SMART SURVEYORS FOR LAND AND WATER MANAGEMENT
CHALLENGES IN A NEW REALITY

FIG NL THE NETHERLANDS

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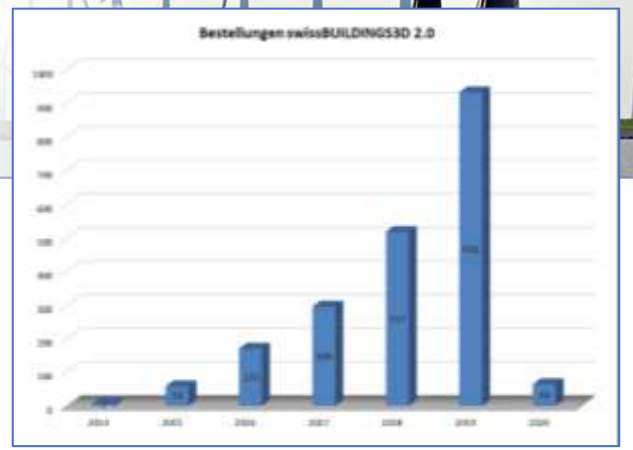
Multi-Purpose Building Models for Switzerland

June 21, 19:30

Study on behalf of Swiss Mapping Agency

Source: Jan Bolomey, Blumer-Lehmann AG



Introduction

- Growing demand on building information
- Many data sources exists but they are not aligned and harmonised
  - What is the meaning of «one building»?
- Transition towards digital design, construction, and operation
  - Building Information Modelling (BIM)
  - International Standardisation ISO 19650
  - Increasing demand for unique and stable key as common identifier (cross-domain)

Objectives of the study

Main objective

- Development and creation of a basis for the initialisation of a new, interdisciplinary data model "Official Building CH".

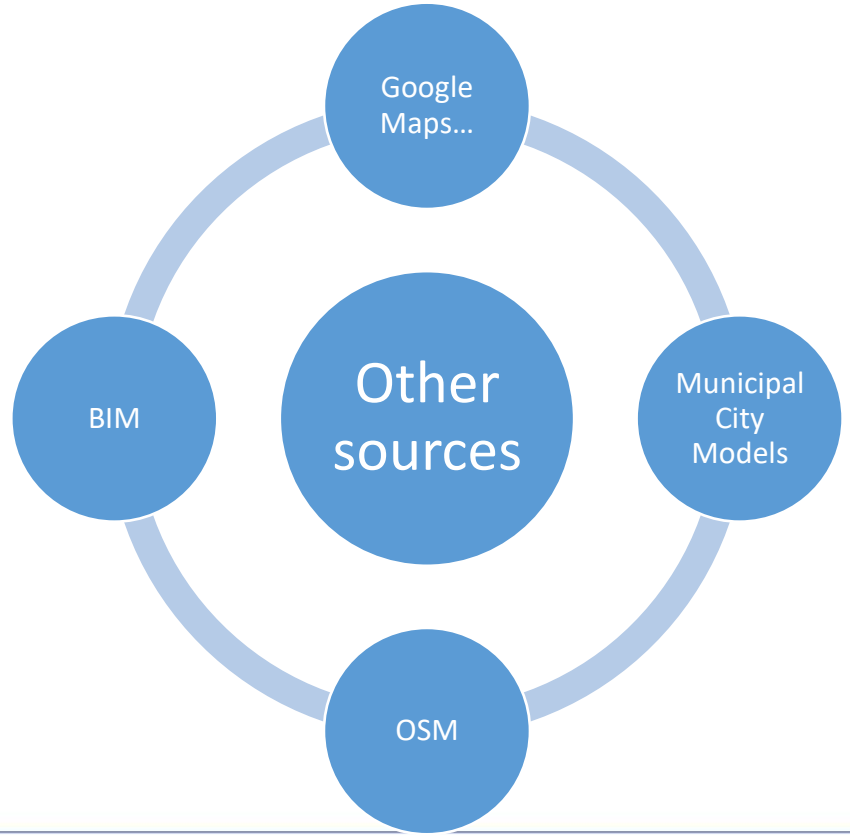
Tasks

- Investigate the need and potential of an "Official Building CH" product.
- Develop a proposal for the term "building" (i.e. one discrete object).
- Develop a draft data model for "Official Building CH" (including a study of variants, taking into account existing national and international standards).
- Develop a roadmap for further steps

Situation analysis - Stakeholder assessment

- Views of *the building* can be very different, depending on tasks and questions → interviews with various stakeholders representing
  - Legal and normative view, best practices
  - Spatial planning view including matters of conception and design
  - View of statistics, insurance, energy, emergency services, economy
  - View of the entire construction value chain:
    Planning
    Structural (construction and refurbishment)
    Operation

Situation analysis - Existing building data



Some conflicts between data sources

swissBuildings: 1 object
Cadastral data: 6 objects

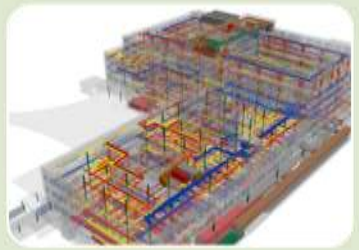
swissBuildings: 1 object
Cadastral data: missing

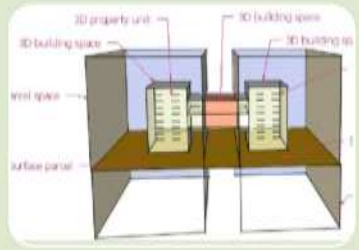
swissBuildings: 1 object
Cadastral data: missing

Geometric inconsistencies

Which object represents a single building?

Situation analysis - relevant international standards





LandXML

Focus on civil engineering, surveying and documentation

Australia: e-Paper

CityGML

Focus Visualisation, City-wide data sets

OGC Standard

IFC

Focus Digital Construction

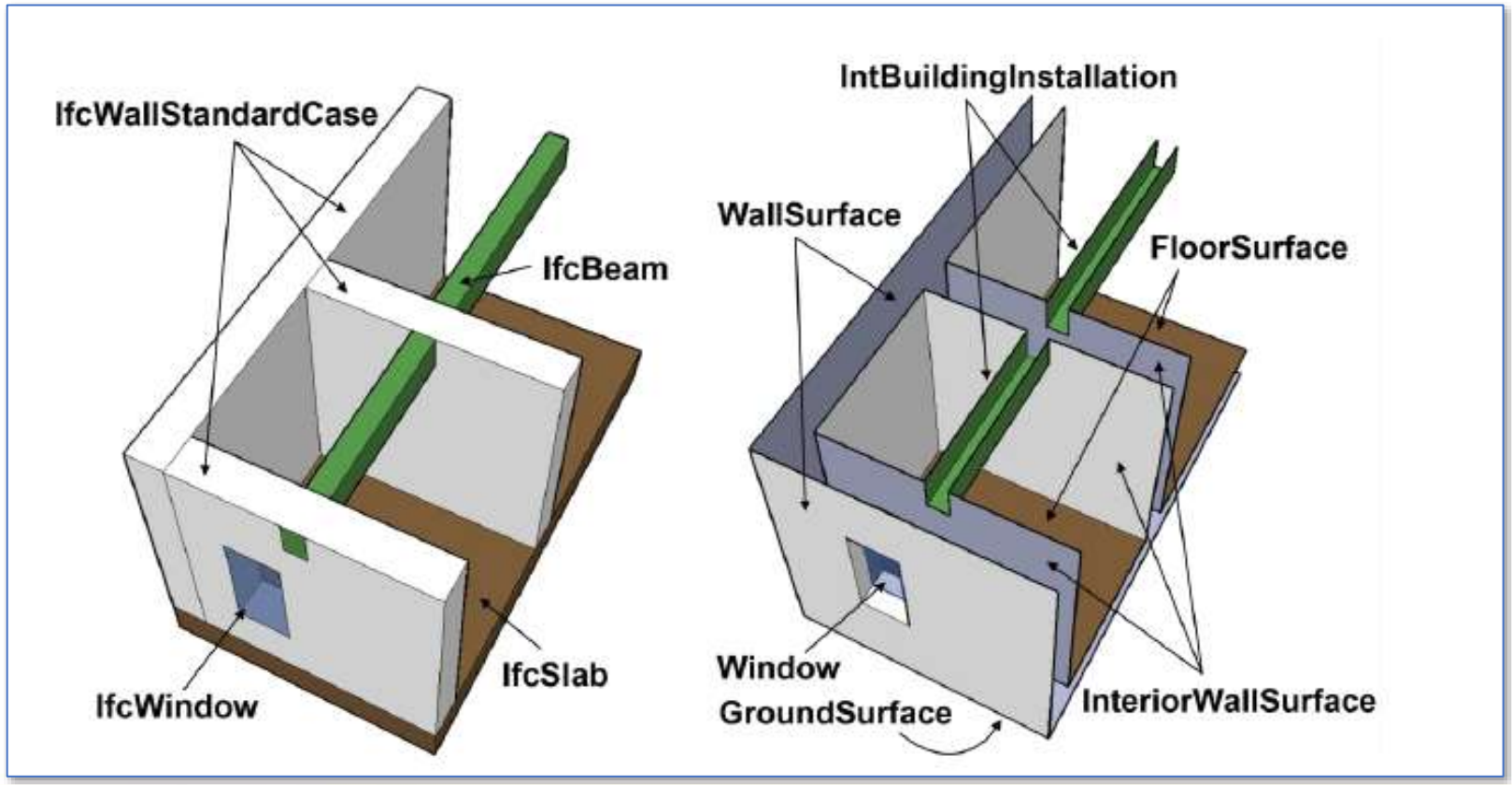
ISO 16739, buildingSmart Standard

LADM

Focus Ownership (Rights, Restrictions and Responsibilities)

ISO 19152 Standard

Situation analysis – different modelling of objects



Ambiguous use of the same term – semantic interoperability!

Different implementation of the spatial dimension in geometric solids

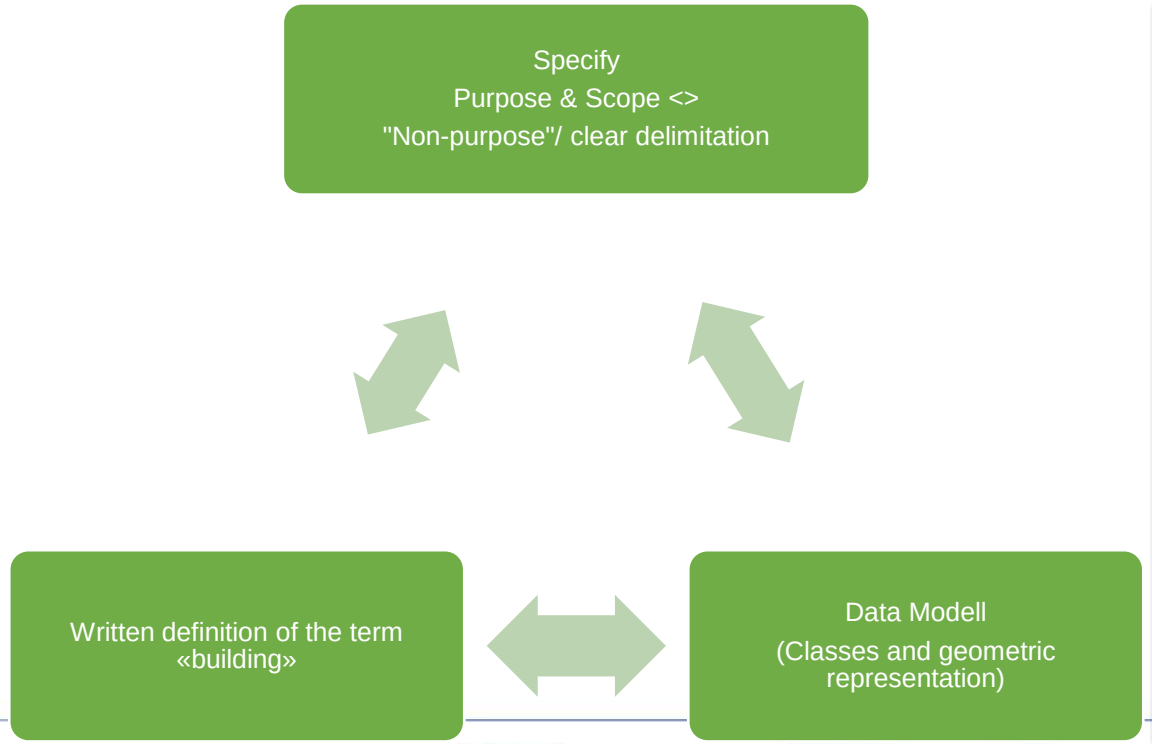
Source: Nagel et al. 2009

Situation analysis – results

- There is a growing demand on harmonised building information:
  - Inter alia carbon footprint estimated by inhabited space (and the heating systems)
- There is great interest in a harmonised term "building“,
- There is a strong to very strong interest in a standardisation of building information,
- In particular, the following requirements are demanded of an "Official Building CH":
  - Uniform terms are to be used, considering the definitions from the RBD (building term) and the standards and norms defined by the Swiss Society of Engineers and Architects (SIA) on building spaces and volumes.
  - The definitions must not contradict legal building terms or masses.
  - Existing data, standards and processes are to be used, not a greenfield start.
  - Differentiation to “other structures” is important.

Results - Definition of term «building»

Dependencies between definition, data model and usage



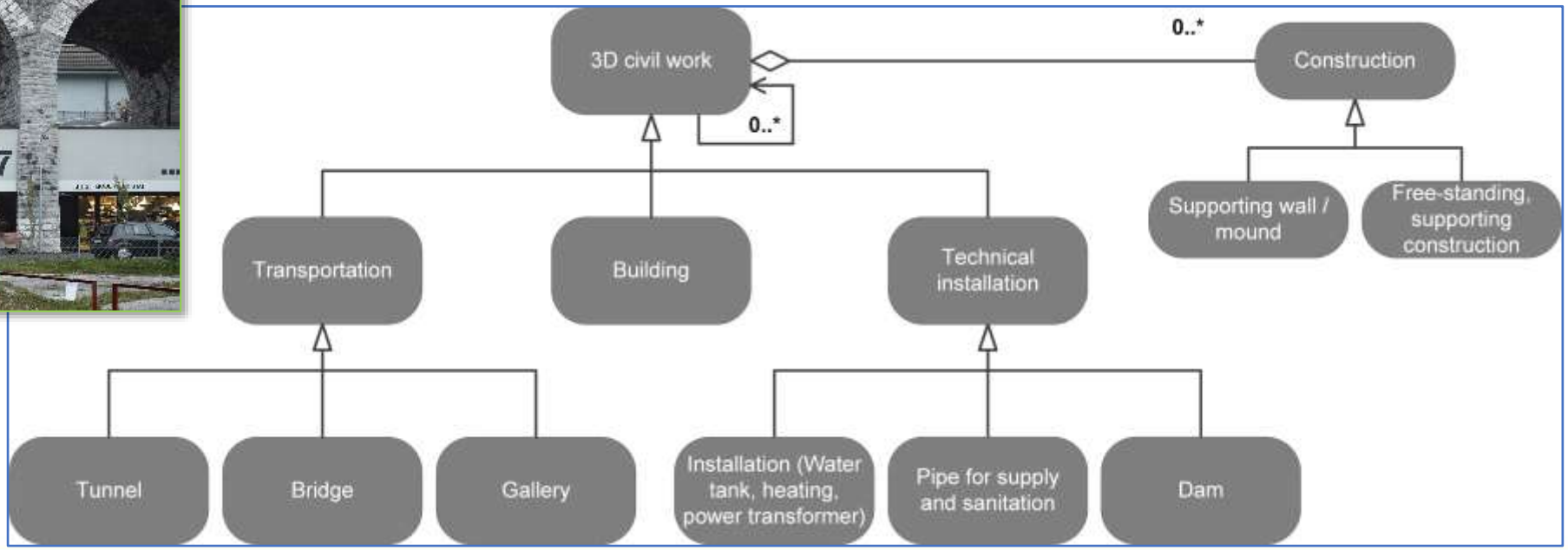
Definition

- A *building* is a permanent structure with a roof, firmly attached to the ground, capable of accommodating persons and used for residential purposes or purposes of work, education, culture, sport or any other human activity;
  - a semi-detached, group and terraced house also counts as a building if it has its own access from the outside and if there is a vertical load-bearing partition wall between the buildings extending from the ground floor to the roof.

Results - Positioning of «building» vs. «civil work»

Source: www.baunetzwissen.de

Is a civil work always a building when the definition is fulfilled?
For which purpose has a civil work been established
What is the current purpose?



Results - Considerations on Data Model

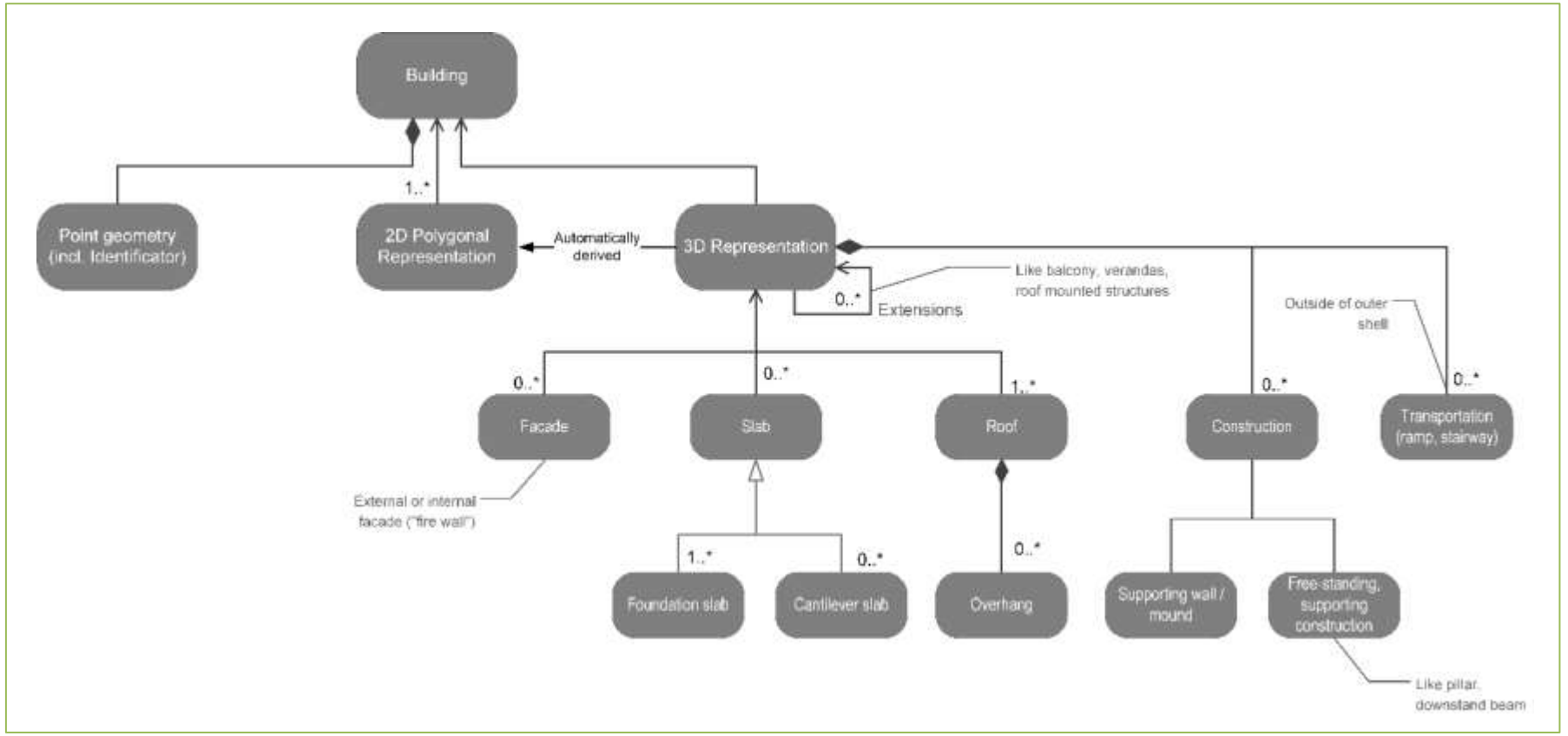
Variants

- *1:1 takeover*: Use an international standard 1:1
- *Adaptation*: extend and adapt the international standard
- *Neutral model*: Design own neutral model
  - «Own»: Swiss model
  - «Neutral»: Application-independent, not directly linked to international standards.
  - Boundary constraint: enable bi-directional exchange with IFC and CityGML.

Results - Favoured variant *Neutral Model*

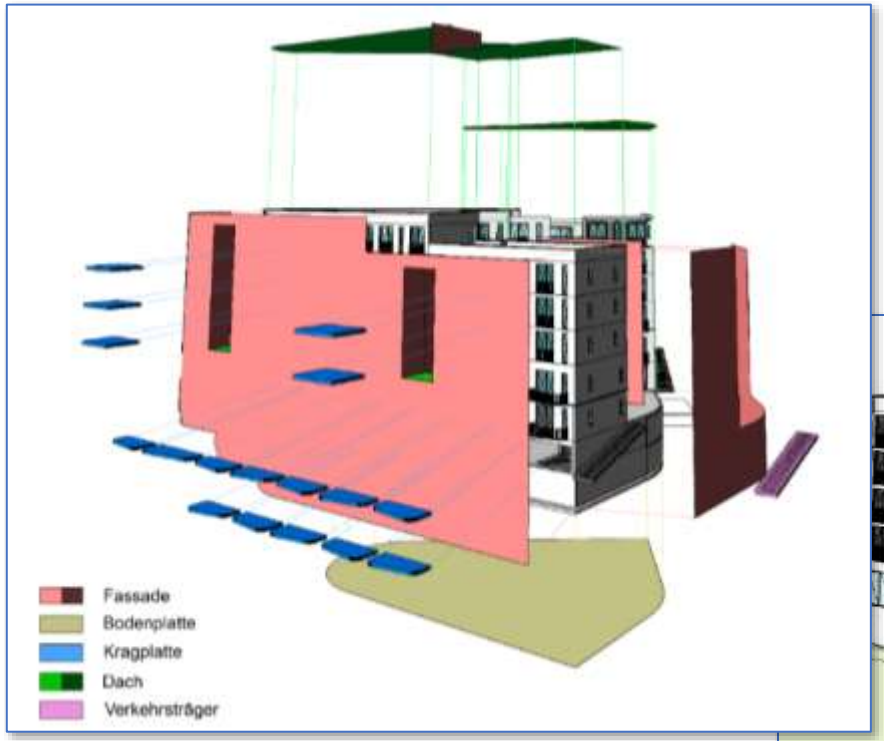
«If you can't break the silos, connect them.»

Results - Class diagram with details of the 3D structure



Results - Implementation of data model in IFC data set

- Class roof (green)
- Class slab (olive)
- Class facade (red)
- Classes Construction and Transportation (purple)



data source: SIA documentation D 0270

Results - Plausibility checks on various buildings

Solution approach for the implementation of a larger site in Zurich in the new data model. Focus: General validation of the classes of the data model

Solution approach for the "Gehry Buildings" in the new data modell. Focus: on Roof-wall transition and triangular mesh for curved surfaces

Conclusion

- Designed data model sucessfully validated against complex buildings
- Proposed data structures cover all components of the building that are relevant from the point of view of a national database
- Data model can be extended for specific purposes like condominium ownership in accordance with the national recommendation.
- Use of basic structures from IFC respectively CityGML support to transfer of existing swissBUILDINGS3D database into the new structure as well as to integrate new data in IFC format.

Outlook

- A harmonised, official repository offers users a significant advantage over data from private providers due to its greater reliability and integrability with other data and business processes.
- Timing for a new national standard is perfect as many of the construction processes are in revision.
- The study will now be followed by a conceptional phase for elaboration the data model in more details and assess the transformation and harmonisation of existing data sets.

Discussion

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