

***Buildings* – Executive Summary**

This document presents spatial data specification for European data related to the theme “*Buildings*”.

Use cases

Building data is a key theme for environmental studies. On one hand, buildings are the places where people live, work and spend more of their time and where they should be ensured good quality of habitat and protection from risks (flood, fire, earthquake, ...) and from pollutions (noise, air pollution, ...). Buildings by themselves may deserve protection because of their historical or architectural interest. On the other hand, buildings and their inhabitants are consuming natural resources (heating, land, transport, construction material) and there is clear need to promote more sustainable buildings and to control urban spreading. This data specification addresses requirements related to European reporting, such as the Noise Directive, the Air Quality Directive, the Energy Performance of Building Directive and the Population and Housing Census Directive. The Flood Directive and the project of Soil Directive have also been taken into account.

Moreover, theme *Buildings* is part of the reference data that is required in a Spatial Data Infrastructure to describe the landscape and for lots of mapping and communication applications. Especially, some specific buildings and constructions are valuable landmarks for travellers.

Scope - Relations with other themes

The spatial features under the scope of this document are local scale spatial features such as buildings (of course) and also some other constructions of major interest for environmental applications, such as elevated constructions or environmental barriers. Spatial features representing building components are also under the scope of this document – they allow very detailed representations of different kinds of building components and ancillary constructions.

Other building related features at a coarser level of detail such as building groups and complexes, built-up areas, urban block, city districts, etc. are not under the scope of this document. Built-up areas and settlements may be found in themes land use, land cover and/or geographical names.

This document mainly focuses on the physical description of real world entities seen as constructions. An important characteristic of buildings is their capability to provide services. Because this information is covered by other INSPIRE themes related to facilities (utility and governmental services, production and industrial facilities, agricultural and aquacultural facilities), this data specification only provides a simplified classification of building services. Furthermore, building theme classes share relations with addresses, cadastral parcels and geographical names themes.

Existing data and standards

There are nowadays many datasets describing building related features. These datasets are mainly produced by well identified member state organisations, usually mandated national cadastral and mapping agencies.

Building data exist with various levels of detail both in geometry and in semantics. For example, there are representations of buildings and constructions as points, surfaces or solids. The 2D surface representation is the most frequent, the building having been captured e.g. by its foot print or roof edge or envelope. The 3D representations of buildings are generally described using the well defined levels of detail of the CityGML OGC standard.

All these various representations have their interest and their limits. For instance, 3D data offer a wonderful tool to design and to communicate about urbanism projects but are far from being accepted by any kind of software. Another example is about the level of detail of the geometric representation: whereas detailed geometry of buildings may be necessary for local use, a more generalised geometry that implies smaller volume of data and so shorter time for computation is generally more suitable for larger areas of interest.

Data model

The data model offers a flexible approach by allowing multiple representations of buildings and constructions, through a set of four profiles with different levels of detail both in geometry and semantics.

The core profiles contain the requirements to be included in the implementing rule. They contain feature types building and building part and a limited set of attributes mainly related to temporal aspects

(construction, renovation and demolition dates), physical information (height, number of floors, elevation) and the classification of buildings according to their physical aspect and current use.

- The **Buildings2D** profile includes various geometrical representations of buildings as 2D or 2,5D data.
- The **Buildings3D** profile has same semantic content as the Buildings2D profile and allows in addition, the geometric representation of buildings in any of the four levels of detail of City GML.

The extended profiles contain the recommendations to provide more detailed information about theme buildings. In addition to building and building part, the main features represented are *other constructions*, *building units* and *installations*.

- The **BuildingsExtended2D** profile is a semantic extension of Buildings2D profile with additional thematic attributes (material of construction, official area or value, connection to utility networks...), classes (building units, installations, other constructions) and references to other data (like cadastral data and addresses).
- The **BuildingsExtended3D** profile is an extension of the Buildings3D profile for rich 3D representations at different levels of details. It includes the possibility to represent many building components, such as the building boundaries (wall, roof ...), the openings (doors – windows) and building interior (rooms, internal installations) and the textures associated with the main feature types. It also contains all the semantic information of extended 2D profile.

Quality and metadata

By allowing all kinds of building representations and various levels of detail, the data model ensures a flexible way to data producers to make their data compliant with INSPIRE. However, this flexibility implies loose harmonisation on some points and has to be counterbalanced by a relevant documentation to be provided to the users. This data specification proposes several tools to document the building data set, such as additional metadata elements for evaluation (content, usability for some use cases, template for additional information).

This data specification does not put any quality requirement in order to avoid to exclude data from INSPIRE but proposes consistency rules between the semantic level of detail and the geometric accuracy.