Research Centre Rez

Hot Cells JHR – CZ Workshop

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http://jhr.cvrez.cz/en/

Jules Horowitz Reactor

- International project to develop and build a new high-power nuclear reactor for material and nuclear fuel research (MTR)
- Power output of approximately 100 MW
- Planned service lifespan of around 50 years
- Expected launch of operation 2021

TechnicAtome

DE LA RECHERCHE À L'INDUSTRIE

Réacteur | Jules | Horowitz | Reactor

Hot cells – what is it for?

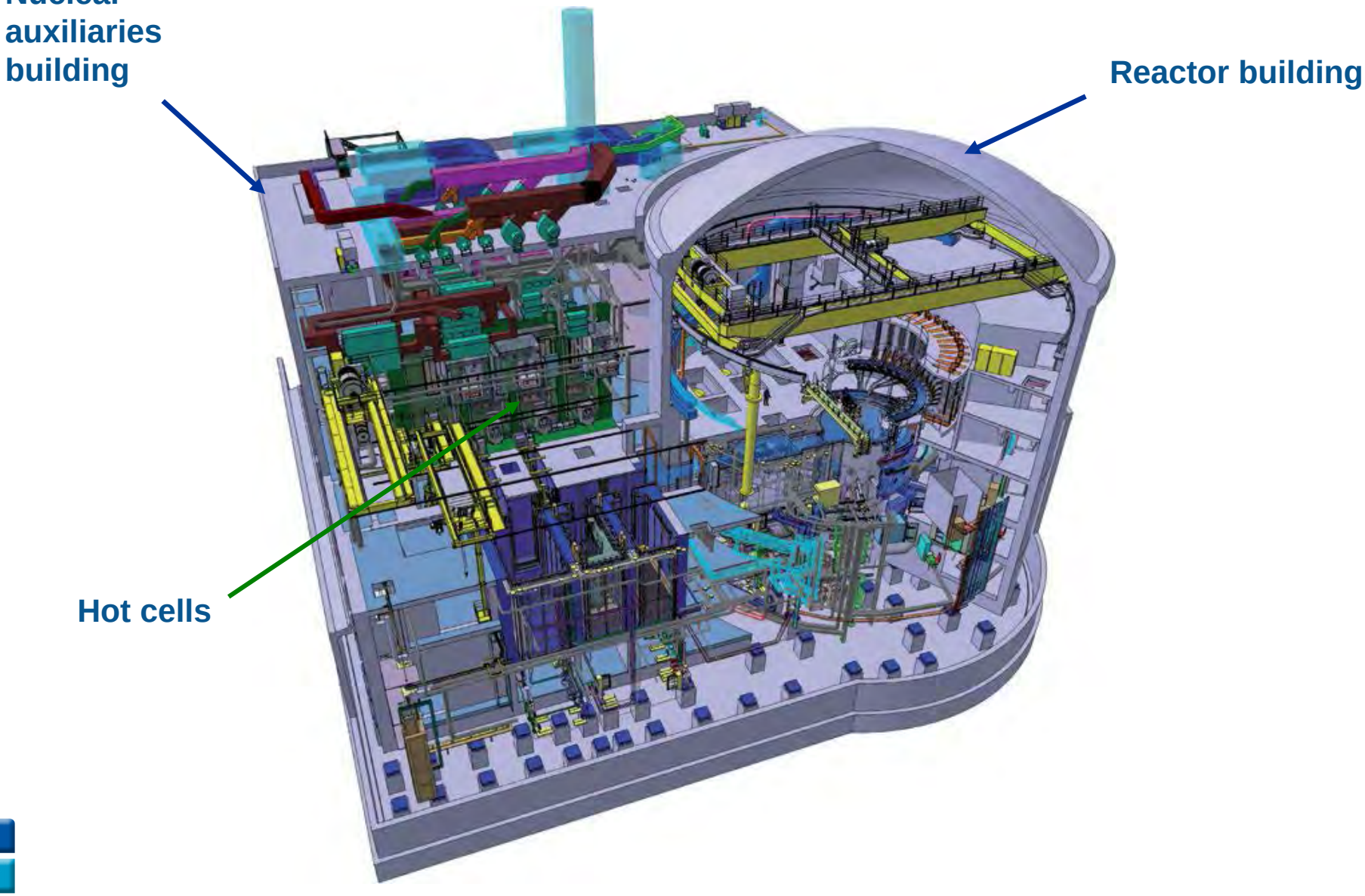
- **Support of experimental process before and after sample irradiation**
  - preparation of fuel and samples to be irradiated
  - after irradiation, the probes are disassembled inside the cells
  - the samples are taken out, sorted, evaluated, and put inside shielding containers connected to the cells → containers are used for shipment of the samples for further processing, measurement or other use

- **Support of nuclear unit operation**
  - used for repairing damaged parts of the reactor equipment, irradiation probes and cell equipment

Hot cells – technical facts

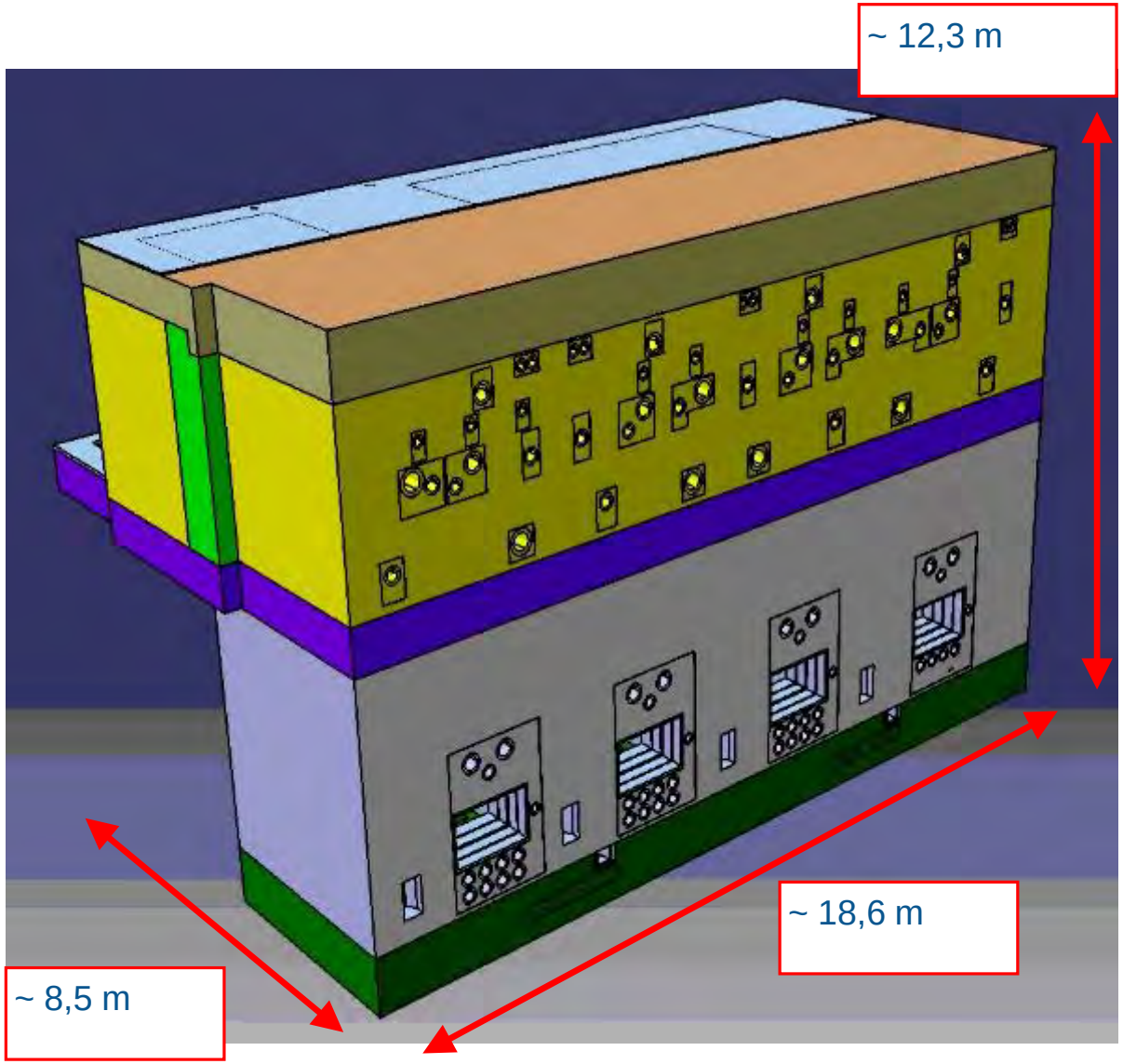
- 7 hot cells (4 large + 3 small), 2 hatches
- Cells inner dimensions (H x D x W):
  - *Large: 10 m x 2.5 m x 3–4 m*
  - *Small: 4 m x 2.7 m x 2.3–4 m*
- Shielding walls: 120 cm of heavy concrete
- Containment barrier: Stainless steel liner
- All big cells connected to pools
- Load capacity of cranes: 2.5 T

Hot cells – location within JHR



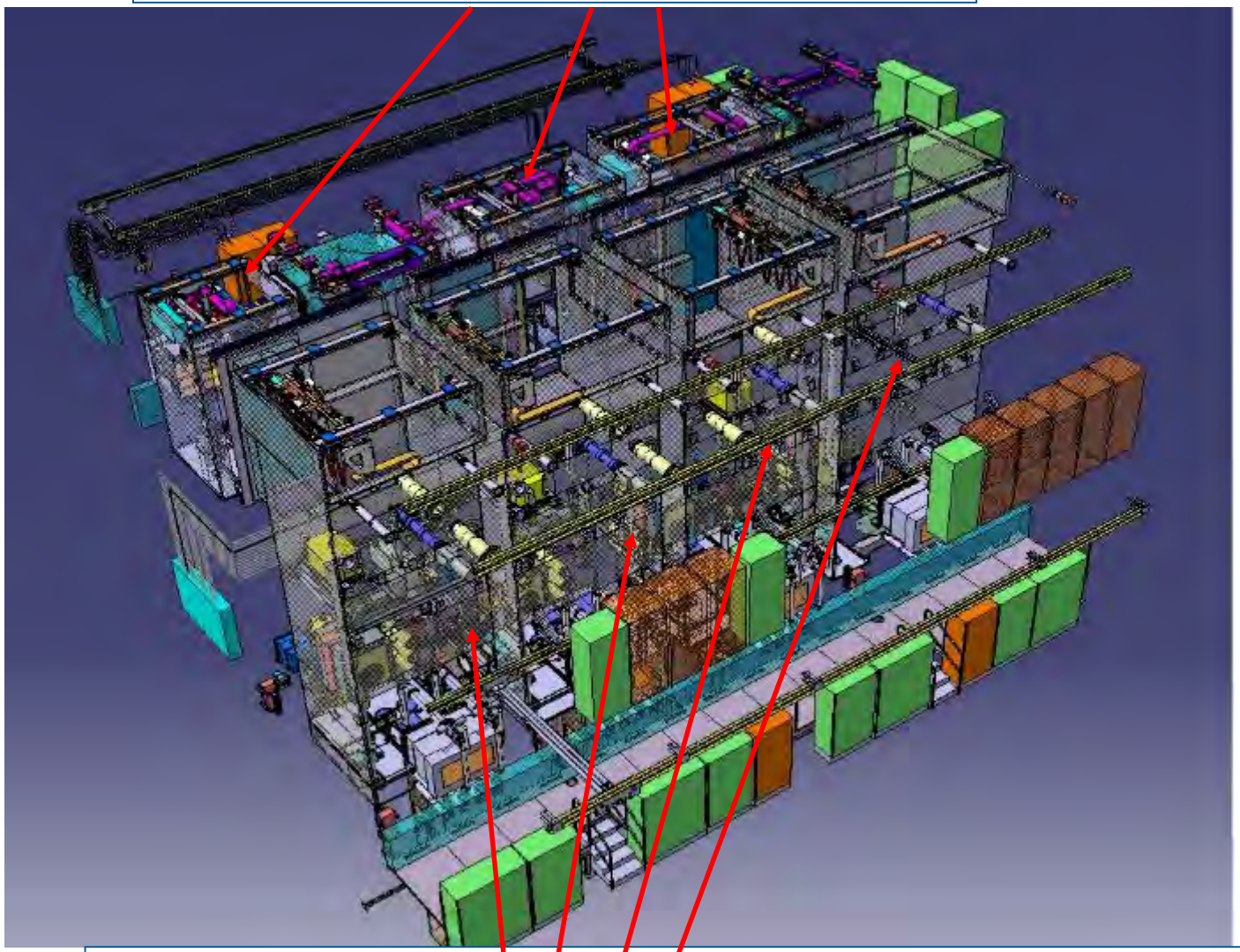
Hot cells – technical facts

- **View of hot cells complex including concrete walls**



Hot cells – 3D view of equipement

3 small cells for non destructive tests and
maintenance operations on large cells equipment



4 big cells for operations on contaminated devices,
material and fuel operations, material and waste conditioning,
expedition of spent fuel, radioisotopes and waste

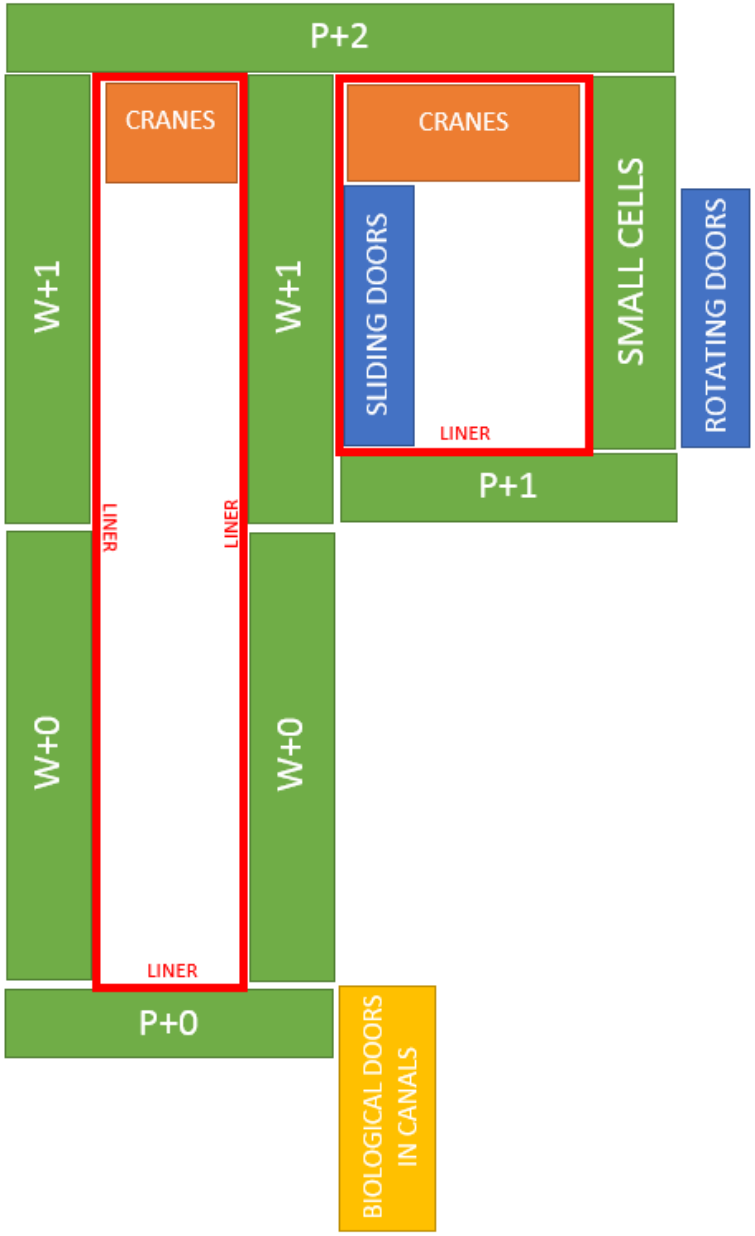
Scope of supply

- **In-kind supply of the following parts:**
  - Embedded pieces – divided into 5 construction phases (Plancher 0, Walls +0, Walls +1, Small cells, Slabs)
  - Stainless steel liner incl. worktops and Alpha doors
  - Equipment – lifting devices outside cells, shielding and sealing doors (rotating, sliding, biological in canal), crossings, DPTE doors,
  - Cranes – lifting devices inside hot cells
  - C11 Design: I&C system, power supply system, ventilation boxes and pipelines, circuits for fluids and pressurized air distribution, biological plugs, wells, heavy doors, lifting support

- **In-kind supply could be divided:**
  - Design – including necessary calculations
  - Manufacturing and Factory Tests
  - Installation on site and Site Tests

Current state of supply

- Embedded pieces → *already mounted on site*
- Stainless steel liner → *being mounted on site according to site schedule*
- Sliding & Rotating doors → *installed on site* (completion - commissioning foreseen in 1.Q 2019)
- Cranes – lifting devices inside hot cells → *design finished, fabrication ongoing*
- Biological doors in canals, *installation ongoing*
- C11 Design: I&C system, power supply system, ventilation boxes and pipelines, circuits for fluids and pressurized air distribution, biological plugs, wells, heavy doors, lifting support → *design finished*



Sectional view hot cells

Current state of supply – global view

- **Design:**

Embedded parts	→ finished
Equipment	→ finished
Liner	→ finished
Cranes inside cells	→ finished

- **Manufacturing / Factory Tests**

Embedded parts and P+2	→ finished
Sliding & Rotating doors	→ finished
Biological doors in canals	→ finished
Liner	→ finished
Cranes inside cells	→ in progress (3.Q 2019)

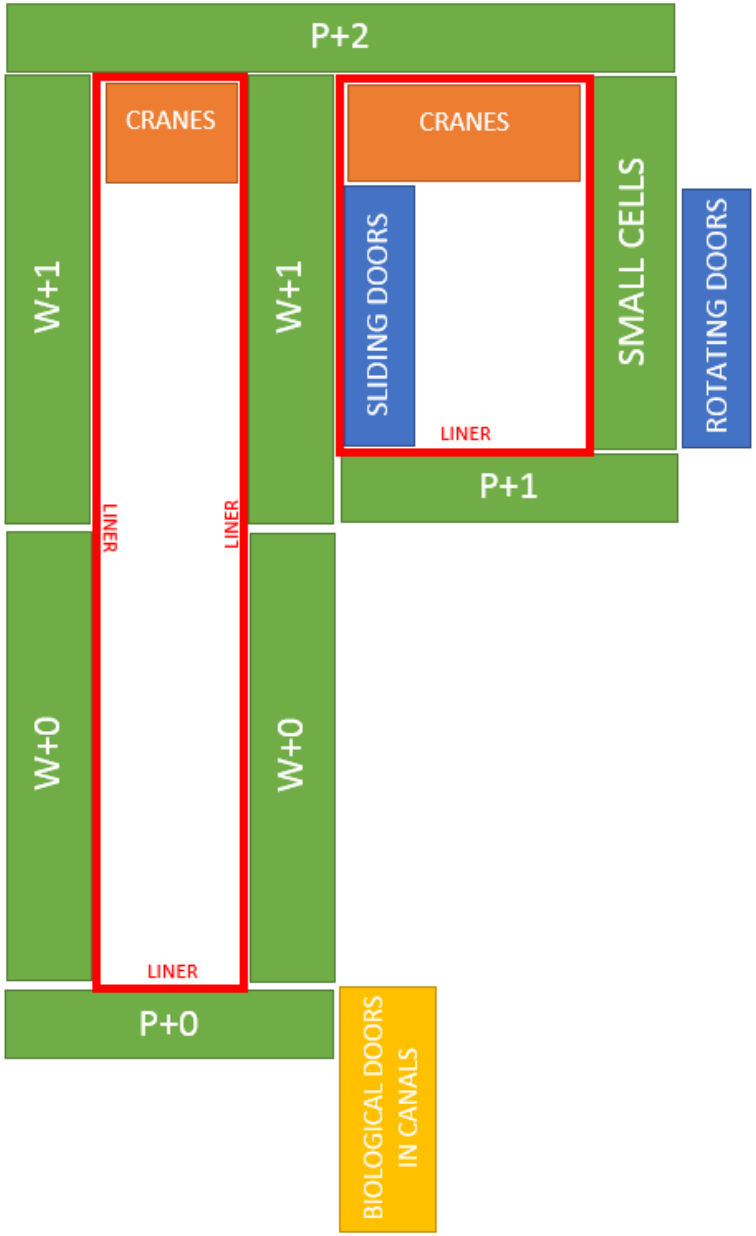
- **Installation on site**

Embedded parts and P+2	→ finished
Sliding & Rotating doors	→ finished (foreseen in 1.Q 2019)
Biological doors in canals	→ in progress (foreseen in 4.Q 2018)
Liner	→ in progress (end 2018)
Leak tests	→ first test in 08/2018
Cranes inside cells	→ not started (foreseen in 1.Q 2019)

Challenges of design & construction

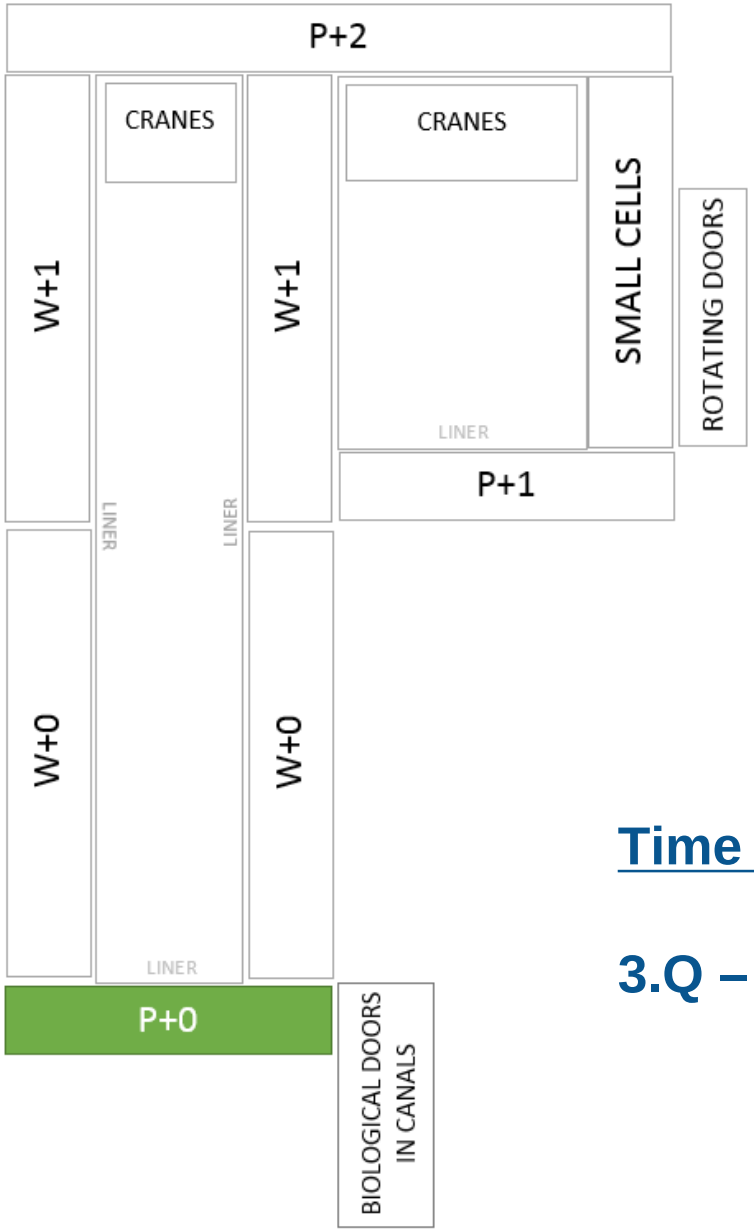
- RCC-G → French Design and Construction rules specific for JHR
- Prototypes – most of the equipment had to be developed → several iteration between Czech and French engineers
- Cost & production estimates
- Fabrication
  - due to uniqueness, higher demands on technical performance
  - touched the limits of manufacturability
  - quality requirements (NDT…)
- Construction
  - Safety requirements
  - Coordination

Construction progress – overall view



Sectional view hot cells

Construction progress – P+0



Sectional view hot cells

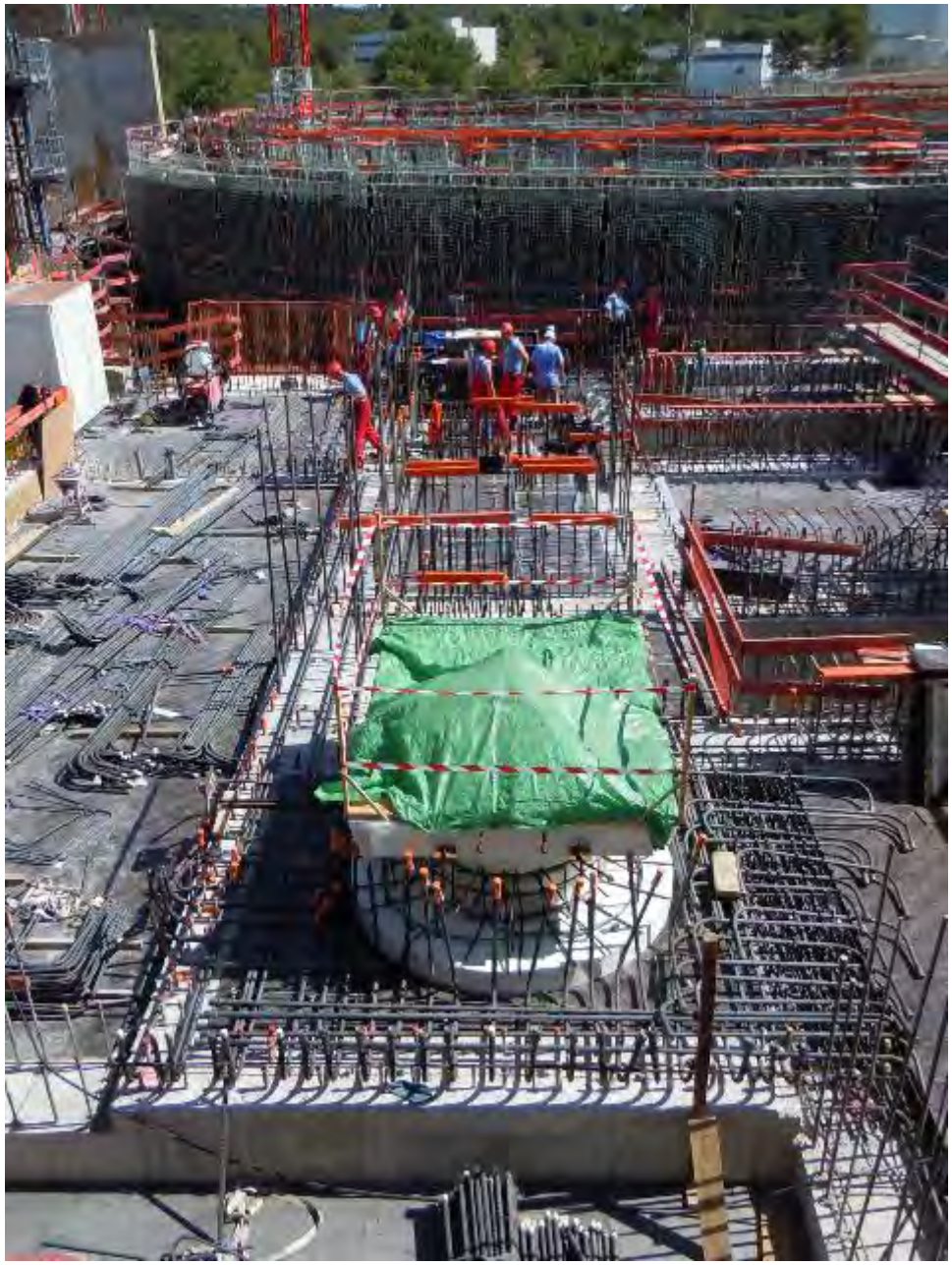
Time of realization:

3.Q – 4.Q 2012

Construction progress – P+0

Construction progress – P+0

Construction progress – P+0



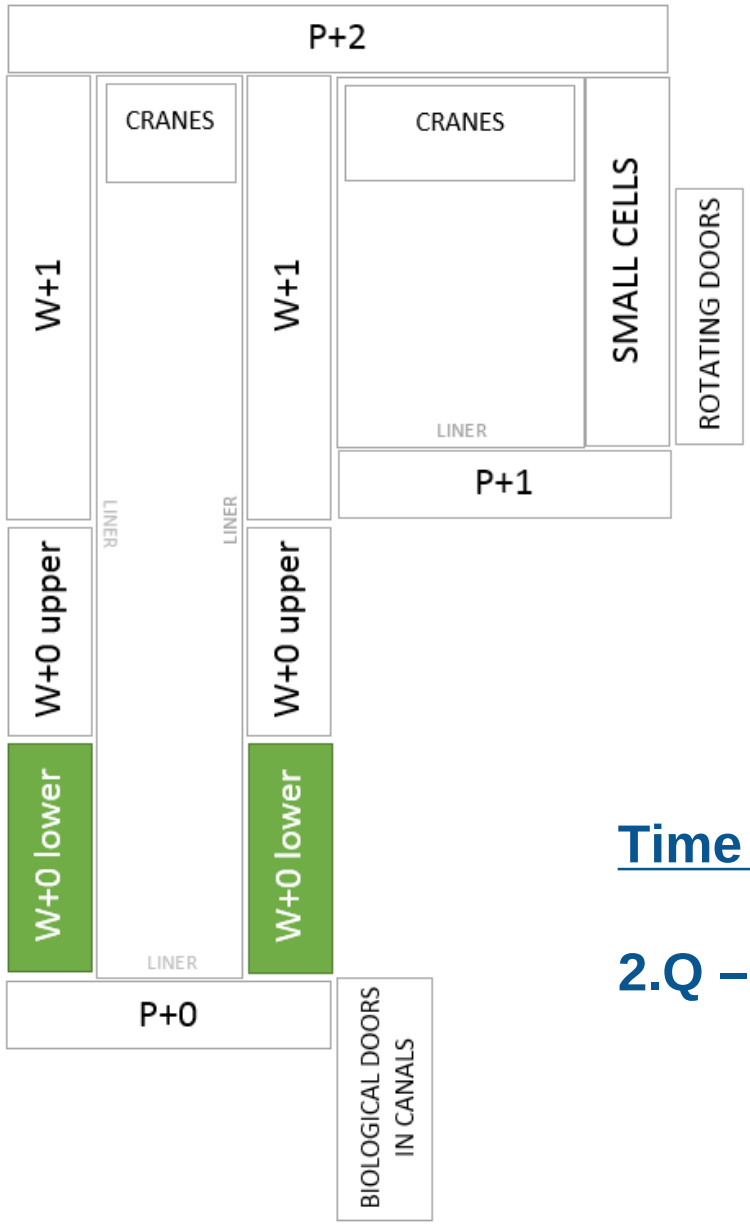
Construction progress – P+0

Construction progress – P+0

Construction progress – P+0

Construction progress – P+0

Construction progress – W+0 lower



Sectional view hot cells

Time of realization:

2.Q – 3. Q. 2013

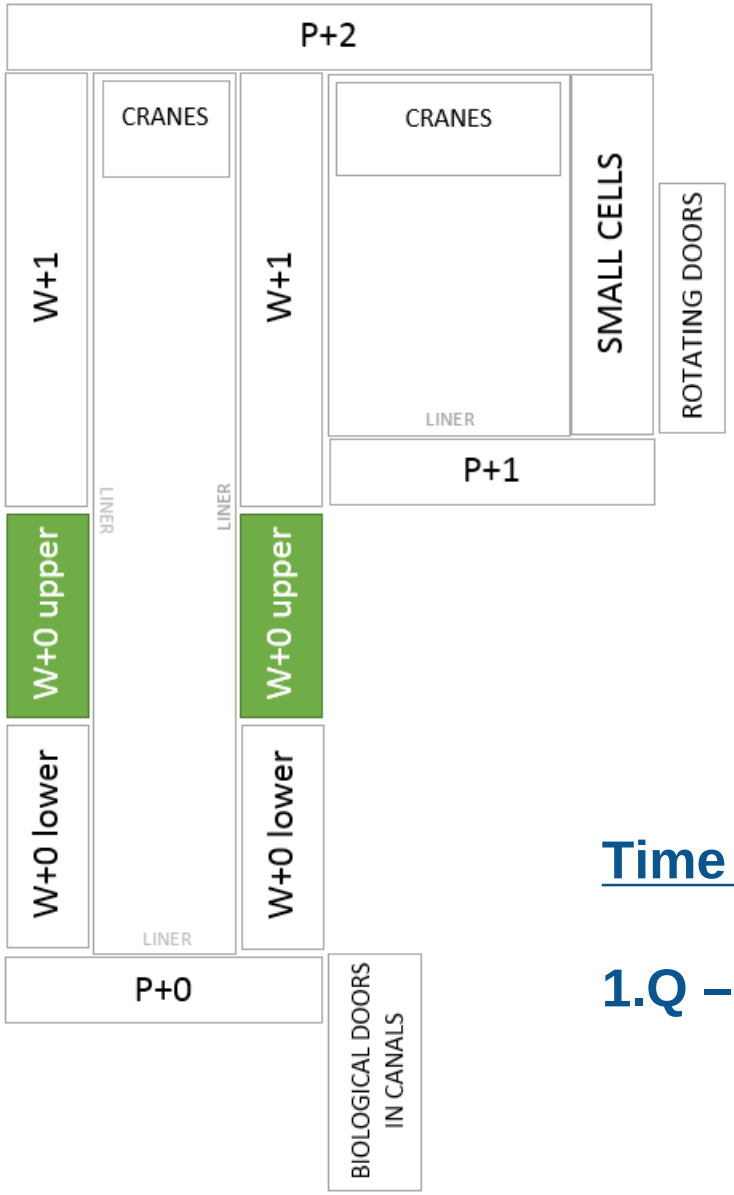
Construction progress – W+0 lower

Construction progress – W+0 lower

Construction progress – W+0 lower

Construction progress – W+0 lower

Construction progress – W+0 upper



Sectional view hot cells

Time of realization:

1.Q – 2. Q. 2014

Construction progress – W+0 upper

Construction progress – W+0 upper

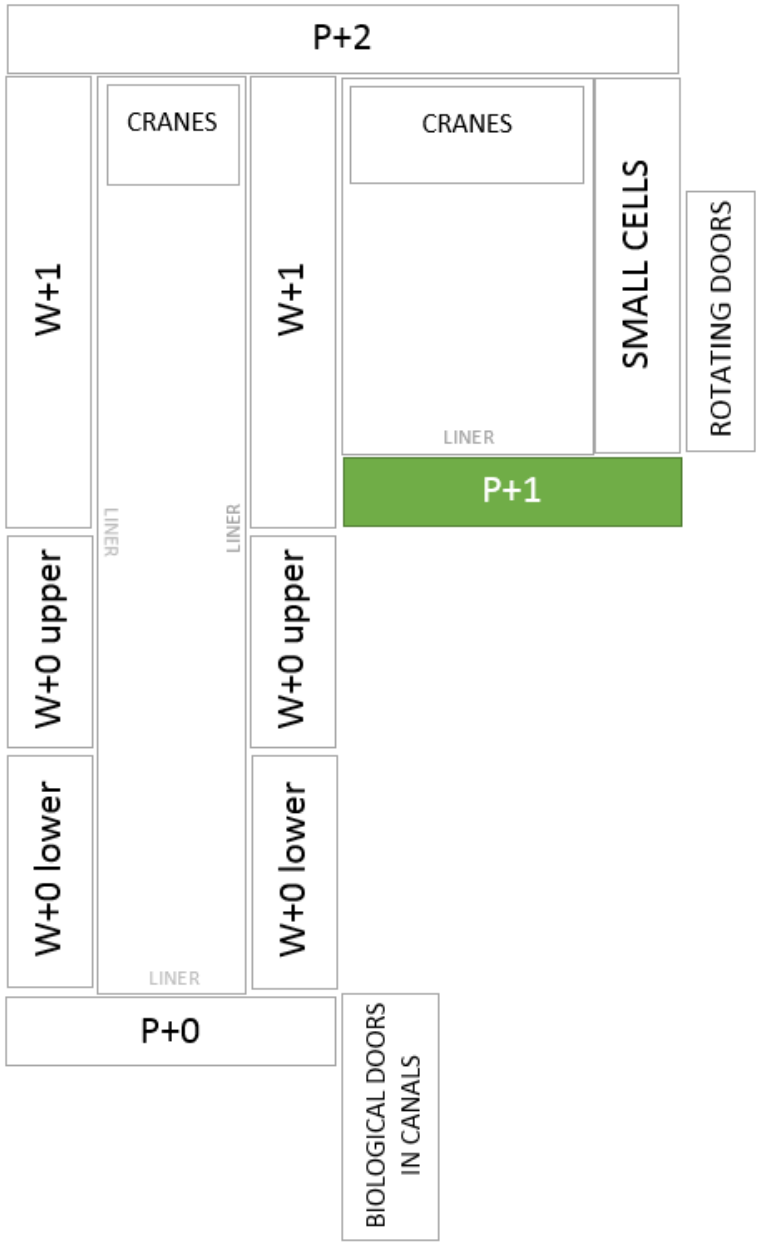
Construction progress – W+0 upper

Construction progress – W+0 upper

Construction progress – W+0 upper

Construction progress – W+0 upper

Construction progress – P+1



Sectional view hot cells

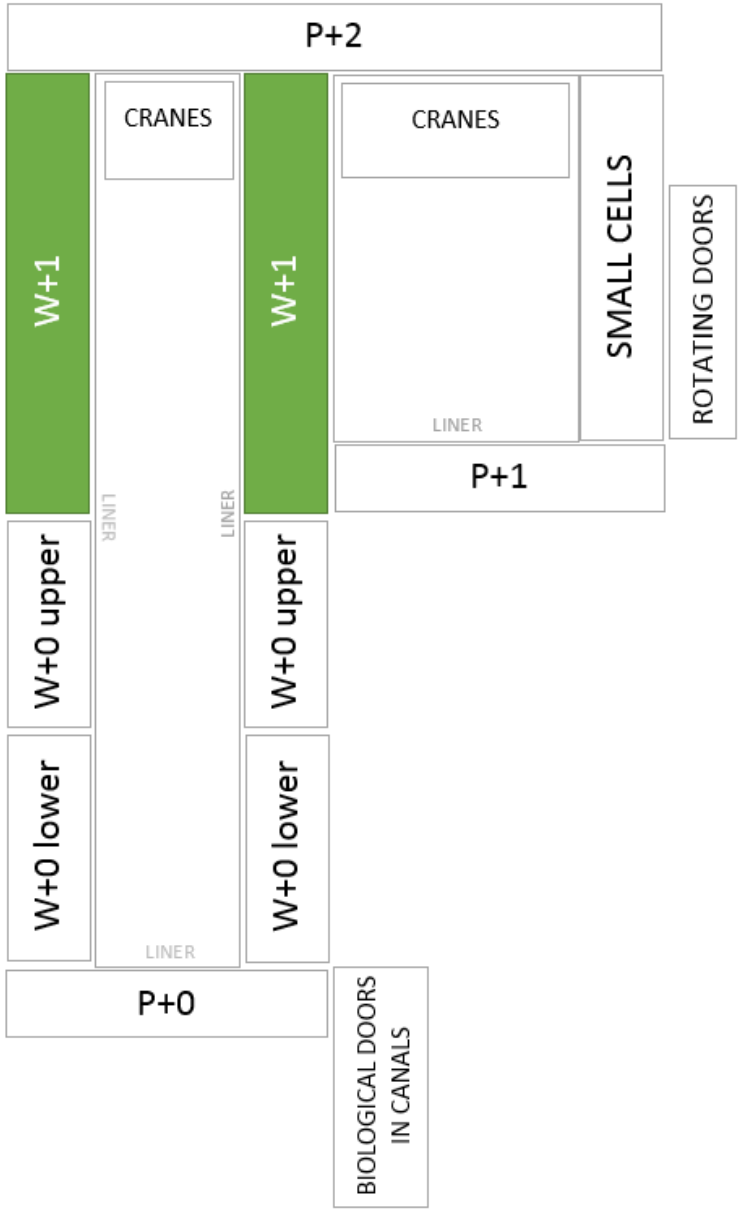
Construction progress – P+1

Construction progress – P+1

Construction progress – P+1

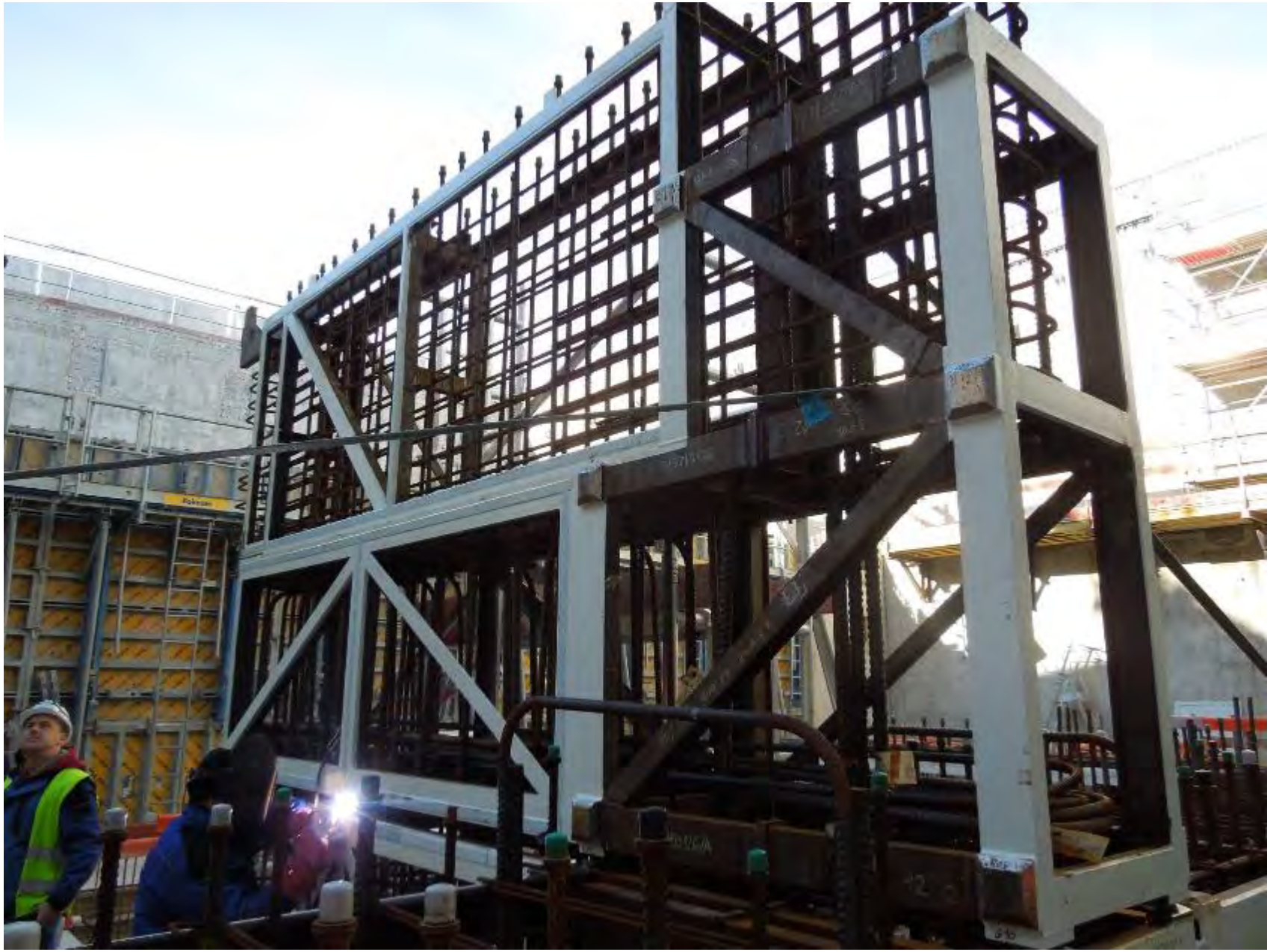
Construction progress – P+1

Construction progress – W+1



Sectional view hot cells

Construction progress – W+1



Construction progress – W+1

Construction progress – W+1

Construction progress – W+1

Construction progress – Small Cells

Sectional view hot cells

Construction progress – Small Cells

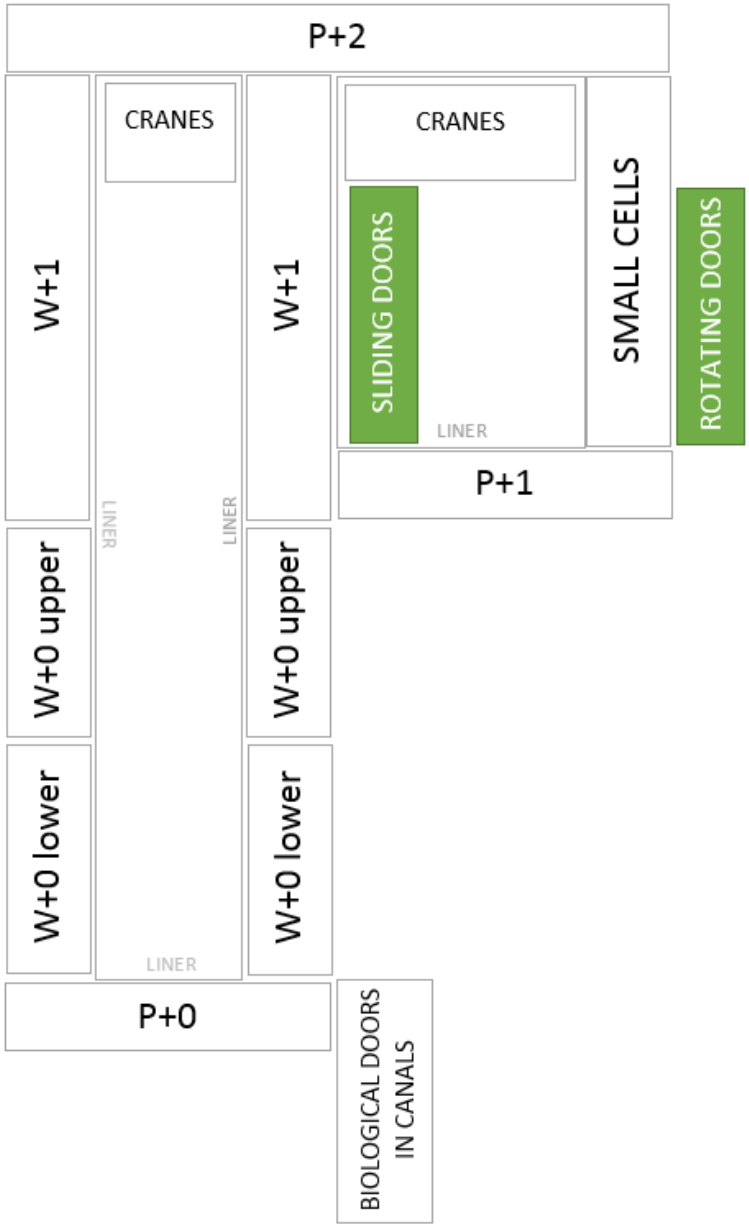
Construction progress – Small Cells

Construction progress – Small Cells

Construction progress – Small Cells

Construction progress – Small Cells

Construction progress – Rotating and sliding doors

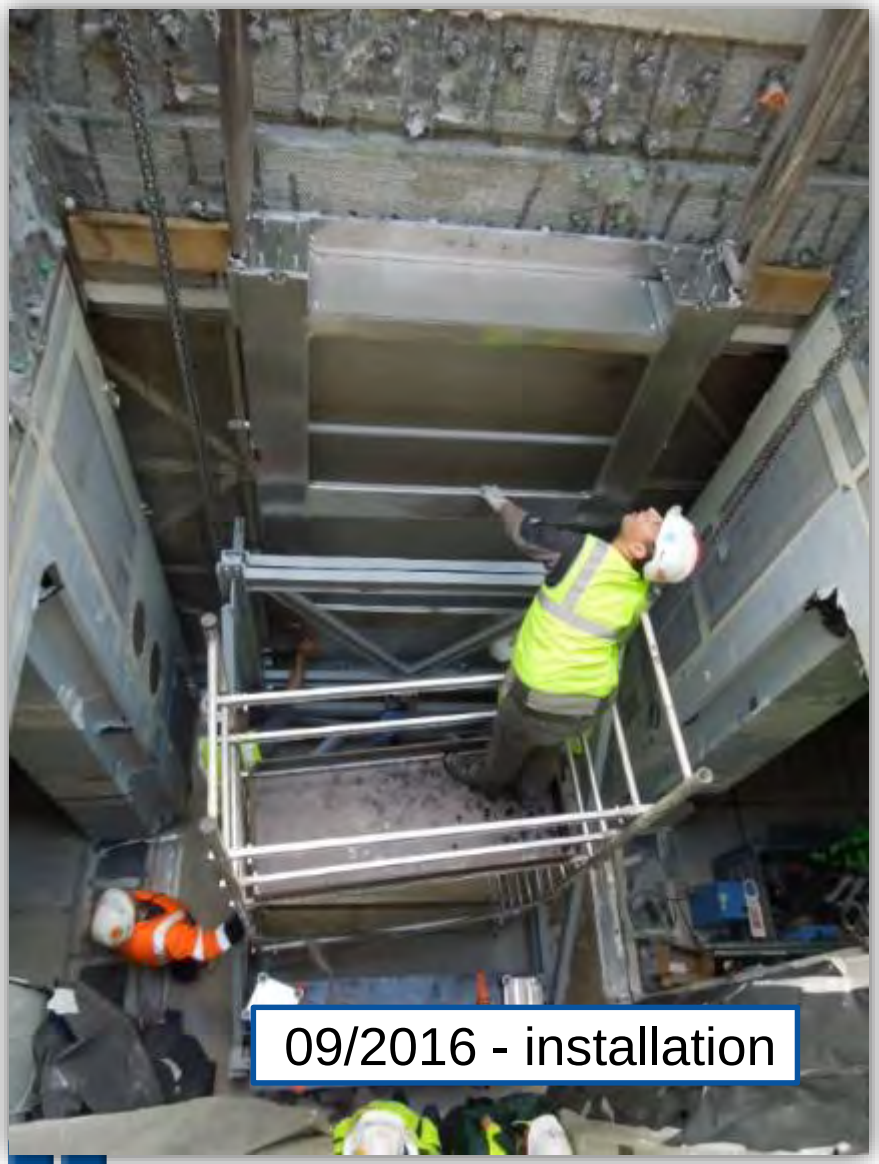


Sectional view hot cells

Construction progress – Rotating and sliding doors

- **Heavy doors (ACPP, France)**
  - 5 rotating and 4 sliding doors
  - Successfully installed on site in 09/2016
  - Delays with completion
  - Completion and SAT - end planned 1.Q 2019

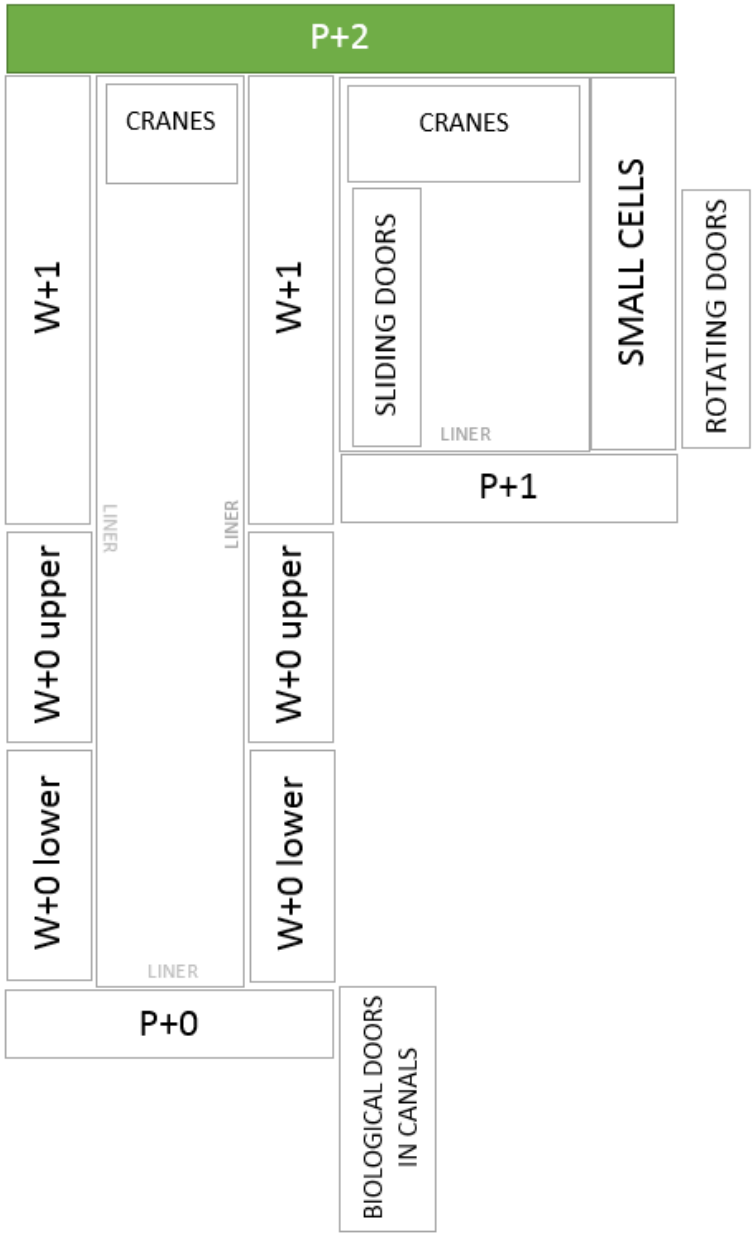
Construction progress – Rotating and sliding doors



09/2016 - installation

04/2018 - completion

Construction progress – P+2

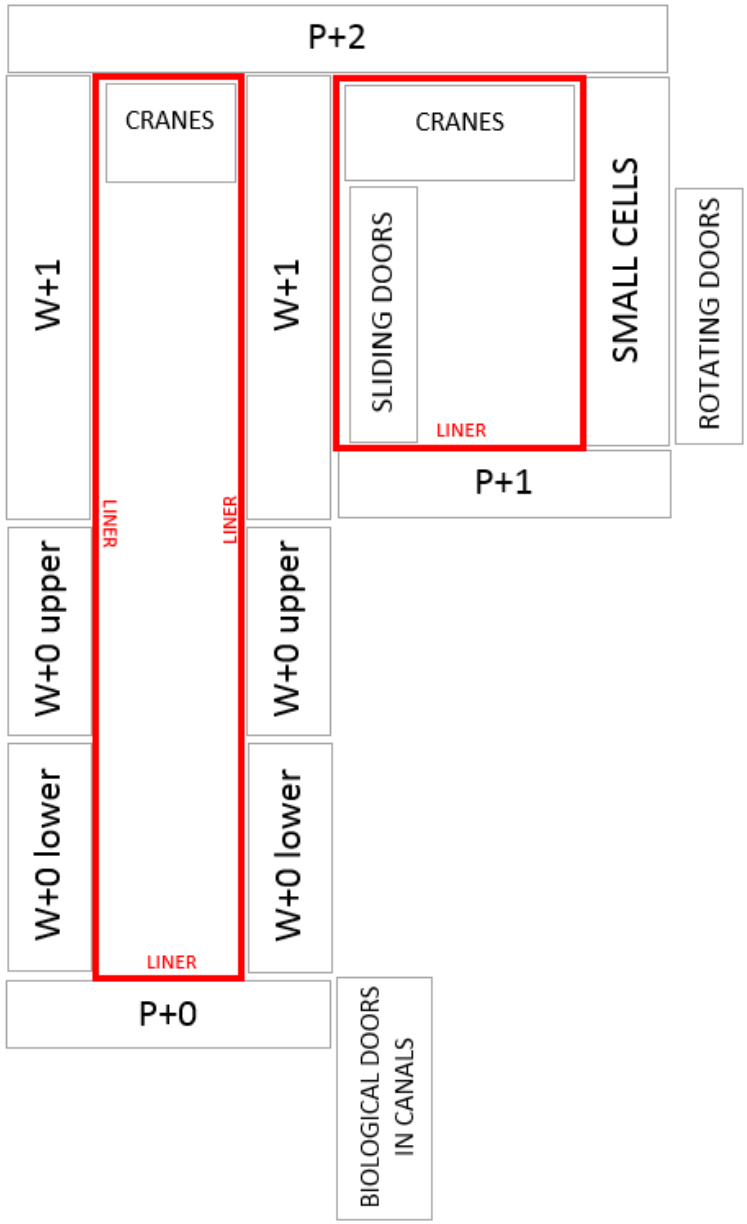


Sectional view hot cells

Construction progress – P+2

Construction progress – P+2

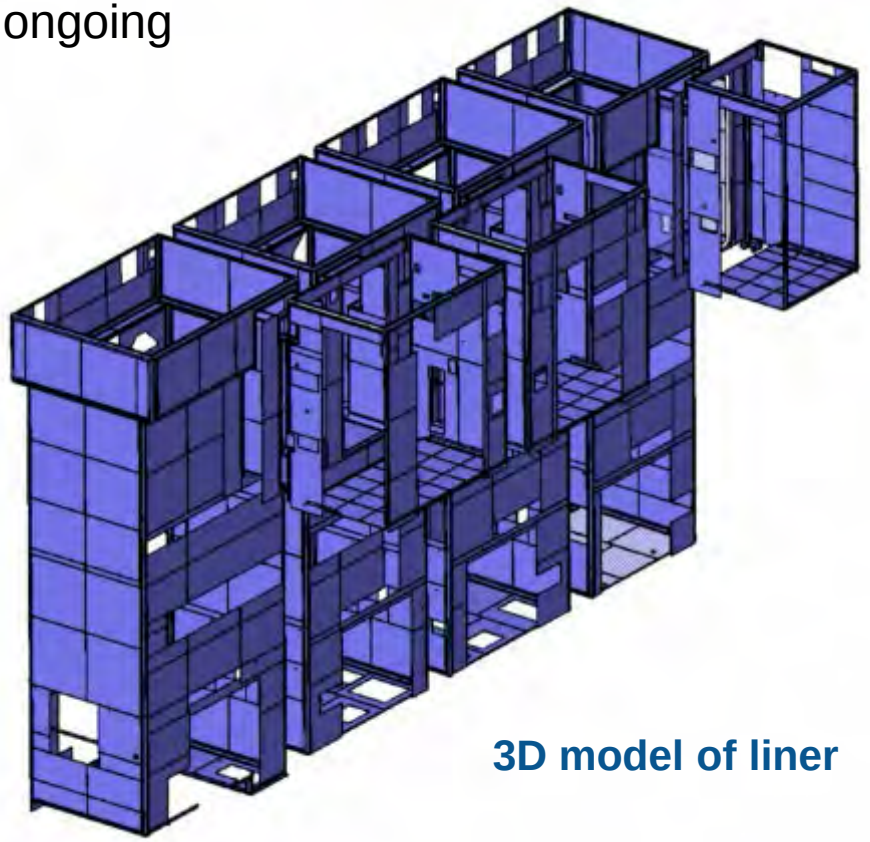
Construction progress – Liner



Sectional view hot cells

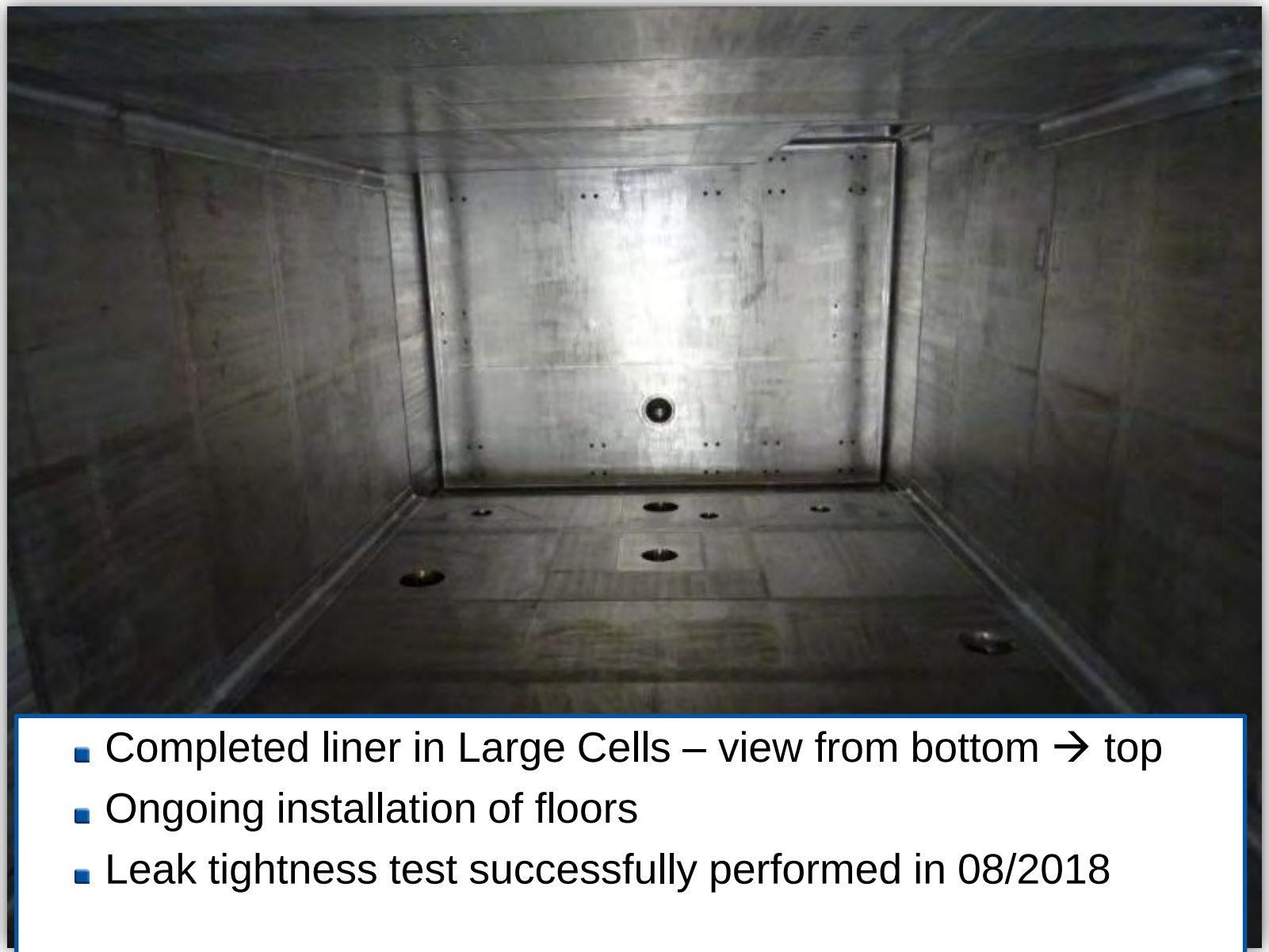
Construction progress – Liner

- **Manufacturing at CHEMCOMEX,** Mochovce, Slovak Republic
  - Manufacturing of liner sheets finished including floors
  - Works are ongoing according to site schedule
  - 99% of liner installed in large and small cells
  - Works on floors of large cells and small cells are ongoing
  - Liner finish by the end of 2018



3D model of liner

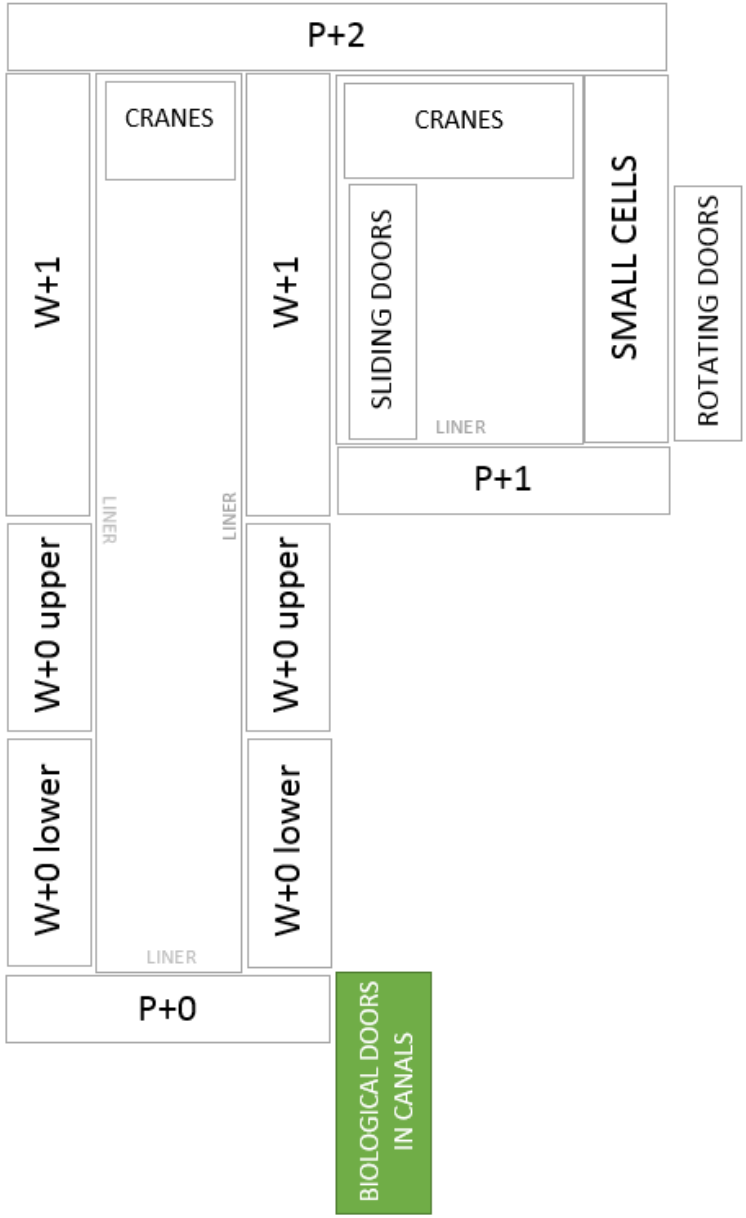
Construction progress – Liner



- Completed liner in Large Cells – view from bottom → top
- Ongoing installation of floors
- Leak tightness test successfully performed in 08/2018

Construction progress – Liner

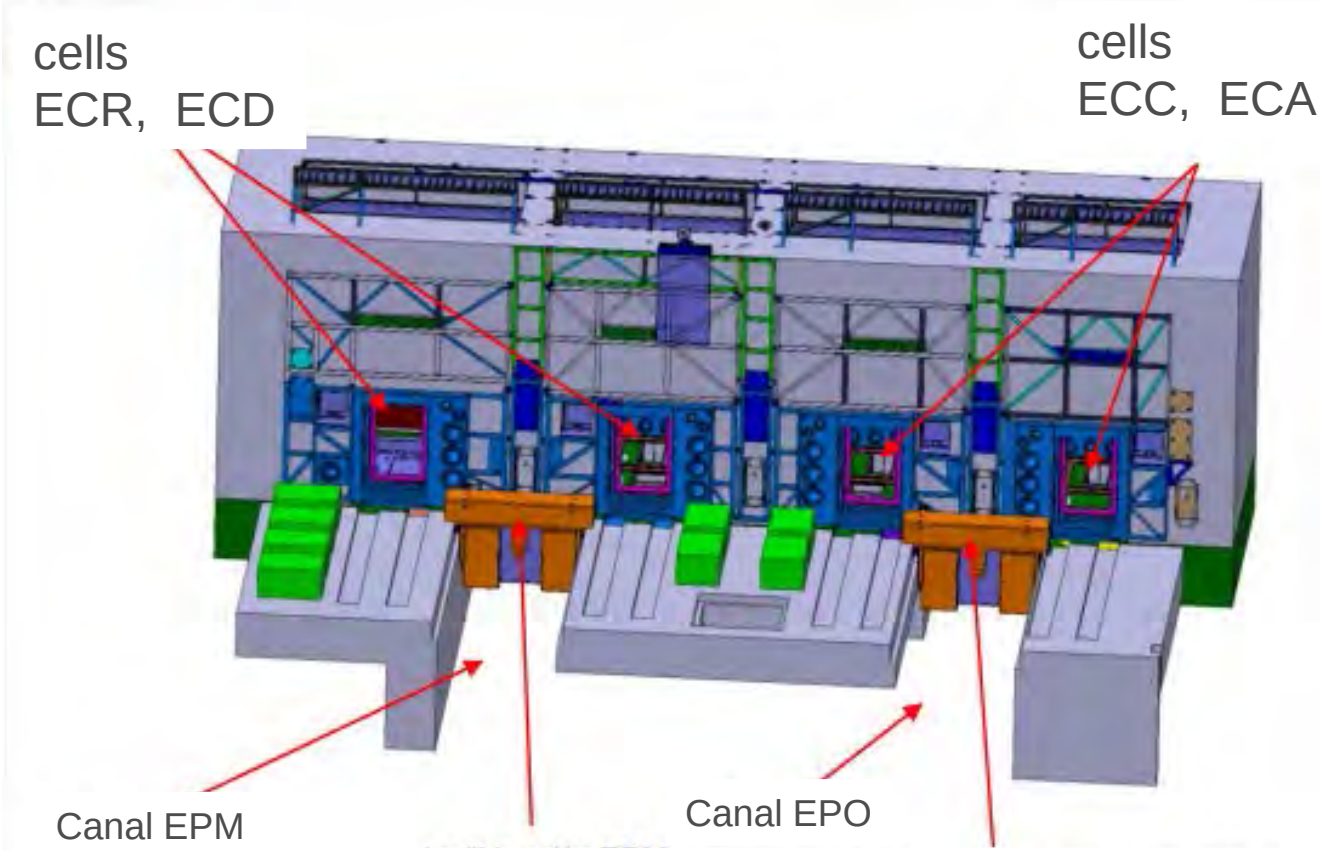
Construction progress – Biological doors



Sectional view hot cells

Construction progress – Biological doors

- **Manufacturing at CHEMCOMEX,** Mochovce, Slovak Republic
  - Fabrication of doors finished including FAT
  - Special lifting device fabricated including FAT
  - Ongoing site installation



Biological doors in canals

Construction progress – Biological doors

03/2018 – installation with use of EMZ crane

Special lifting device

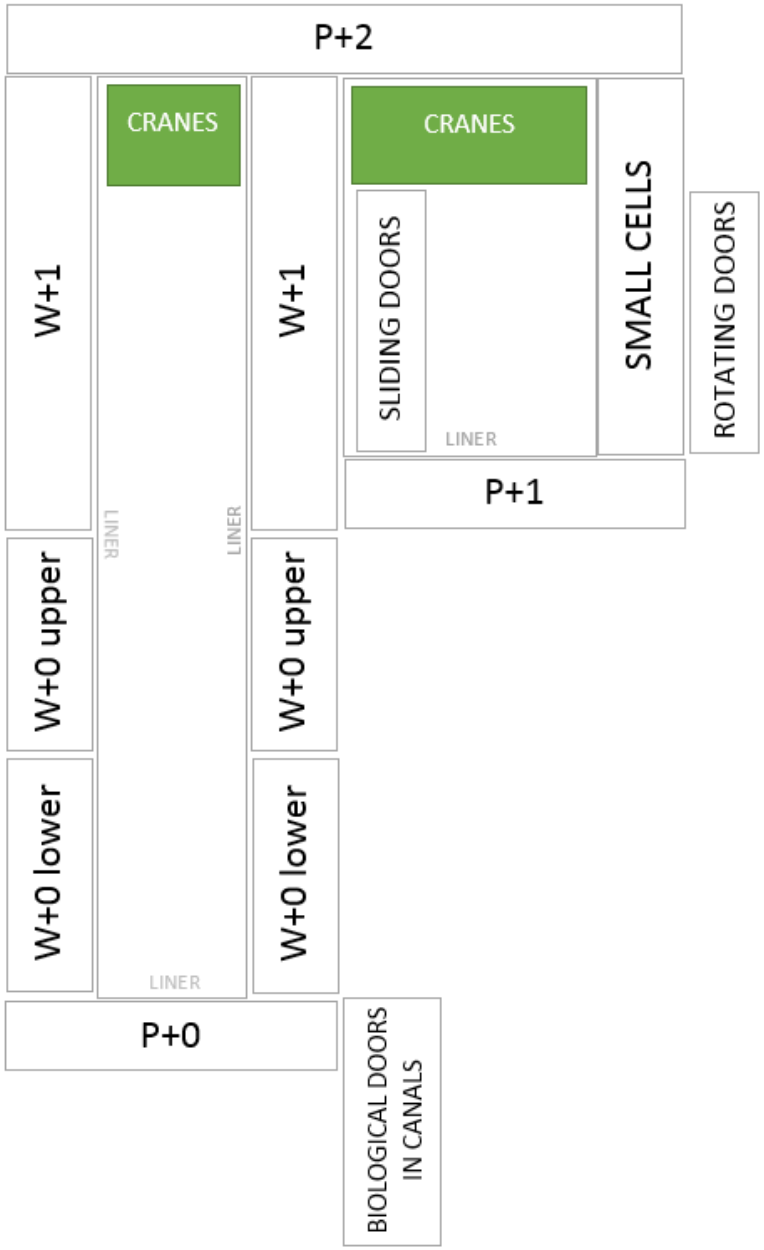
Construction progress – Biological doors

installation with use of EMZ crane

Door in place of EPO canal

Construction progress – Biological doors

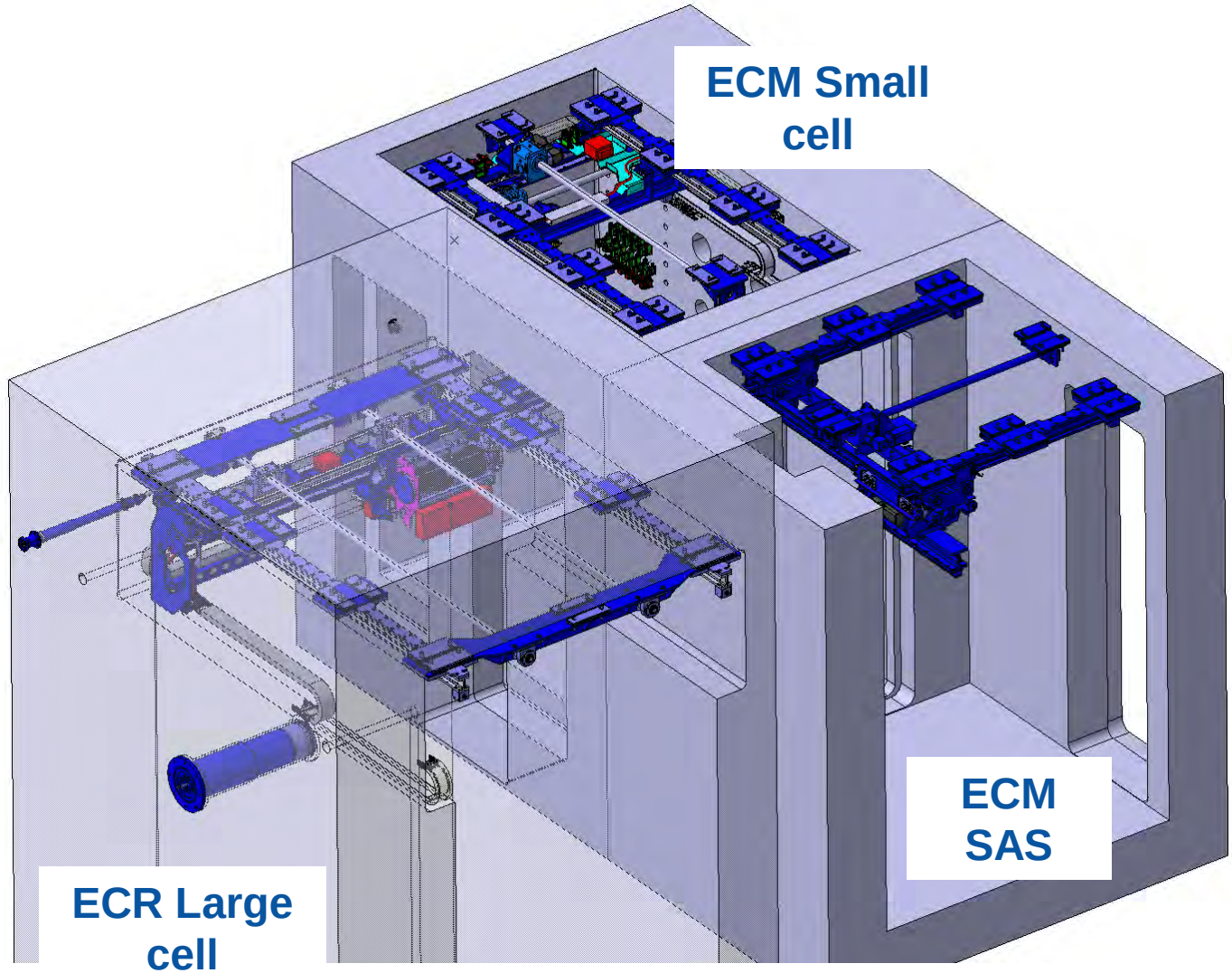
Construction progress – Cranes



Sectional view hot cells

Construction progress – Cranes

- **Provided by NUVIA Czech**
  - Design finished
  - Delays due to design changes and clarifications
  - Mechanical part of prototypes fabricated
  - Electro and I&C fabricated
  - FAT of prototypes 12/2018
  - End of SAT foreseen in 09/2019



Hot cells cranes prototypes assembly

Construction progress – Cranes

Blank mounting in factory of Large Cell (ECR) crane tracks

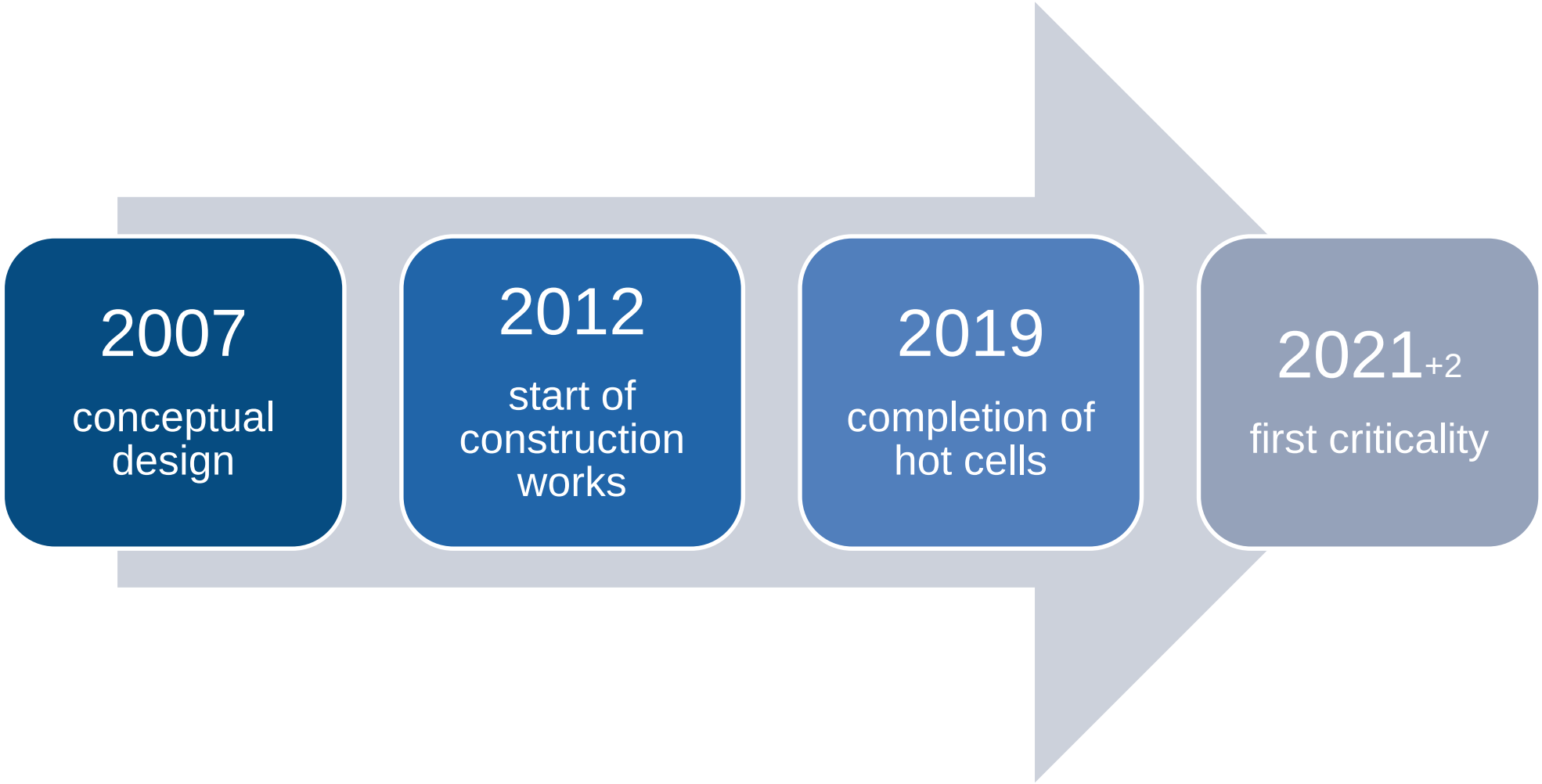
Construction progress – Cranes

Trolley of Large Cell (ECR) crane - assembling in factory

Overall completion of the hot cells (JHR-CZ)

More than 80%

Hot cells – time span



Thank you for your attention