

6) Attach other screenshots or files that you consider useful

1. Visualizations in FZK Viewer (before conversion)

Buildings LoD3 – Dataset CityGML

- ▶ Lightweight LoD3 level dataset
- ▶ Complete hierarchy and relevant information
- ▶ Includes minor geometric details like WallSurface as smoke stack etc.

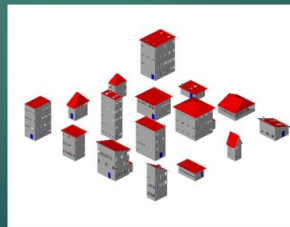
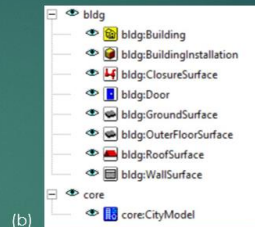


Figure 1.6.1

Visualizations: FZKViewer

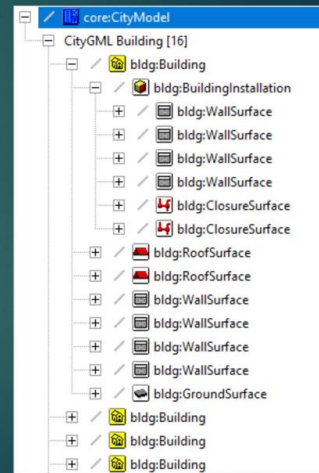


Figure 1.6.2 (a)

2. Conversion through FZK Viewer

a. Visualization in BIM Vision

Buildings LoD3 – Experiment 1 CityGML to IFC

- ▶ Hierarchy is kept with correct semantics
- ▶ Geometric and semantic information is transformed
- ▶ Generic attributes from GML are converted to GML PropertySet in IFC attributes

Properties	Location	Classification	Relations	Value
Element Specific				
CompositionType		ELEMENT		
Guid		OP_6bmsGCCPzyrHChv		
IdEntity		IFCBuilding		
Name		bldg:Building		
GML PropertySet				
bldg:Function		Industrial		
bldg:RoofType		Shed		
bldg:StoreysAboveGround		3		
bldg:YearOfConstruction		1953		
core:creationDate		2019-06-11		
global		UKID_caf31126-e0db-4f61-9d0e-9a5323b6f5f		

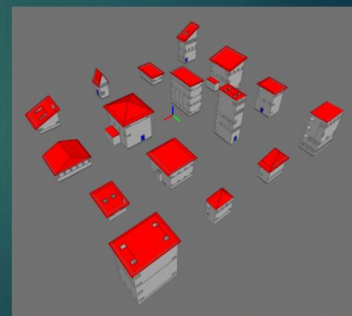
Figure 3.1.1 (a)

Visualizations: BIMVision
Conversion tool: FZKViewer

(b)

Active	Type	Name
<input checked="" type="checkbox"/>	Project	core:CityModel
<input checked="" type="checkbox"/>	Building	bldg:Building
<input checked="" type="checkbox"/>	Building Element Proxies	
<input checked="" type="checkbox"/>	Walls	
<input checked="" type="checkbox"/>	Roofs	
<input checked="" type="checkbox"/>	Slab	bldg:RoofSurface
<input checked="" type="checkbox"/>	Slab	bldg:RoofSurface
<input checked="" type="checkbox"/>	Slab	bldg:RoofSurface
<input checked="" type="checkbox"/>	Footings	
<input checked="" type="checkbox"/>	Doors	
<input checked="" type="checkbox"/>	Door	bldg:Door
<input checked="" type="checkbox"/>	Building	bldg:Building
<input checked="" type="checkbox"/>	Footings	
<input checked="" type="checkbox"/>	Walls	
<input checked="" type="checkbox"/>	Roofs	
<input checked="" type="checkbox"/>	Doors	
<input checked="" type="checkbox"/>	Building	bldg:Building

Figure 3.1.2



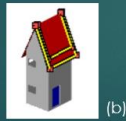
b. Visualization in FZK Viewer and BIM Vision (dark background)

Buildings LoD3 – Experiment 1 (contd.) CityGML to IFC

- ▶ Attributes and geometries are transformed correctly (measurements and dimensions)
- ▶ Details for minor geometry are also kept in correct hierarchy with correct mapping
- ▶ Conversion enables possibility of the reverse conversion i.e. CityGML to IFC to **CityGML**



Figure 3.1.5 (a)

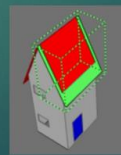


(b)

Visualizations: BIMVision and FZKViewer
Conversion tool: FZKViewer

Name	Value
GML Attributes	
gml:id	UUID_bb576e7c-f82b-48f...
core:creationDate	2019-06-11
Calculated Values (L...	
BoundingBoxLe...	2.04 [m]
BoundingBoxLe...	4.34 [m]
BoundingBoxLe...	4.56 [m]
SurfaceArea	6.61112

Figure 3.1.6 (a)



(b)

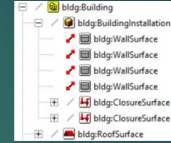
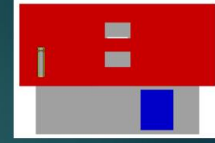


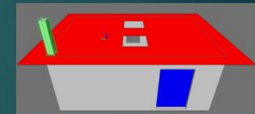
Figure 3.1.3 (a)



(b)

Name	Value
Walls	
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface
Wall	bldg:WallSurface

Figure 3.1.4 (a)



(b)

Guid	0x16c7c1d1b6c7c1d1b6c7c1d1b6c7c1d1
ifc:Entity	ifc:Entity
Name	bldg:RoofSurface
PredefinedType	ROOF
GML PropertySet	
core:creationDate	2019-06-11
gml:id	UUID_bb576e7c-f82b-48f...
Global X	41.615
Global Y	-0.26
Global Z	5.361496
Bounding Box Length	2.045
Bounding Box Width	4.34
Bounding Box Height	4.558514

c. Discussion

FZK Viewer is generally used for viewing and analysis of data. However, it provides you with option of exporting data into multiple formats like IFC, Collada, STL etc. In this case, we used CityGML file exported as IFC data and as results it converts data both in terms of semantic and geometric details very accurately. Hierarchy is kept as original and CityGML elements are translated to matching IFC entities (Figure 3.1.3 and 3.1.4). In these figures, elements are selected in original CityGML data set and crosschecked with converted IFC LOD 200 data.

Interestingly, conversions are almost immediate and dataset that is exported has same size each time which states the contents are consistent if not fully completed. However, contents are checked in terms of attributes, measurement extent and they are completely translated (see Figure 3.1.5 and 3.1.6). Most importantly, such transformation enables bidirectional conversion, for instance this approach gives CityGML to IFC and if correct translation is adapted, new converted IFC file can produce matching CityGML data to original data set.

FZKViewer also provides option for IFC data to be exported in multiple formats; EXPRESS (.ifc), XML (.ifcxml) or Zip (.ifczip) with IFC 2x3 or IFC4 format. CityGML data set was converted to IFC 2x3 and IFC4 with EXPRESS based IFC LOD 200 file and they were observed as identical.