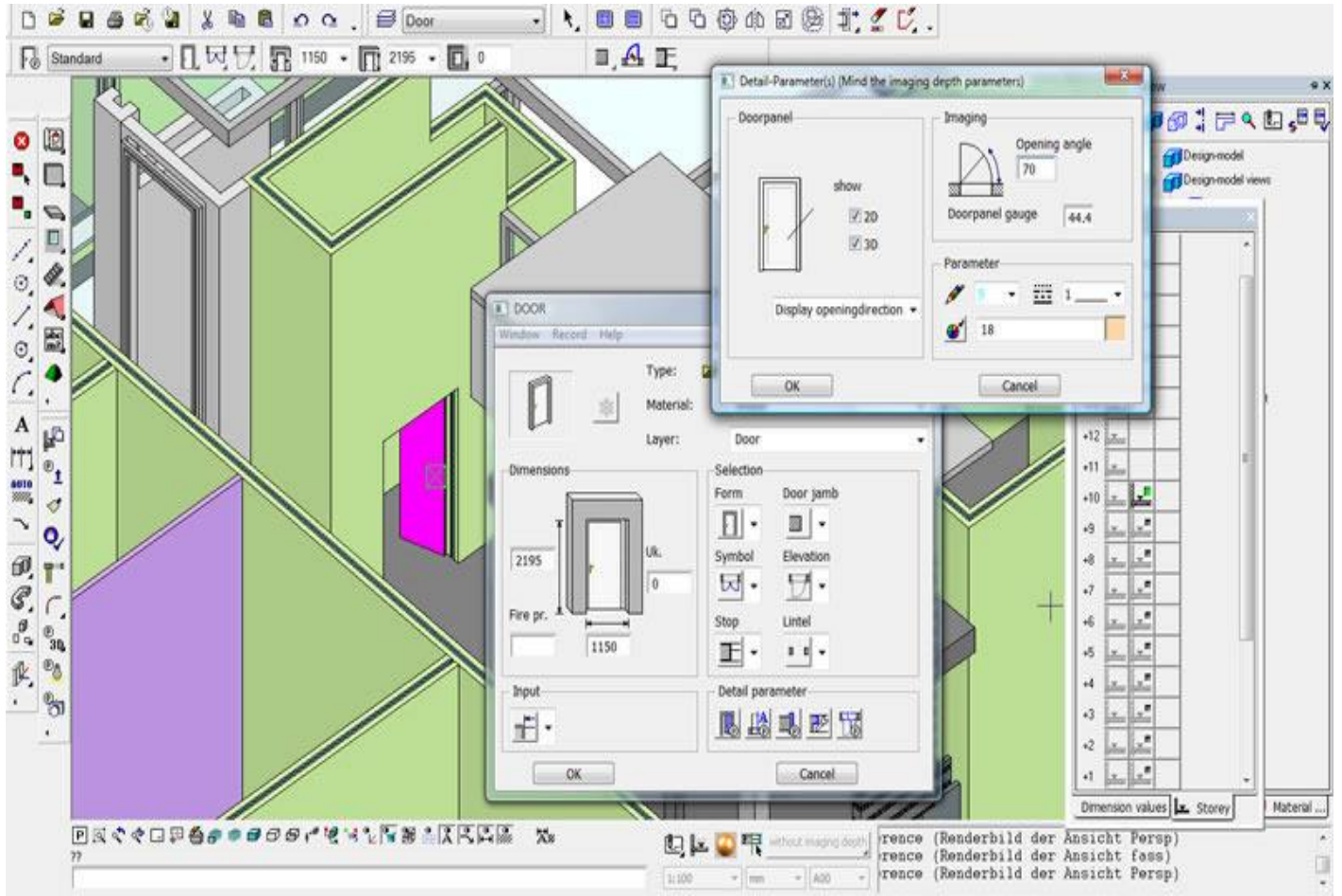

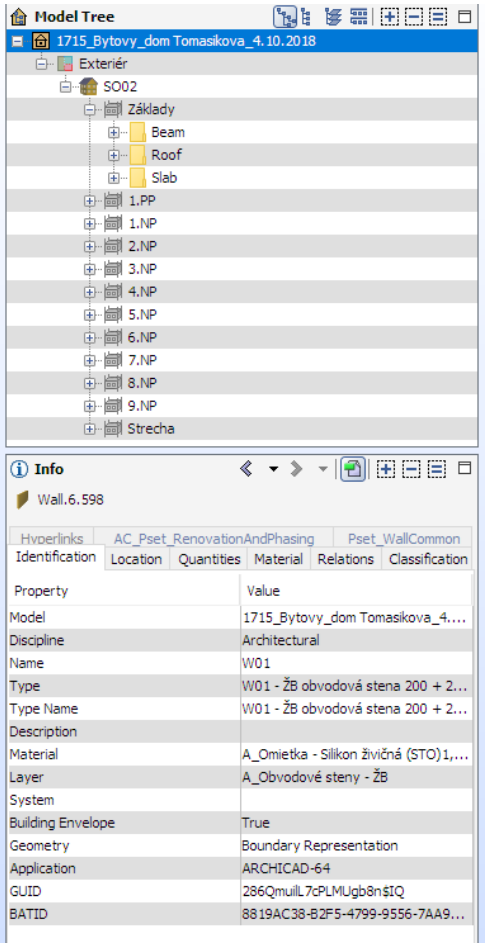

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INFORMATION

LOI

- Steny

- Všeobecné 00

Kód	Skupina	Názov	Popis	Príklad	Dátový typ	Jednotka	dur	dsp	rpd	dsv
01	Všeobecné informácie	Kod_prvku	Jednoznačné alfanumerické označenie prvku		text		☐	☑	☑	☑
01	Všeobecné informácie	Podlazie	Informácia o priradení prvku ku konkrétnemu podlažiu. Parameter navyse k systemovemu parametru Level		text		☐	☐	☑	☑
01	Všeobecné informácie	Sekcia	Jednoznačné alfanumerické označenie sekcie, v ktorej sa daný prvok nachádza		text		☐	☑	☑	☑
01	Všeobecné informácie	Stavebny_objekt	Jednoznačné alfanumerické označenie stavebného objektu, v ktorom sa daný prvok nachádza		text		☑	☑	☑	☑
02	Geometria	Dlzka	Pokial je mozne, pouzit systemovy parameter, alebo ho nazvat rovnako		number		☑	☑	☑	☑
02	Geometria	Objem	Číselné vyjadrenie objemu prvku		number	m3	☐	☐	☐	☑
02	Geometria	Plocha	Číselné vyjadrenie plochy prvku		number	m2	☐	☐	☐	☑
03	Fyzikálne vlastnosti	Beton_konzistencias	Parameter určuje stupeň konzistencie betónu podľa normy STN EN 206-1 v danej betónovej konštrukcií.		text		☐	☐	☐	☑
03	Fyzikálne vlastnosti	Hmotnost	Číselné vyjadrenie hmotnosti prvku v kg/m3		number	kg	☐	☐	☐	☑
03	Fyzikálne vlastnosti	Material	-		text		☐	☑	☑	☑
03	Fyzikálne vlastnosti	Rw_stavebna	Index vzduchovej nepriezvučnosti uvedený v dB - "stavebná" (nižšia) hodnota (minimálna požadovaná		number		☐	☐	☑	☑

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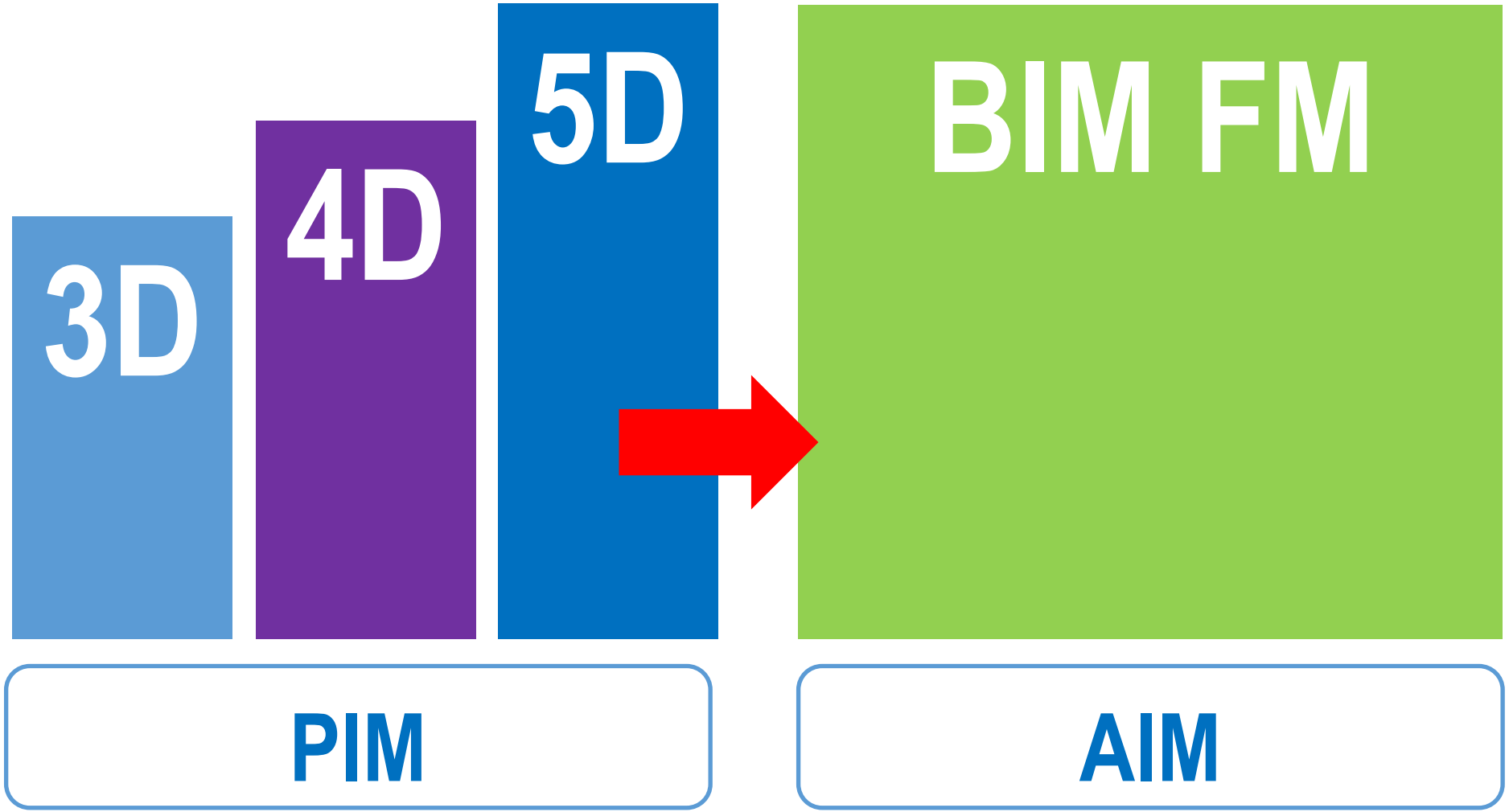

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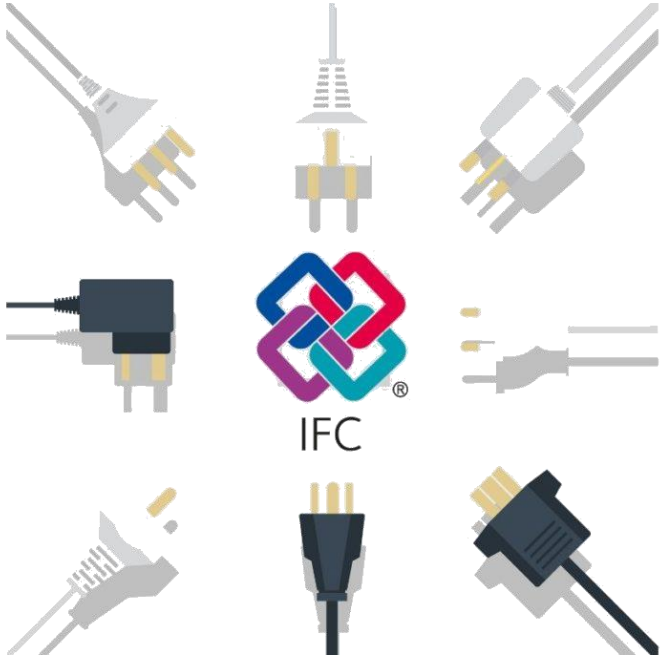
INTEROPERABILITY



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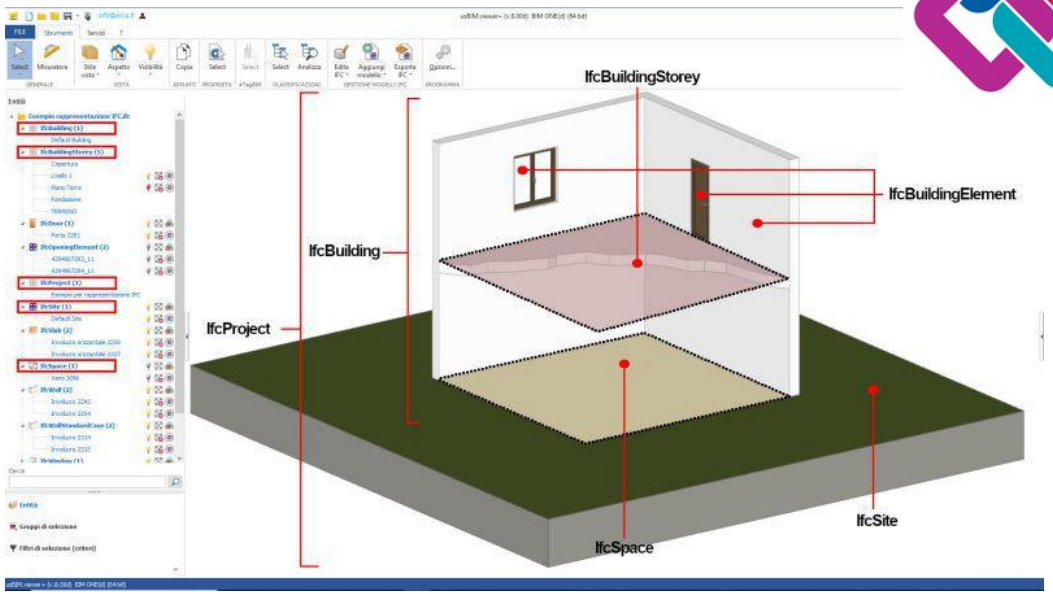
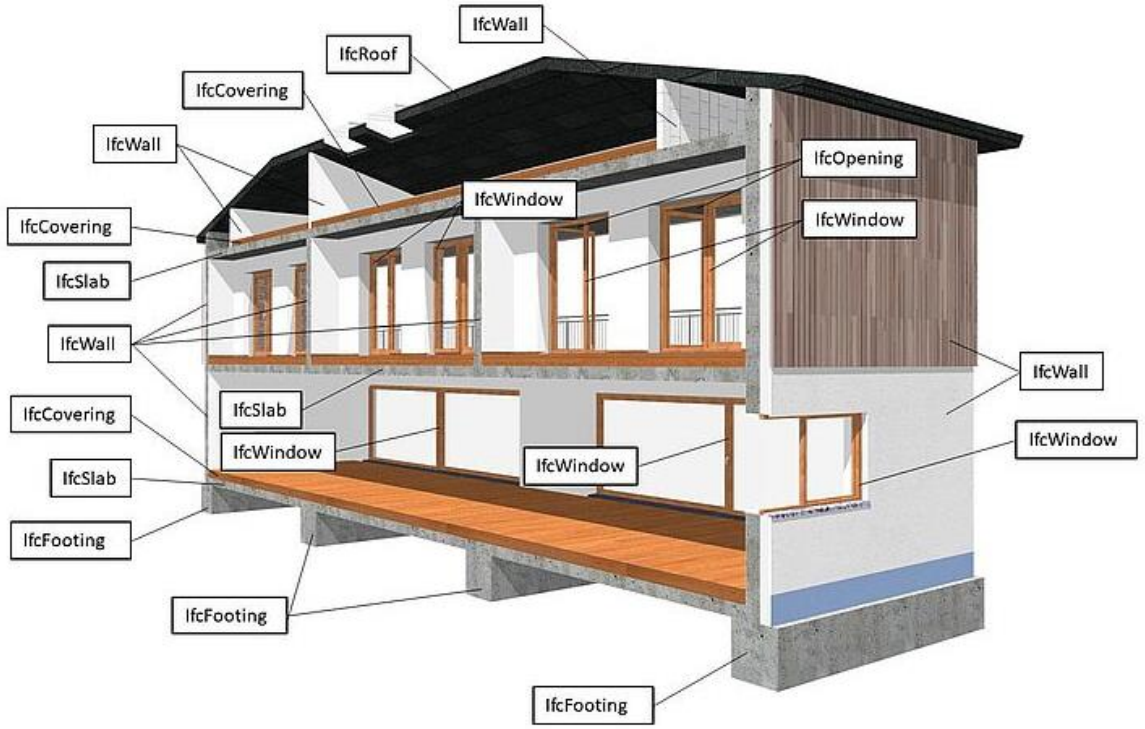
IFC STRUCTURE





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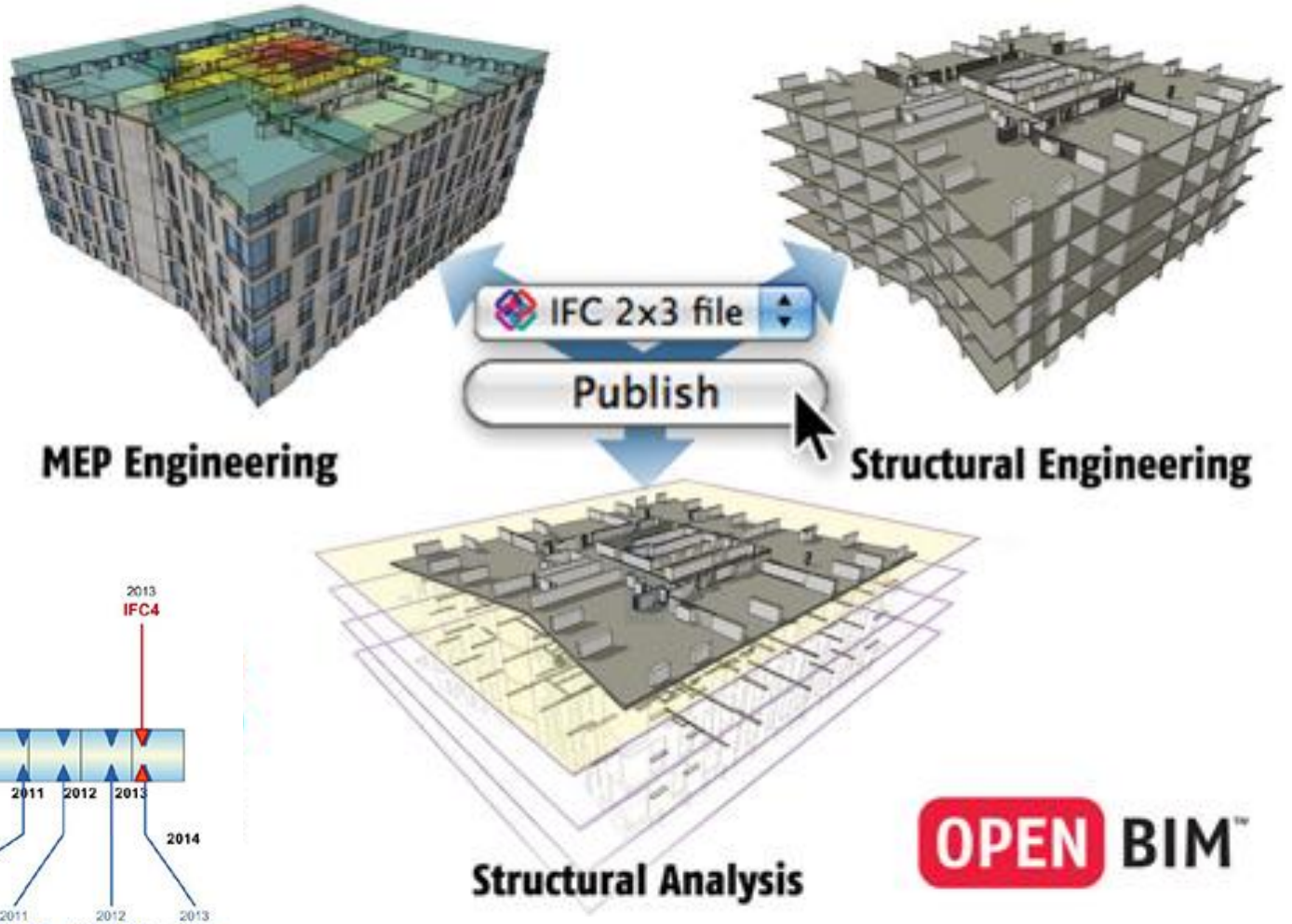
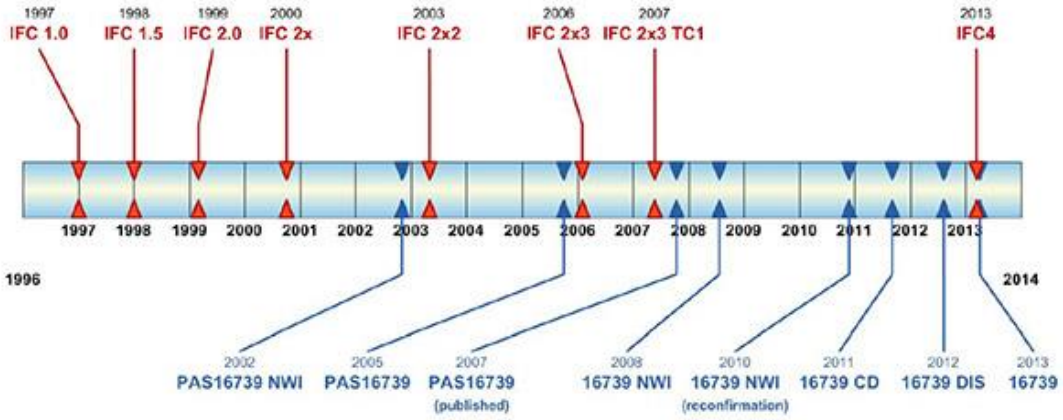
IFC





Version	Name (HTML Documentation)	ISO publication	Published (yyyy-mm)	Current Status	HTML	EXPRESS	XSD	pSet XSD	OWL HTML	RDF	TTL
4.4 - dev	IFC 4.4.0 development	not started		Extension of 4.3.0. Adding additional functionality (mainly for Tunnels). Currently under development in the Standards & Solutions program							
4.3.1.0	IFC4.3.1.x dev	Updates from 4.3.1.x might be used as input into the ISO DIS process.	Updates after 4.3.0.1 coming from the Implementer Forum.	Focussed on documentation improvement, clarifications and further detailing of implementation.	Latest HTML	GitHub output		PSD output			
4.3.0.1	IFC4.3 TC1 (zip)	Under ISO DIS Voting		under ISO DIS Voting	HTML						
4.2.0.0	IFC4.2	-	2019-04	Withdrawn	ZIP	EXP	IFC4x2.xsd	-			
4.1.0.0	IFC4.1	-	2018-06	Withdrawn	ZIP	EXP	IFC4x1.xsd	-	ifcOWL IFC4.1	RDF	TTL
4.0.2.1	IFC4 ADD2 TC1	ISO 16739-1:2018	2017-10	Official	ZIP	EXP	IFC4.xsd	-	ifcOWL IFC4 ADD2 TC1	RDF	TTL
4.0.2.0	IFC4 ADD2	-	2016-07	Retired	ZIP	EXP	IFC4_ADD2.xsd	-	ifcOWL IFC4 ADD2	RDF	TTL
4.0.1.0	IFC4 ADD1	-	2015-06	Retired	ZIP	EXP	IFC4_ADD1.xsd	-	ifcOWL IFC4 ADD1	RDF	TTL
4.0.0.0	IFC4	ISO 16739:2013	2013-02	Retired	ZIP	EXP	ifcXML4.xsd	PSD_IFC4.xsd	ifcOWL IFC4	RDF	TTL
2.3.0.1	IFC2x3 TC1	ISO/PAS 16739:2005	2007-07	Official	ZIP	EXP	IFC2X3.xsd	PSD_R2x3.xsl	ifcOWL IFC2x3 TC1	RDF	TTL
2.3.0.0	IFC2x3	-	2005-12	Retired	ZIP	EXP	-	-	ifcOWL IFC2x3	RDF	TTL
2.2.1.0	IFC2x2 ADD1	-	2004-07	Retired	ZIP	EXP	-	-	-	-	-
2.2.0.0	IFC2x2	-	2003-05	Retired	ZIP	EXP	-	-	-	-	-
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2.1.0.0	IFC2x	-	2000-10	Retired	ZIP	EXP	-	-	-	-	-
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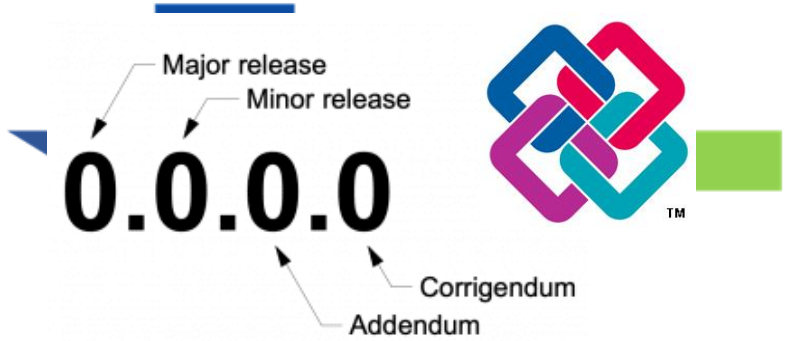

IFC 4x3

IFC 2x3

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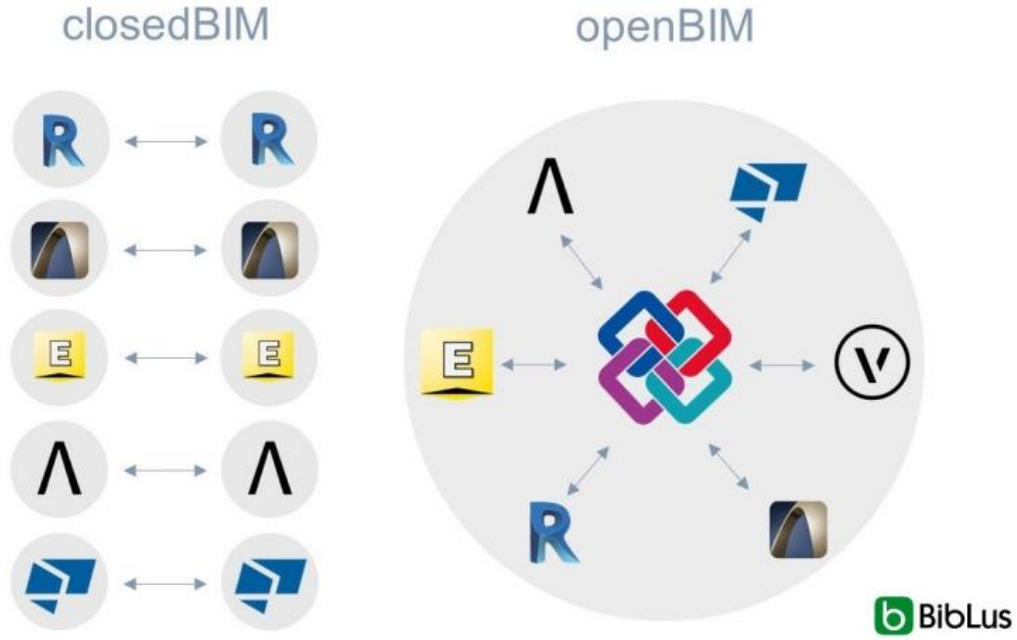
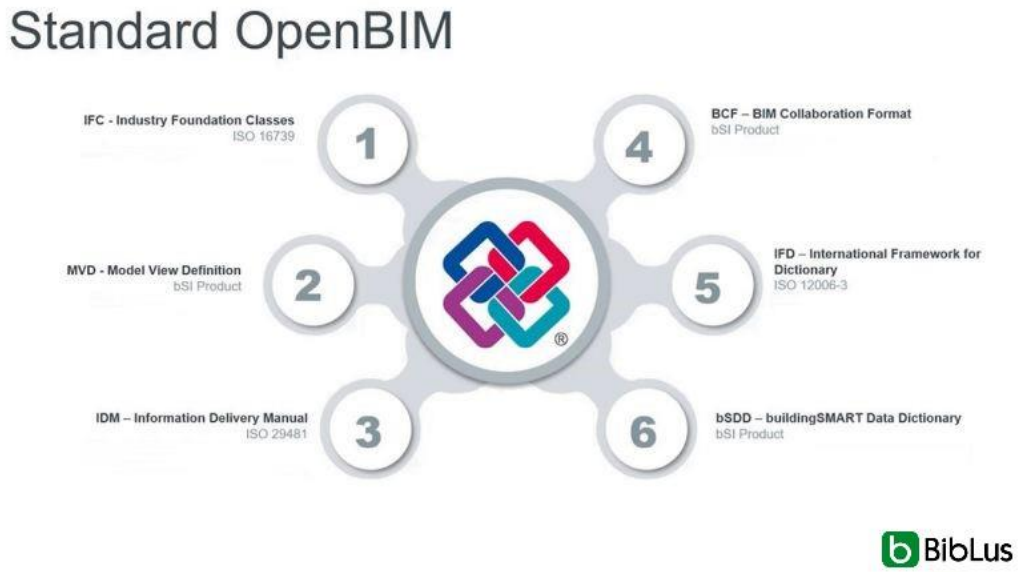
OpenBIM





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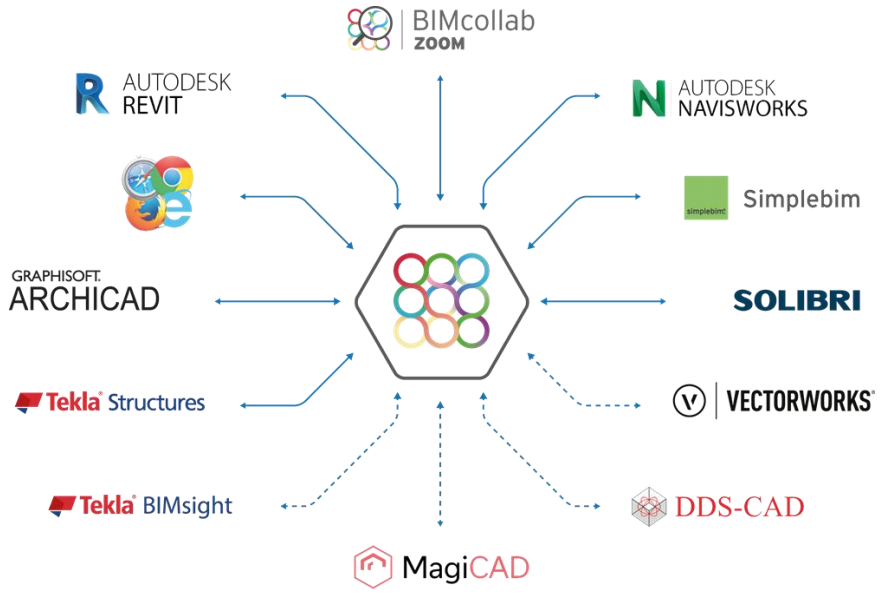

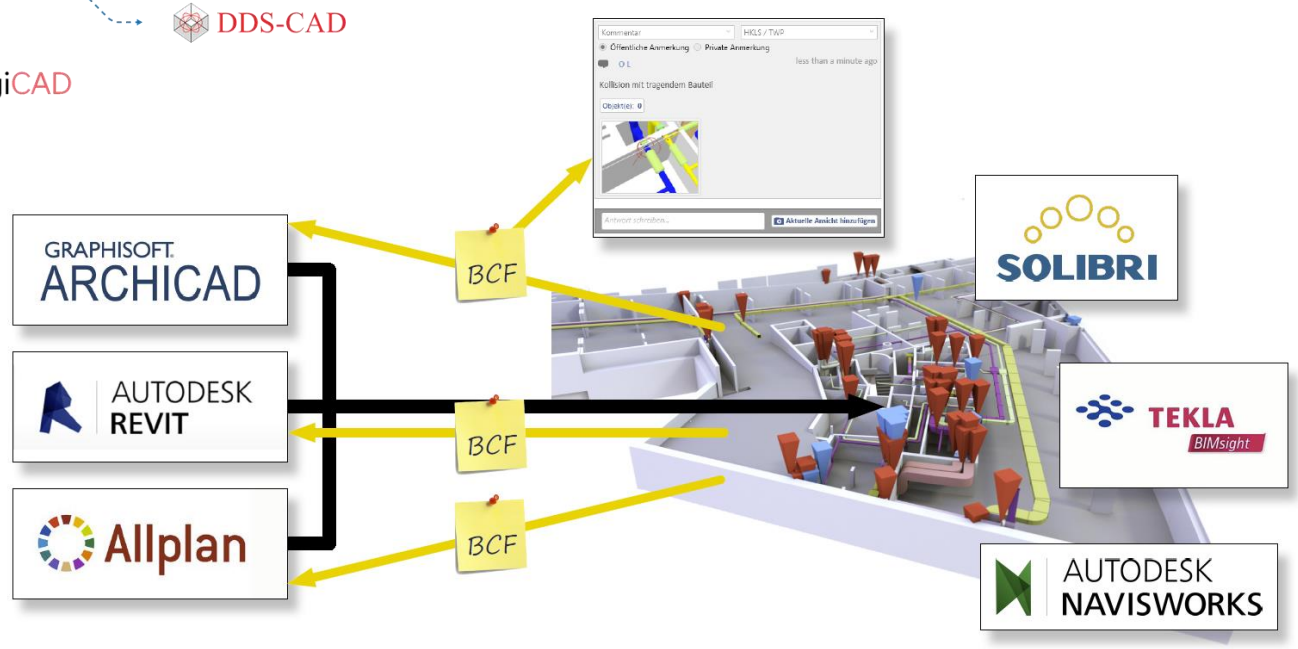

BCF

BIM COLLABORATION FORMAT

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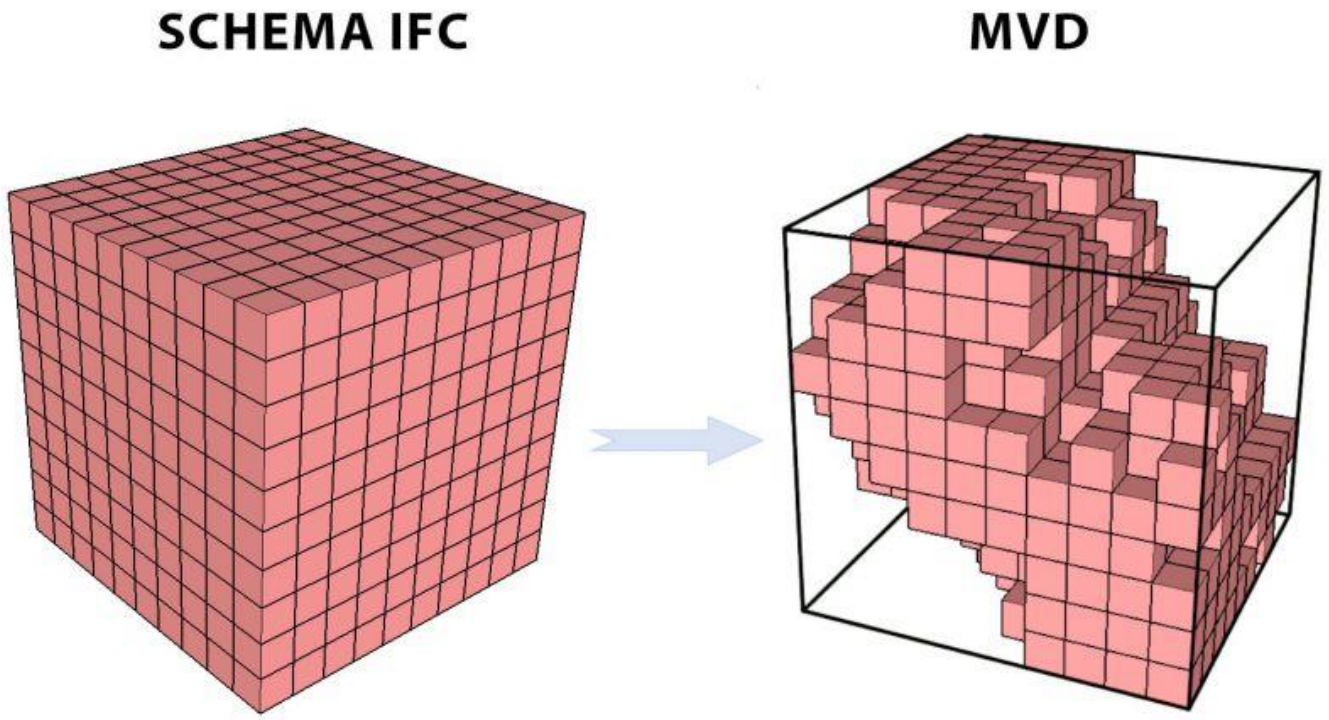
MVD

Model View Definition



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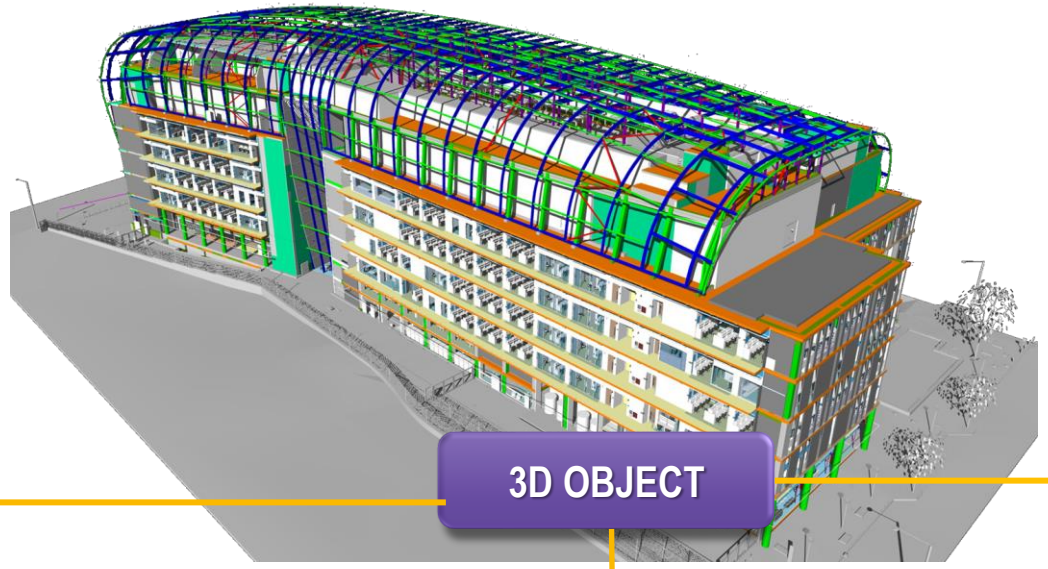

CLASH DETECTION

3D OBJECT

SCHEDULE

QUANTITY TAKEOFF

BUDGET

4D

5D

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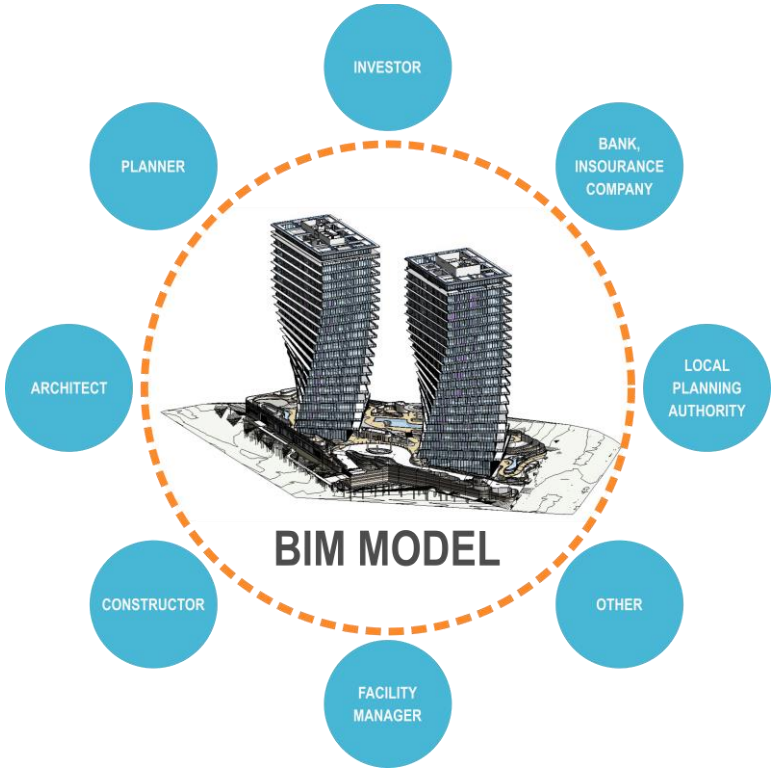

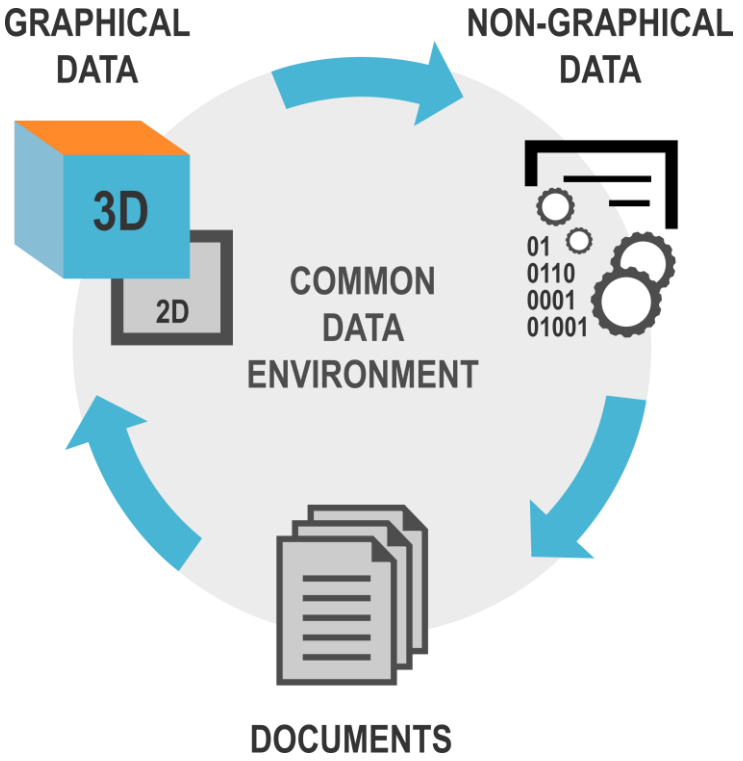

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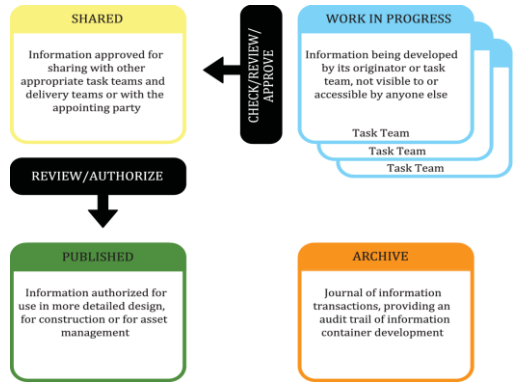

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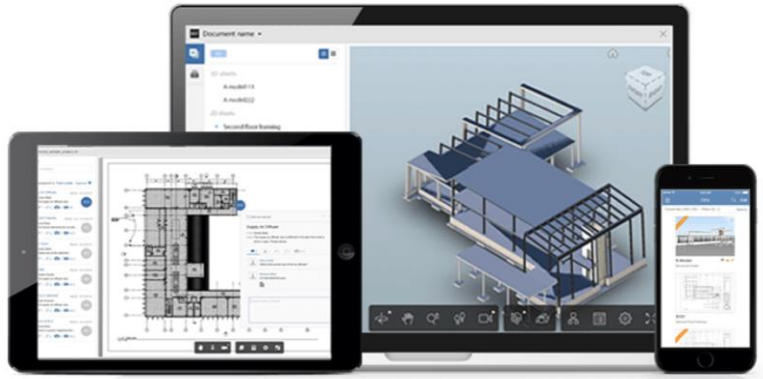

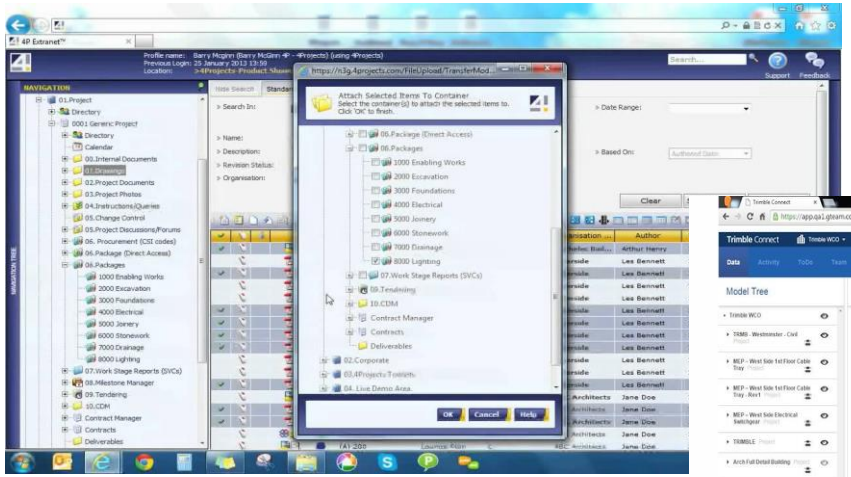

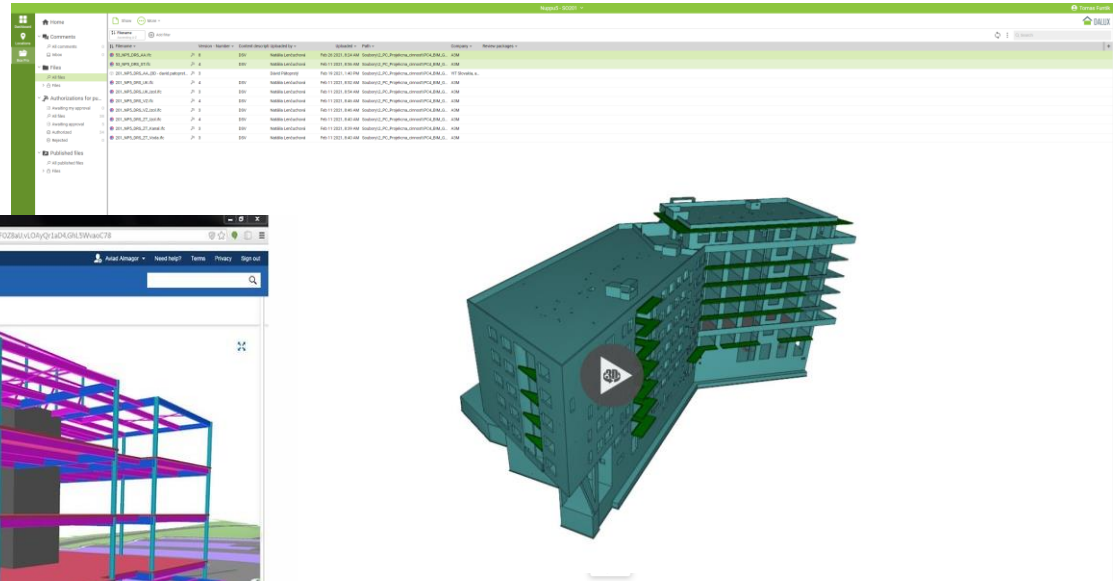

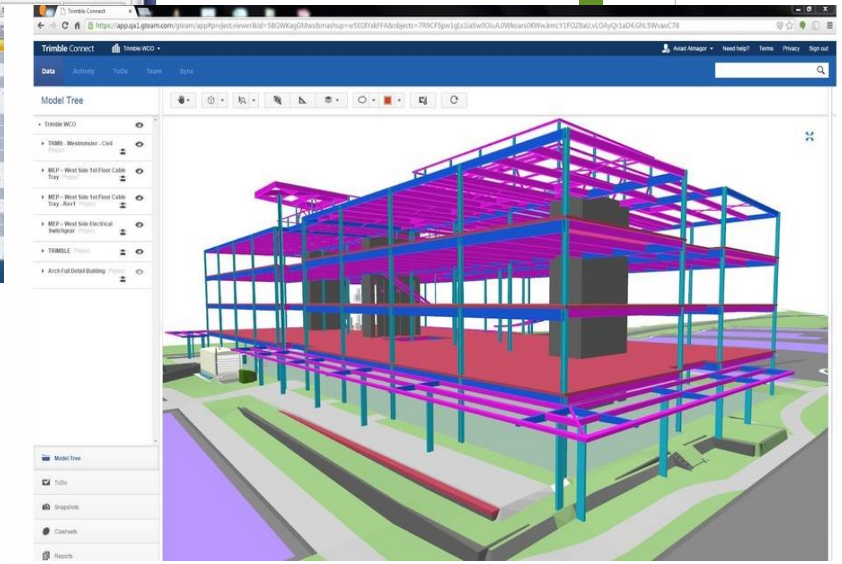

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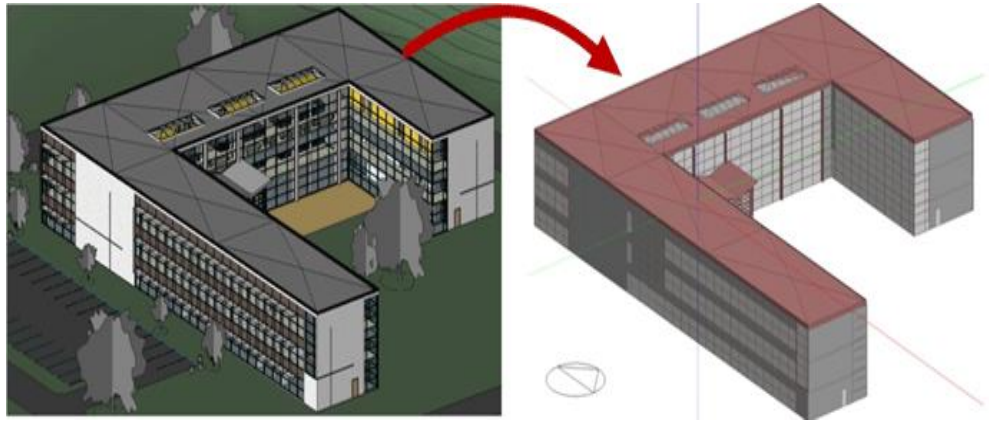
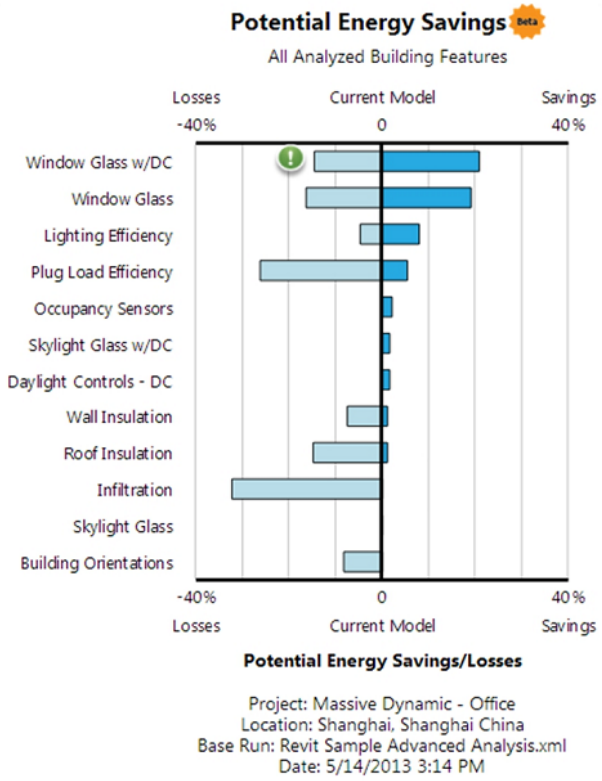
BEM – BUILDING ENERGY MODEL



BIM MODEL ANALYTICAL MODEL



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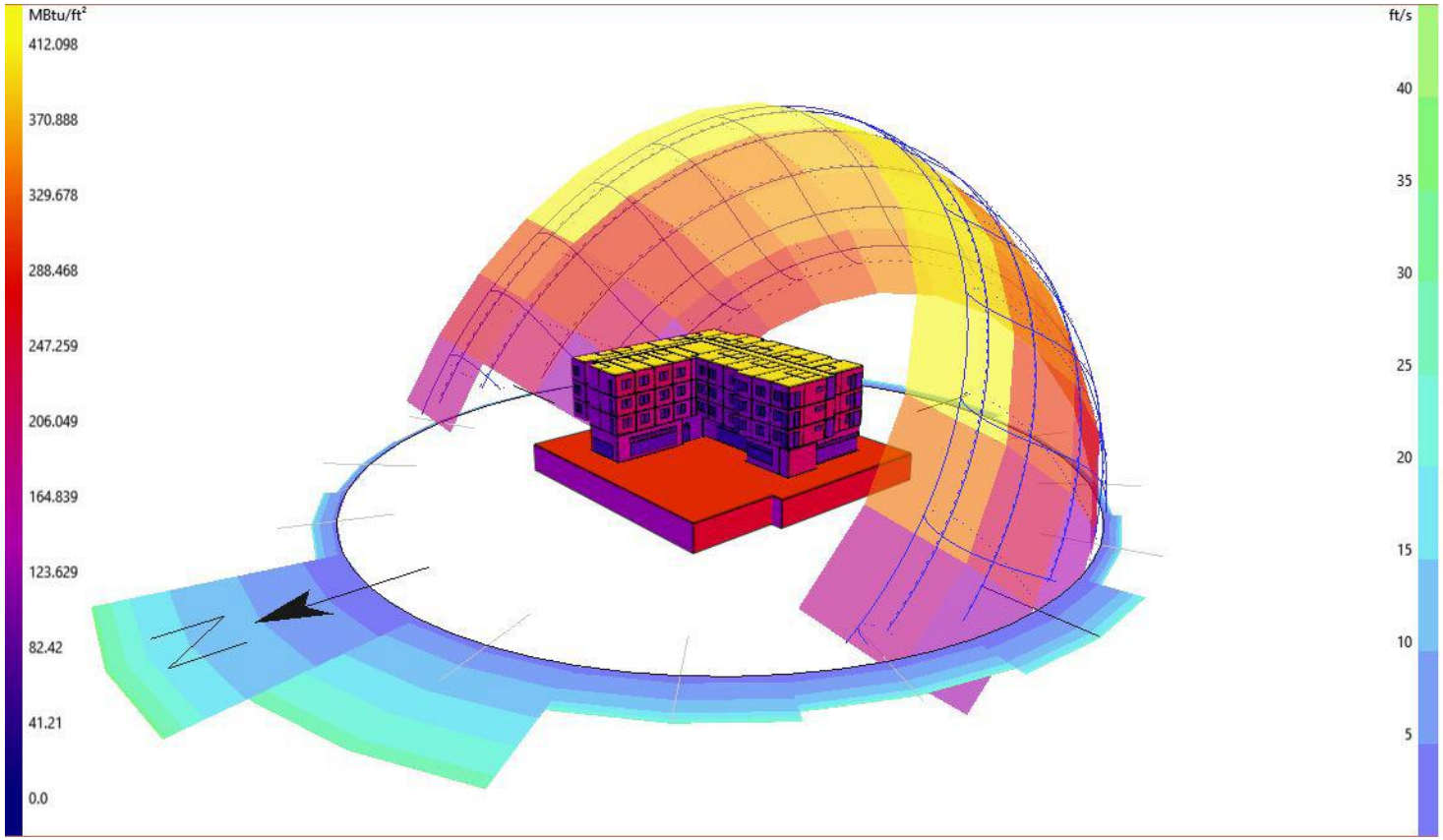

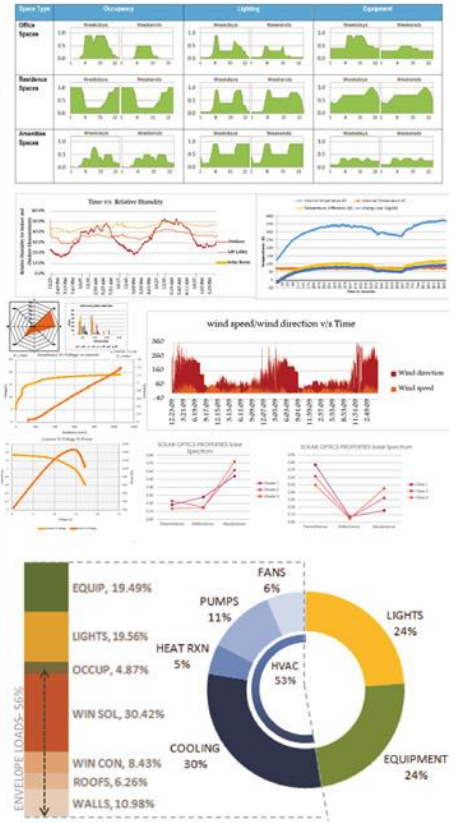

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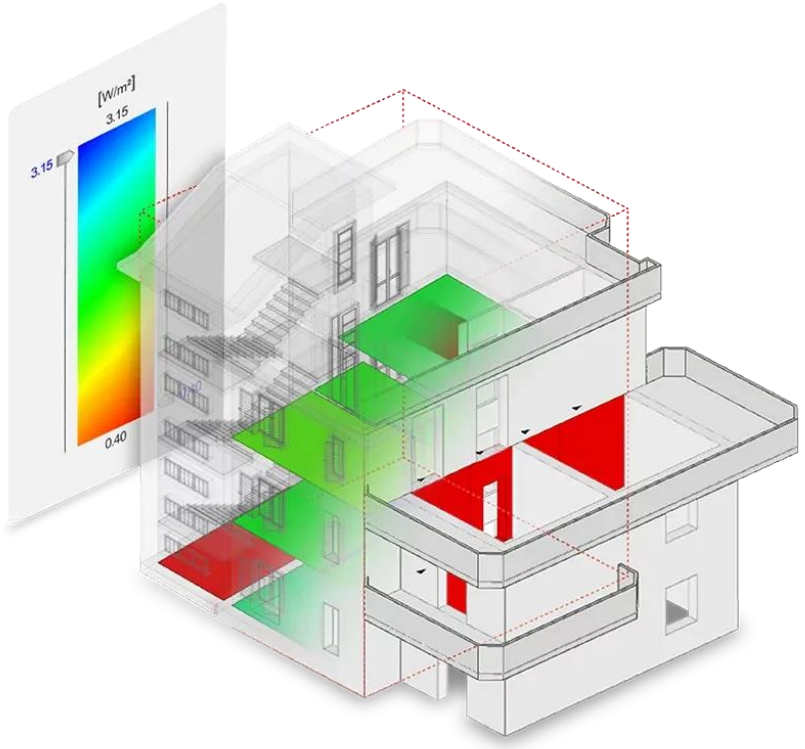
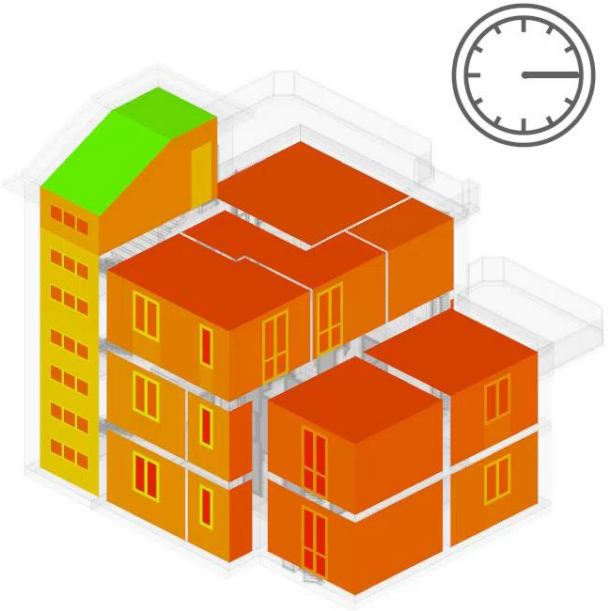
DYNAMIC SIMULATION OF CONSUMPTION





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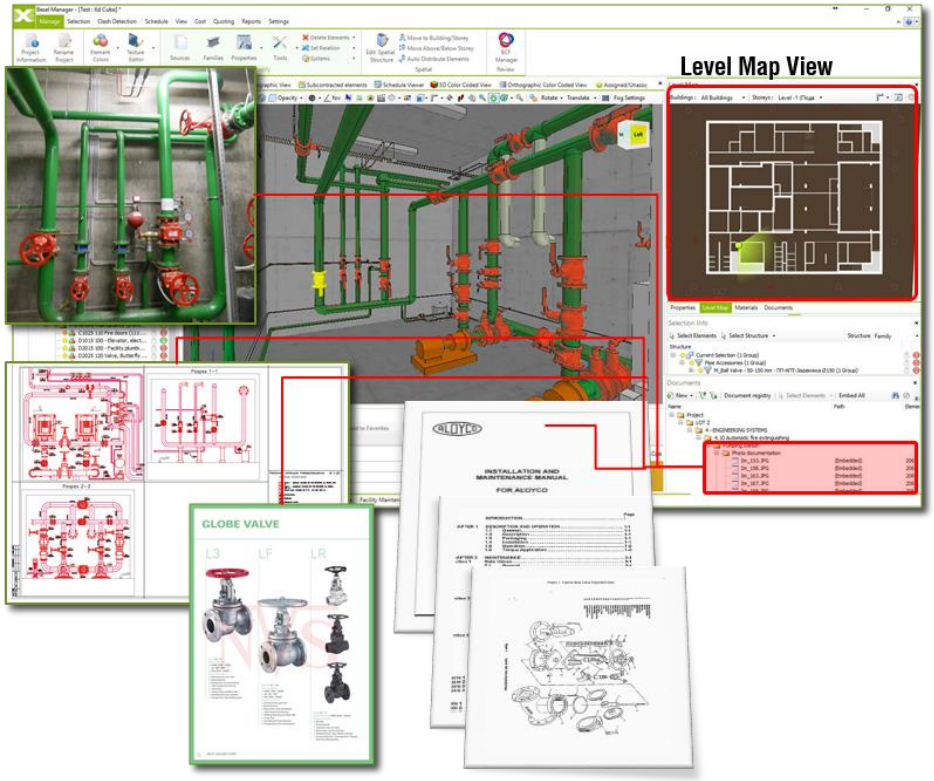
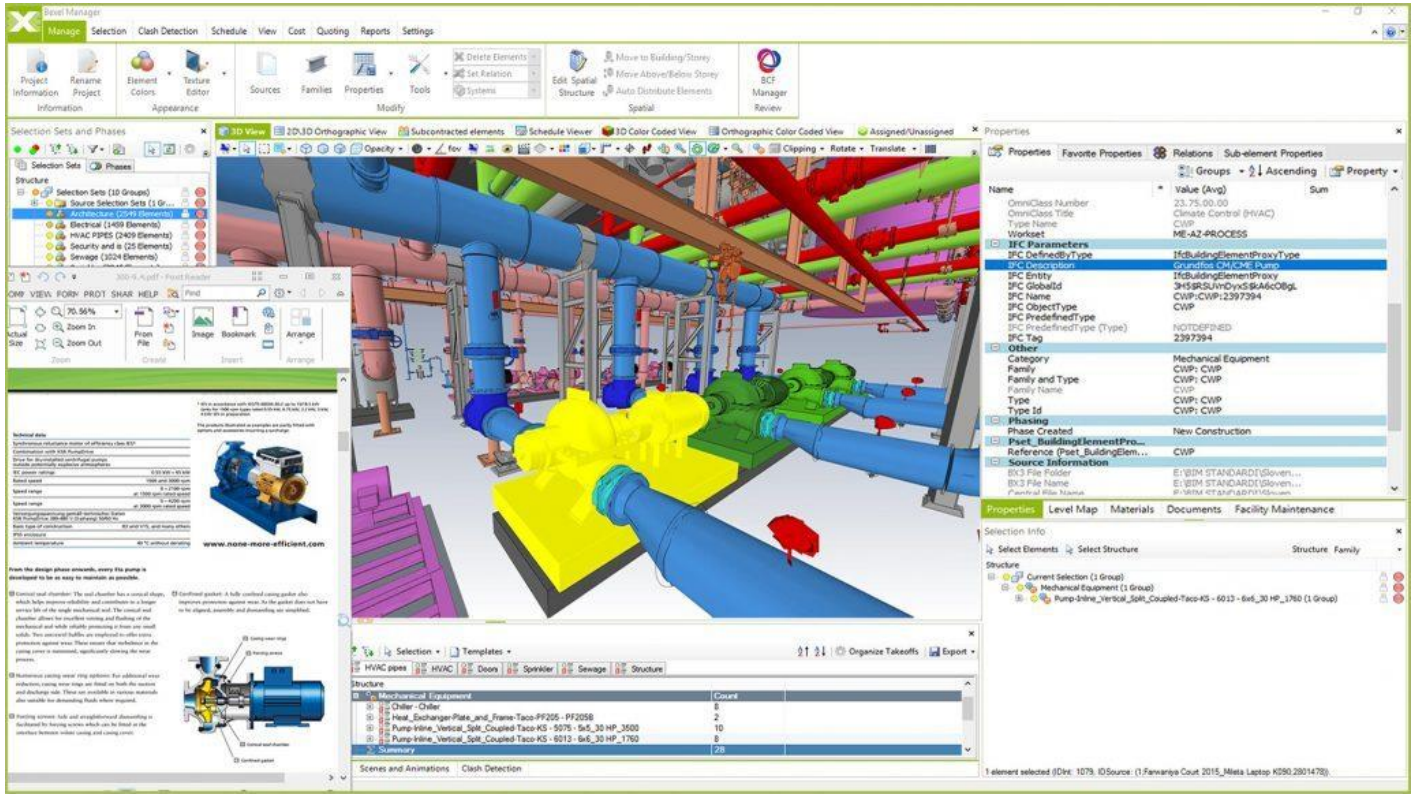
FACILITY MANAGEMENT





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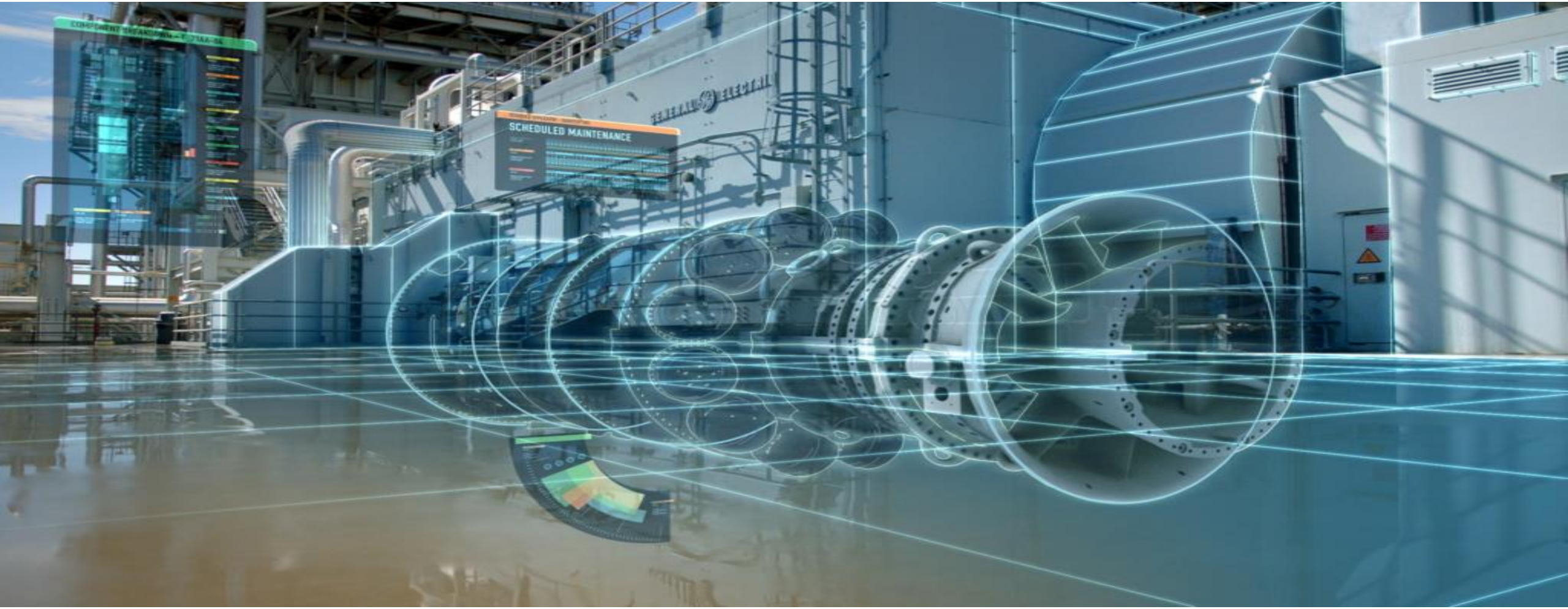
DIGITAL TWIN CONCEPT



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ISSO