3D/4D Cadastre

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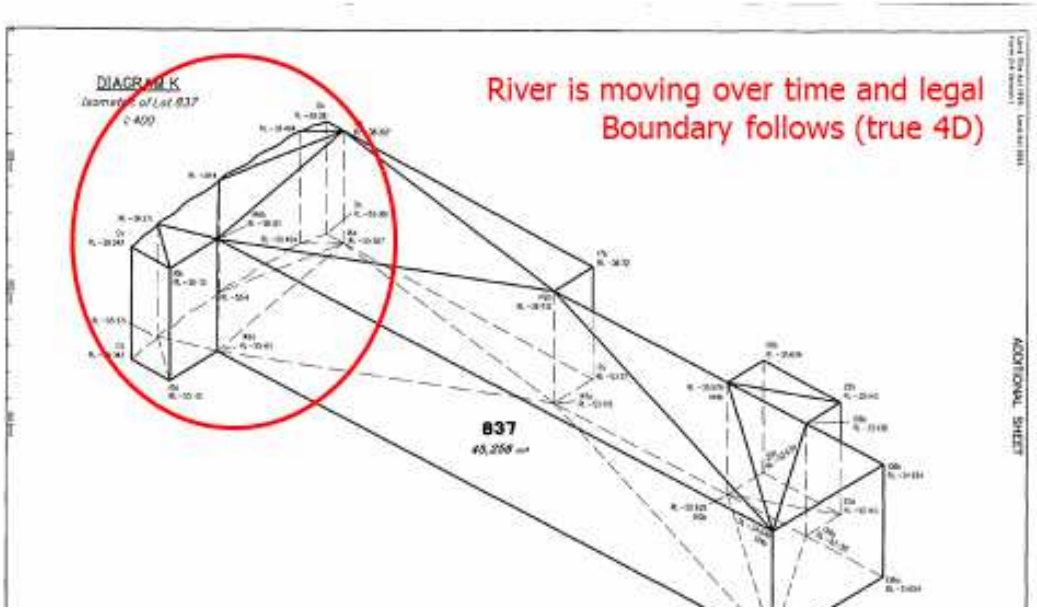
Deep integrating 3D space and time: 4D Cadastre Example

Partition: no gaps or overlaps in the parcelation on which the rights (e.g. ownership) are based

2D: a planar partition of the surface

3D: a partition of space with no overlaps or gaps

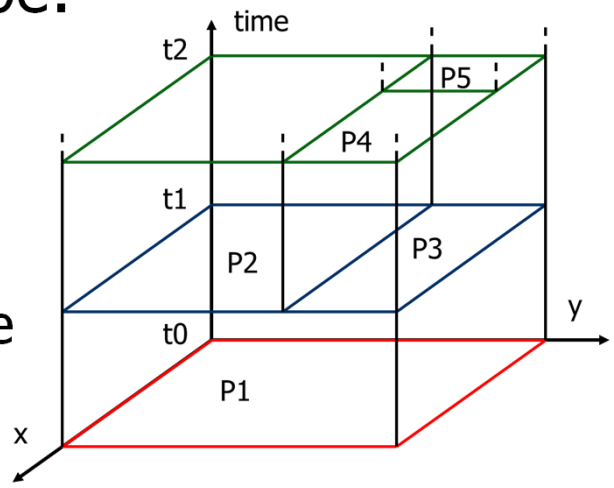
4D: no overlaps or gaps in the rights, not only in space but also in parallel the time dimension



4D cadastre: separate space and time or an integrated attribute?

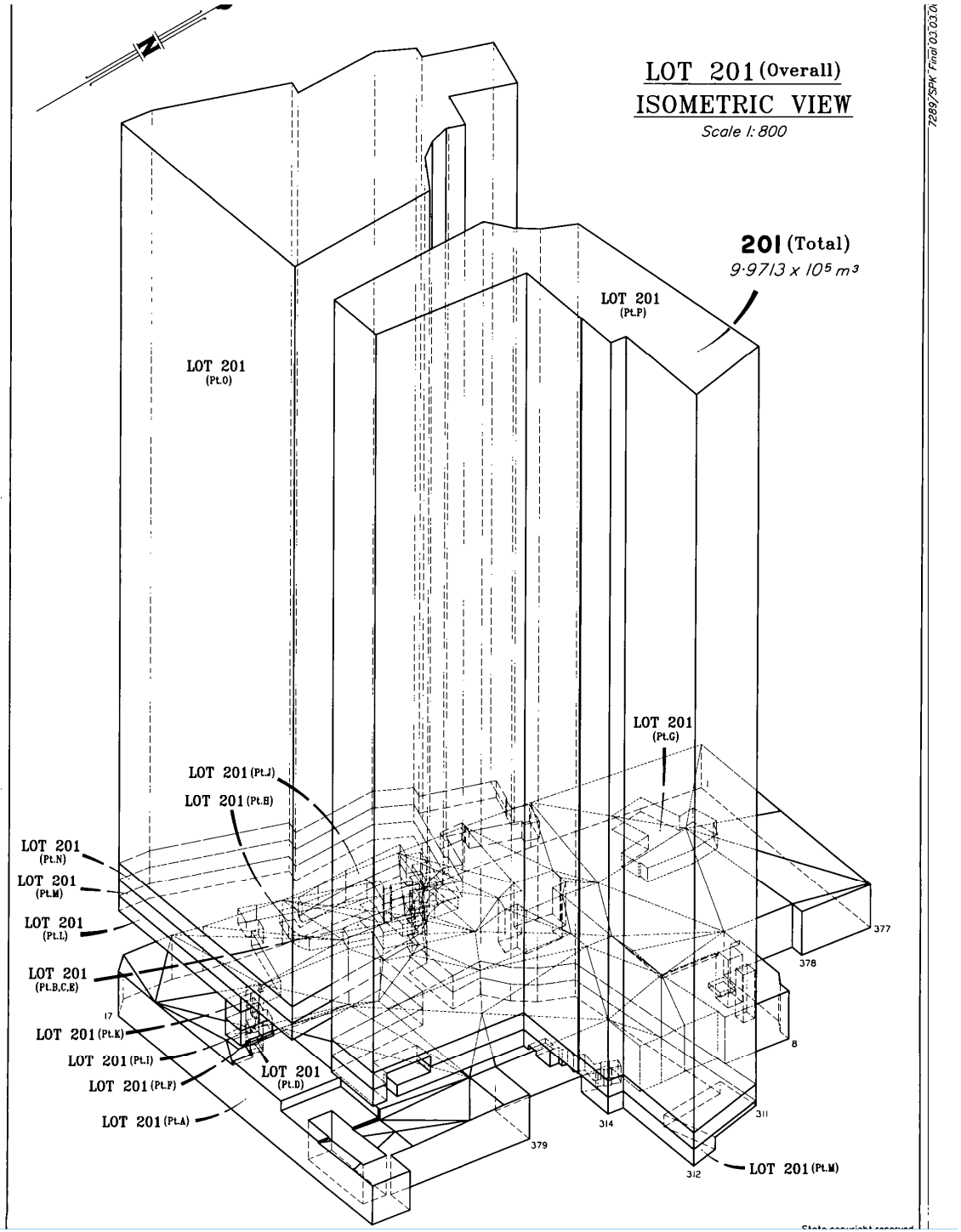
- Advantages of separate 2D/3D and time attributes:
  1. Already able to represent all cases
  2. Supported by state-of-the art technology (LADM v1)
  3. Temporal aspect is more than just one dimension

- Advantages of integrated 4D data type:
  1. optimal efficient 4D searching
  2. Parent-child becomes topology
     neighbor query in time
  3. Foundation of full (4D) partition:
     no overlaps or gaps in space and/or time
  4. 4D analysis: do two moving cattle rights
     have spatio-temporal overlap/touch



More cases: Timesharing

- 3D volumetric survey plan (apartments)
- Timesharing of 40 units/week: 40*52 shares
- Timeshare can be traded, mortgaged, etc.
- 3D+time=4D



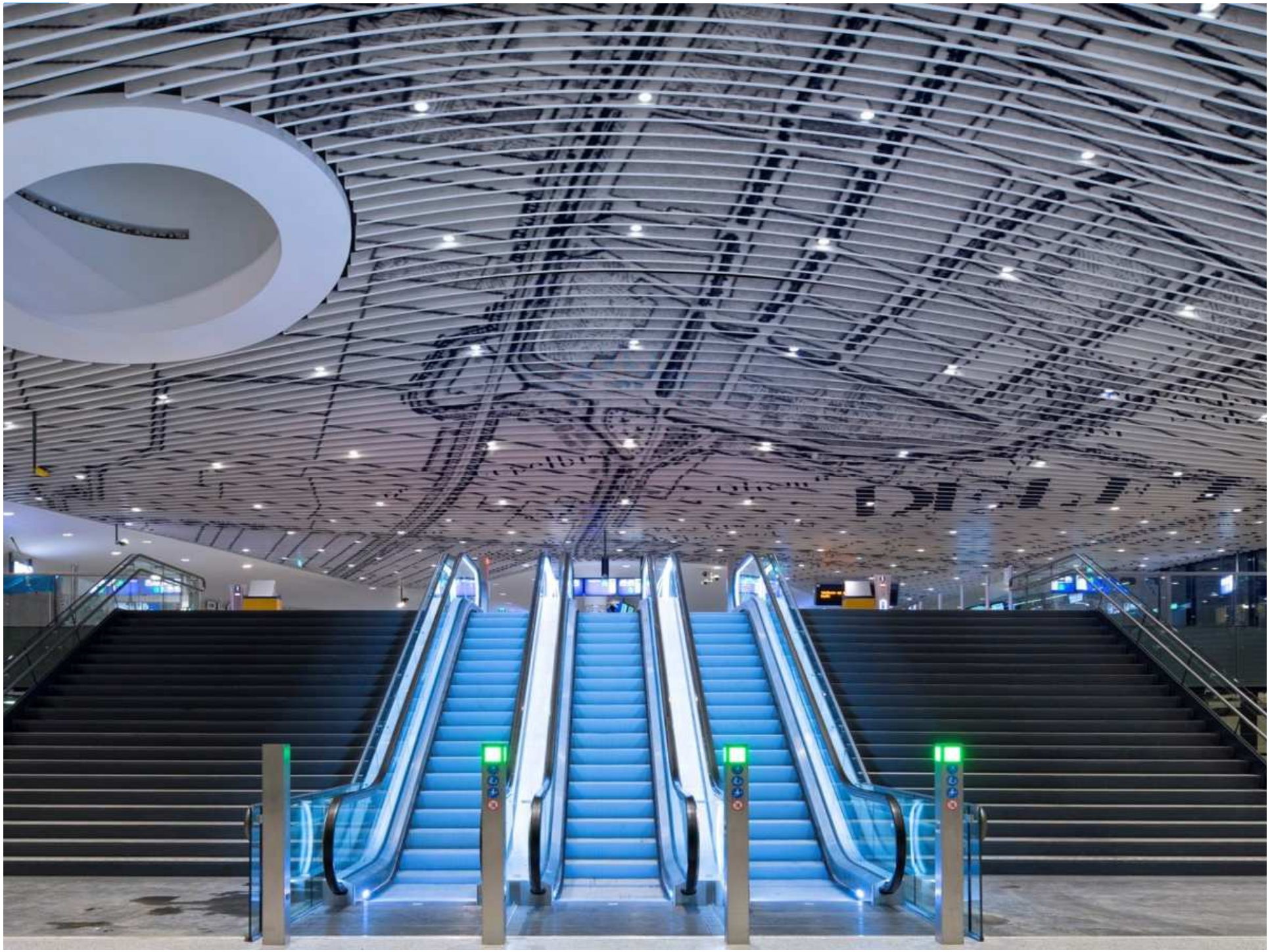
TU Delft

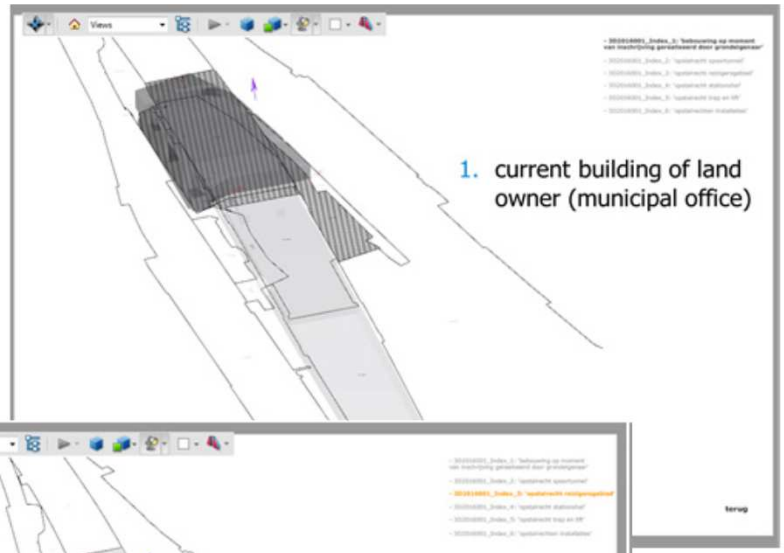
3D Cadastre in the Netherlands
Findings from the case studies

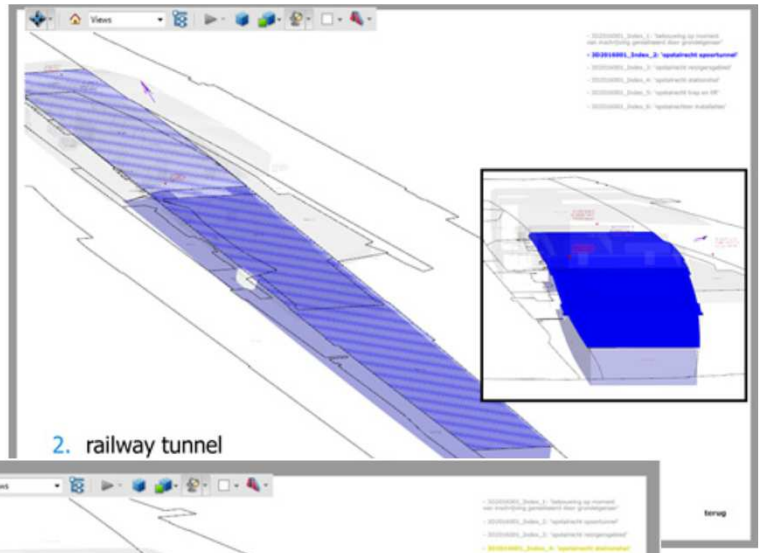
- Registration and publication of rights on 3D property is possible with the traditional 2D approach, but:
  1. Registration is not clear:
     Hard to understand if more than one object/part is involved
  2. Objects are divided over several parcels:
     Hard to maintain

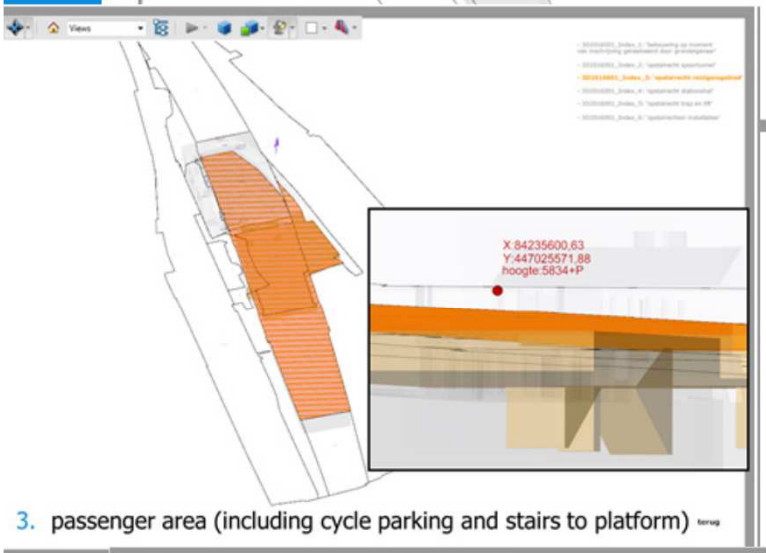
- 3D Cadastre in the Netherlands, phase 1:
  - Principle: refuse "fragmented parcel creation"
  - Require a registration of 3D representation that reflects the space to which right applies
  - First 3D registration: spoorzone Delft, march 2016 → 6 3D parcels

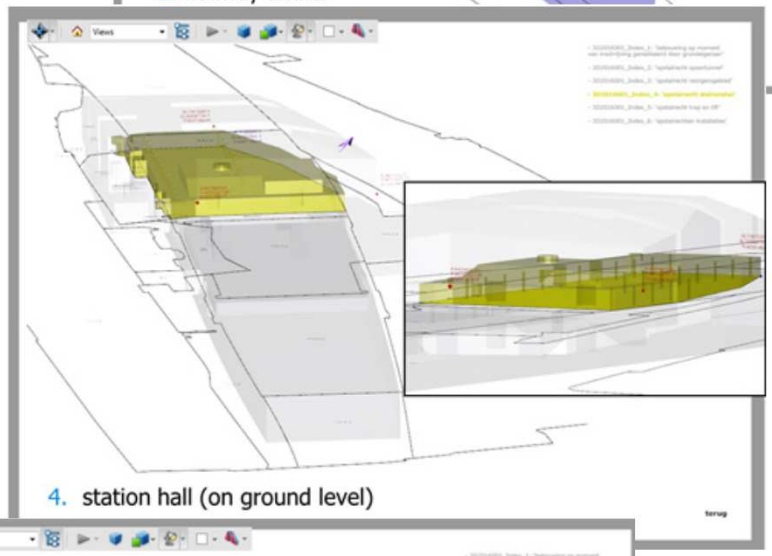
pdf https://www.kadaster.nl/-/wereldprimeur-inschrijving-met-rechten-in-3d

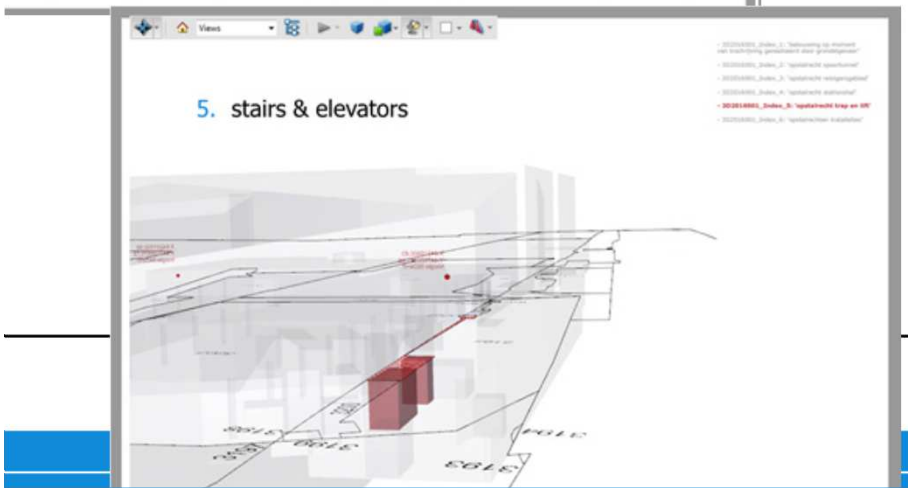


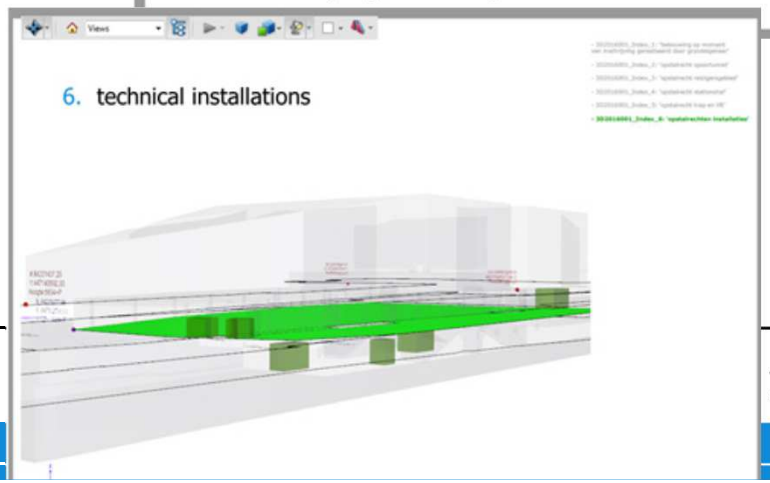

1. current building of land owner (municipal office)


2. railway tunnel


X:84235600,63
Y:447025571,88
hoogte:5834+P
3. passenger area (including cycle parking and stairs to platform)


4. station hall (on ground level)


5. stairs & elevators


6. technical installations

Further development

- 3D Cadastre is here to stay and #implementations increase
- Often renewal in combination with LADM conformance
- In 3D even more need to connect to other registrations via SDI: buildings, tunnels, cables/pipelines, terrain elevation, etc. (physical and legal 3D objects should be aligned)

- FIG 3D cadastres working group continues for term 2014-2018
- Most of the earlier topics remain
- However, emphasis on following topics:
  1. Experiences of operation 3D Cadastral systems (law, organization, technology)
  2. 3D Cadastre in mega-cities, often in Latin-America (Brazil, Mexico), Asia (China, Malaysia, Korea, Singapore) and Africa (Nigeria)
  3. 3D Cadastre usability studies, web-dissemination and 3D cartography

Intention often more than 3D Cadastre …full life cycle in 3D

Involved steps (order differs per country):

1. Develop and register zoning plans in 3D
2. Register (public law) restrictions in 3D
3. Design new spatial units/objects in 3D
4. Acquire appropriate land/space in 3D
5. Request and provide (after check) permits in 3D
6. Obtain and register financing (mortgage) for future objects in 3D
7. Survey and measure spatial units/objects (after construction) in 3D
8. Submit associated rights (RR)/parties and their spatial units in 3D
9. Validate and check submitted data (and register if accepted) in 3D
10. Store and analyze the spatial units in 3D
11. Disseminate, visualize and use the spatial units in 3D