



## ***Integration of 3D Cadastre, 3D property formation and BIM in Sweden***

**Mohamed EL-Mekawy, Stockholm university**  
*moel@dsv.su.se*

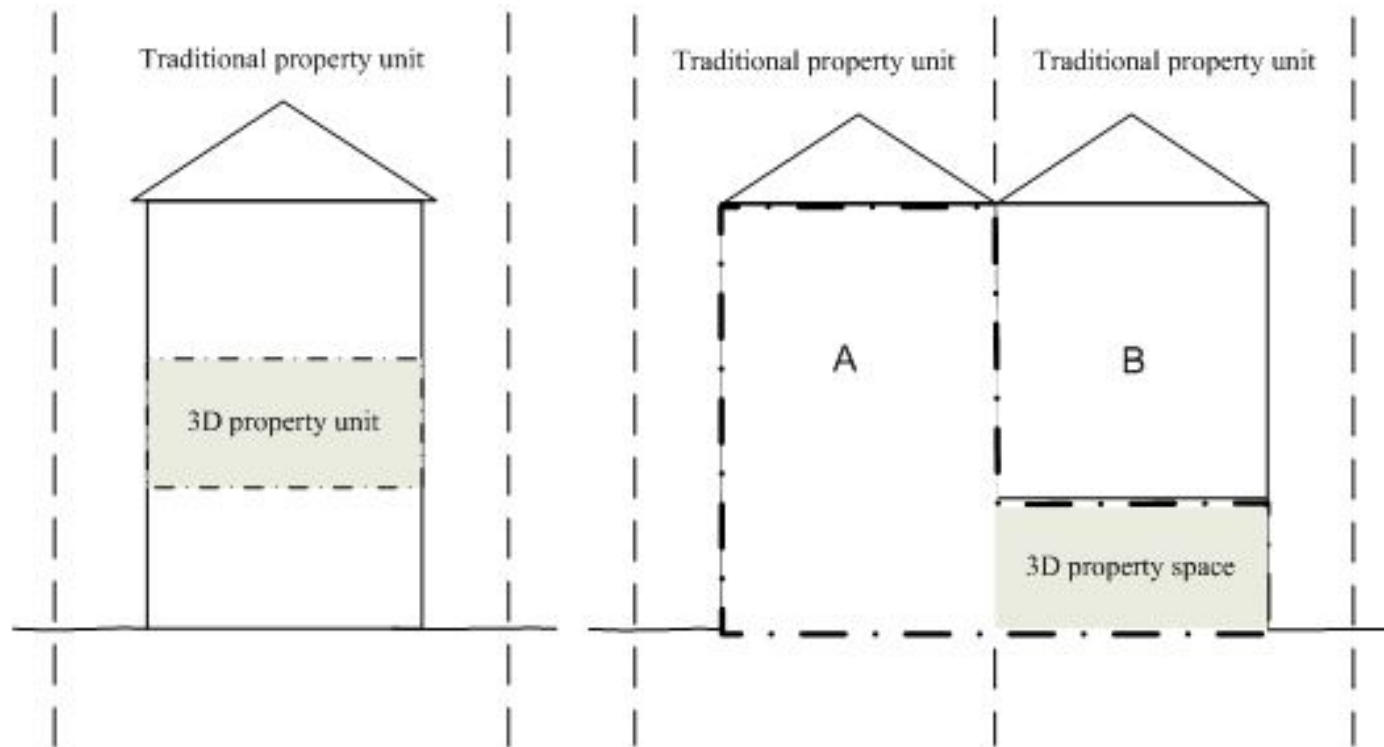
**Jesper M. Paasch, Lantmäteriet, [the Swedish mapping, cadastral and registration authority]**  
land *jesper.paasch@lm.se*

**Jenny Paulsson, KTH Royal Institute of Technology**  
*jenny.paulsson@abe.kth.se*

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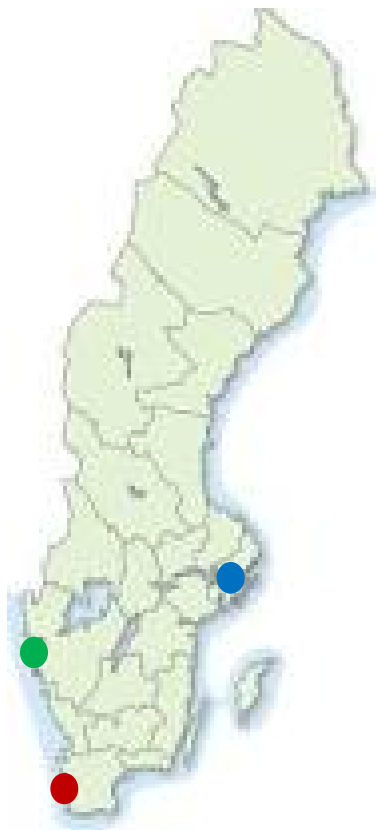
## Background

Swedish 3D formation possible since 2004: (3D property unit, 3D property space, Ownership apartment / condominiums)



## Background

Some statistics:

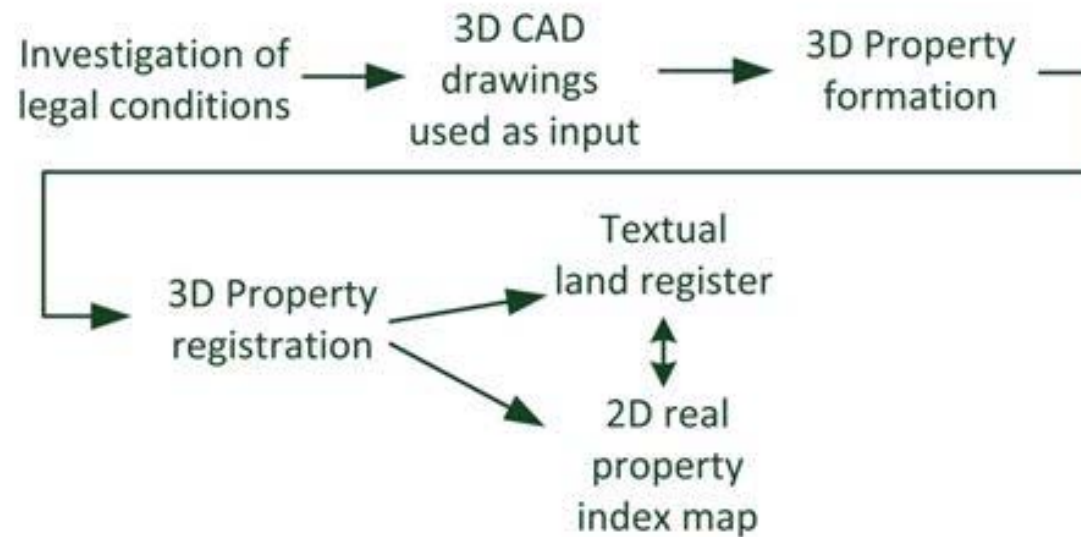


<i>Municipality</i>	<i>No. of 2D real properties</i>	<i>No. of 3D real properties</i>	<i>Population</i>
● Stockholm municipality	59 333	154	897 700
● Gothenburg municipality	69 567	55	533 271
● Malmö municipality	31 467	91	312 994

## 3D Property formation

Basically same process as “2D” property formation, but often with input from 3D CAD

Very simplified view of process:



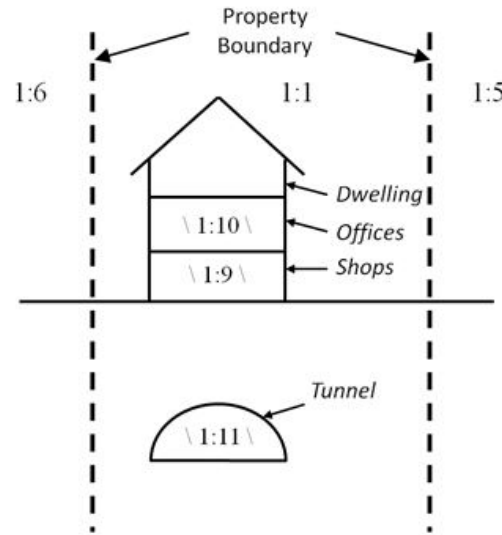
# 3D Property registration

Registration on 3D property in the Swedish real property register (textual part)

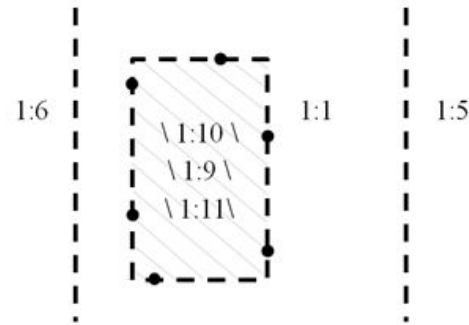
## Läge, karta (09)

Område	N, E (SWEREF 99 TM)		N, E (SWEREF 99 18 00)	
1	6582728.4	671911.8	6581457.7	151337.1
2 3D-utrymme	6582787.6	672177.9	6581504.8	151605.6
Ändamål: byggnad				
Storlek: Utrymmet i horisontalplan är ca 75 kvm.				
Höjd: Höjdläget är mellan CA+31,2 meter och CA+55 meter i RH00.				
Urholkar: Solna Haga 4:20, Solna Haga 4:26				
3 3D-utrymme	6582888.3	672049.6	6581611.2	151481.9
Ändamål: byggnad				
Storlek: Utrymmet i horisontalplan är ca 6 kvm.				
Höjd: Höjdläget är mellan CA+26,3 meter och CA+58,5 meter i RH00.				
Urholkar: Solna Haga 4:20				
Urholkas av				
3D-utrymme: Solna Haga 6:1 område 1				

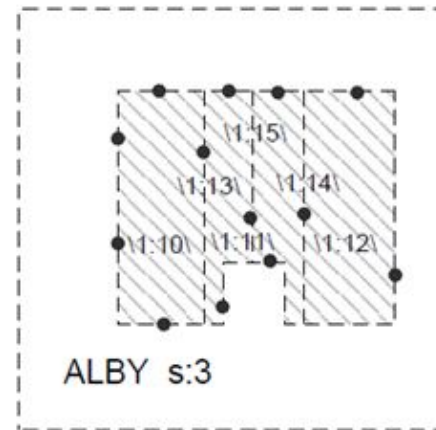
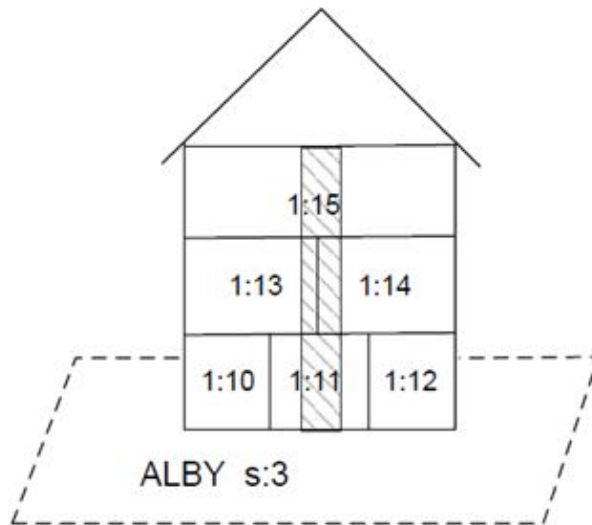
# Other examples of 3D property registration (visualisation in the Cadastral Index Map)

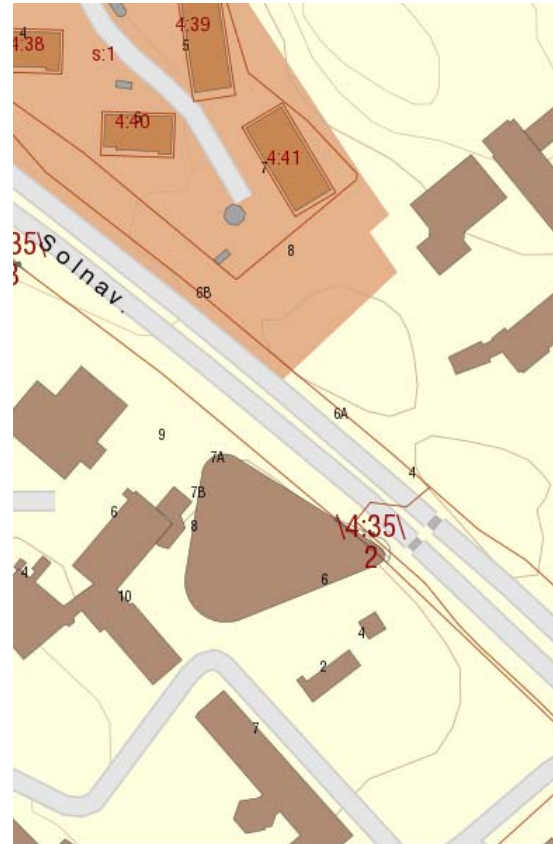
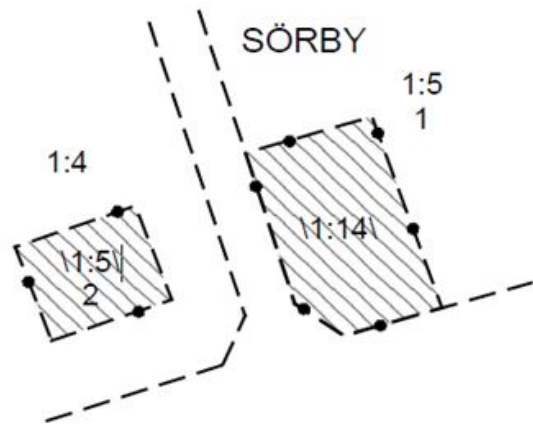


*“Real life” side view*



*Cadastral Index Map*

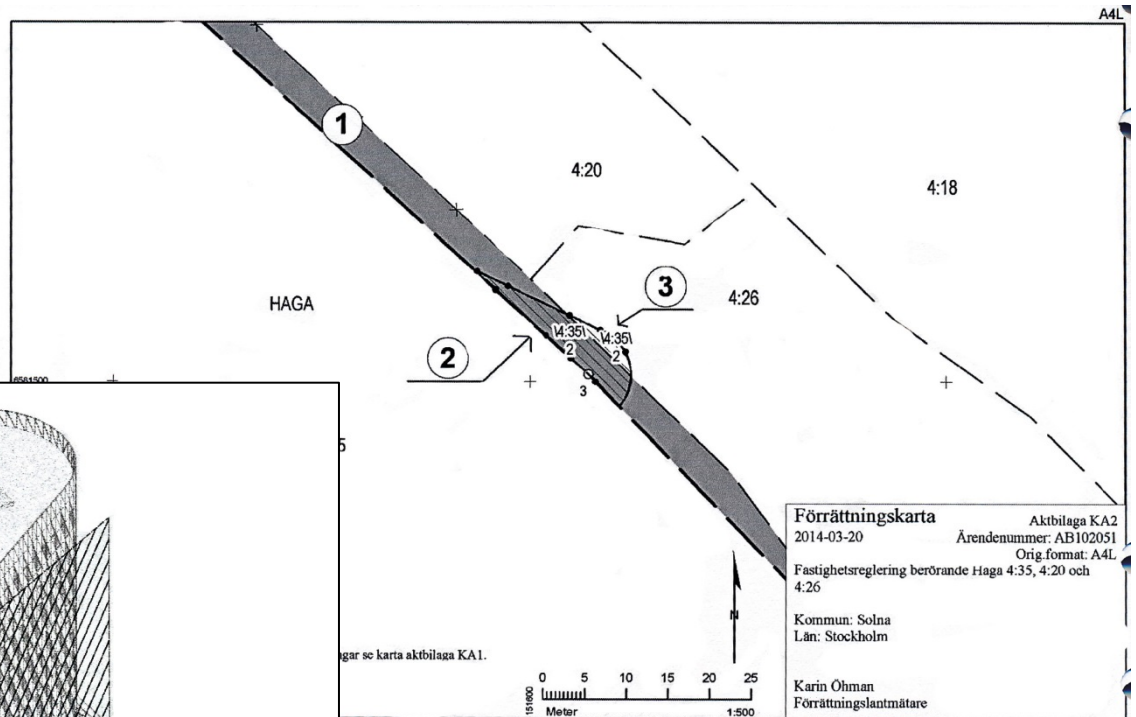
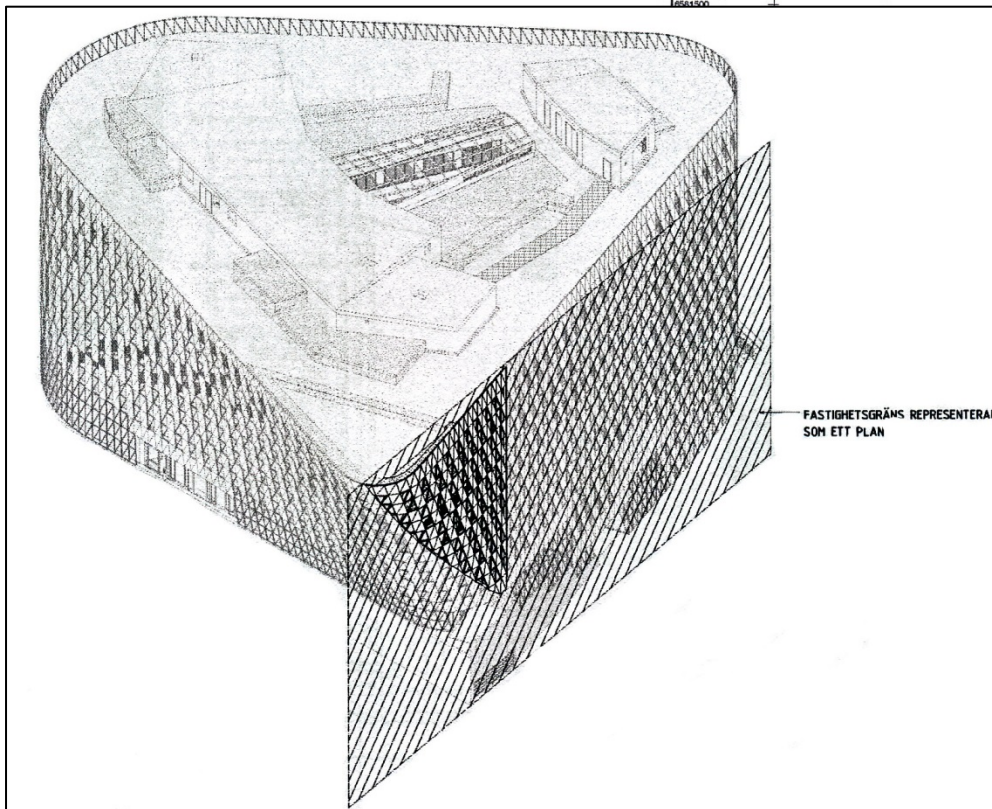






# 3D Property formation

## Examples of 3D documentation in legal cadastral documents





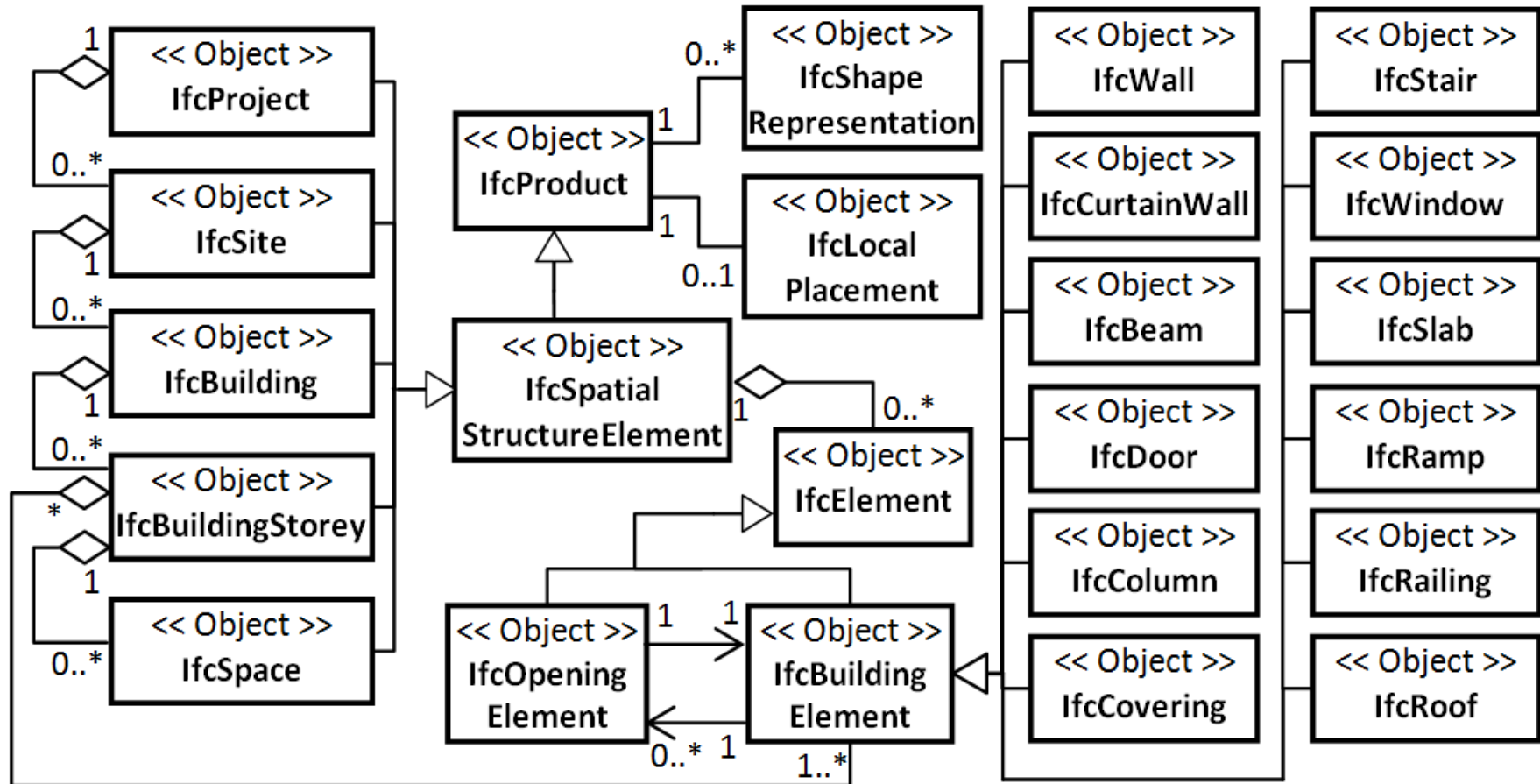
## **BIM in Sweden**

- **Relatively new field**
- **There is an increased interest in BIM but mainly as a cost-effective tool in construction and building management rather than a life cycle management tool.**
- **The lack of or use of co-operating standards, resulting in variants of BIM created for each building project**
- **There are suggestions for how to improve the interchange between BIM and GIS**

## **BIM for real 3D Property Information**

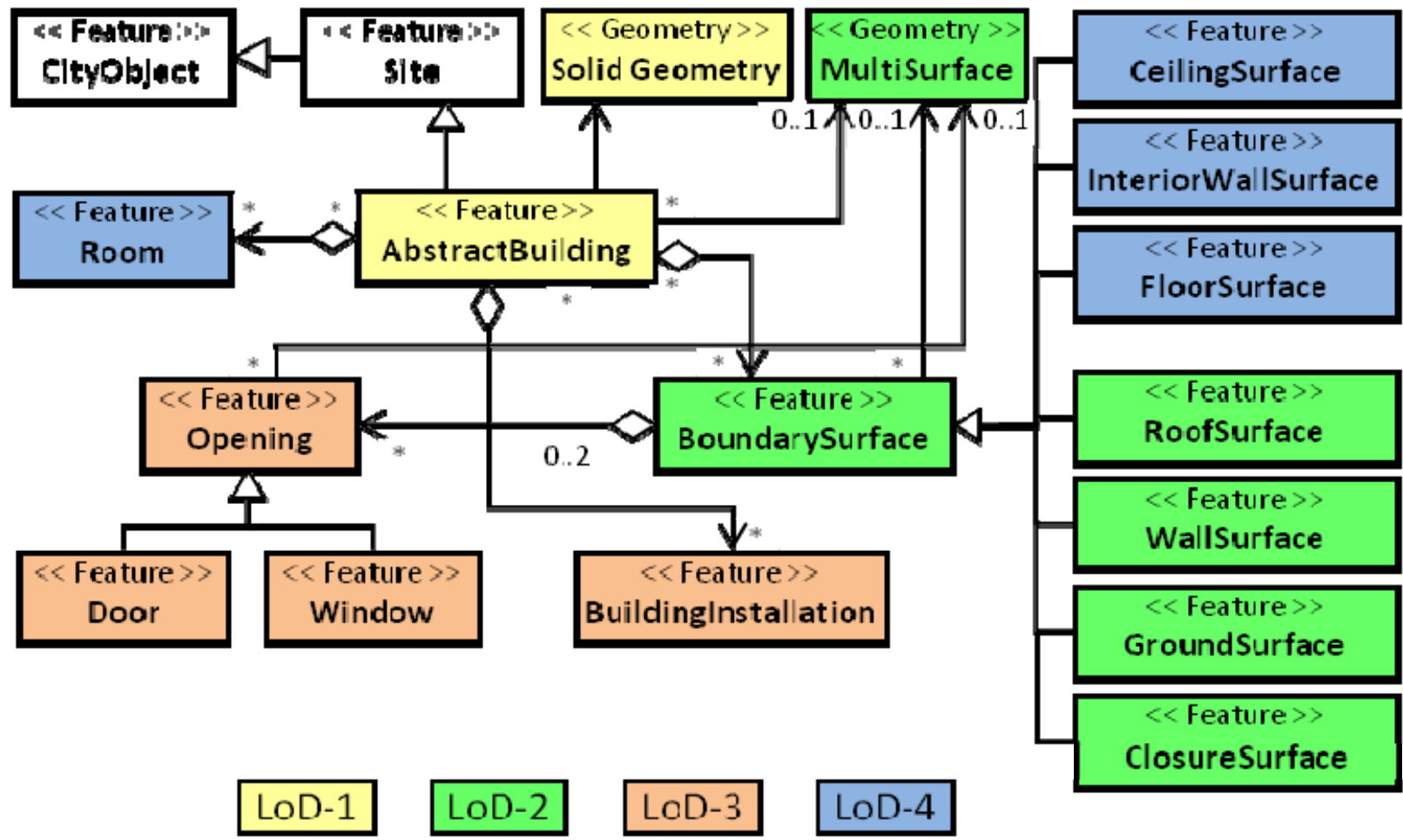
- **Legal aspects** define the boundaries of a property, the rights of its activities, how the area is calculated and the content of a property.
- **Technical aspects** deal with how 3D properties can be visualized, geometrically represented, managed and extracted from different data source formats on technical applications.
- **Registration aspects** concern how the registration of 3D property in land administration systems is done. It includes aspects such as the content, storage, structure and maintenance of 3D property information.
- **Organizational aspects** include aspects for institutional, management and capacity-building issues. They even deal with operational issues on the property and its financial structure.

## Existing Building Model in BIM (IFC)



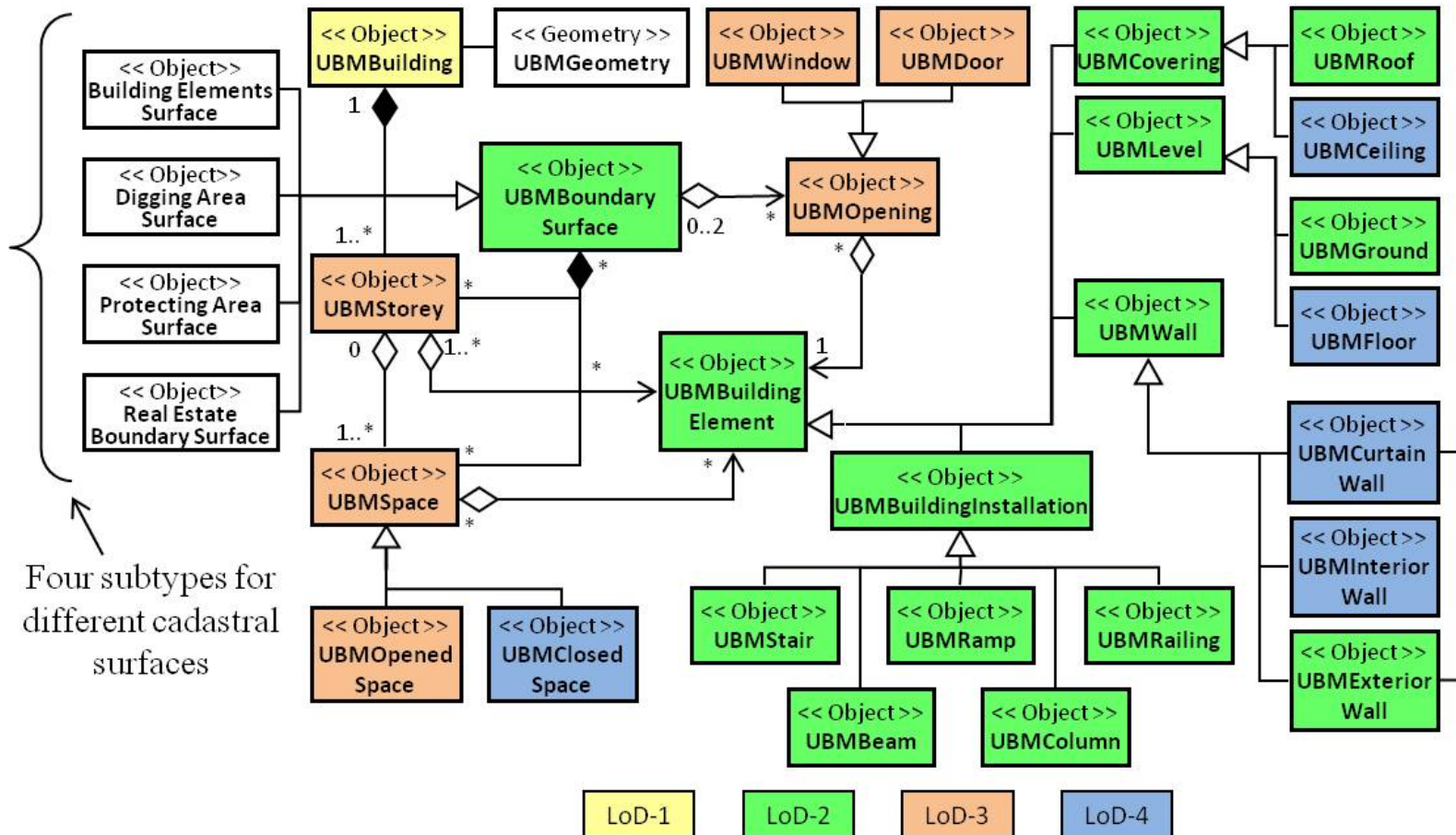
Based on IAI (2011), the ISO standard (ISO 16739, 2011) and Benner et al., (2005)

# Existing Building Model in Geospatial Standards (CityGML)



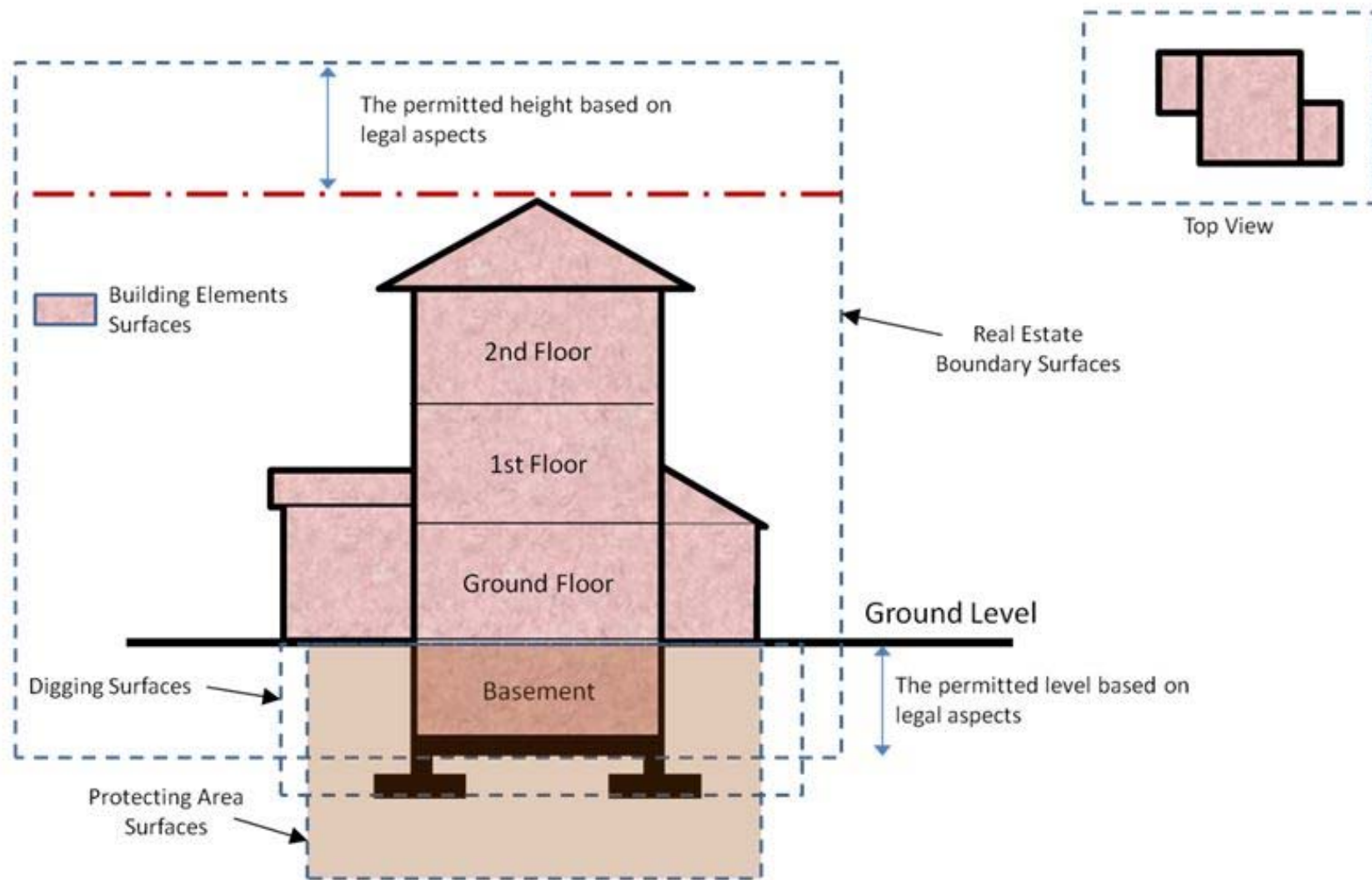
*Excerpted simplified version from the CityGML standard*

# Unified Building Model



El-Mekawy et al. (2011) and El-Mekawy & Östman (2012)

# Towards a real 3D Property Formation



*Based on El-Mekawy & Östman (2012, p. 47)*

## **Conclusions**

- **The Swedish real property system is stable and reliable.**
- **Still there is no single complete 3D property information system, making use of 3D CAD / BIM facilities.**
- **How to proceed with 3D property formation, registration and visualisation and BIM is currently being discussed.**
- **Although BIM is considered today as the most detailed and comprehensive object-oriented method of modelling buildings, it still does not fulfil the needs for modelling complete 3D cadastre.**
- **The proposed four different virtual surfaces could be a useful way of achieving this purpose and creating possibilities for the potential use of 3D cadastre for presenting its legal parts in several stages of the construction process.**



Thank you for your Attention

**Questions !!!**