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APPLICATION OF TNI VYAL-B NEUTRON SHIELDING TO NEW EPR™ REACTOR NEEDS

G.FOUSSARD

LOGISTICS

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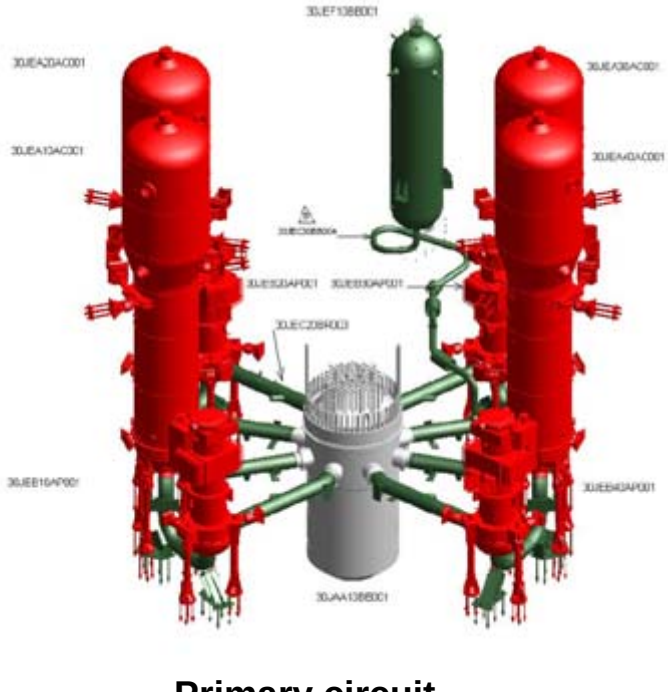
EPR: A New Concept for Safety And Operational Use



Primary circuit

Construction site

- **Personnel access in the RB during power production**
- **ALARA principle**
- **Criteria for Maximum dose rate in the RB**

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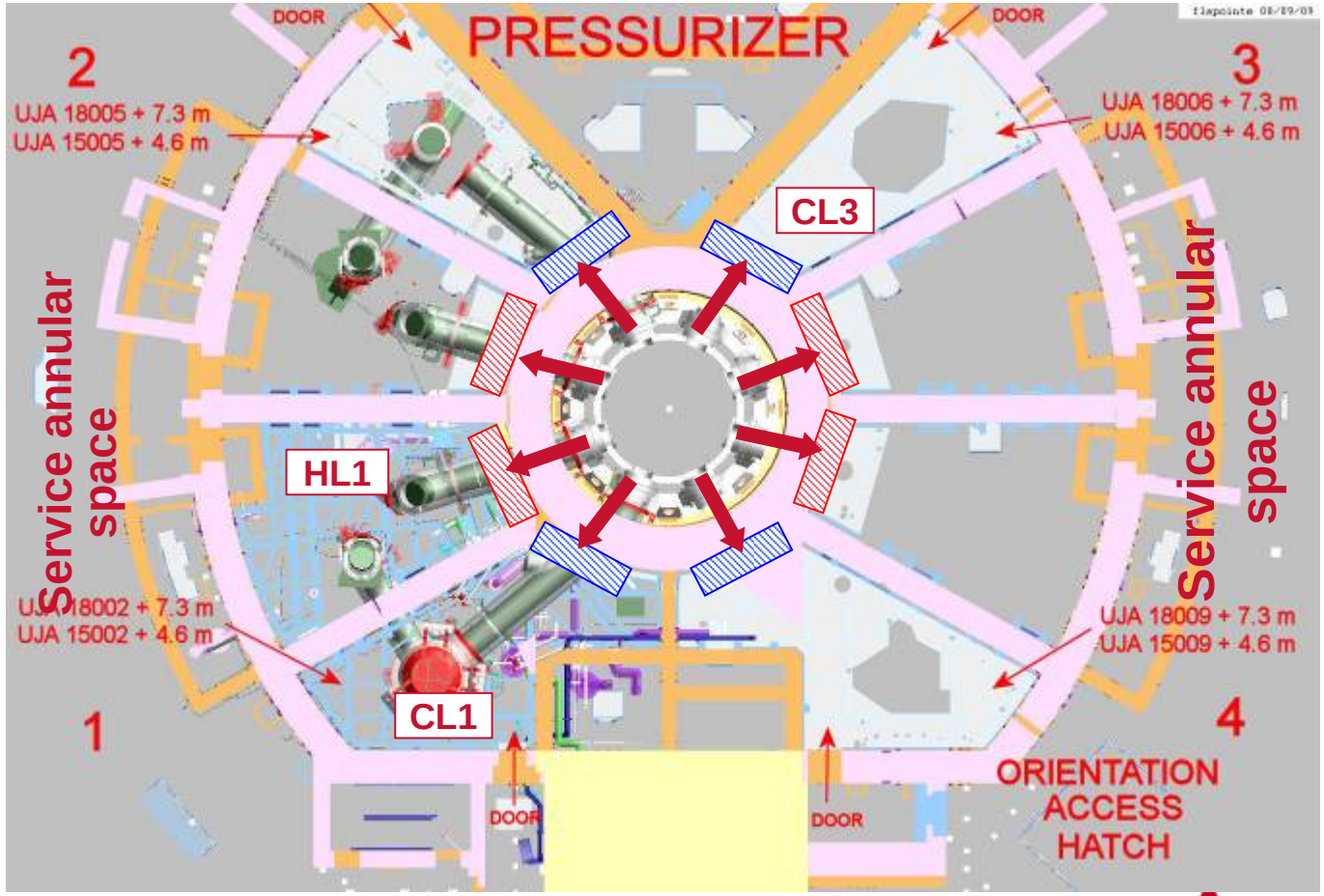
EPR™ Neutron Shielding

Section of the reactor building

Neutron streaming

Neutron protection around hot legs

Neutron protection around cold legs



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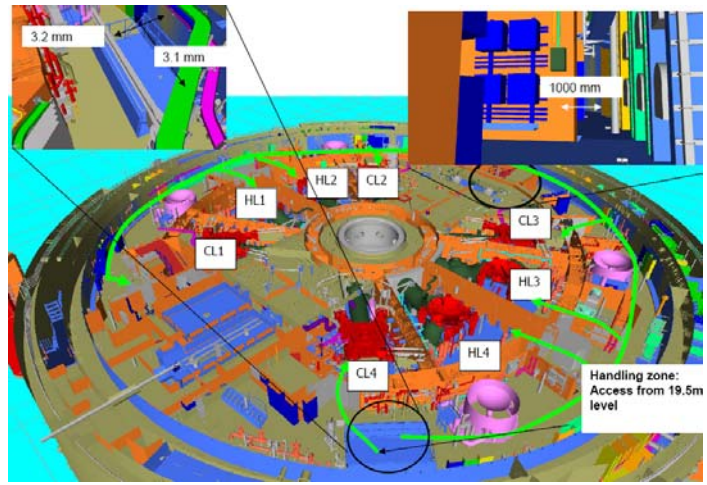
Neutron Shielding : Technical Conditions

- **Use of Vyal-B™ resin TNI material used commonly for nuclear casks**
- **Dealing with all RB plant interfaces**
- **Access to the reactor pit for every 10 years for maintenance operations**
- **No shielding failure**
- **Routing and installation on construction site**



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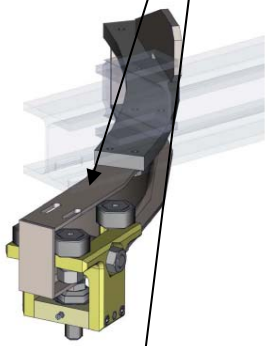
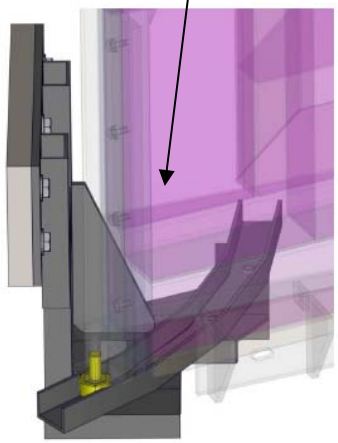
Focus HL Design

Special mechanism developed by TNI



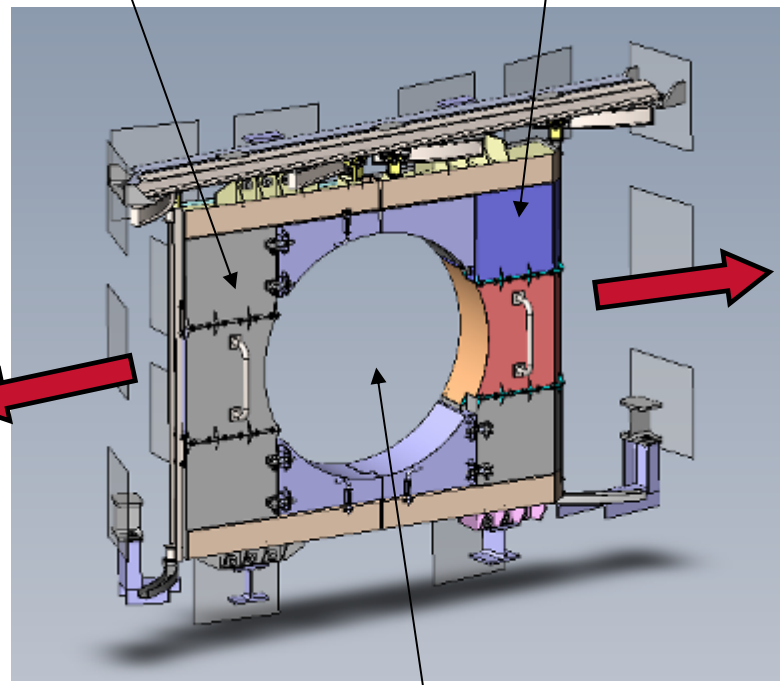
Upper Roller-& ball bearings assemblies (#2 per door)



Lower ball bearing assemblies (#1 per door)

Right sliding door

Left sliding door



Opening for the main coolant pipe (Hot leg)

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Focus On CL Design

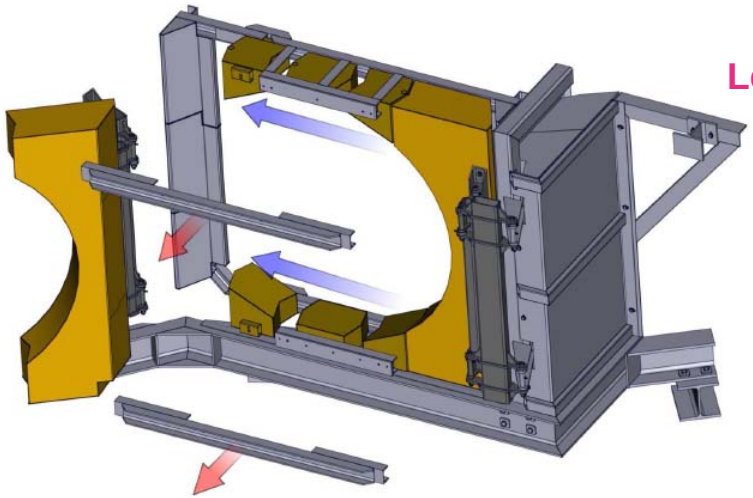


Figure 10: CL1 - 30JEC10BZ003 opening sequence.

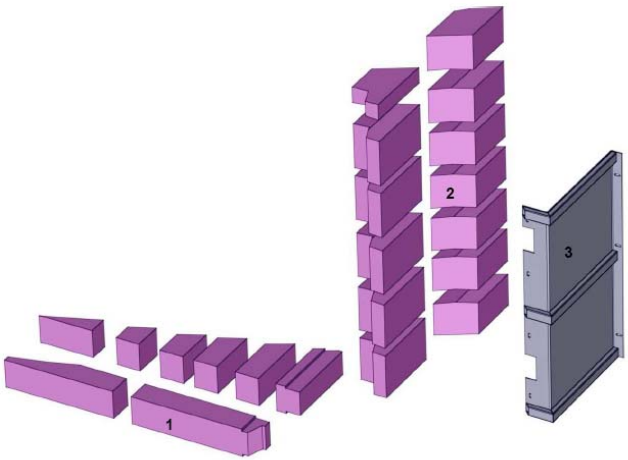
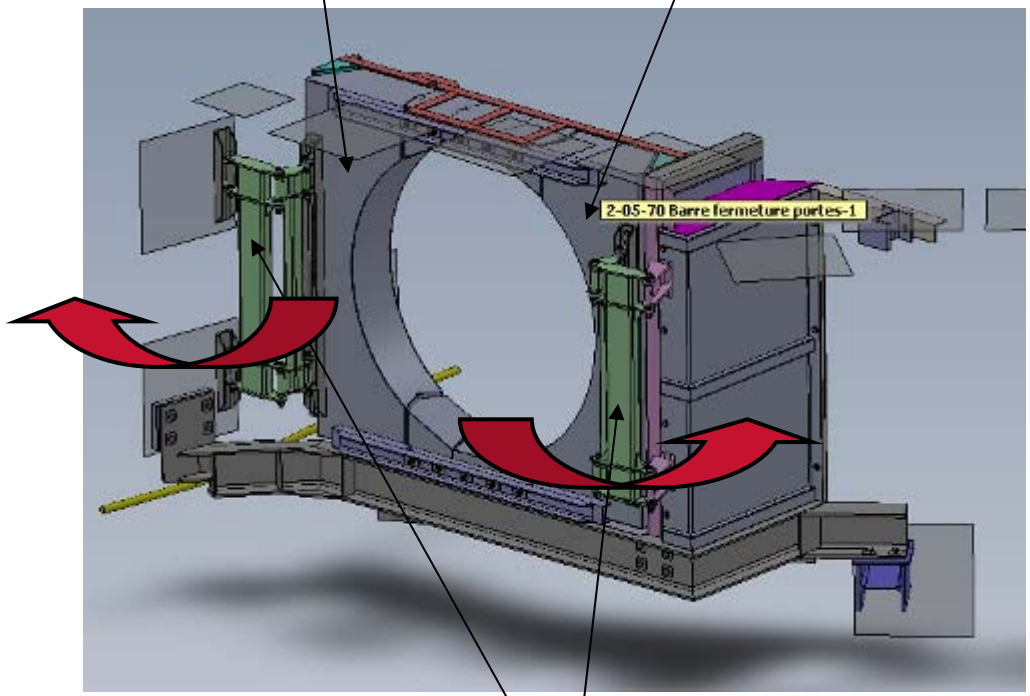


Figure 14: Fixed blocks

Left hinged door

Right hinged door



Special mechanism developed by TNI

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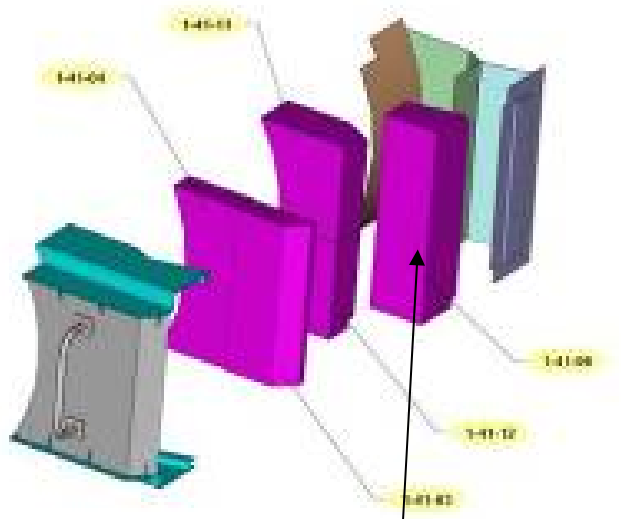
New Application of Vyal-B™ Resin 1/2

- **Rejection of blocks with non-conformities**
- **Traceability of the blocks at each manufacturing stage**
- **Simplification of the logistics of the blocks**



Vyal™ blocks are inserted in stainless steel boxes

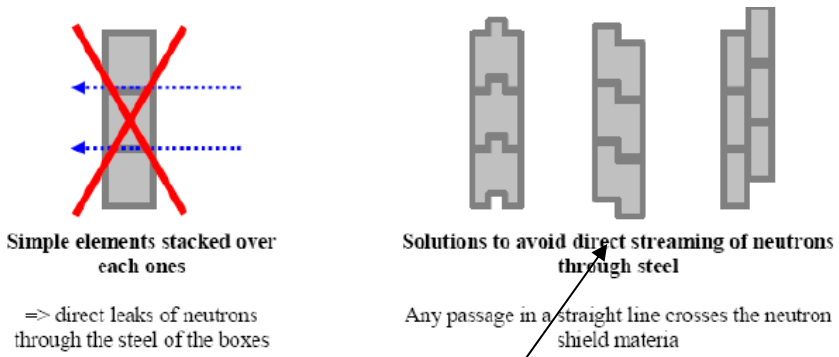


Figure3: Neutron shielding "good practices".

Good practice to avoid shielding failures : ridges

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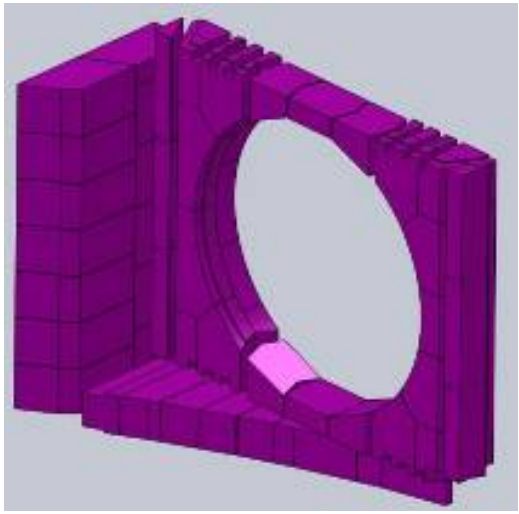
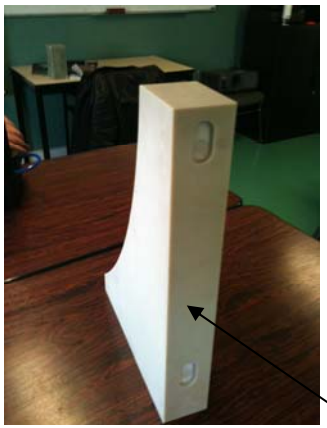
New Application of Vyal-B™ Resin 2/2



Set of cold leg shieldings blocks

- **Some figures :**
  - 8 sets of blocks
  - 10 tons of Vyal-B™ resin
  - 500 blocks
  - 125 shapes
  - 26 moulds
  - Lots of symmetries
- **Setting of a new manufacturing management**



Trial machined blocks

Moulds for the pour of the Vyal-B resin

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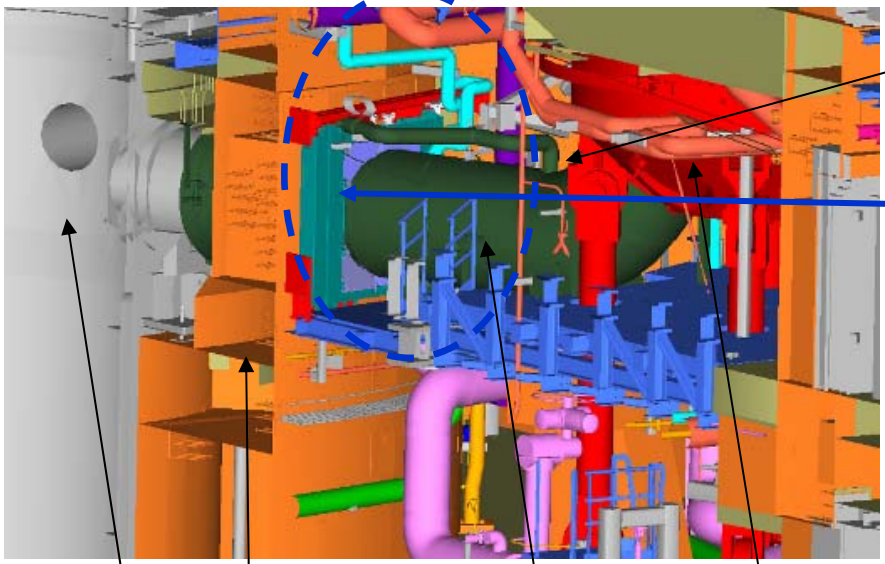
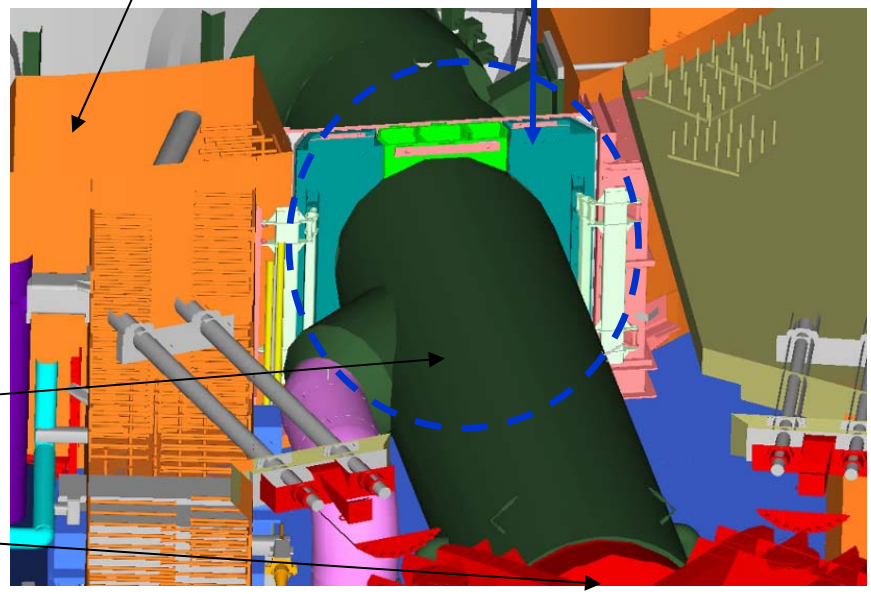
An Extremely Dense Area





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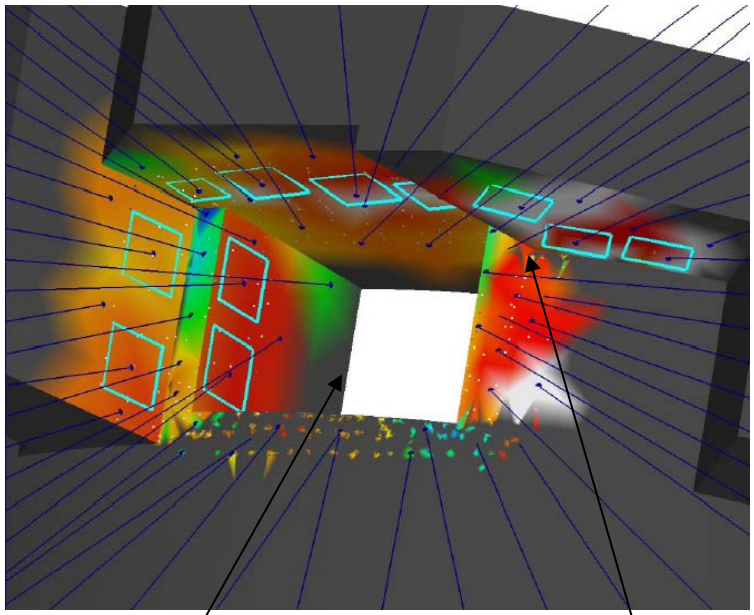
Management of Site Interfaces 1/2

Civil Works : Comparison between dimensional survey and nominal model

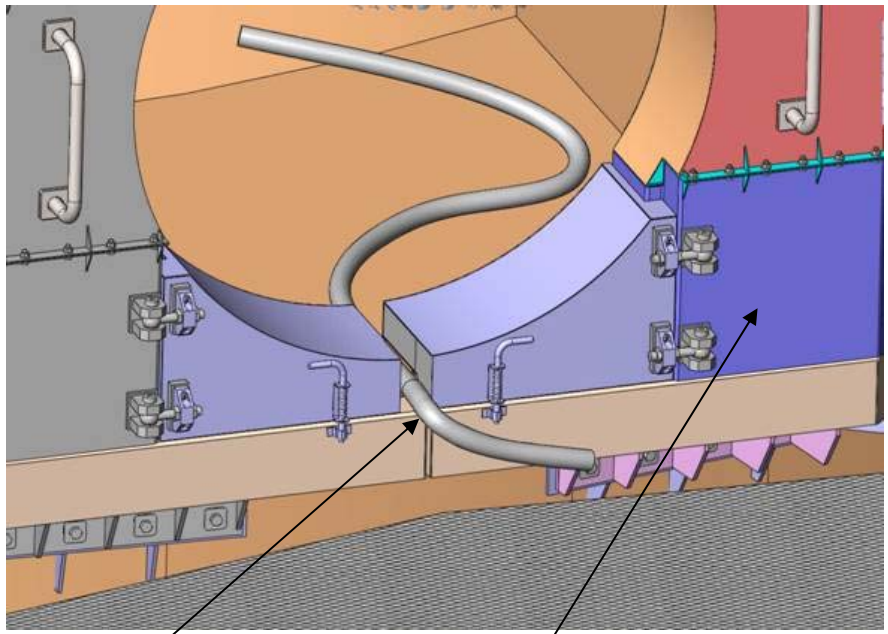


Openings of the reactor pit

Anchor plates

- Check the conformity of the concrete walls
- Check the position of the anchor plates
- Define installation tolerances (±20mm)

Pipes and Cables : Routing proposed by TNI for HL Neutron Protection (Loop 3)



FAMOS Cable

Neutron Protection

- Check the passage of pipes and cables
- TNI proposes solutions to its customer

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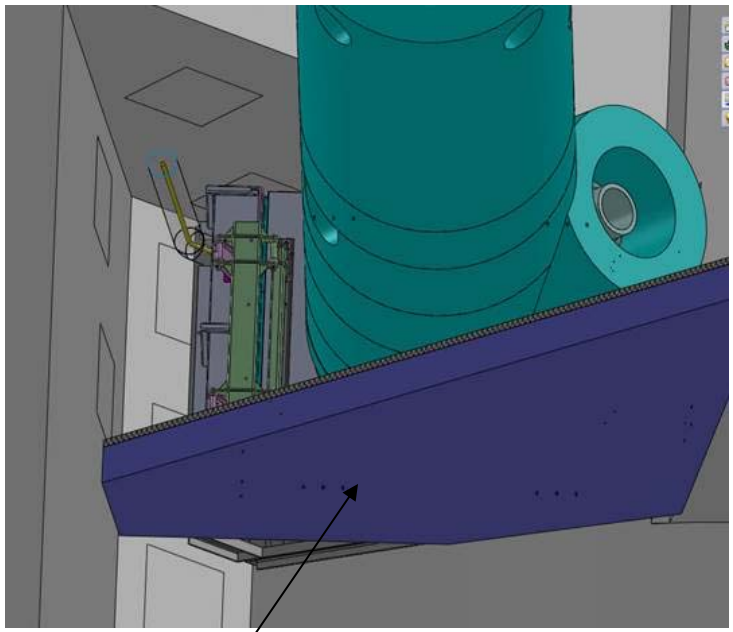
Management of Site Interfaces 2/2

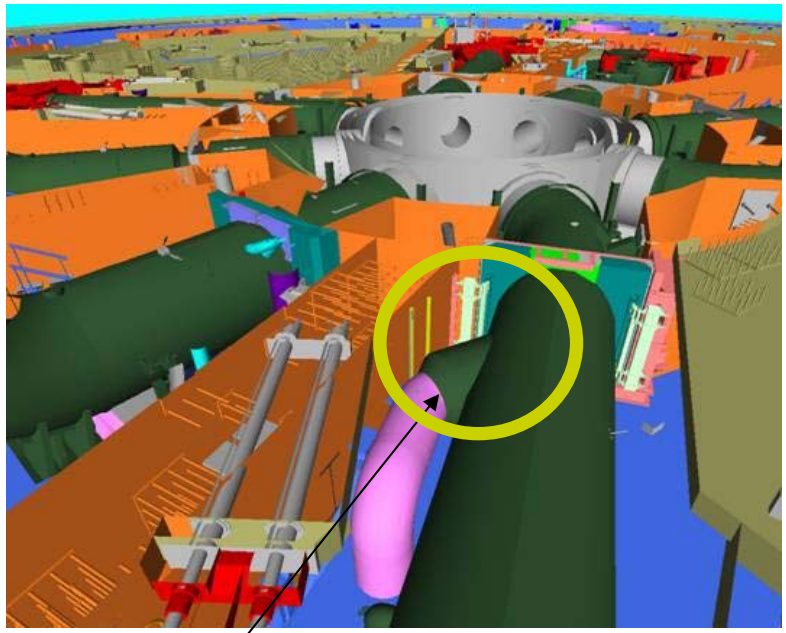
Steel platforms at 4.64m



Steel platform at 4.64 m level

- Study of customer drawings
- Modelisation of the interfaces in the design office
- Clash studies
- Proposition of a new design

Safety Injection System



Safety Injection System

- Positioning survey of the parts in the 3D mock-up Naviswork
- How to install doors of the cold leg neutron shields ?
- Conception of special handling tools

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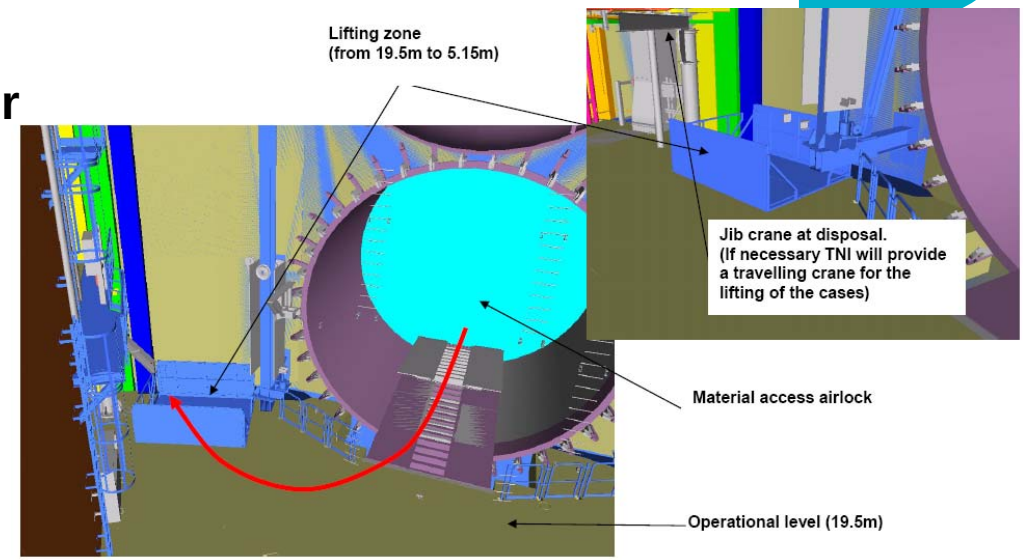
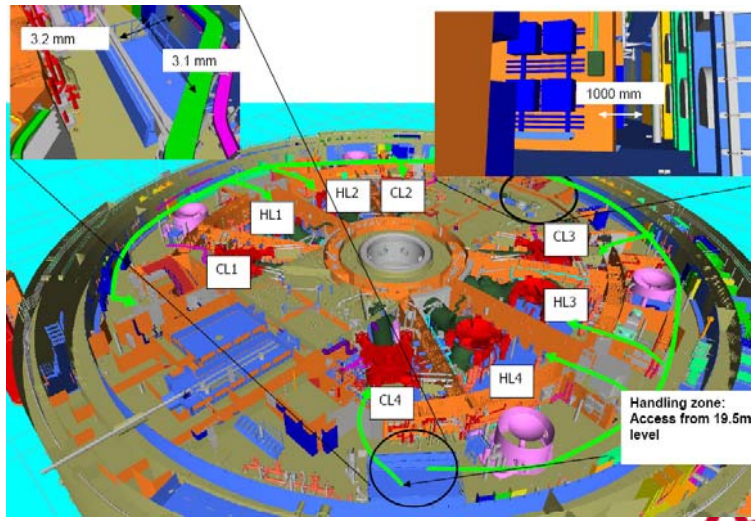
Installation on site

- Access through the material and/or personnel entrance according to the volume of each part
- Use of common equipment of construction site
- Access through the annular space in the various bunkers
- Installation of the 8 neutron shieldings in the 8 bunkers





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Conclusion

- **Successful transfer of know-how from nuclear casks to EPR™ Reactors**
- **The FOAK of a new product group for TNI**
- **Open new markets with new applications for an existing material**
- **Development of new skills and competences for a complicated installation design and routing**

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