



LUCOEX

Large Underground Concept EXperiments 2011 – 2014

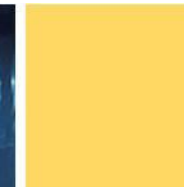
Work Package 5

KBS-3V Emplacement tests in ONKALO

Progress and Plans

Project Progress Meeting
13st May 2014

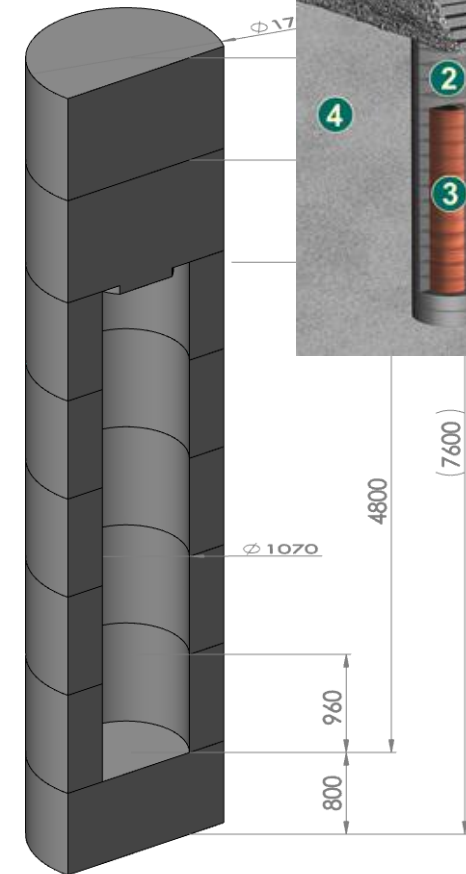
Keijo Haapala



WP5 SITUATION



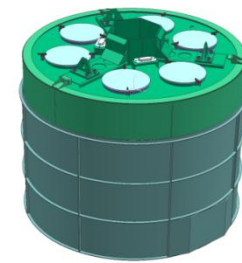
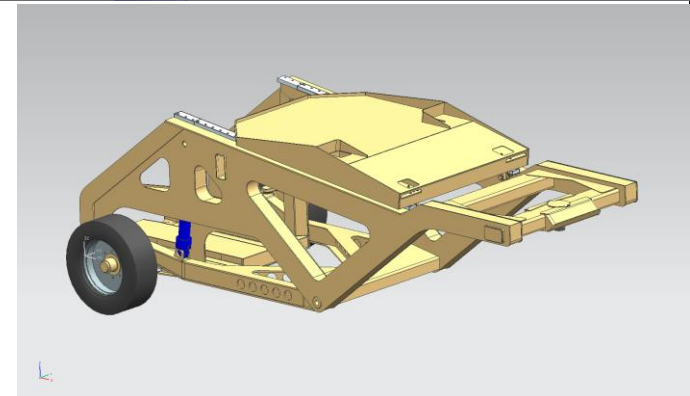
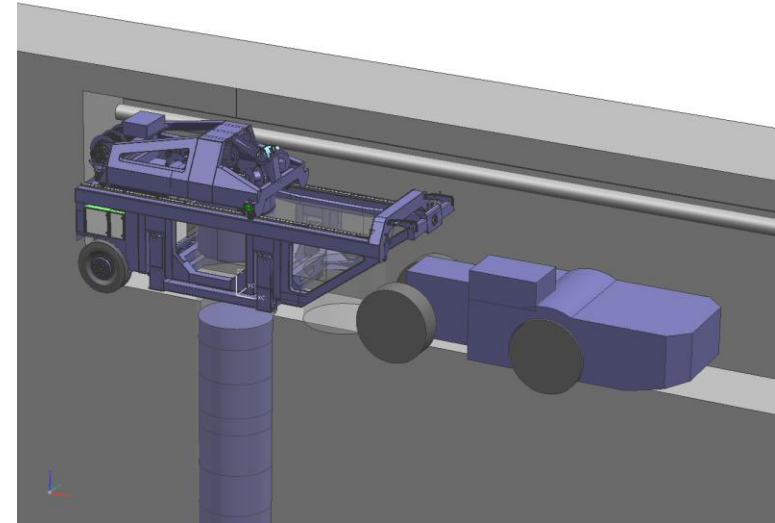
- The content of WP5
 - LOT1: Development of bentonite buffer and pellet installation.
 - LOT2: Quality of installation
 - LOT3: Problem handling tools



WP5 SITUATION

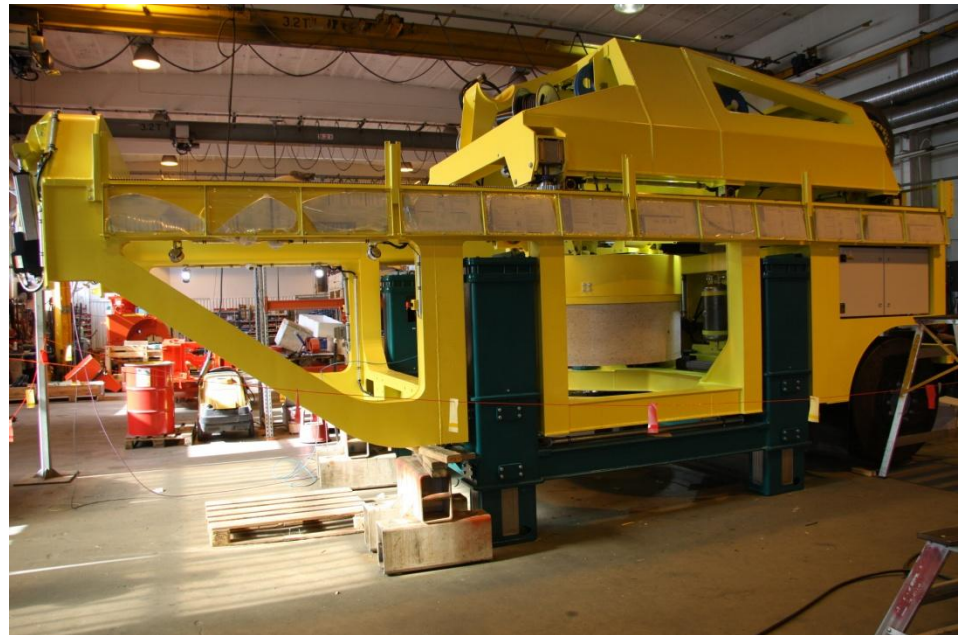
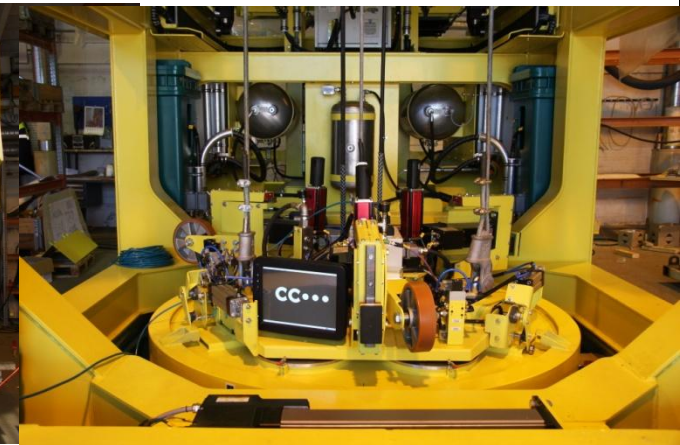
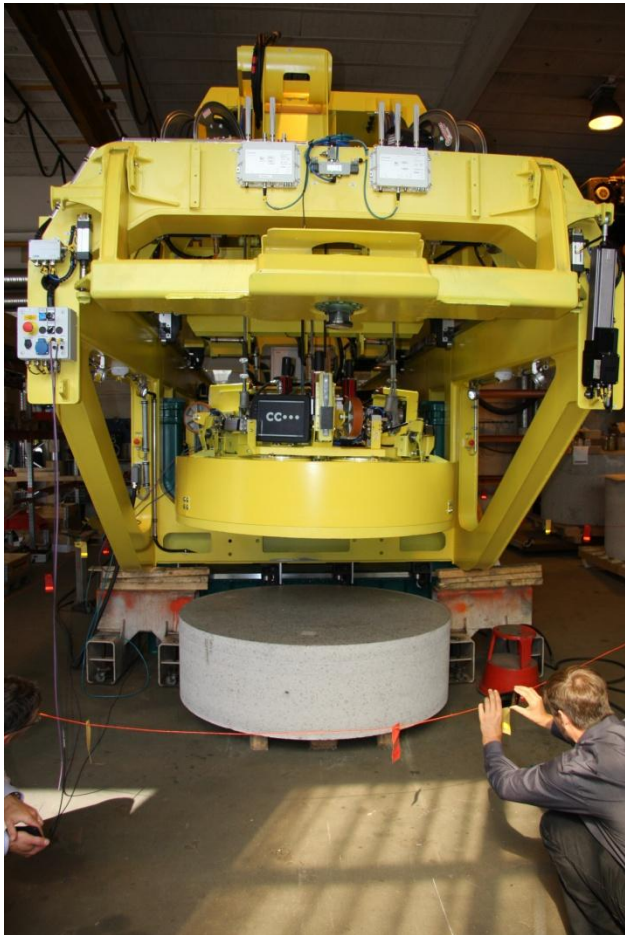


- Two machines has developed
 - Installation machine (BIM) for buffer block emplacement
 - Buffer transfer device (BTD) for transferring of buffer blocks from service tunnel for BIM.



BIM AND TRANSPORTATION CONTAINER

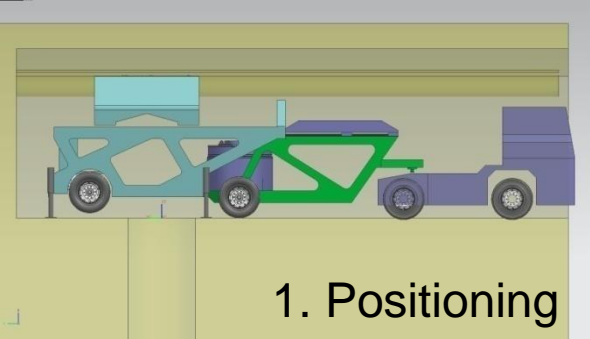




BTD

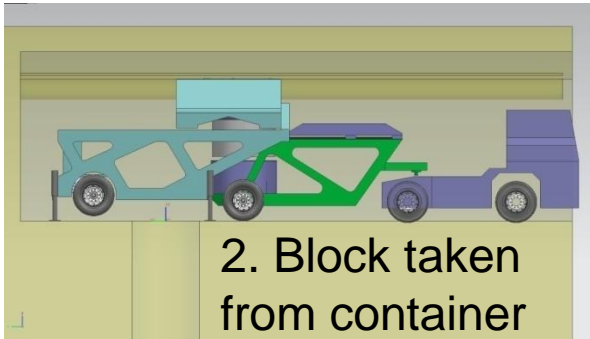


BUFFER INSTALLATION SEQUENCE



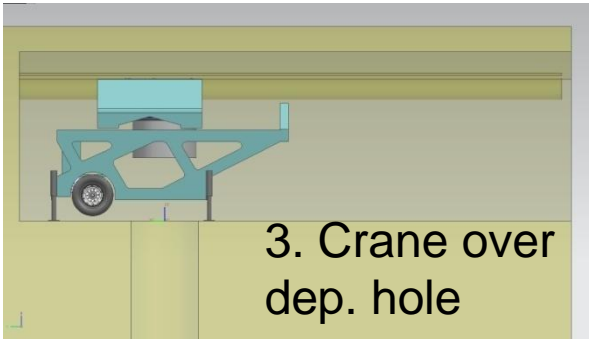
1. Positioning

The diagram shows a blue crane with a green gripper arm positioned over a container. The crane is on a yellow platform.



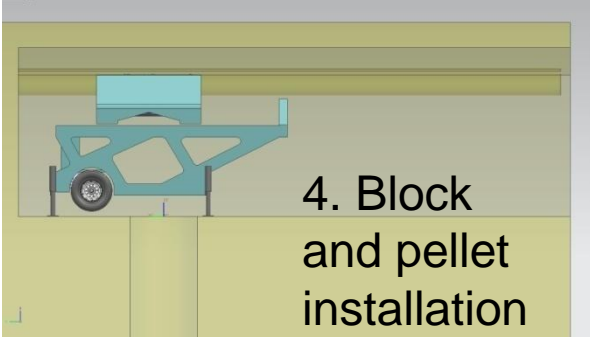
2. Block taken from container

The diagram shows the green gripper arm holding a blue block, having just taken it from the container.



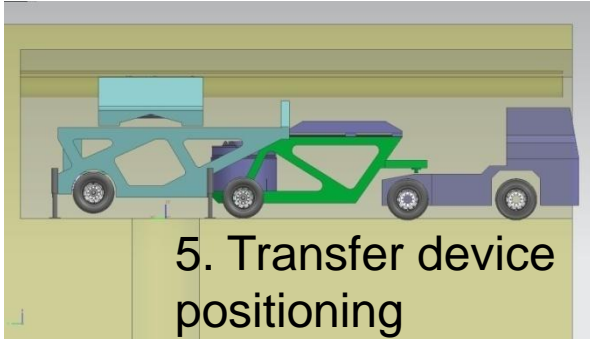
3. Crane over dep. hole

The diagram shows the crane moved to the right, now positioned over a depression (dep. hole) in the floor.



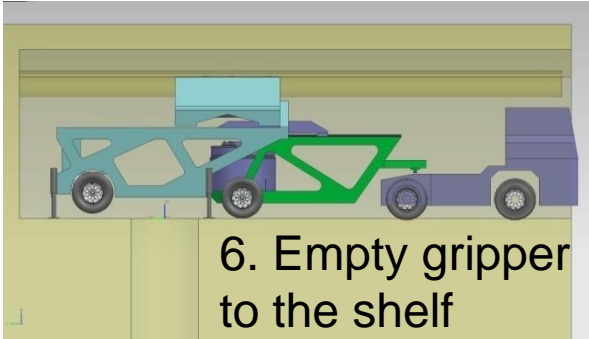
4. Block and pellet installation

The diagram shows the crane positioned over the depression, with the green gripper arm holding the blue block.



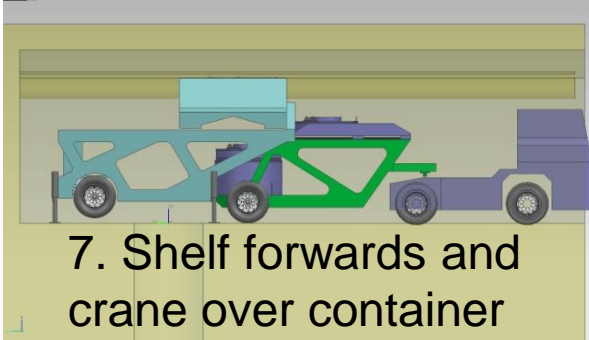
5. Transfer device positioning

The diagram shows the crane moved to the left, now positioned over the container.



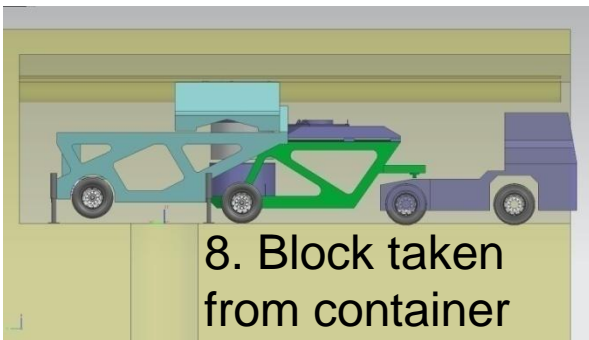
6. Empty gripper to the shelf

The diagram shows the crane moved to the right, now positioned over the depression, with the green gripper arm holding the blue block.



7. Shelf forwards and crane over container

The diagram shows the crane moved to the left, now positioned over the container.



8. Block taken from container

The diagram shows the green gripper arm holding a blue block, having just taken it from the container.



LOT1, Installation of bentonite buffer and pellets

- **BIM was ready for shipment from the manufacturer in October last autumn.**
- **Test plan of Demonstration Phase 1 has prepared.**
- **Writing of Operating and Service Manual for machines.**
- **Test hall in Onkalo area was ready in the end of March.**
- **Final programming and preparations of the machine for the test started in Aprill.**



LOT1, Installation of bentonite buffer and pellet



- Things to note:
 - Laser tracker changed, Leica -> API Control
-> some extra work.
 - Automation and electric has caused extra work
 - Co-operation between different components
 - Wiring faults -> broken components.



LOT1, Installation of bentonite buffer and pellet

- Things to note:
 - Work safety is a bit harder than expected
 - Limited access to test hall, only persons who have a task in the project.



LOT2: Quality of installation

- Work has done at the same time with LOT1, mainly programming
- Main part of the work will take place when the buffer installation demonstrations start.

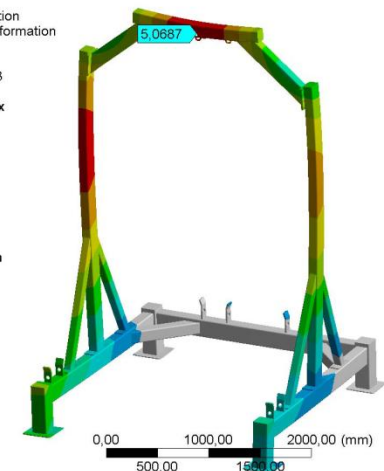


LOT3: Problem handling tools.

- What is needed if the bentonite block falls to the deposition hole during installation?
- Demonstrations after LOT 1 and 2.
- Work has divided in two situations:
 - Before canister installation.
 - After canister installation.

P: 1600 kg
Total Deformation
Type: Total Deformation
Unit: mm
Time: 1
28.2.2014 9:58

5,1855 Max
4,6314
4,0773
3,5232
2,9692
2,4151
1,861
1,307
0,75288
0,1988 Min



DEMONSTRATIONS



- **Demo Phase 1: Testing in test hall in Onkalo site.**
- **Demo Phase 2: Testing in Onkalo demonstration tunnel with concrete blocks.**
- **Demo Phase 3: Testing in Onkalo demonstration tunnel with bentonite blocks.**



DEMO PHASE 1 IN TEST HALL



- Purpose to finalize the installation machine.
 - Detailed test for different functions
 - Adjusting the speed of functions in the machine
 - Perform the installation test with full size concrete blocks
 - To find out what is critical



DEMO PHASE 1 IN TEST HALL



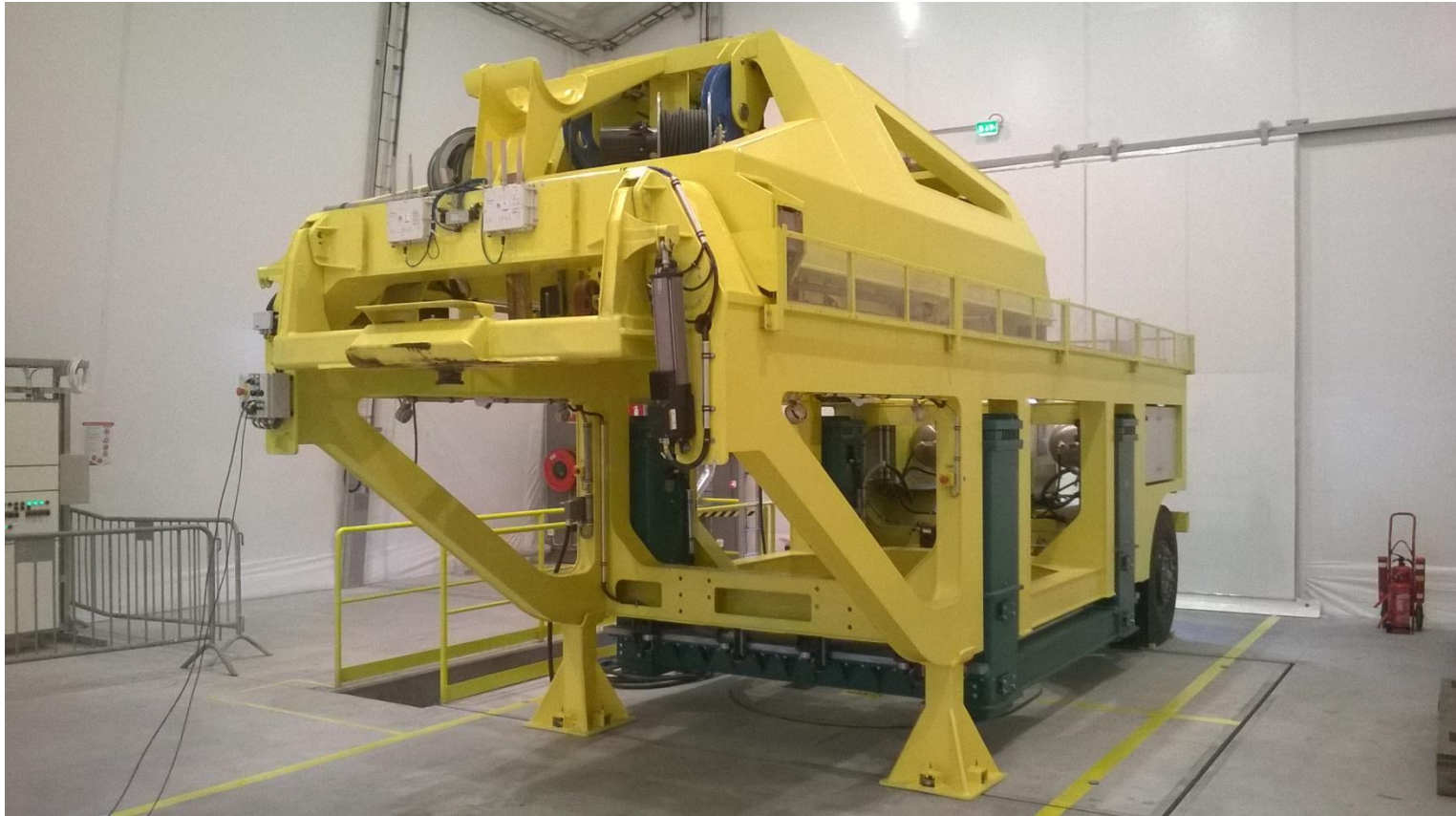
- Most important part of demonstration
- Estimated testing time 3 months: April - June, if everything goes well.



TEST HALL



BIM IN TEST HALL



BIM IN TEST HALL



CONCRETE BLOCKS WITH CONTAINER TOPS



DISPOSAL HOLE IN TEST HALL



DEMO PHASE 2: TESTING IN ONKALO WITH CONCRETE BLOCKS

- **Targets:**
 - **To test the installation in Onkalo conditions**
 - **Installing of whole buffer within two hours**



DEMO PHASE 3: TESTING IN ONKALO WITH BENTONITE BLOCKS

- What kind of effect the bentonite gives to installation process?
- What is the effect of moist conditions in Onkalo
- How safe is the process?



DEMO PHASE 3: TESTING IN ONKALO WITH BENTONITE BLOCKS

- Possibly isostatically pressed bentonite blocks are not available.
- Alternative buffer: Mixture of uniaxially pressed bentonite and concrete blocks.
- The handling of concrete blocks with vacuum lifter is more risky than bentonite blocks



DEMO PHASE 3: TESTING IN ONKALO WITH BENTONITE BLOCKS

- **Alternative buffer: Mixture of uniaxially pressed benonite and concrete blocks.**
 - **Bentonite blocks in critical positions:**
 - **Bottom and top**
 - **First and last ring**
 - **First on the canister**



WORK SAFETY OF BIM AND BTD

- During the demonstrations, access to the test place is limited.
- Demo Phase 1 in the test hall.
 - When demonstration is going on, only operators and responsible persons can be in the test hall!
 - Special arrangements for visitors; the access is denied, follow up of demonstrations via cameras.



WORK SAFETY OF BIM AND BTD

- **Demo Phase 2 and 3**
 - **Steering of installation will be performed by cameras with wireless method outside of disposal tunnel**
 - **During the installation the access to disposal tunnel is denied**



WORK SAFETY OF BIM AND BTD

- Before the start of demonstrations, is needed:
 - Detailed test plan.
 - Safety estimation of tests.
 - Training of employers for working in Onkalo area and in demonstrations.
 - Operating manual of machines.





POSIVA