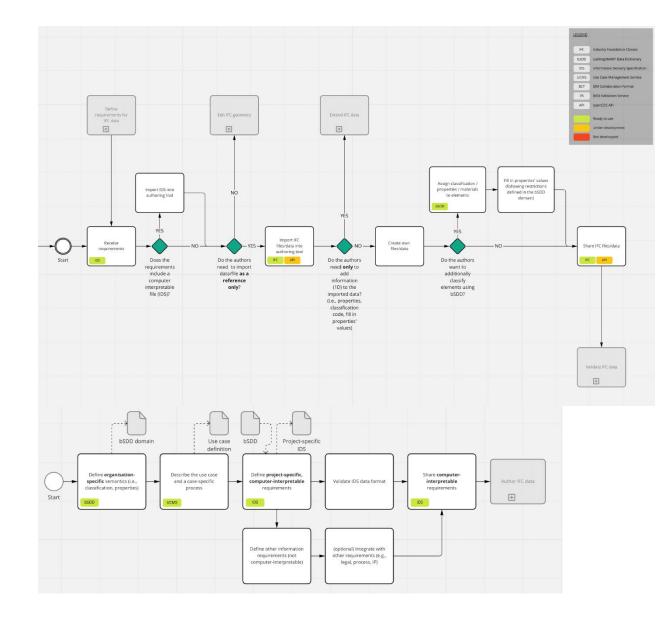
## Adding value

# with openBIM Workflows



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#### Which bSI solution can I use for my task?

Solutions functionalities IFC / openCDE VS BCF UCM bSDD Other tools API Define Define organisation Define project-(optional) Integrate Describe the use case specific semantics specific, computerwith other requirements and a case-specific (i.e., classification, interpretable requirements (e.g., for IFC data process properties) requirements legal, process, IP) Define other Define project-Share computerinformation specific, computerinterpretable requirements (not interpretable requirements computer requirements interpretable) Validate IDS data format Fill in properties' Assign classification Check bSDD Author IFC Import IFC files/data values (following properties / materials Receive requirements classification into authoring tool restrictions defined data compliance to elements in the bSDD domain) Create own IFC Extend IFC Share IFC files/data files/data data IFC API Import IDS into authoring tool Validate IFC data Validate IFC data Validate IFC Receive IFC data Log errors found in against syntax and against IDS (from the author) IFC data data schema compliance requirements (optional) Check Share errors found in Validate IFC data bSDD classification IFC data (to the against other compliance author) requirements

#### Full workflow diagrams:





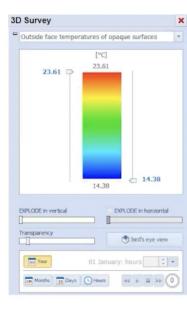
## **Example: Energy analysis**



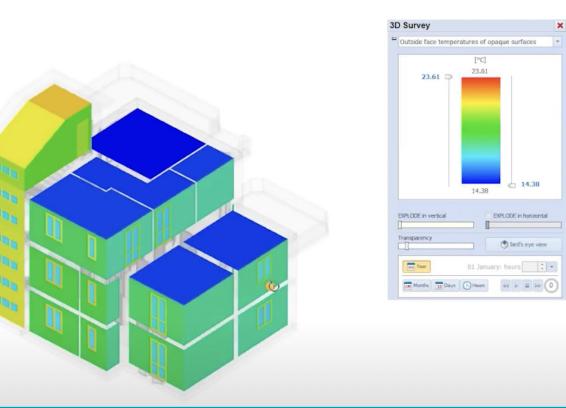
## **Example: Energy analysis**

## **Simulation tool**







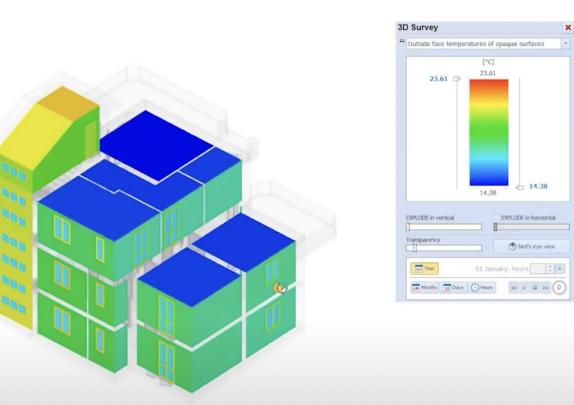




Walls

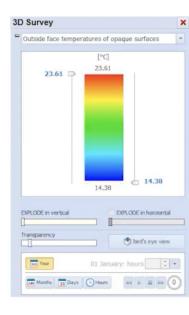
Windows

#### Rooms





## What do we need? Walls Material Windows u Value Rooms Number of people Type of room





#### Room id:

Type of room:

Window in room - id:

Window u value:

Wall around room - id:

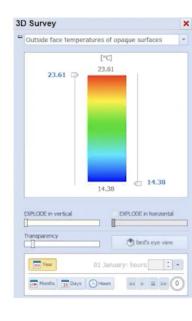
Material of wall:

Complete the form to enable button.

Submit

### What do we need? Walls *Material* Windows *u Value* Rooms *Number of people Type of room*







#### Room id:

Type of room:

Window in room - id:

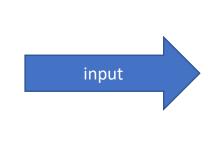
Window u value:

Wall around room - id:

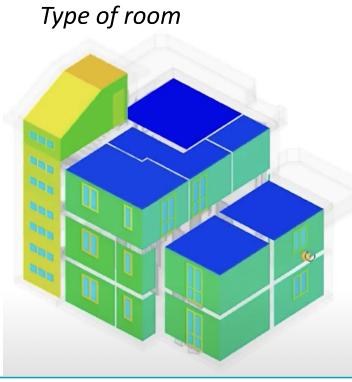
Material of wall:

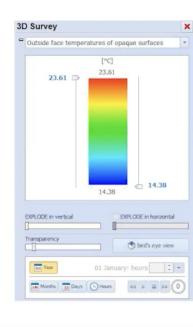
Complete the form to enable button.

Submit

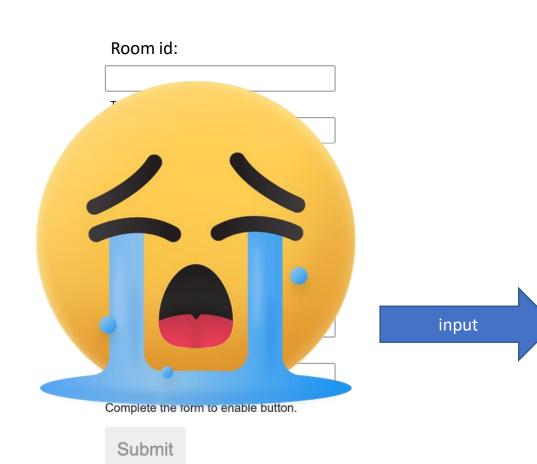


### What do we need? Walls *Material* Windows *u Value* Rooms *Number of people*





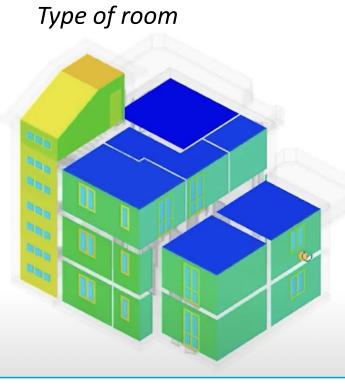


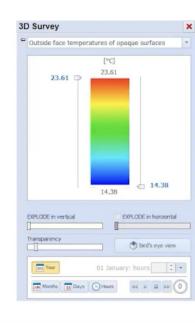


*Material* Windows *u Value* Rooms *Number of people* 

Walls

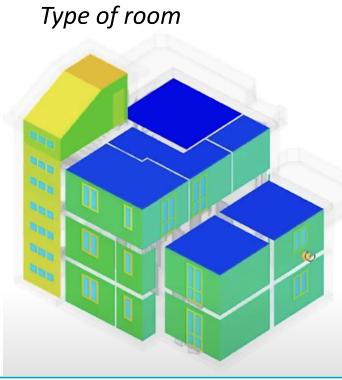
What do we need?











Number of people

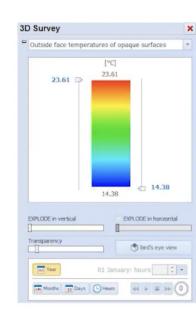
Material

u Value

Windows

Rooms

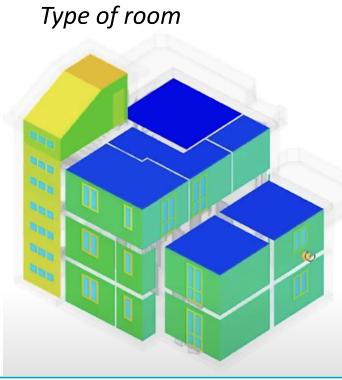
Walls





Li Lu





Number of people

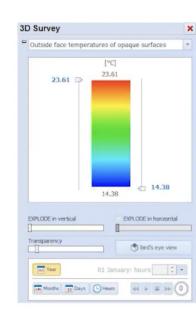
Material

u Value

Windows

Rooms

Walls





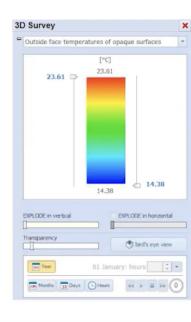
Li Lu

### What needs to be in here?

## What do we need?

Walls Material Windows u Value Rooms Number of people Type of room









Linu

Luna

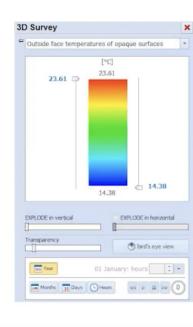
## What needs to be in here?

Walls *Material* Windows *u Value* Rooms *Number of people Type of room* 



What do we need? Walls *Material* Windows *u Value* Rooms *Number of people Type of room* 





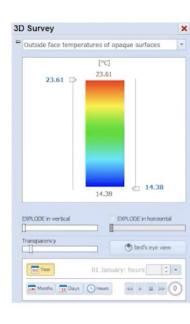


## How to put that in?



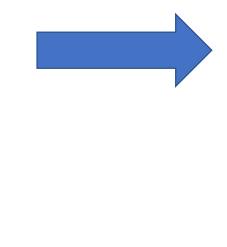
Walls *Material* Windows *u Value* Rooms *Number of people Type of room* 







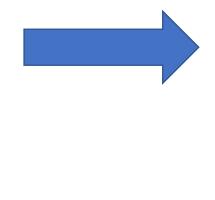




## How to put that in? Form again?



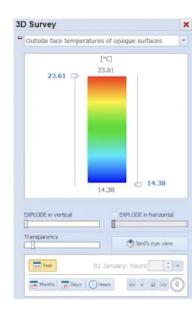




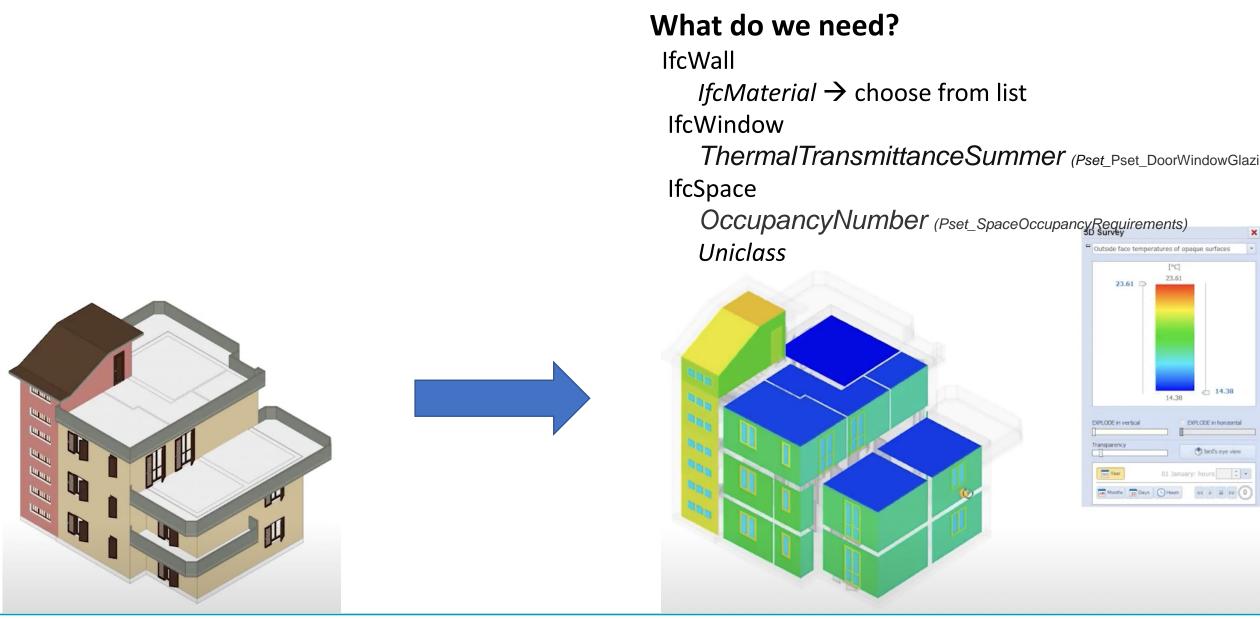
## What do we need?

Walls *Material* Windows *u Value* Rooms *Number of people Type of room* 











## IFC Uniclass (National) material list Extend with your own properties (when needed)

## What do we need?

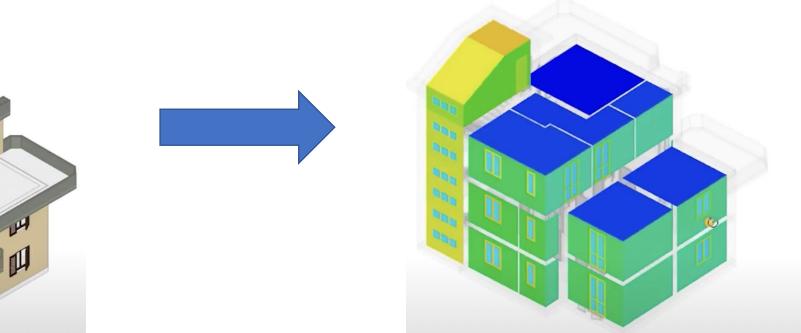
### IfcWall

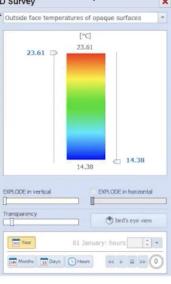
If cMaterial  $\rightarrow$  choose from list

#### IfcWindow

ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazi IfcSpace

OccupancyNumber (Pset\_SpaceOccupancyRequirements) Uniclass







Hb

EFFF

IfcWall

*IfcMaterial*  $\rightarrow$  choose from list IfcWindow

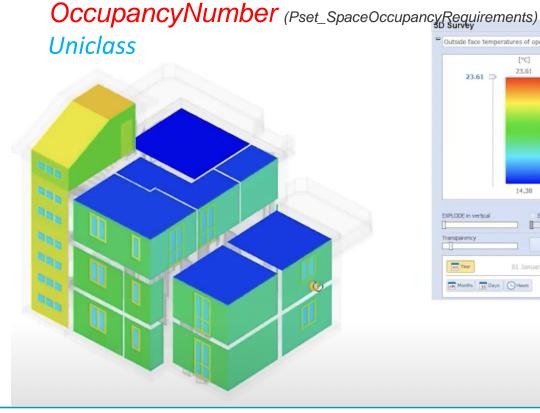
ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazingType) ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazingType) IfcSpace **IfcSpace** 

IfcWall

IfcWindow

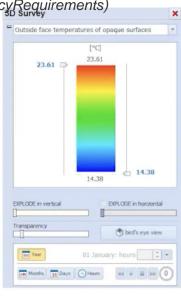
**OccupancyNumber** (Pset\_SpaceOccupancyRequirements) Uniclass





*IfcMaterial*  $\rightarrow$  choose from list

What do we need?





IfcWall

*IfcMaterial* → choose from list IfcWindow

ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazingType)ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazingType)IfcSpace

IfcWall

IfcWindow

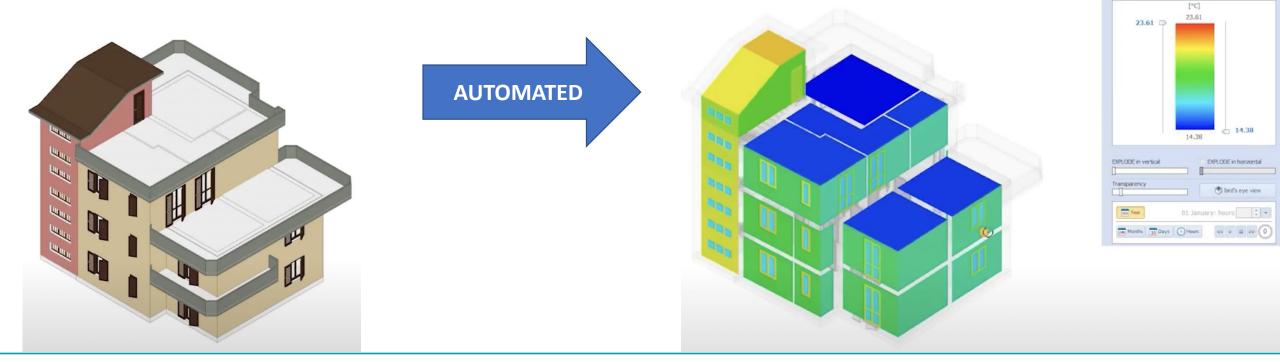
Uniclass

What do we need?

*IfcMaterial*  $\rightarrow$  choose from list

OccupancyNumber (Pset\_SpaceOccupancyRequirements)

OccupancyNumber (Pset\_SpaceOccupancyRequirements) Uniclass





Outside face temperatures of opague surfaces

IfcWall

*IfcMaterial* → choose from list IfcWindow

ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazingType)ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazingType)IfcSpace

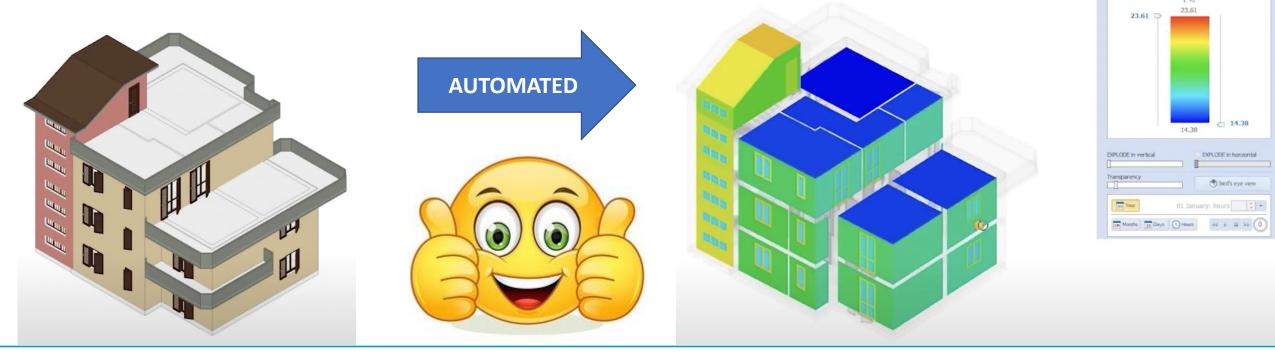
IfcWall

IfcWindow

What do we need?

*IfcMaterial*  $\rightarrow$  choose from list

OccupancyNumber (Pset\_SpaceOccupancyRequirements) Uniclass OccupancyNumber (Pset\_SpaceOccupancyRequirements) Uniclass





### What if we use agreements?

IFC Uniclass (National) material list Many many more...



What if we **publish** the agreements?

IFC Uniclass (National) material list ETIM CCI NL-Sfb CoClass Many many more...

- -







## search.bSDD.buildingSMART.org





stair



IL-CL. TI IDEE OLIADTED TUDNI CTAID

	All Classifications Properties			
Domains	Classification IFC > > IfcBuiltElement			
<ul> <li>IFC 4.3</li> <li>CCI Construction 1.0</li> <li>ETIM 8.0</li> <li>NL-SfB 2005 2.2</li> <li>Uniclass 2015 1</li> <li>UniversalTypes 1.0</li> </ul>	IfcStair D A stair is a vertical passageway allowing occupants to walk step from one floor level to another floor level at a different elevat			
	Classification IFC > > IfcStair IfcStair.CURVED_RUN_STAIR  A stair extending from one level to another without turns or winders. The stair is consisting of one curved flight.			
	Classification IFC > > IfcStair IfcStair.DOUBLE_RETURN_STAIR 🖸 A stair having one straight flight to a wide quarterspace landing, and two side flights from that landing into opposite directions			
	Classification IFC > > IfcStair IfcStair.HALF_TURN_STAIR 🖸 A stair making a 180 turn, consisting of two straight flights connected X 0D by a halfspace landing. The orientation of the turn i			
	Classification IFC > > IfcStair IfcStair.HALF_WINDING_STAIR D A stair consisting of one flight with one half winder, which makes a 180 turn. The orientation of the turn is determined by the wa			
	Classification IFC > > IfcStair IfcStair.LADDER 🗋 a piece of equipment consisting of a series of bars or steps between two upright elements used for climbing up or down something			
	Classification IFC > > IfcStair IfcStair.QUARTER_TURN_STAIR 🗋 A stair making a 90 turn, consisting of two straight flights connected by a quarterspace landing. The direction of the turn is det			
	Classification IFC > > IfcStair IfcStair.QUARTER_WINDING_STAIR 🗋 A stair consisting of one flight with a quarter winder, which is making a 90 turn. The direction of the turn is determined by the			
	Classification IFC > > IfcStair IfcStair.SPIRAL_STAIR 🗋 A stair constructed with winders around a circular newel often without landings. Depending on outer boundary it can be either a ci			
	Classification IFC > > IfcStair IfcStair.STRAIGHT_RUN_STAIR 💭 A stair extending from one level to another without turns or winders. The stair consists of one straight flight.			
	Classification IFC > > IfcStair			

....





#### All Classifications Properties

stair

Domains Classification ETIM > ... > Stairs and railings Accessories/spare parts for stairs and railings 🗆 IFC 4.3 CCI Construction 1.0 Classification ETIM > ... > Accommodation/storage space ETIM 8.0 Industrial stairway D NL-SfB 2005 2.2 Classification ETIM > ... > Power tools Uniclass 2015 1 Stair cleaning device (electric) UniversalTypes 1.0 Classification ETIM > ... > Stairs and railings Stair nosing **D** Classification ETIM > ... > Stairs and railings Stair rod 🛛 Classification ETIM > ... > Power tools Stair stringer milling machine (electric) Classification ETIM > ... > Devices for distribution board-/surface mounting Staircase lighting timer Classification ETIM > ... > Stairs and railings Property ETIM Ramp and stair function Property ETIM Stair light and forewarn Property ETIM





#### All Classifications Properties

stair

Domains	Classification CCI Construction > > Level connecting component
□ IFC 4.3	Flight of stairs [] level connecting object in the form of sequential steps
<ul> <li>CCI Construction 1.0</li> <li>ETIM 8.0</li> <li>NL-SfB 2005 2.2</li> <li>Uniclass 2015 1</li> <li>UniversalTypes 1.0</li> </ul>	Classification CCI Construction > > Positioning object Stair stringer  positioning object for tread Classification CCI Construction > > Access building Staircase tower  access building designed to create non-automated vertical access between two or more storeys
	Classification CCI Construction > > Assembly system Stairway construction  assembly system establishing a step-wise link between two or more levels Classification CCI Construction > > Circulation space
	Stairwell D circulation space vertically and non-automated between two or more storeys or levels
	Classification CCI Construction > > Ground surface construction system Terrain stairway/Terrain ramp construction [] ground surface construction system which connects spaces at different levels
	Classification CCI Construction > > Level connecting component Landing $\Box$ level connecting object in the form of a horizontal plane connected to a flight of stairs

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#### Classification

L

Landing	ENGLISH	~		
Namespace URI	http://ident	tifier.buildingsmart.org/uri,	/molio/cciconstruction-	-1.0/class/L-XSA
Domain	CCI Constru	uction		
Domain version	1.0			
Domain license	MIT license	ž		
Domain state	Released			
More info	https://anvi	risninger.molio.dk/Gratis-va	aerktojer/CCI_Klassifikat	tion
Domain quality assu procedure	rance Private			
Owner	Molio			
Parent classification	Level conne	ecting component		
Related IFC entity	IfcSlab			
Description	level conne	ecting object in the form of	f a horizontal plane con	nnected to a flight of stair

#### Properties

ConstructionMethod

The type of construction action to the building, the project deals with, e.g. new construction, renovation, refurbishment, etc.

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Property

#### ConstructionMethod



 $\sim$ 

Namespace URI	http://identifier.buildingsmart.org/uri/buildingsmart/ifc-4.3/prop/ConstructionMethod
Domain	IFC
Domain version	4.3
Domain license	Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International
Owner	buildingSMART Change request
Description	The type of construction action to the building, the project deals with, e.g. new construction, renovation, refurbishment, etc.
DataType	string
Classifications	
Abutment	structural supporting object in a plane or curved surface form withstanding compression forces and bending moment
Balcony	assembly system that creates an adjoining outer user space built into wall system or roof system
Bay window	assembly system that creates an extended inner user space built into wall system
Beam	structural supporting object in a straight linear form withstanding bending moments
Cable tray	carrying object between discrete positions
Ceiling structure	structural system terminating a space upwards
Column	structural supporting object in a curved or straight linear form transferring compressing forces to other structural objects
Cooker hood	enclosing object for spot ventilation
Cubicle	enclosing object for devices
Dormer	assembly system that creates an extended inner user space built into roof system
Drive belt	mechanical energy guiding object by a belt
Fixed light fibre socket	light connecting object for pluggable connections
Flight of stairs	level connecting object in the form of sequential steps
Floor structure	structural system terminating a space downwards
Foundation construction	assembly system forming separation towards underground
Foundation structure	structural system connecting a construction entity with the underground
Gutter	open enclosure guiding object for liquid in open conduit
High voltage socket	high voltage connecting object for pluggable connections
High voltage terminal	high voltage connecting object for a single connection







stair

	All Classifications Properties				
Domains	Classification NL-SfB 2005 > > (75.1) vaste onderhoudsvoorzieningen; standaard				
<ul> <li>IFC 4.3</li> <li>CCI Construction 1.0</li> <li>ETIM 8.0</li> <li>NL-SfB 2005 2.2</li> <li>Uniclass 2015 1</li> <li>UniversalTypes 1.0</li> </ul>	(75.13) vaste onderhoudsvoorzieningen; standaard, gevelonderhoudsvoorzieningen D				
	Classification NL-SfB 2005 > > (75.1) vaste onderhoudsvoorzieningen; standaard (75.12) vaste onderhoudsvoorzieningen; standaard, interieur onderhoudsvoorzieningen [] Classification NL-SfB 2005 > > (75.1) vaste onderhoudsvoorzieningen; standaard (75.11) vaste onderhoudsvoorzieningen; standaard, gebouwonderhoudsvoorzieningen [] Classification NL-SfB 2005 > > (24.3) trappen en hellingen; ladders en klimijzers (24.32) trappen en hellingen; ladders en klimijzers, klimijzers []				
	Classification NL-SfB 2005 > > (24.3) trappen en hellingen; ladders en klimijzers (24.31) trappen en hellingen; ladders en klimijzers, ladders D				
	Classification NL-SfB 2005 > > (75.2) vaste onderhoudsvoorzieningen; bijzonder (75.23) vaste onderhoudsvoorzieningen; bijzonder, gemechaniseerde gevelonderhoudsvoorzieningen [				
	Classification NL-SfB 2005 > > (75.2) vaste onderhoudsvoorzieningen; bijzonder (75.22) vaste onderhoudsvoorzieningen; bijzonder, interieuronderhoudsvoorzieningen 💭				
	Classification NL-SfB 2005 > > (75.2) vaste onderhoudsvoorzieningen; bijzonder (75.21) vaste onderhoudsvoorzieningen; bijzonder, gebouwonderhoudsvoorzieningen 🛛				
	Classification NL-SfB 2005 > > (24.1) trappen en hellingen; trappen (24.13) trappen en hellingen; trappen, spiltrappen []				
	Classification NL-SfB 2005 > > (24.1) trappen en hellingen; trappen (24.11) trappen en hellingen; trappen, rechte steektrappen 💭				
	Classification NL-SfR 2005 S (24.1) transen en hellingen: transen				



## So far:

- Industry Foundation Classes (IFC)
  - Global agreement on objects, properties, geometry, etc.
  - Global foundation agreements



## So far:

- Industry Foundation Classes (IFC)
  - Global agreement on objects, properties, geometry, etc.
  - Global foundation agreements
- Other standards
  - They exist!
  - Niche industries, country specific, simulation specific, etc.



## So far:

- Industry Foundation Classes (IFC)
  - Global agreement on objects, properties, geometry, etc.
  - Global foundation agreements
- Other standards
  - They exist!
  - Niche industries, country specific, simulation specific, etc.
- bSDD
  - Publishing standards
  - Including Product Data Templates, Materials, etc.
  - Allows other standards to extend IFC



## Back to our use-case

## This is what simulation needs:

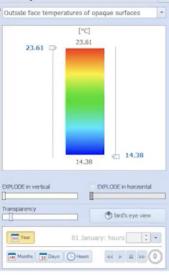
IfcWall

*lfcMaterial* → choose from list lfcWindow

ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazi

OccupancyNumber (Pset\_SpaceOccupancyRequirements) Uniclass





×





## How do I know what you need?





## This is what simulation needs:

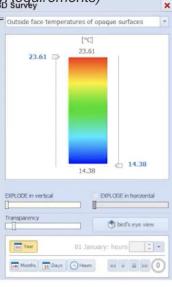
IfcWall

If cMaterial  $\rightarrow$  choose from list If cWindow

ThermalTransmittanceSummer (Pset\_Pset\_DoorWindowGlazi

OccupancyNumber (Pset\_SpaceOccupancyRequirements) Uniclass









• Excel!



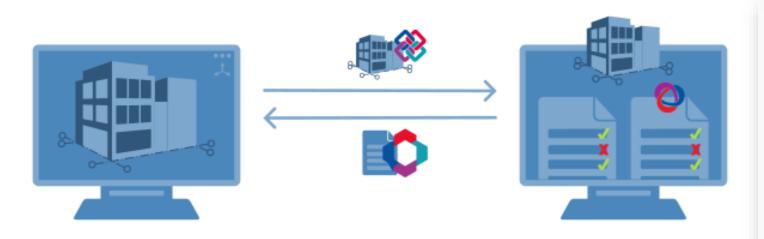
- Excel!
- Information Delivery Specification (IDS)
- Product Data Templates (PDT)
- Information Delivery Manual (IDM & idmXML)
- Exchanges (mvdXML)
- Level of Information Need (LOIN)
- So many more...



buildingsmart.org/information-requirements/

#### **Information Delivery Specification (IDS)**

provided in the dataset of benefick	
{system}	12 Brandblusser
rided in the dataset 03 Kwantitatief	12 primino more
either beton, nub or beton, generiek or beton, binnbeton or "gasheton or beton, geueghen dar beton, grindbeton or beton, isolatiebeton m, slakkenbeton or beton, voorgespannen or beton, schuimbeton or elos, spuiteben or binnen, gleen binnen, generiek or binnen, agfalt or ib or enneni, generiek or eenneni, asbestement er eenneni, seenenistis or spuiteneni enneni, tervisso or enneni, seenet seenetten, mori provisso or gip, nuomi, travisso er enneni, seenette, mori neni, sandecment-verzel or gip, nub or gipz, generiek or gipz, anhydriet or neni, sandecment-verzel or gipz, nub or gipz, generiek or gipz, anhydriet or pend or gius, helder or gipz, nub or gipz, generiek or gipz, spiegelend or generiek or groundsjo, aarke or grondsjo, fonssaad or grondstoj, grind	18 Brandmeldinstallatie
	14 <u>Closetcombinatie</u>
	15 <u>Console</u>
	16 Dak
	MART.
Internetional	





LOAD → SAVE ▷ AUDIT MODEL × CLOSE	1 <u>Aanrecht</u>
AedesIDS 2.0	2 Afdekker
図 ruben@bimbase.nl ◇ 0.0.2 台 2022-10-10+02:00 ⊕ Design handover to manufactuer	3 <u>Armatuur</u>
Aedes ILS 2.0 © Aedes / buildingSMART	4 Bad
Aanrecht	5 Balk
Describe why the requirement is important to the project.	6 <u>Balkon</u>
Provide instructions on who is responsible and how to achieve it.	7 Balustrade
RPPLIES TO: Elements with Objecttype data of Aanrecht in the dataset 02 Generick	8 <u>Beglazing</u>
REQUIREMENTS: Bag Pand Id data shall be provided in the dataset 01 Lokalisatie	9 <u>Boeiboord</u>
Bag Verblijf: Object Id data shall be provided in the dataset 01 Lokalisatie Eenheid Id data shall be provided in the dataset 01 Lokalisatie	10 Boiler
If Export As data shall be provided in the dataset 02 Generiek	11 Borstwering
Shall be classified using {system} Lengte data shall be provided in the dataset 03 Kwantitatief	12 Brandblusser
Shall have a material of either beton_ntb or beton_generiek or beton_bimisbeton or beton_cellenbeton or beton_gasheton or beton_gewapend or beton_grindbeton or beton_isolatiebeton or beton_ichtelen or beton=akkenbeton or beton_voorgespannen or beton_schuimbeton or	13 Brandmeldinsta
beton_staalvezelbeton or beton_spuitbeton or bitumen_ntb or bitumen_generiek or bitumen_asfalt or bitumen_teer or cement_ntb or cenent_generiek or cement_absetscement or cement_stude cement_grout or cement_houtvezelcement or cement_houtvolcement or cement_metiselspecie or	14 <u>Closetcombinati</u>
cement_mortel or cement_spuitmortel or cement_terrazzo or cement_vezelcement or cement_zandcement or cement_zandcement-vezel or zips_ntb or gips_generied or gis_anhydriet or grips_gipkarton or gips_spuisitus or gips_ntu or gids_ntb or gids_generied or giss_cellulairgids or	15 <u>Console</u>
glas_gehard or glas_gewapend or glas_helder or glas_kwartsglas or glas_opaal or glas_spiegelend or grondstof_ntb or grondstof_generiek or grondstof_aarde or grondstof_bimszand or grondstof_grind	16 Dak



# So far:

Industry Foundation Classes (IFC)

- Global (foundation) agreement on objects, properties, geometry, etc.
- Other standards
  - Niche industries, country specific, simulation specific, etc.
- bSDD
  - Publishing standards
- Information Delivery Specification (IDS
  - Define what you need for your situation / use-case / tool / project / whatever



### Is there more?

• Way too much....



#### Is there more?

• Way too much.... But my time is up...



#### Bonus round

- Want to check if your IFC file is valid?
- Want to check if your data is consistent against bSDD data?
- Want to get 'sanity' check on your data?
- BETA Test

validate.buildingSMART.org



#### Bonus rounds

- What if something is wrong?
- What if you want to discuss an object?
- What if you want someone else to contribute to something?
- BIM Collaboration Format (BCF)
  - Agreements on how to do messaging about BIM objects



#### Bonus rounds in reserve time

- Want to know what other did?
- Want to get a 'best practice' to use?
- Want to share your best practice with others?
- Want to see what buildingSMART Rooms produced?
- Use-case Management Service
   ucm.buildingSMART.org



#### Bonus rounds in reserve time

• Want to know even more?



#### Bonus rounds in reserve time

• Want to know even more?

Become a member of buildingSMART Turkiye!





# Teşekkürler!

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