



Data format description Official 3D Building Model of Germany in Level of Detail 2 (LoD2-DE)

For the data distribution from the data stock of the Central Office for House Coordinates
and Building Polygons (ZSHH)

Version 3.0

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valid from the provision of the LoD-DE 2024

1. Description of the data format

The distribution format for the 3D building models is the CityGML format in accordance with the AdV-CityGML¹ profile. The CityGML-LoD2-DE example instances are obtained from the annex to the “Product and quality standard for 3D building models”². The description of the OGC standard is obtained from the OGC specification³ “CityGML, version 1.0.0, OpenGIS® City Geography Markup Language (CityGML) Encoding Standard 08-007r1”.

2. Specification

The 3D building model is an extension of the dataset of the building polygons including the third dimension. It is a digital, numerical surface model of the earth’s surface reduced to the object fields of buildings and structures defined in ALKIS/ATKIS (definition according to ALKIS/ATKIS-OK in the GeoInfoDok⁴). Underground buildings and structures are not included.

2.1. Data sources

For the data stock of the 3D building model all objects modelled as areas from the following object groups are used:

- AX_Gebaeude
- AX_Turm
- AX_BauwerkOderAnlageFuerIndustrieUndGewerbe
- AX_VorratsbehaelterSpeicherbauwerk
- AX_BauwerkOderAnlageFuerSportFreizeitUndErholung
- AX_SonstigesBauwerkOderSonstigeEinrichtung
- AX_HistorischesBauwerkOderSonstigeEinrichtung
- AX_BauwerkImVerkehrsbereich

A detailed list of all the defined building and structure functions for ALKIS and ATKIS can be found under the following link:



<https://repository.gdi-de.org/schemas/adv/citygml/Codelisten/BuildingFunctionTypeAdv.xml>

If the objects listed are recorded in ALKIS or ATKIS in the respective Land, they are an integral part of the 3D building model.

The building footprints are usually derived from the official real estate map. Alternatively, outlines of structures and buildings from ATKIS can be used. In the building representation the location accuracy corresponds to that of the underlying building footprint.

2.2. Georeference

The coordinates for the geometries are specified by default as ETRS89/UTM coordinates in zones 32 and 33 combined with the height data in the DHHN2016_NH in metres with three decimal places. Because of the geometric distortion the Laender Berlin, Brandenburg, Mecklenburg-Western Pomerania and Saxony are provided only in zone 33.

2.3. Content

Characteristics of the LoD2 model:

- The building representation is carried out by 14 standardized roof types.
- The geometry is described by “solids” and their surface aggregates (multisurface).
- Shared geometries are kept redundantly.
- The height accuracy is mostly 1m. Gross deviations are possible in individual cases with complex roof types.

Besides the geometry description of the solid figure, the dataset of an object includes the following content:

- The height of the object as difference in metres between the highest reference point and the lowest reference point of the object
- Object identifier
- Building and structure function
- Generalized roof type
- Indications of quality (please see paragraph 4 Attributes)
- Official municipality key
- Optional, if kept (even partially) in a land:
 - Name
 - Number of storeys
 - Address
 - TerrainIntersection



3. File characteristics

- The dataset is splitted in 2x2 km tiles
- The tilename respectively filename is composed of the “CityModel” LoD2, the UTM zone, the tile area (coordinates of the lower left corner [LU], in km), the edge length of the tiles in kilometres and the abbreviated designation of the Land:

LoD<Level>_<UTM-Zone>_<Rechtswert_LU>_<Hochwert_LU>_<Kantenlänge>_<BL>.xml

Example of data name (ETRS example):

LoD2_32_692_5334_2_BY.xml

Example of CityModels (ETRS example):

`<gml:name>LoD2_32_692_5334_2_BY</gml:name>`

- In every file the coordinate reference system (CRS) is named, which is recorded at the highest geometry level according to AdV convention:

ETRS89_UTM<zn>*DE_DHHN2016_NH

- Likewise, only one envelope (bounding box) per CityModel (file) is created.

```
<gml:boundedBy>
<gml:Envelope srsName="urn:adv:crs:ETRS89_UTM32*DE_DHHN2016_NH">
<gml:lowerCorner srsDimension="3">EEEEEE.EEE NNNNNNN.NNN
HHHH.HHH</gml:lowerCorner>
<gml:upperCorner srsDimension="3">EEEEEE.EEE NNNNNNN.NNN
HHHH.HHH</gml:upperCorner>
</gml:Envelope>
</gml:boundedBy>
```

- The coordinates and heights can either be specified in a list (posList) or as individual positions (pos).

```
<gml:posList srsDimension="3">381954.215 5721415.891 66.542 381956.984 5721428.649
66.542 381957.034 5721428.638 66.542 381957.877 5721432.519 66.542 381962.801
5721445.057 66.542 381973.572 5721442.723 66.542 381970.857 5721430.094 66.542
381973.902 5721429.432 66.542 381972.911 5721424.874 66.542 381969.875 5721425.533
66.542 381967.185 5721413.131 66.542 381954.215 5721415.891 66.542</gml:posList>
```

```
or
<gml:pos srsDimension="3">381954.215 5721415.891 66.542</gml:pos>
<gml:pos srsDimension="3">381956.984 5721428.649 66.542</gml:pos>
```

...

4. Attributes

The attributes of an object are described as follows:

- Object identifier (gml:id):

Per building or building part the attribute gml:id defines an object identifier (OID) which starts with “DE” and a two-character abbreviated designation of the Land “BL”:

```
<bldg:Building gml:id="DEMVAL75000AFzxo">
```



- Reference to the 2D building (externalReference):

In addition to the OID of the 3D building, a reference to the 2D building is recorded in the dataset. If the building polygons from ATKIS are used, the OID of the ATKIS object is to be stated.

```
<core:externalReference>  
  <core:informationSystem>  
    http://repository.gdi-de.org/schemas/adv/citygml/fdv/art.htm#\_9100  
  </core:informationSystem>  
  <core:externalObject>  
    <core:name>DENW52AL05562020</core:name>  
  </core:externalObject>  
</core:externalReference>
```

- Production date (creationDate):

The production date states when the LoD2 data have been imported into the database of the respective Land. This is a data processing production date, which is recorded as "creationDate" yyyy-mm-dd.

```
<core:creationDate>2008-08-13</core:creationDate>
```

The production data tells nothing about the up-to-dateness of the individual object.

- Building function (function):

The building function in ALKIS respectively ATKIS is to be recorded as "function" only with the attribute values. In the case of several functions only the first attribute value is delivered. Since the ranges of values of building function (GFK) and structure function (BWF) overlap, with the LoD2 objects the attribute value is preceded by the identifier of the object type with an underscore.

```
<bldg:function>31001_1121</bldg:function>
```

- Measured height of the building (measuredHeight):

The "measuredHeight" is the difference between the highest and lowest reference point (above mean sea level) of the building. In accordance with the conventions of the GeoInfoDok it is to be recorded in metres with three decimal places.

```
<bldg.:measuredHeight uom="urn:adv:uom:m">7.700</bldg.:measuredHeight>
```

- Generalized type of roof (roofType):

Is specified according to the enumeration in the GeoInfoDok:

```
<bldg:roofType>3100</bldg:roofType>
```

Note: LoD2 buildings that are automatically modeled from an LoD1 object (Level of Detail 1) with a flat roof have the identifier "9999" (other) as the attribute for the roof type.

- Municipality key (Gemeindeschlüssel):

The eight-digit municipality key must be recorded under the generic attribute municipality key:



```
<gen:stringAttribute name="Gemeindeschluessel">  
  <gen:value>09679122</gen:value>  
</gen:stringAttribute>
```

- Building footprint up-to-dateness (Grundrissaktualitaet):

The date for the last comparison with the ALKIS or ATKIS footprint is recorded under the generic attribute footprint up-to-dateness:

```
<gen:stringAttribute name="Grundrissaktualitaet">  
  <gen:value>2020-06-30</gen:value>  
</gen:stringAttribute>
```

- Source references:

The source references are recorded as generic attributes and provide information about the database and thus about the quality. The attribute names and values listed in the AdV's "Produkt- und Qualitätsstandard 3D-Gebäudemodelle"² are to be used:

```
<gen:stringAttribute name="DatenquelleDachhoehe">  
  <gen:value>1000</gen:value>  
</gen:stringAttribute>  
<gen:stringAttribute name="DatenquelleLage">  
  <gen:value>1000</gen:value>  
</gen:stringAttribute>  
<gen:stringAttribute name="DatenquelleBodenhoehe">  
  <gen:value>1000</gen:value>  
</gen:stringAttribute>  
<gen:stringAttribute name="DatenquelleGeschossanzahl">  
  <gen:value>1000</gen:value>  
</gen:stringAttribute>  
<gen:stringAttribute name="Geometriotyp2DReferenz">  
  <gen:value>3000</gen:value>  
</gen:stringAttribute>
```

- Name (gml:name) - only if recorded with the object in ALKIS or ATKIS:

Under the attribute *Name*, only the proper name of the building should be stated, not the descriptive designation of the GFK respectively BWK

```
<gml:name>Maria_Montessori_Schule</gml:name>
```

- Number of storeys (storeysAboveGround) – if recorded:

The attribute provides the number of storeys. How it has been recorded is defined in the attribute "Datenquelle Geschossanzahl".

- Addresses (address) – if recorded:

The attribute provides the location description stored for the object, which contains (even partial) information on the state, city, street and house number.



- Terrainintersection (lod2TerrainIntersection)– if recorded:

The polygon represents the intersection of the terrain with the building. The calculation basis is the same DTM (digital terrain model) that is specified in the "DatenquelleBodenhoehe".

For more details on this information, please do not hesitate to contact ZSHH.

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¹ <https://repository.gdi-de.org/schemas/adv/citygml/>

² <https://www.adv-online.de/AdV-Produkte/Standards-und-Produktblaetter/ZSHH/>

³ <https://www.opengeospatial.org/standards/citygml>

⁴ <https://www.adv-online.de/GeoInfoDok/>