Technical Realization of a Closure Concept for a Chamber-system in the Underground Richard Repository in the Czech Republic

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The Project Background

- **Phare project CZ 632.02.04 “Realization of closure of a chamber in the Richard repository as input for establishing a safety case”**
- **a follow up implementation phase of**
- **Phare project, CZ 01.14.03 “Solution for closure of a chamber in the Richard repository”.**

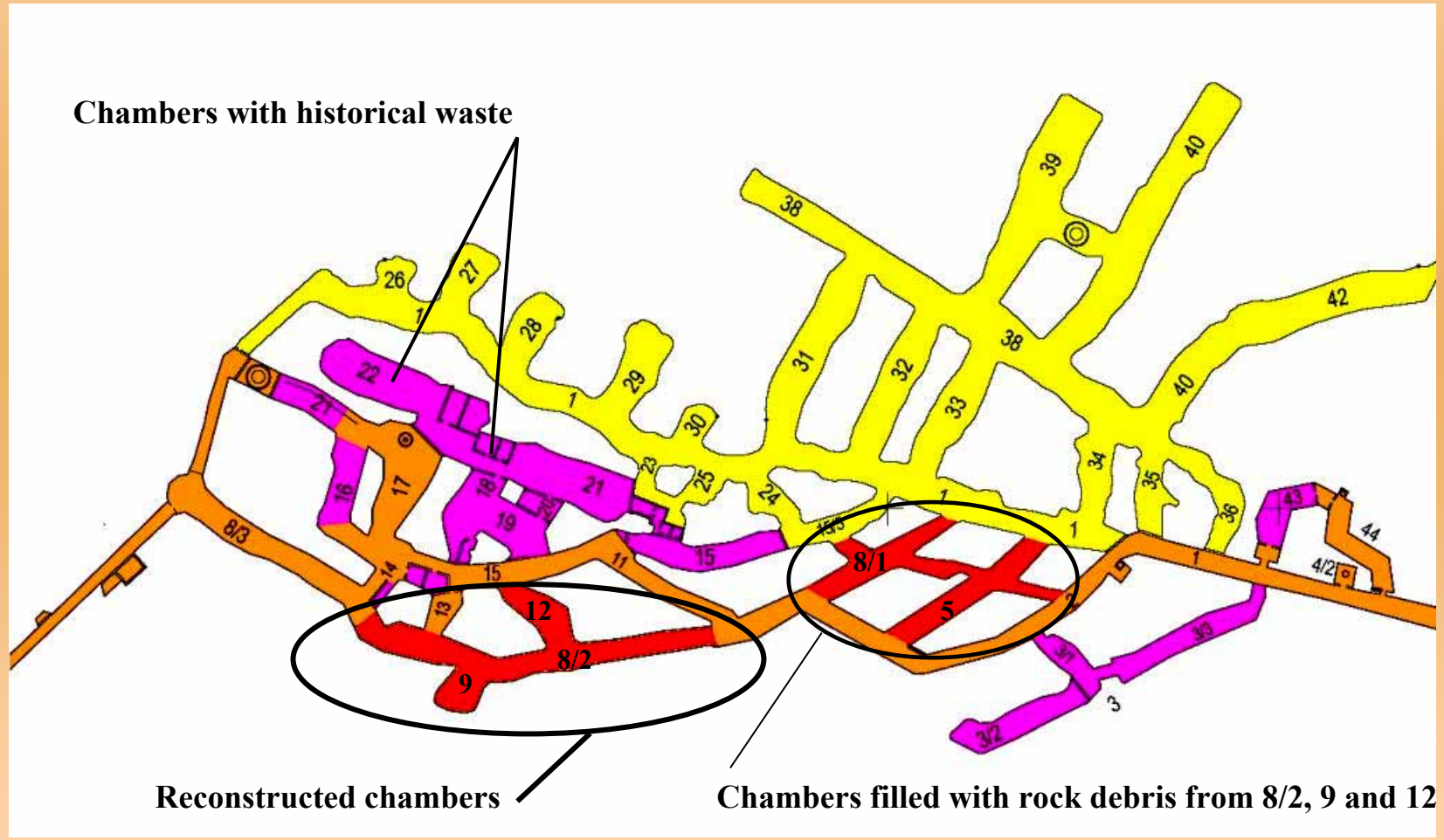
The Project Objective

To eliminate burden from the past practices of the first phase of the Richard repository operation (1965 – 1980) and to improve its overall long term safety.

This objective will be achieved by:

- **Proposal of a safe disposal concept**
- **Reconstruction of selected disposal chambers**
- **Inspection, conditioning, relocation and backfilling of historical waste in reconstructed chambers**

Layout of the Richard Repository



Basic project information

Contractor:

EREBOS – podpovrchová výstavba spol. s r.o.

Subcontractors:

TUBES spol. s r.o., Praha, (design)

AGE, a.s. Praha (technical supervision)

DBE TECHNOLOGY, GmbH, (consultancy)

RAWRA contractor:

ALLDECO.CZ a.s. (waste treatment and relocation)

Budget (EUR)

Phare contract

- construction and backfilling	1 000 000

RAWRA co-financing

- relocation, conditioning waste	264 000
- reconstruction of Richard cabling	151 000
- reconstruction of drainage system	38 000

Project Time Schedule

- **Project financing approval** ***December 2002***
- **Tender dossier completion** ***June 2005***
- **Contractor selection** ***July – Sept. 2005***
- **Project start up** ***December 2005***
- **Construction start up** ***February 2006***
- **Waste relocation start up** ***July 2006***
- **Project completion** ***June 2007***

Licensing

Regulatory authorities:

- State Office for Nuclear Safety
- Regional Mining Office

Stakeholders:

- Municipality of town Litoměřice
- Watershed Authority

Project Realization Phases

1. Detailed realization design and technologic procedures development
2. Preparatory work and clean up of the chambers
3. Construction of the hydraulic cage and concrete structures
4. Relocation of “historical waste” into new chamber segments
5. Backfilling of the segments.

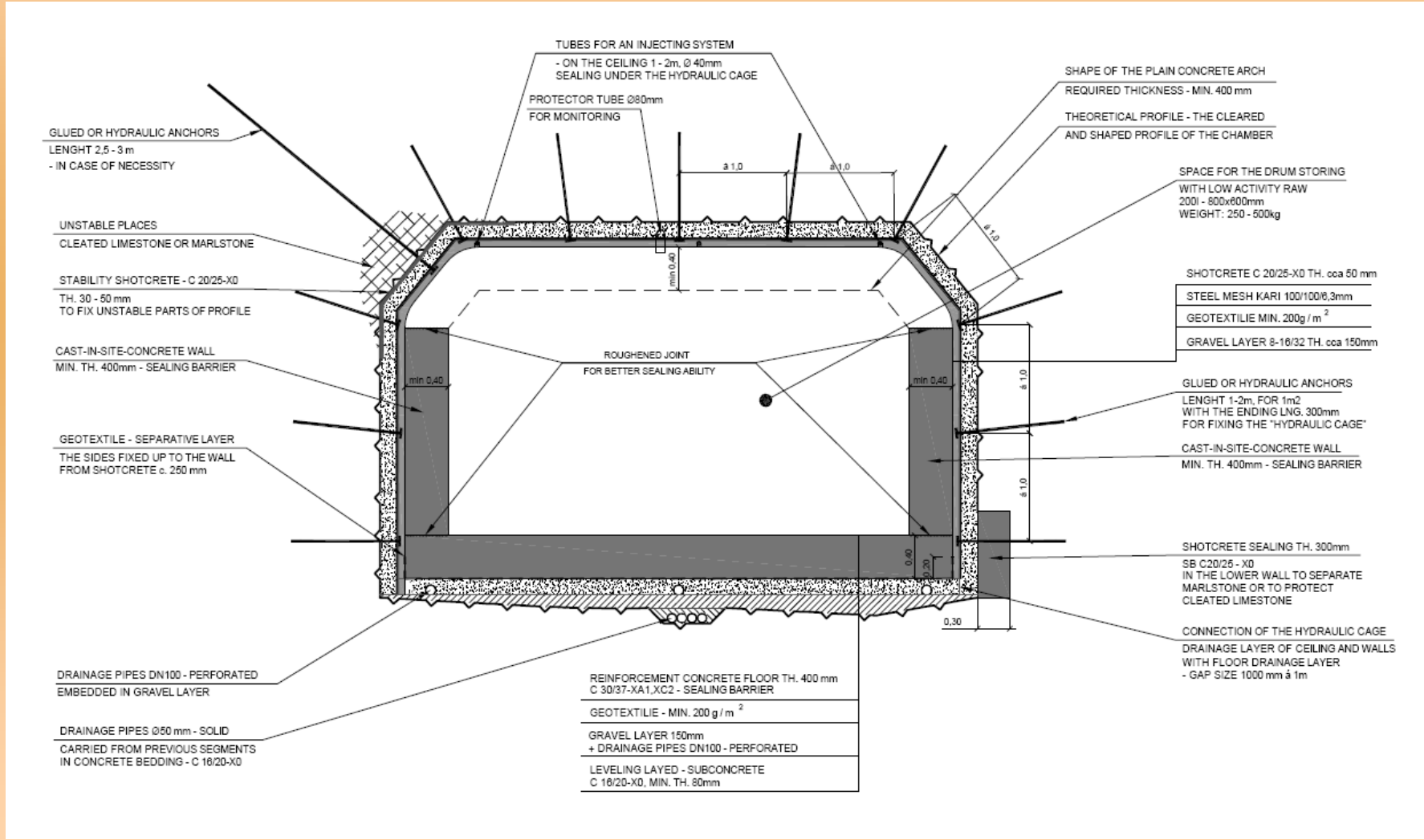
Design Concept

- concept of so called “hydraulic cage”
- proposed by DBE TECHOLOGY GmbH
- Phare project CZ 01.14.03 “Solution for closure of a chamber in the Richard repository”

Realization Design Changes

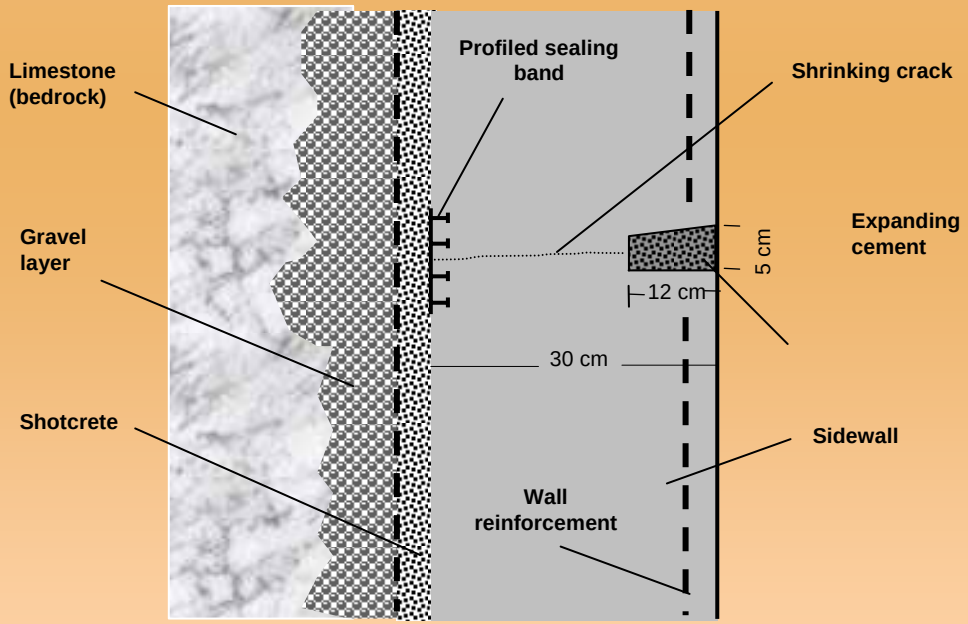
Technical solution according to 2005 closure plan (DBE Technology)	*Technical implementation agreed by RAWRA, EREBOS and TUBES*
Fixing of the wire gauze to steel KARI – mesh to separate gravel layer from shotcrete	**Wire gauze replaced by geotextile**
Construction of concrete pillars for controlled drum stacking; **Backfilling of 40 cm space between walls and RW with backfilling concrete during closure of chamber segment**	**Construction of concrete side walls prior to drum stacking as advanced part of the later backfilling,** **Using shrinking joints (6-8 m apart),** **50 mm cover to reinforcement of the walls (KARI-mesh 6,3/100/6,3/100)**
Application of 10 cm layer of shotcrete (SB C 20/25) to separate gravel layer with wire gauze from inner chamber	**Application of 5 cm layer of shotcrete (SB C 20/25)**
Roadway construction as 40 cm reinforced concrete layer	**Realization without reinforcement** **Using shrinking joints (6-8 m apart)**
Chronological separation between disposal of compacted 50-l drums waste and disposal of 200-l drums	**Concurrent disposal of different kind of waste**
Backfilling of voids between compacted 50 l drums within containers before disposal or alternatively in compartments within chamber segment **Backfilling of remaining voids during closure of whole chamber segment**	**Backfilling of voids between different waste packages (mainly 50-l drums) stepwise in 3 – 4 m wide modules across the chamber,** **Backfilling of remaining voids between waste packages and free space (40 cm) in upper layer towards ceiling in whole chamber segment**

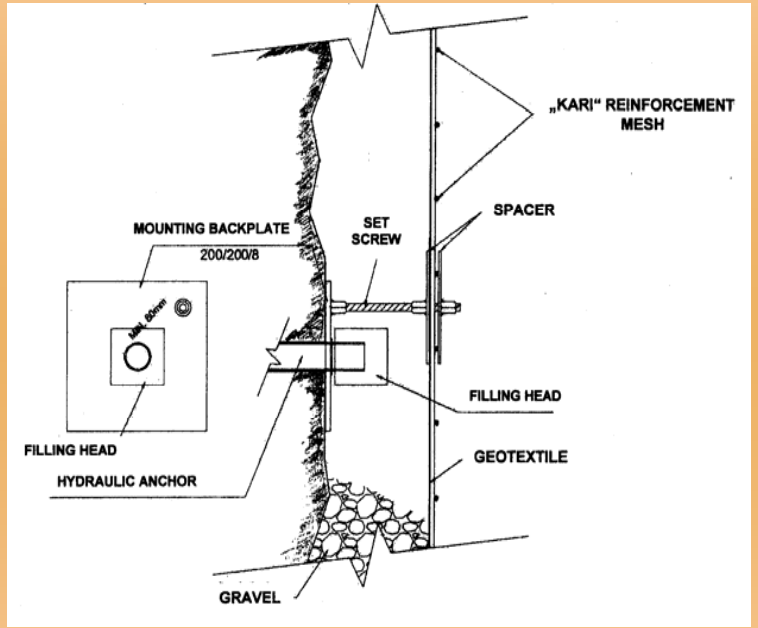
Chamber cross - section



Realization Design

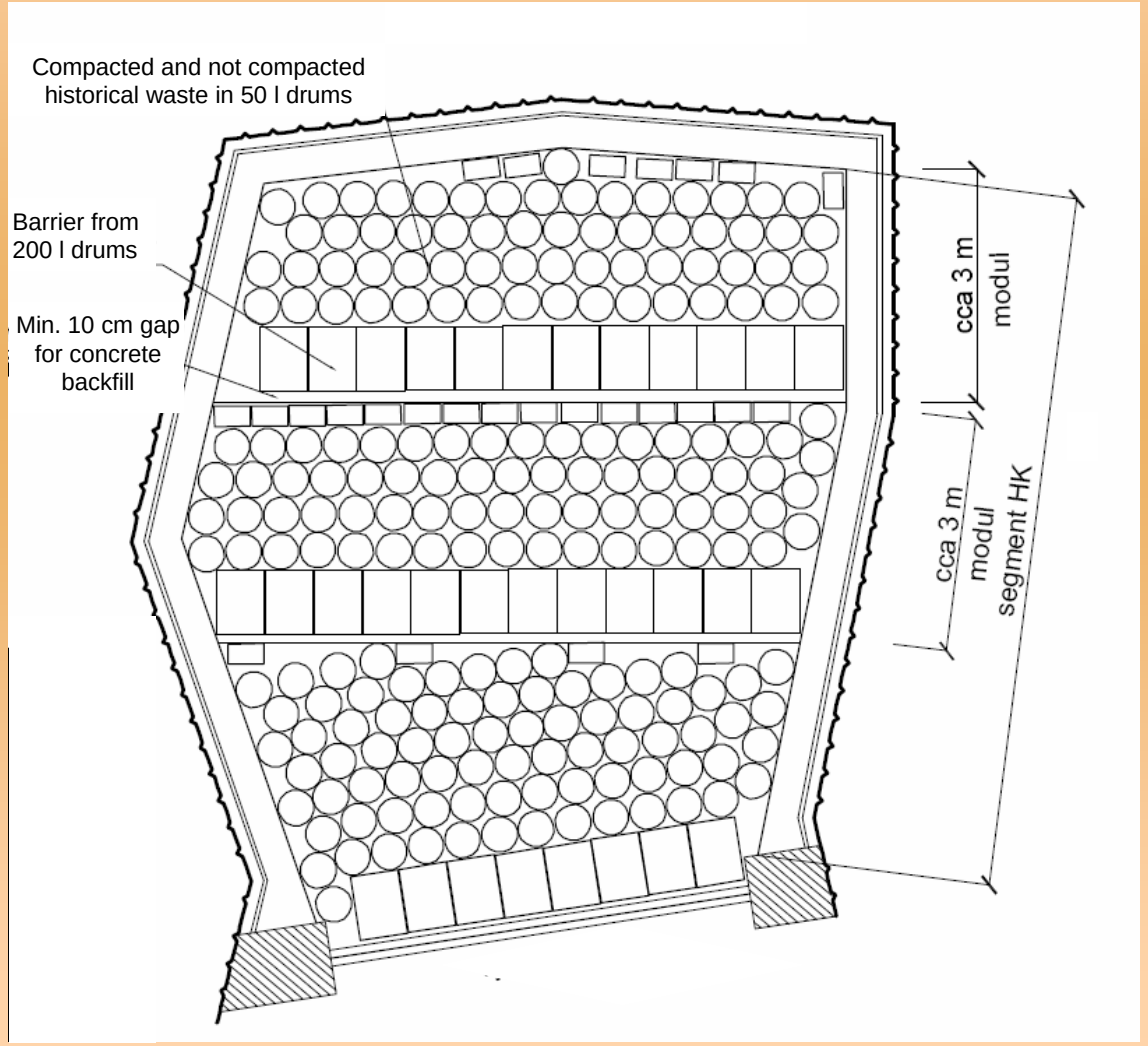
Controlled shrinking joint



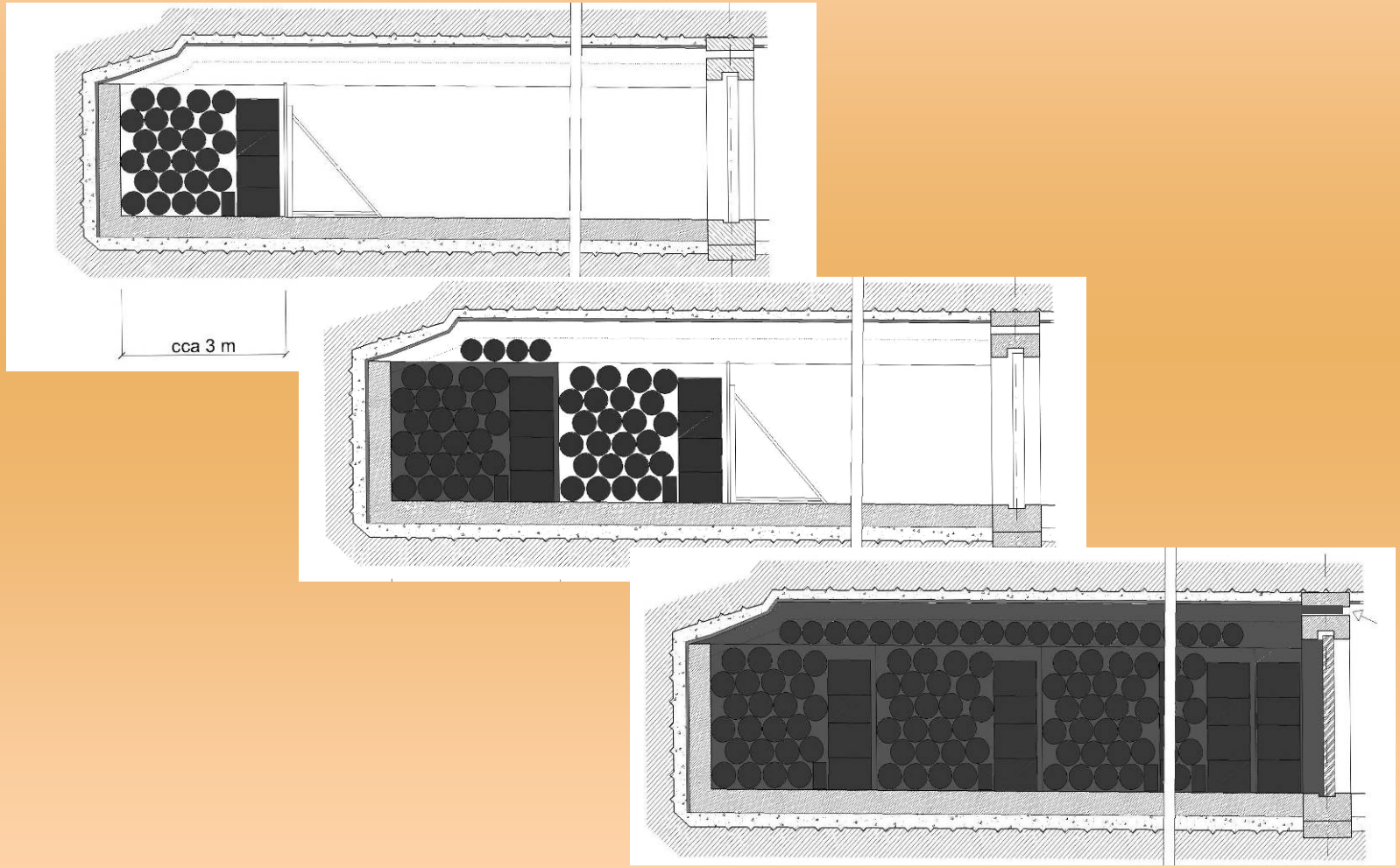


Hydraulic cage mounting

Emplacement of waste in the chamber



Sequencing of waste packages emplacement and backfilling



Access road

Repository Entrance

Main Access Tunnel

Entrance into the chamber 8/2

Chambers clean up

Chambers clean up

Hydraulic Cage construction

Hydraulic Cage construction

Hydraulic Cage construction

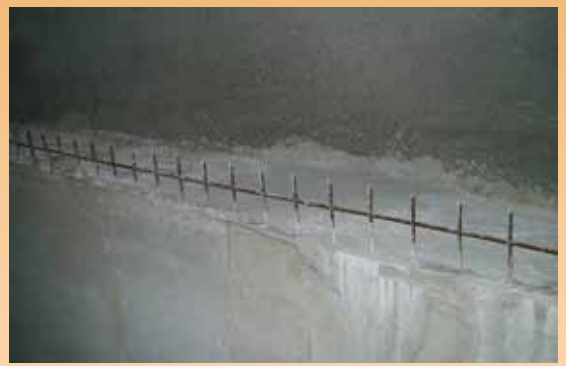
Supporting Frames Construction

Supporting Frames Construction

Road construction

Walls Construction

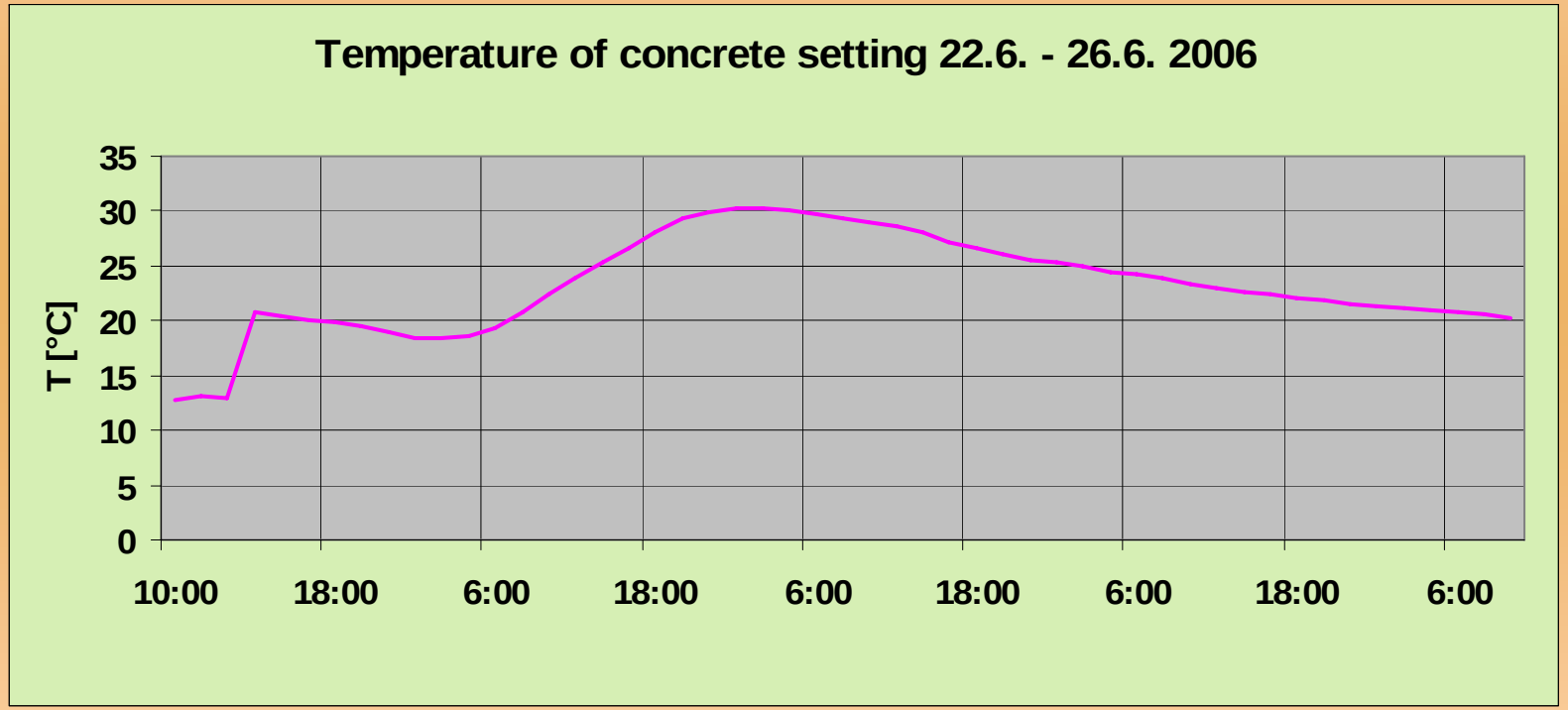
Walls Construction



Parameters of concrete used for the walls and floor construction

Parameter	Required	Achieved
Compressive strength	30 MPa	35 – 50 MPa
Content of cement	300 Kg/ m^3	400 Kg/ m^3
Water penetration depth	75 mm	16 mm
Temperature during concrete setting	Max. 60°C	Max. 32°C

Temperature of concrete setting



Waste management

In the chamber 17 is created a separated working place for inspection and compaction of waste packages

Waste package inspection:

- **gamma dose rate and neutron flux**
- **surface contamination**
- **weight**
- **each 50 l drum content is visually controlled by opening a lid**

Depending on results of waste content checking, the shift engineer takes a decision on compaction or other treatment of the waste package.

Waste management workplace

Waste management workplace

Historical waste in the chamber 22


Entrance into the chamber 22

Waste inspection

Treated Waste

Waste emplaced in the chamber 9

Thank you for attention