Design and construction: outlines and planning

Wim Bastiaens

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  some reminders
- Design process
  some theory
- Construction of auxiliary facilities
  some pictures
- Construction of the disposal facility
  some facts and figures
- Demonstration projects
  some RD&D and movies
- *Some concluding remarks*

Concept: **Surface disposal**

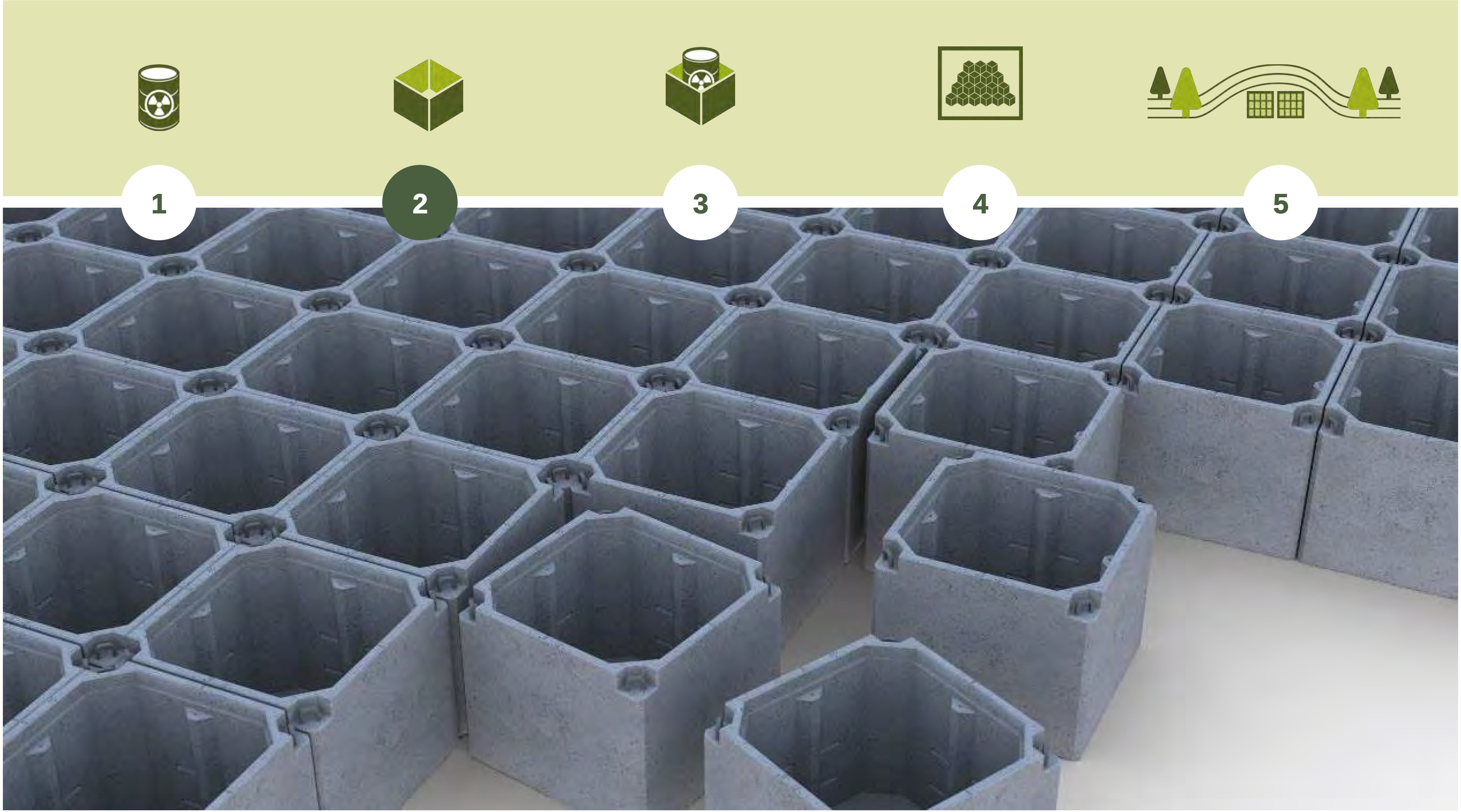
1

2

3

4

5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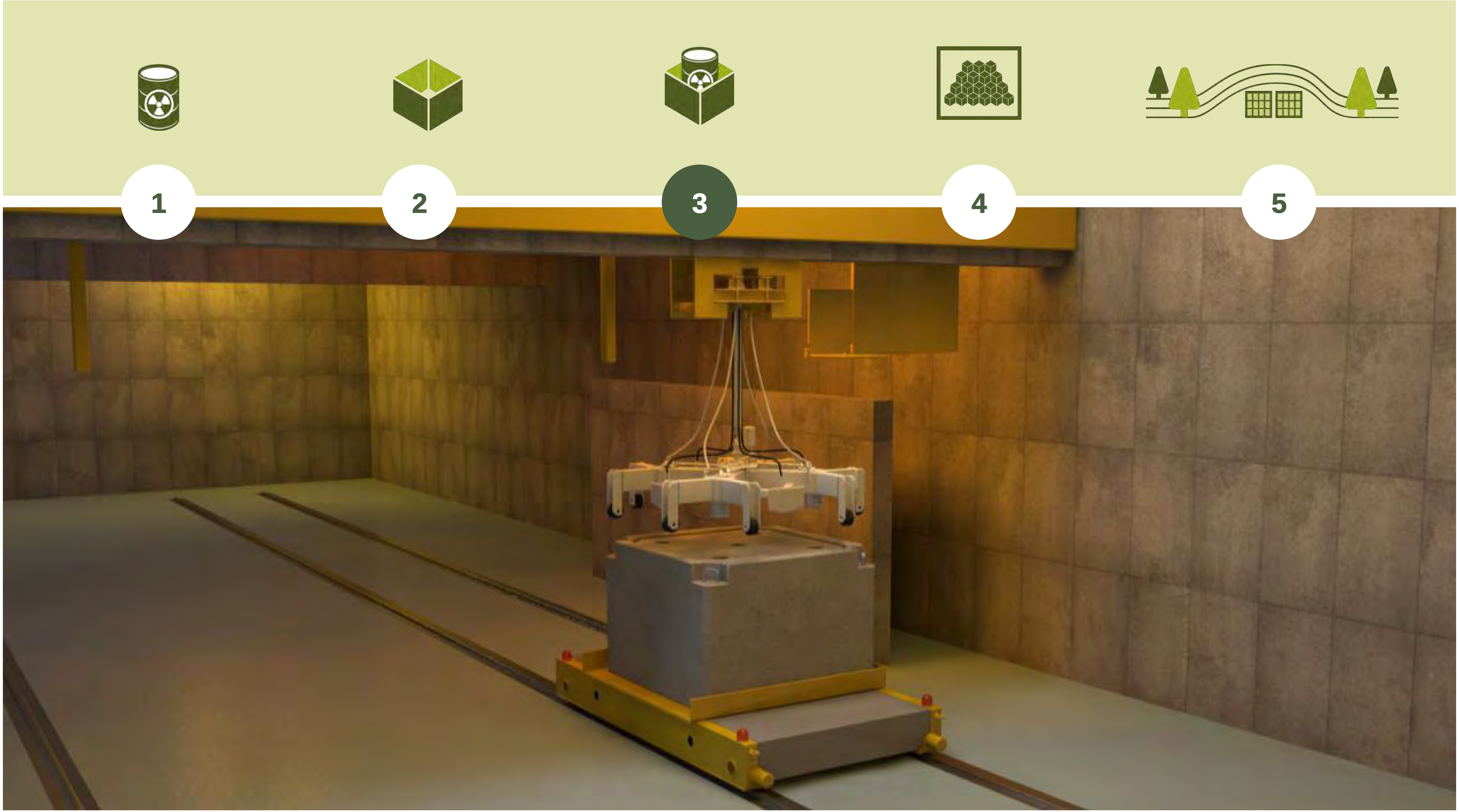
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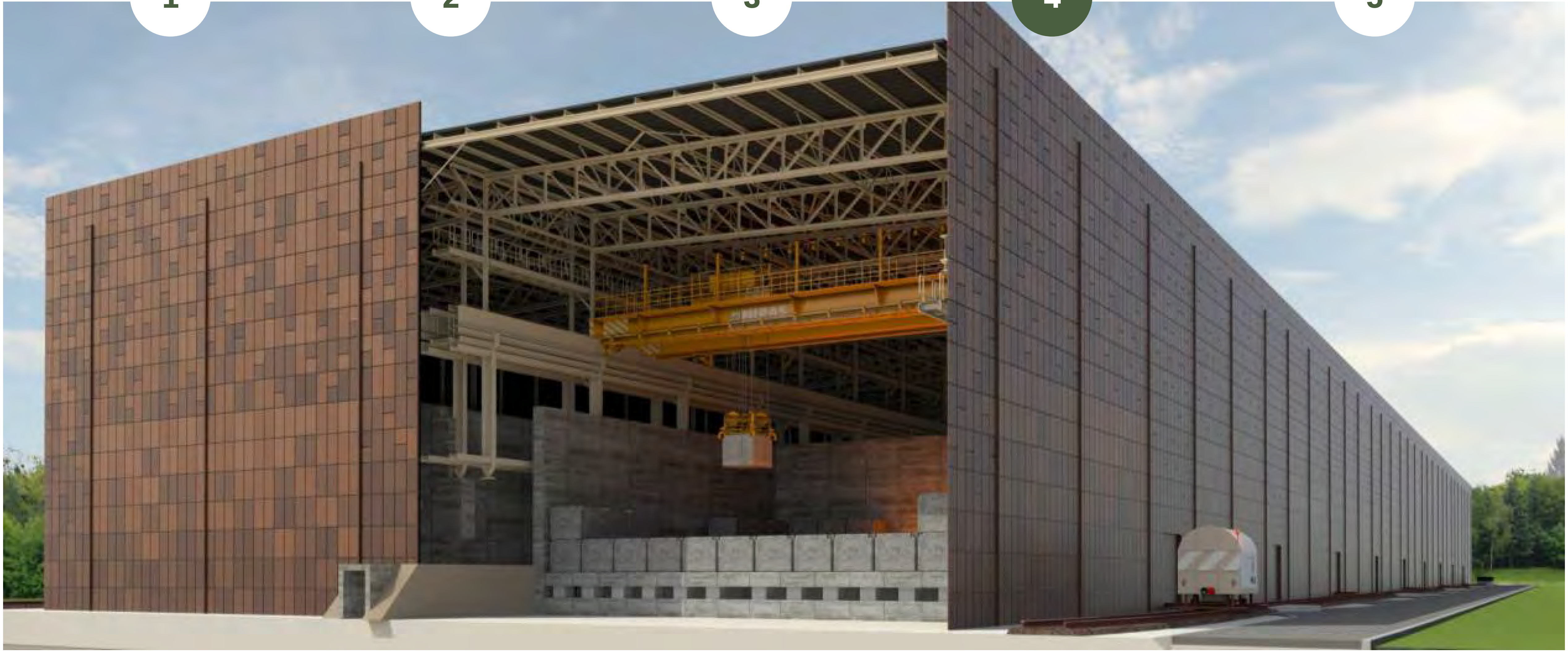


1
2
3
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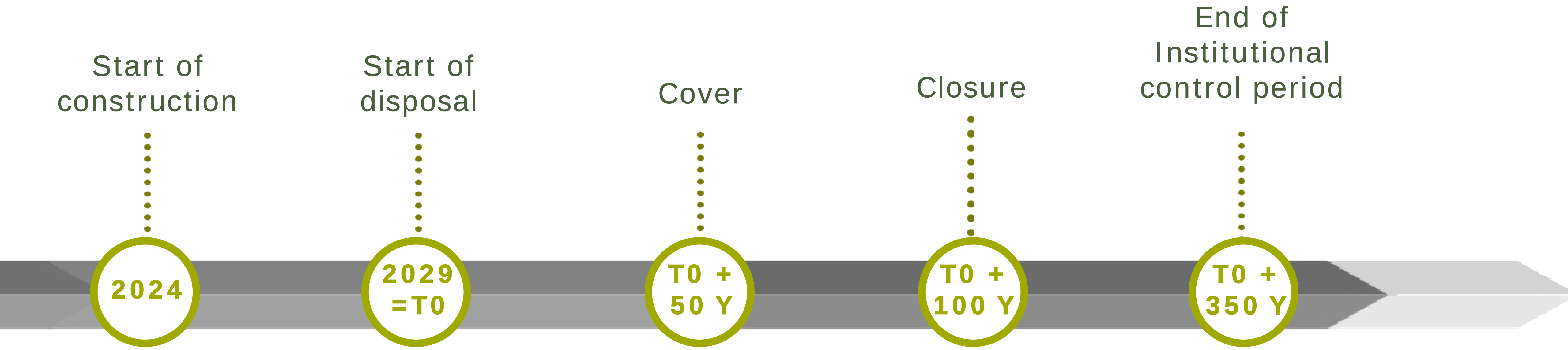
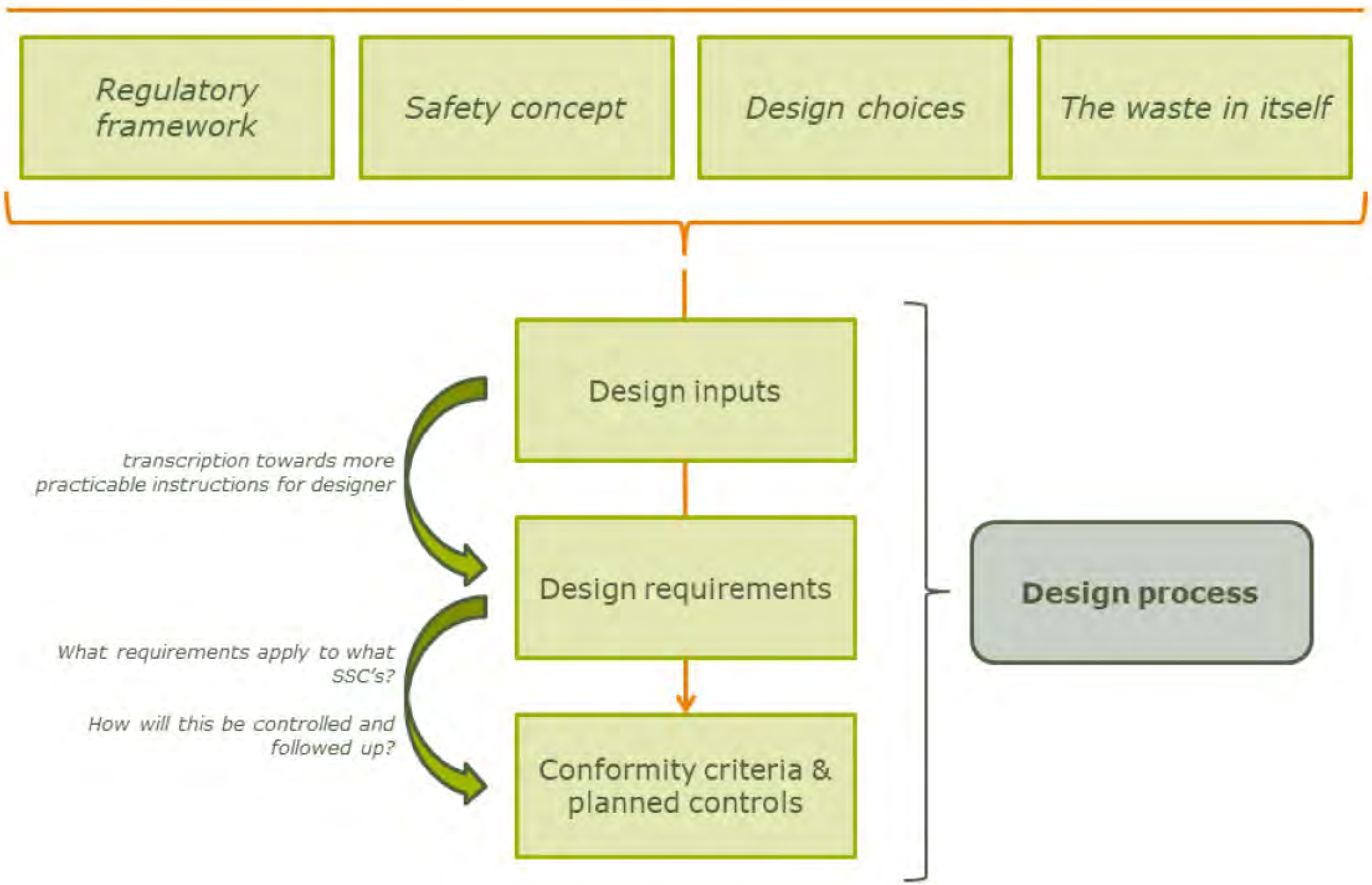
Overall planning

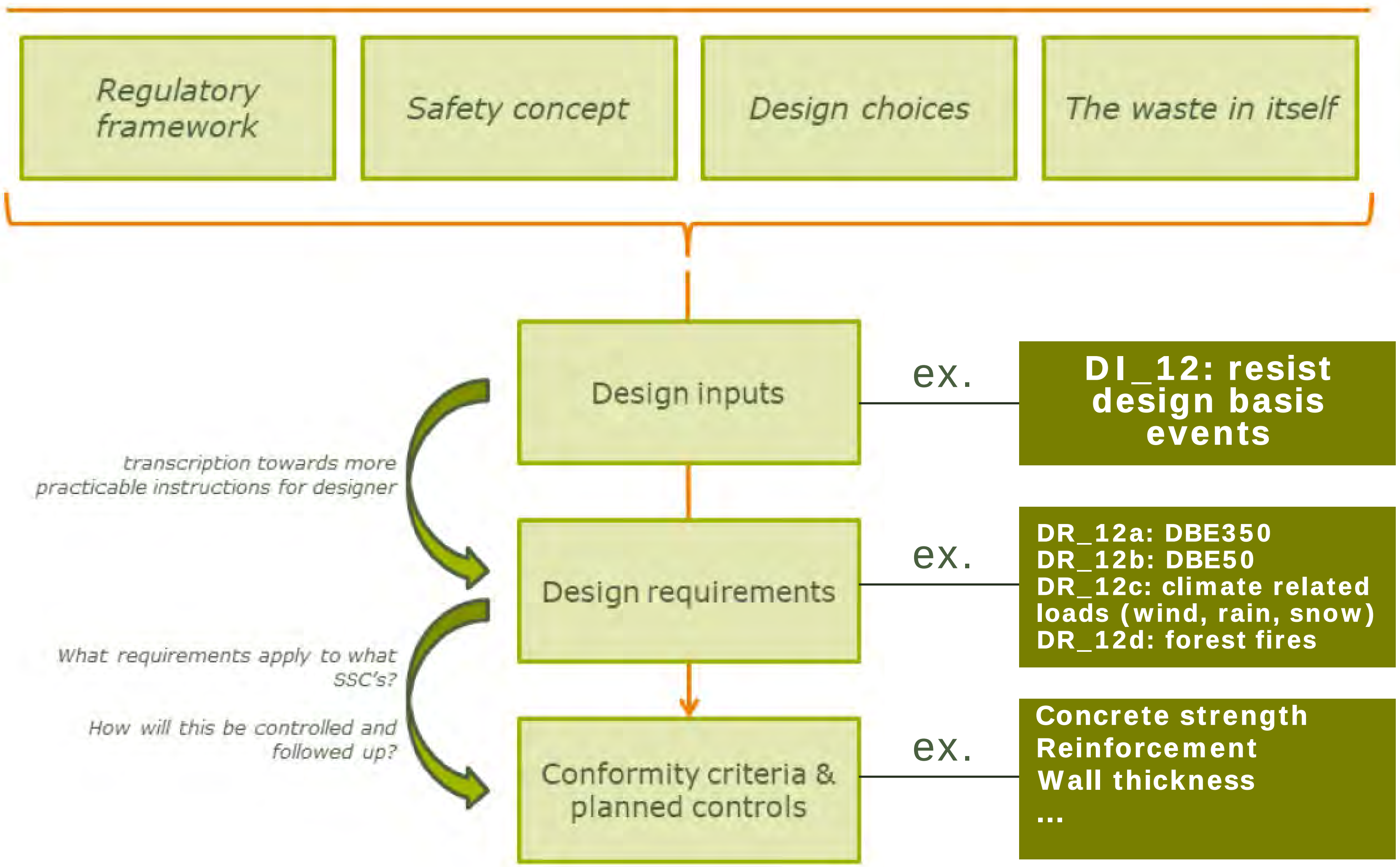


Design process

Design process (1/2)



Design process (2/2)



Construction of auxiliary facilities

Aerial view of the site


STORAGE BUILDING FOR LOW-LEVEL WASTE

CAISSON PRODUCTION FACILITY

Caisson production facility

Caisson production facility

MONOLITH PRODUCTION FACILITY (IPM)

IPM


MAES

IPM

Design of the monoliths

- Reinforced concrete boxes
  - Project specific concrete composition
  - Controlled hardening conditions
- Three types
- Wall thickness 12 cm
- Surface: 1,95 m x 1,95 m
- Stacked 5 or 6
  - 1,35 m (Type I) of 1,62 m (Type II/III)
- 780 à 936 per module
- Max 20 ton
- Max 20 mSv/h contact dose rate

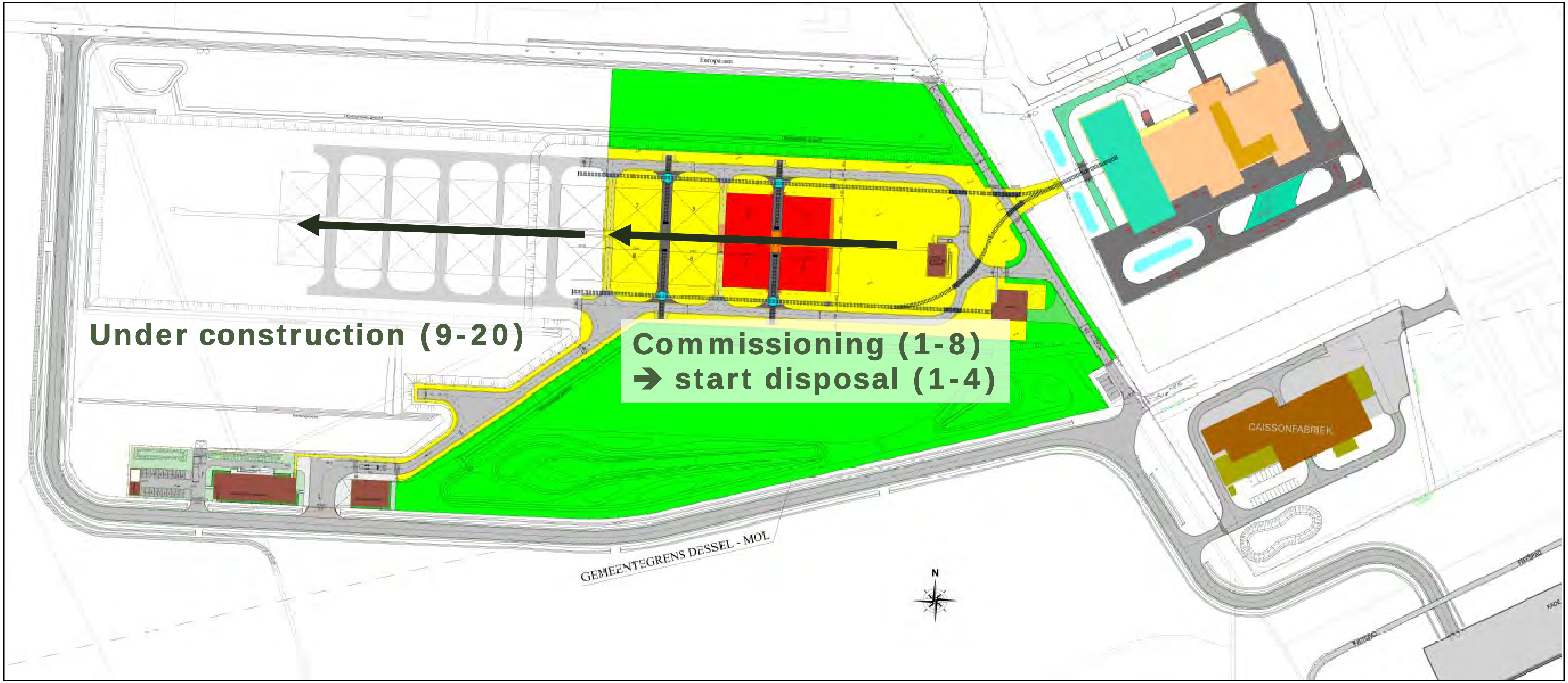
- Fibre reinforced alternative is being studied


DISPOSAL MODULES AND ACCESS CLUSTER

Construction of disposal facility

Site preparation

Construction sequence (20 modules)



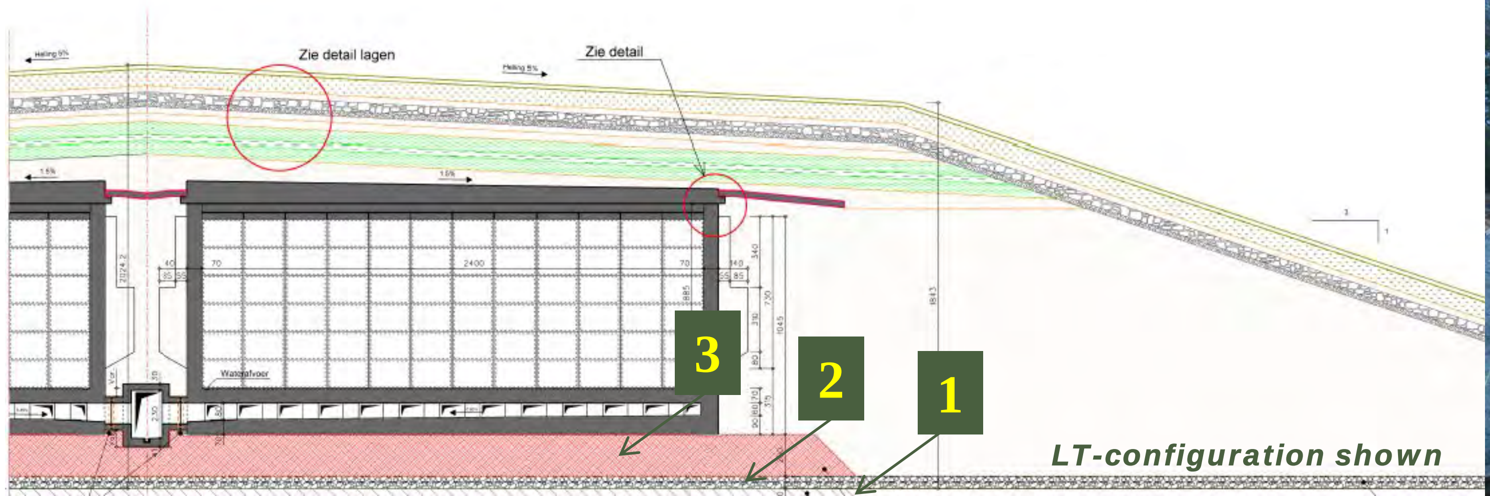
Construction sequence (20 modules)

Construction – Foundations

1. Soil mixing (non-swelling bentonite)

2. Drainage layer 0,6 m
    - Gravel and geotextiles

3. Sand-cement embankment 2,0 m
    - 5 w% cement

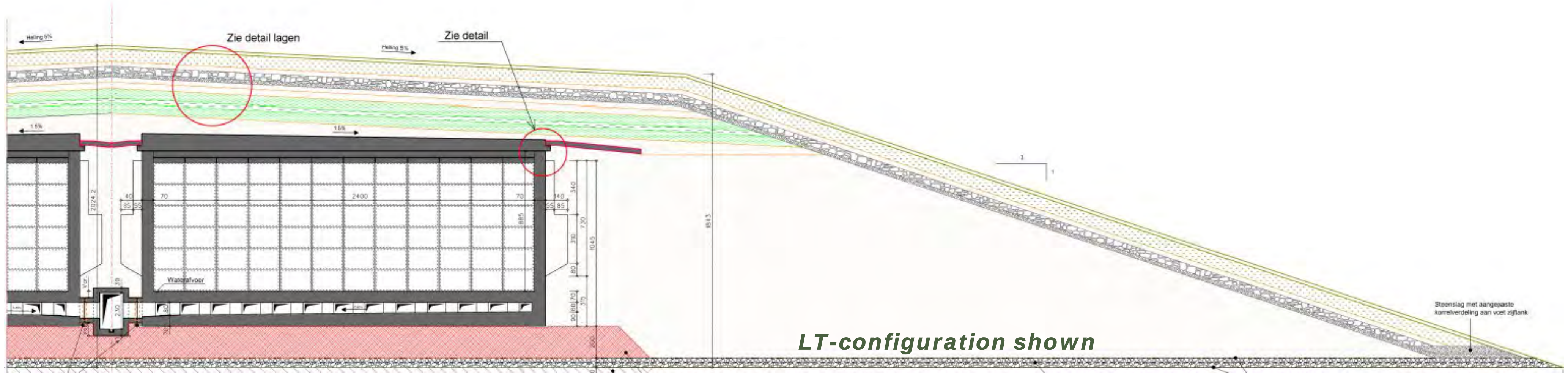


LT-configuration shown

Construction - modules

1. Walls	70-85 cm thickness - 25 x 27 x 11 m^3
2. Concrete pedestal	roof structure fixing
3. Foundation slab	70-90 cm thickness
4. Columns	75 x 75 cm (12 x 13)
5. Support slab	70 cm thickness
6. Structural topslab	40 cm thickness
7. (Backfilled) gaps between stacks	fine gravel, nominal width: 5 cm
8. (Backfilled) inspection room	60-80 cm height

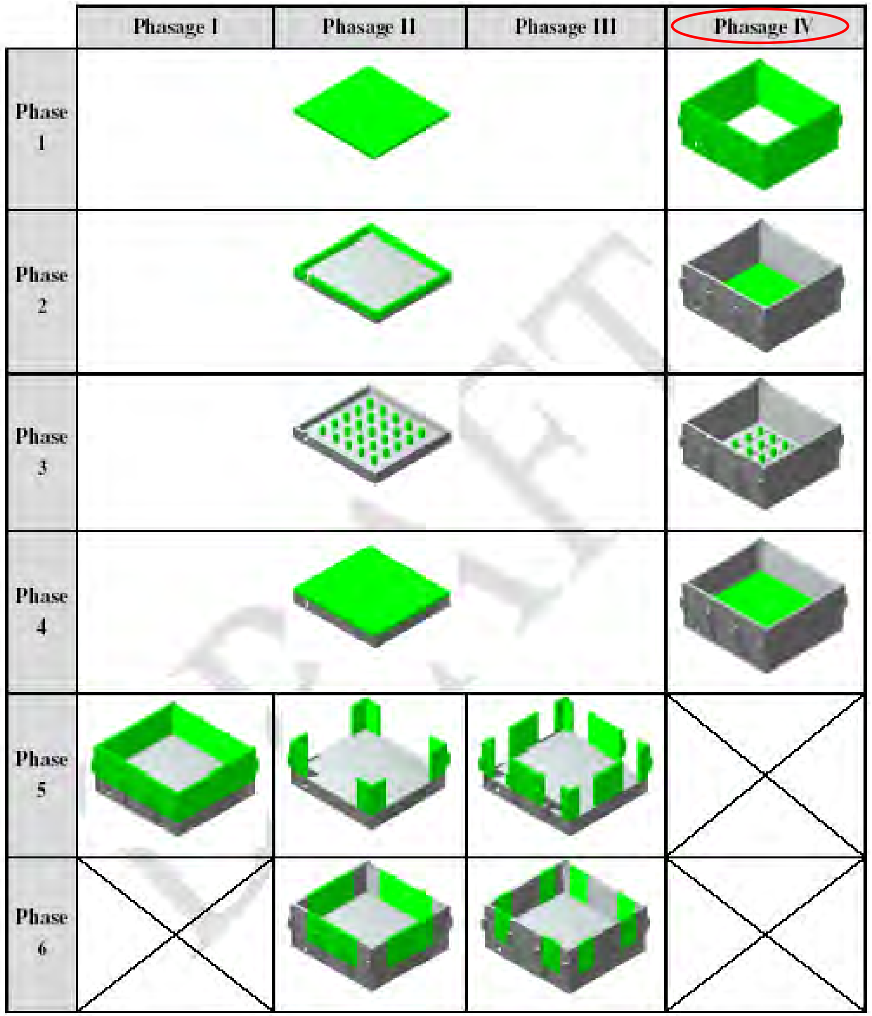
9. Drainage system (➔ Anti-bathtub system)



LT-configuration shown

Construction sequence of a module

- **Goals**
  - Limit (shrinkage related) cracks and construction joints
  - Technological feasibility
- Construction **sequence**
  - Construct walls first (1 phase – ~1.000 m³)
  - Semi-traversing formwork
  - Limit friction at the bottom of the walls & loosen internal formwork
  - Construct slabs & columns later using coupler systems to connect rebars
- On-site **concrete plant**
- Project specific **concrete mix** design with a focus on long-term durability
  - Attack mechanisms ?
  - ➔ limit risks by design
- Tested in **demonstration test** (see further)



Construction – steel roof structure

- Insulated, protects modules
  - from wind, rain, snow, temperature (variations)
- Each module is structurally independent
  - Cope with differential settlements

Construction – steel roof structure

- Insulated, protects modules
- Each module is structurally independent
- Fixed on concrete pedestals
- Runway beams are integrated

Construction – contractual matters (1/2)

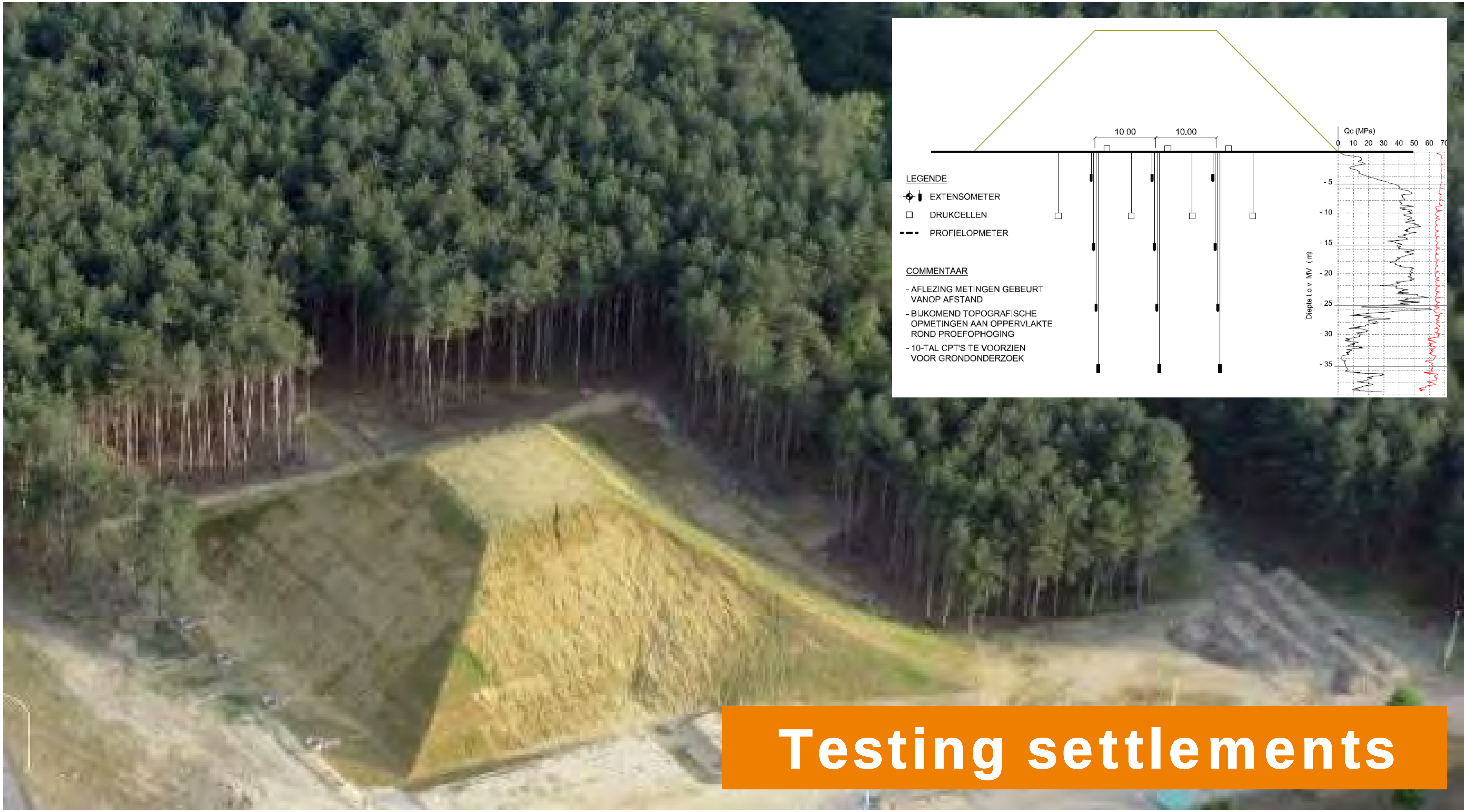
- Public procurement
  - Negotiation procedure
    - Selection phase
    - Initial offer
    - Negotiation
    - Best And Final Offer
    - Contract (Q4 2024)

  - Divided in 2 lots
    - Civil construction works
    - Electromechanical works

Construction – contractual matters (2/2)

- Also focus on
  - QA & QC
    - Starting from tender phase
    - Approval of intervention plans before works can start
    - Test panels (concrete & foundations)
    - Traceability
  - Environment
    - Transport
    - Treatment of concrete/water
    - Noise and dust control
  - Social measures

DEMONSTRATE feasibility: test materials and construcion techniques



Testing settlements


Testing & optimizing
construction techniques

Demonstration test

1. Foundation
2. Concrete structure
   - 1/1 scale
   - 1/8 of surface
3. Inspection gallery
4. Roof structure (test specific)

Demonstration test

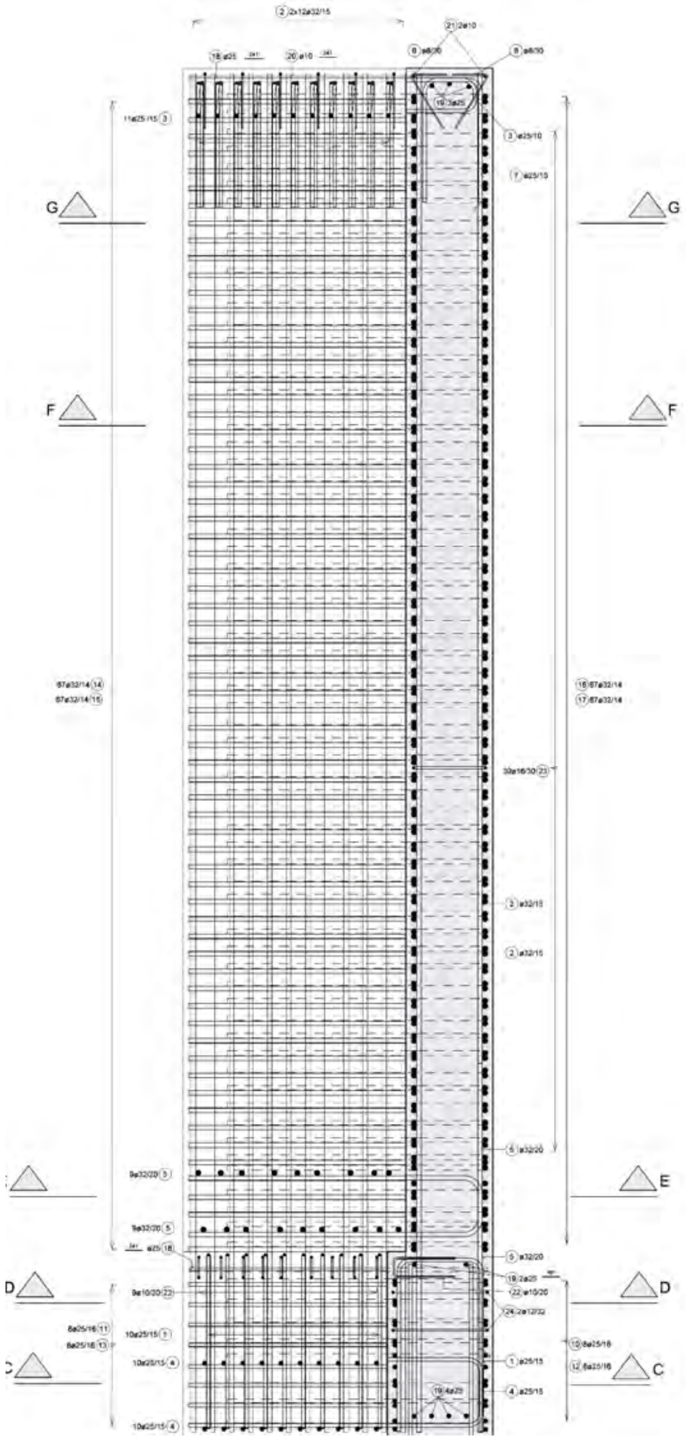

Demonstration test

Several test panels to

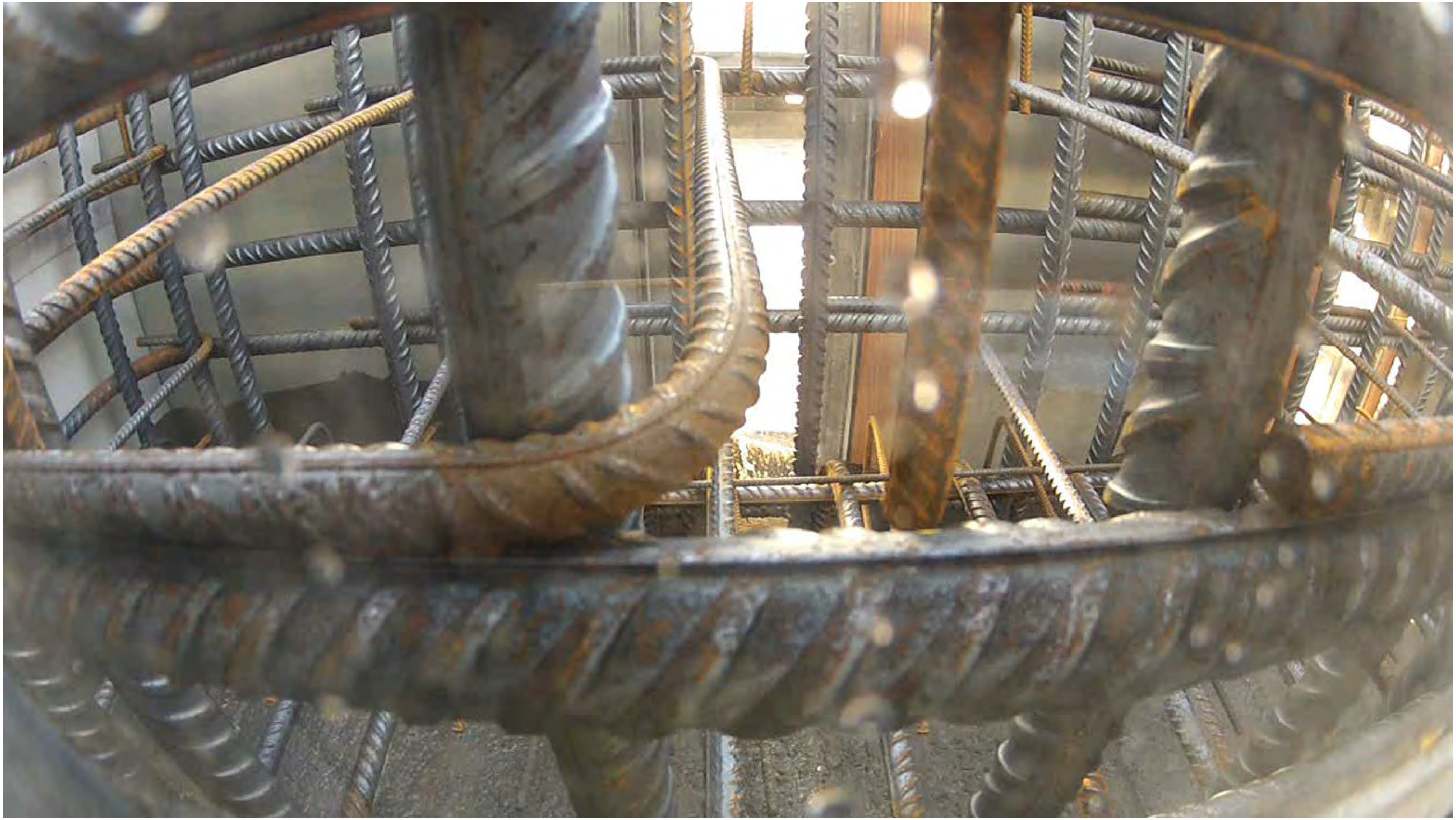
- optimise concrete **composition**
- optimise **rebar configuration**
- optimize concreting operations: use **concreting tube**
- optimize **concrete compaction** → use **SCC** for the walls
- Optimise carbonation resistance (**CPF-liner**)

Concreting tubes

- limit drop height of concrete
- get concrete all the way to the bottom of the formwork without ‘splashing’ onto the rebars
- 5 in each module wall
- remain inside the structure




90 x 360
90 x 360
105 x 360
105 x 360



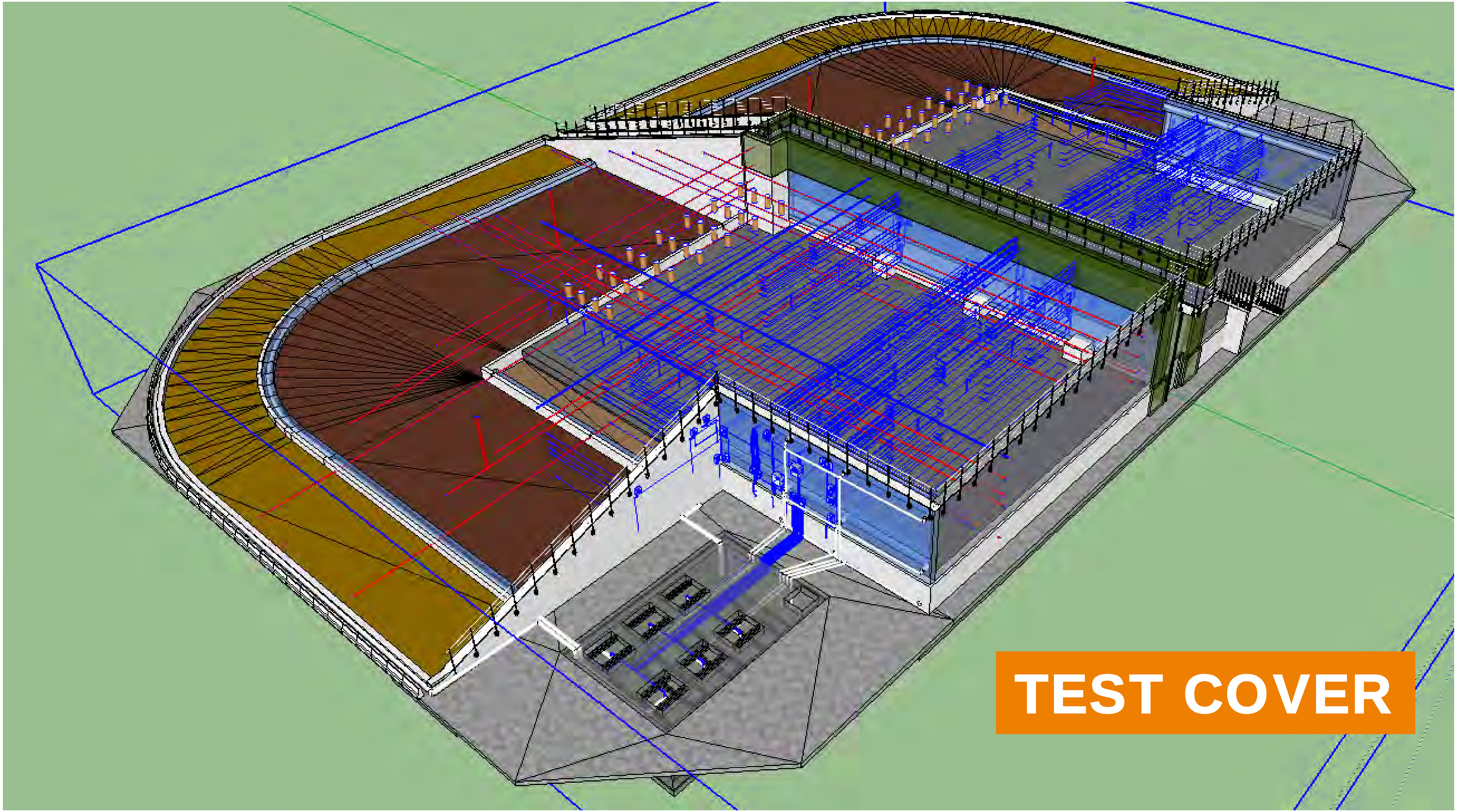
PROTOTYPES


Testing robustness

Testing process equipment (IPM)

- System of natural materials and foils
  - Biological layer
  - Bio-intrusion barrier
  - Infiltration barrier
  - Drainage layer
  - Fibre-reinforced concrete slab
- Protect underlying layers
  - Divert water
  - Avoid damage by roots and animals
  - Provide stable and favorable conditions for buried components

TEST COVER


TEST COVER

Some concluding remarks

- The design of the surface disposal facility was driven by **LT safety**
- **Feasibility** was also addressed, a.o. by large-scale testing
- **Auxiliary facilities** are constructed
- **Public procurement** procedure is ongoing
- LT safety is – to a large extent - realised during construction ➔ **QA / QC**

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