Brief Overview of Interaction Region Conventional Facilities in RDR Times

Presenter

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RDR Basis

- The CMS Detector Hall design concepts were applied as the basis for the ILC IR design and costing.
  - **Detector Constructed on the surface**
  - **Detector Moving System**
  - **Platforms along wall**
  - **Power Requirements**
  - **Hoists and Cranes**
- HVAC and Fire Protection extended from other areas of RDR, No Process Cooling included.

General Description (RDR)

- Experimental Area: The largest cavern of the ILC project is the Detectors hall which is centered on the Intersection Point of the two 250 GeV beams. The two Detectors being placed in a “Push Pull” type configuration, the total length of this hall is 120 m. It is connected to the surface assembly buildings through two 16 m diameter shafts, one for each Detector.

General Description (RDR)

- It is also connected to the Beam Tunnel, to the service cavern through a passageway and to the survey galleries. The floor slab is thick enough to accommodate the weight of the two Detectors and the weight of the movable shielding wall (2 pieces) in between the Detectors. The walls of the hall are equipped with 3 to 5 levels of steel platforms to be used for services and access at various levels to the Detectors.

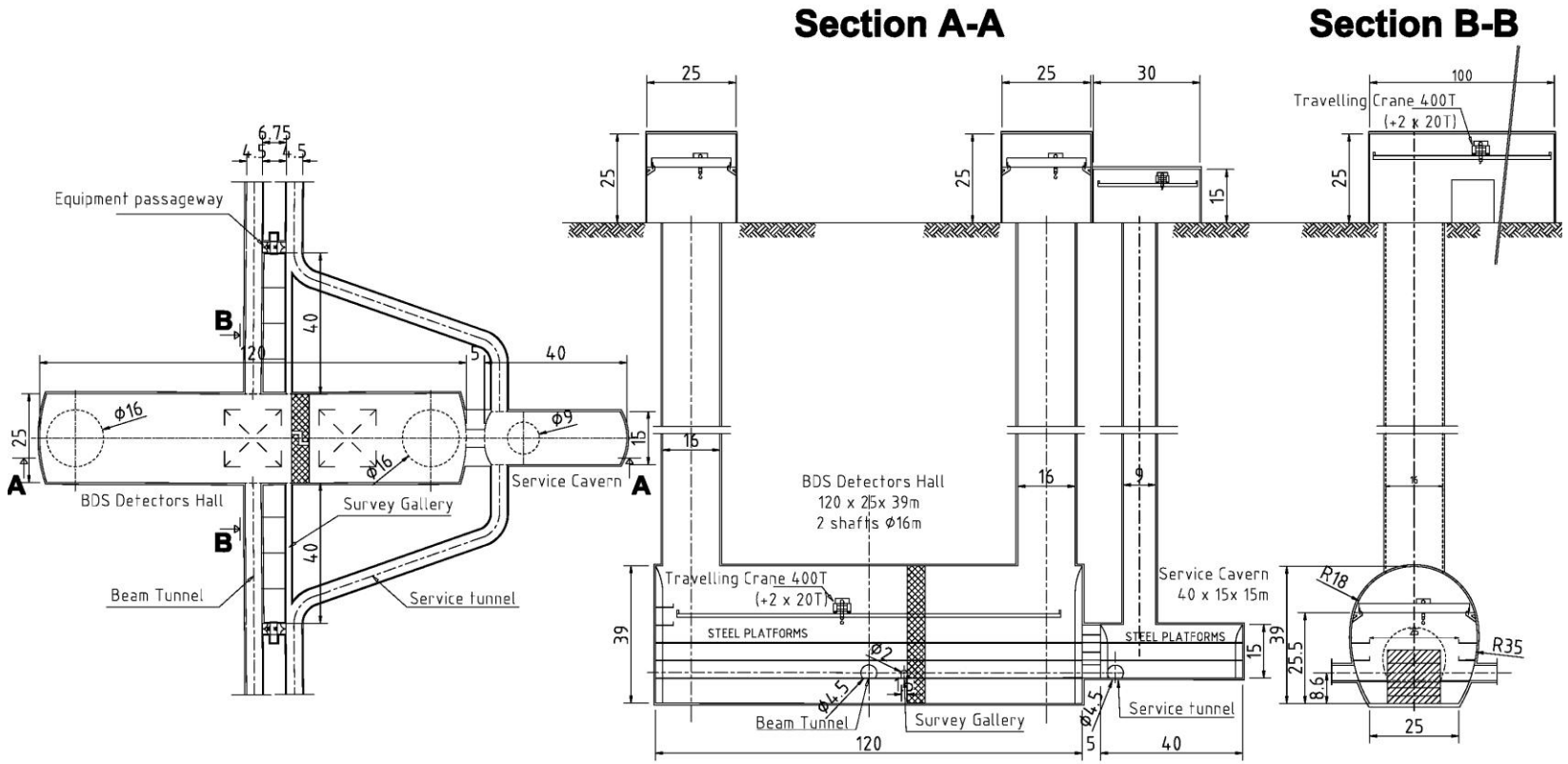
General Description (RDR)

- It also receives beams and rails for one 400 tonnes crane and two 20 tonnes cranes, taking into account the pre-assembly at surface of Detector elements of 400 tons at most.

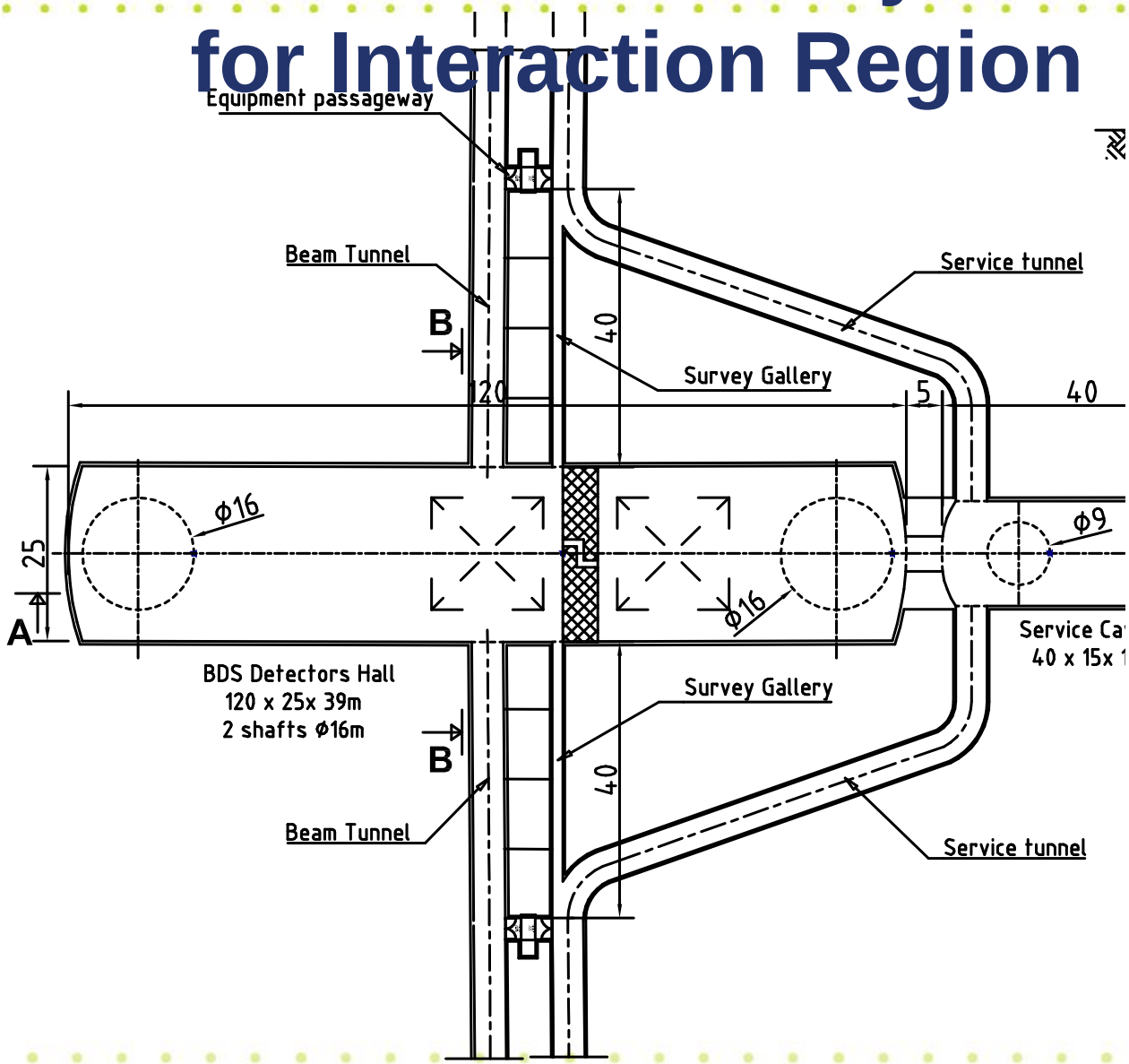
Geotechnical Constraints

- The shapes of the caverns, alcoves and of the Detectors hall are defined by the geotechnical characteristics of the surrounding ground. For the American, Asian and European sites, the most efficient design implies vaults of different radii (i.e. lower vaults in granite at the Asian site, more cylindrical shapes in sandstone at the European- CERN site). The linings are made of cast in situ concrete or sprayed on concrete with drainage systems behind it.

Plan and Sections (Europe)



RDR Baseline Layouts for Interaction Region



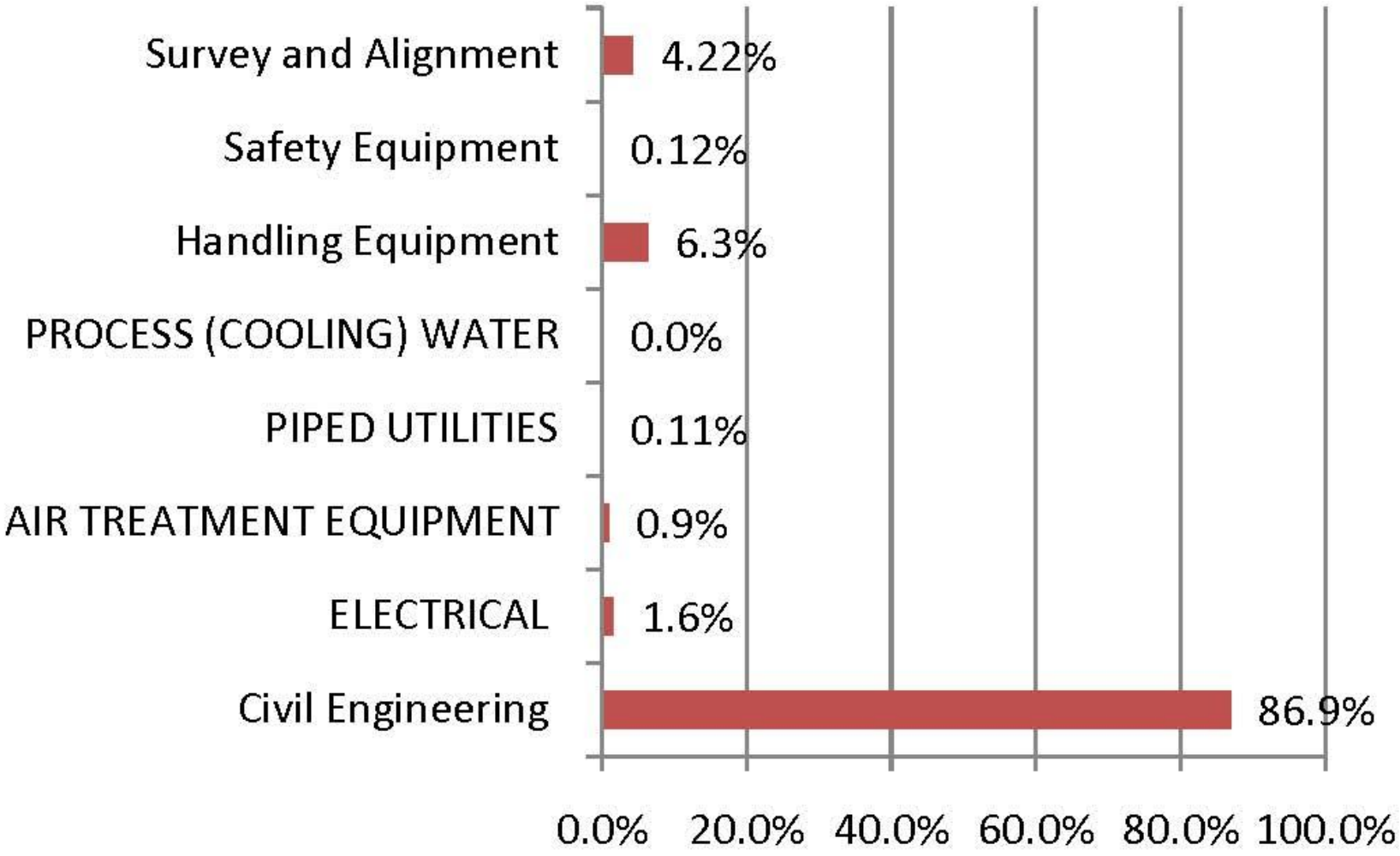
Civil Cost Elements (Americas)

Shafts
Shafts, 16m dia. - Points 1.1 & 1.2 (2 x 425 vert ft)
Surface Grouting of Points 1.1 and 1.2 16m dia. Shafts (2 x 425 vert ft)
Points 1.1&1.2 - 16m dia. Shafts, finishing (stairs, conc. wall, elev.#2)
IR Underground Potable Water (Points 1.1 & 1.2)
IR Underground Sanitary Sewer (Points 1.1 & 1.2)
Halls
IR Detector Hall, D&B Excavation 120x25x37m (151,941 CY)
IR Detector Hall, Steel Platforms (incl. all fittings)
IR Detector Hall, Steel Track Plates (20x80x.05m @ 8000 kg / m3)
Caverns

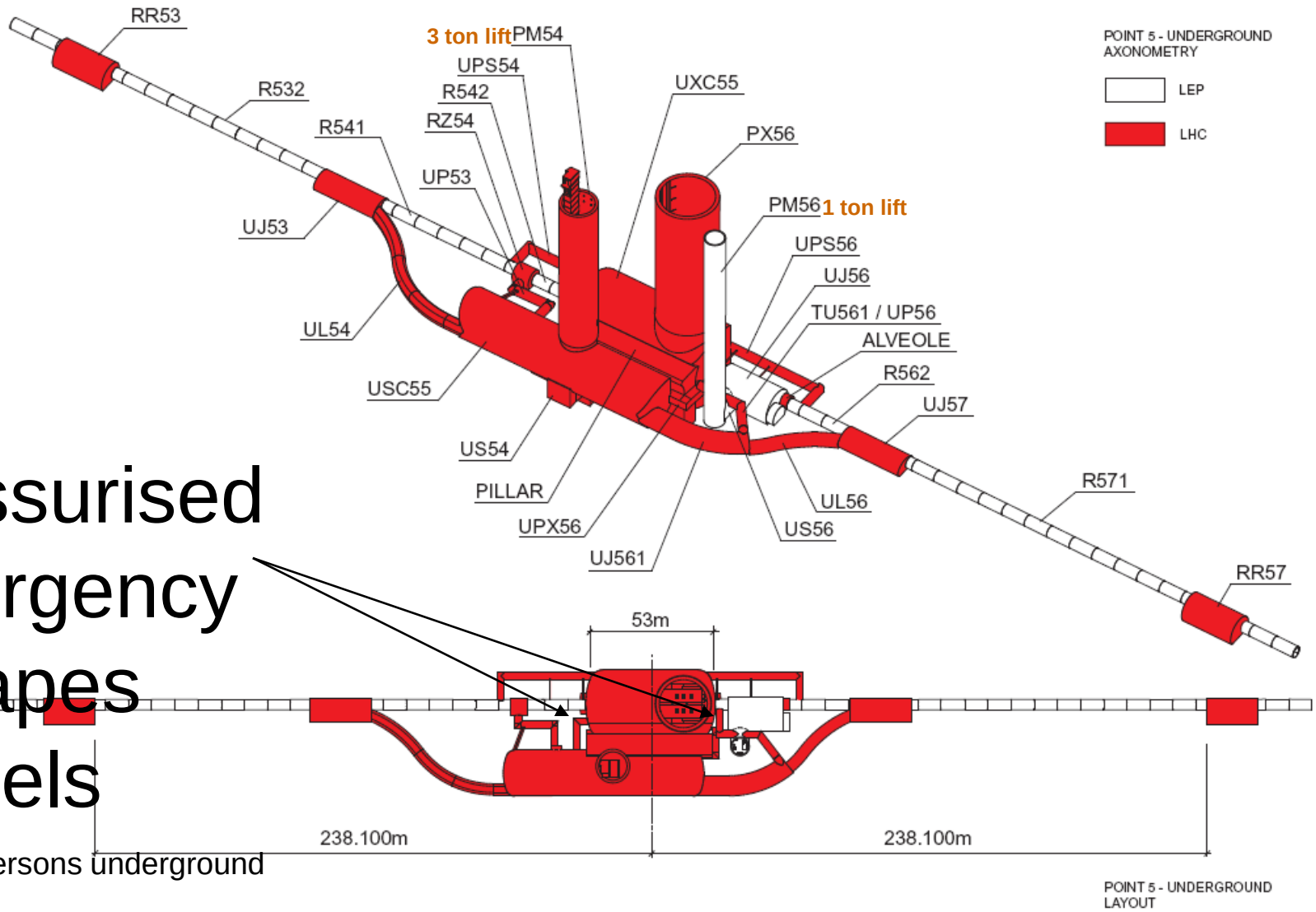
Civil Cost Elements (Americas)

Detector Assembly Buildings
Points 1.1 & 1.2 Detector Assembly Buildings (2 x 37,500 sq ft)
Office Buildings Service Buildings
Point 1.1 Machine & Detector Access Building (22,500 sq ft)
Point 1.1 Electricity Service Building (1,500 sq ft)
Point 1.1 Cooling Towers & Pump Station Building (7,500 sq ft)
Point 1.2 Cooling Towers & Pump Station Building (7,500 sq ft)
Point 1.1 Cooling Ventilation Building (2,500 sq ft)
Point 1.2 Cooling Ventilation Building (2,500 sq ft)

Cost Distribution



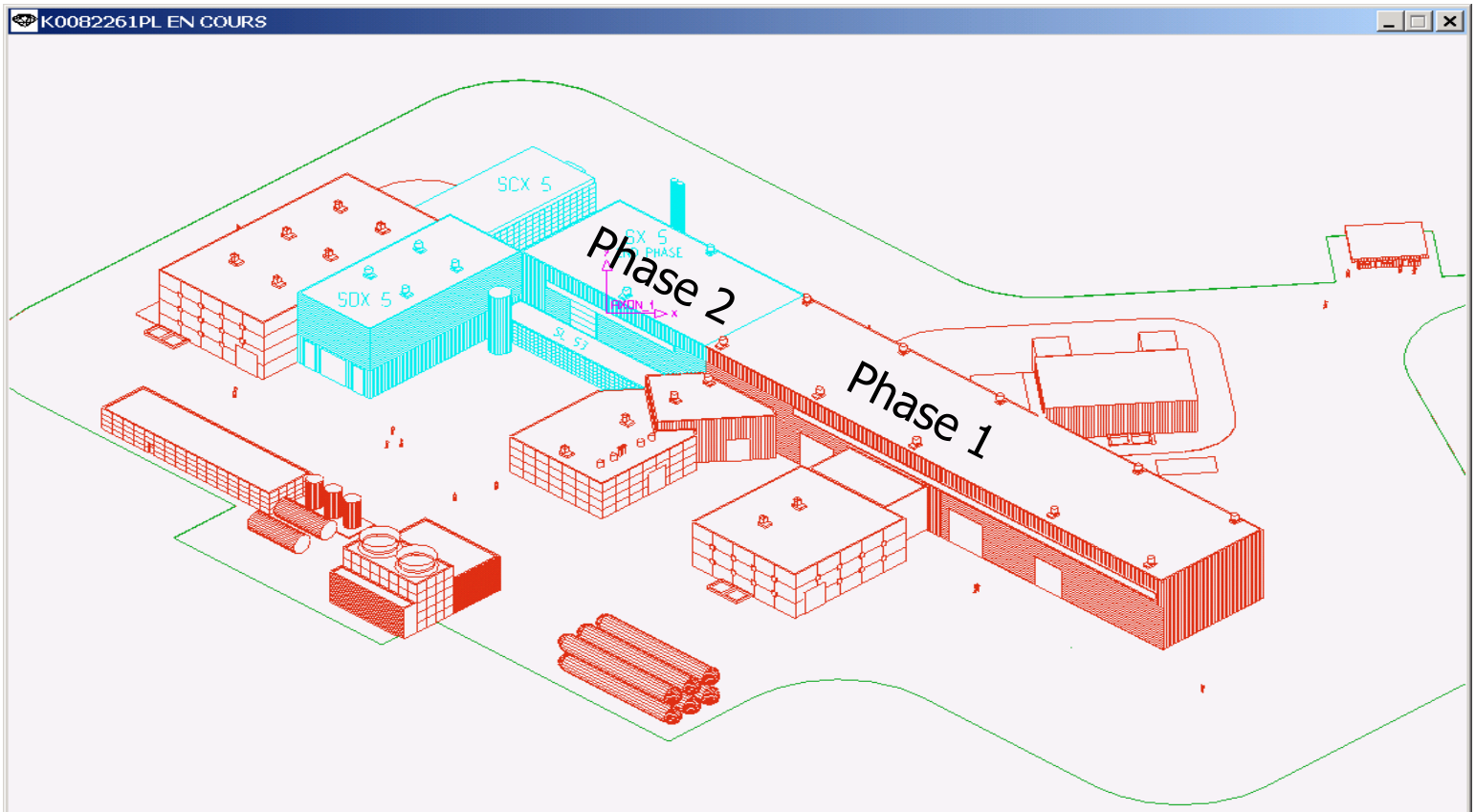
CMS



Pressurised emergency escapes tunnels

Max 100 persons underground

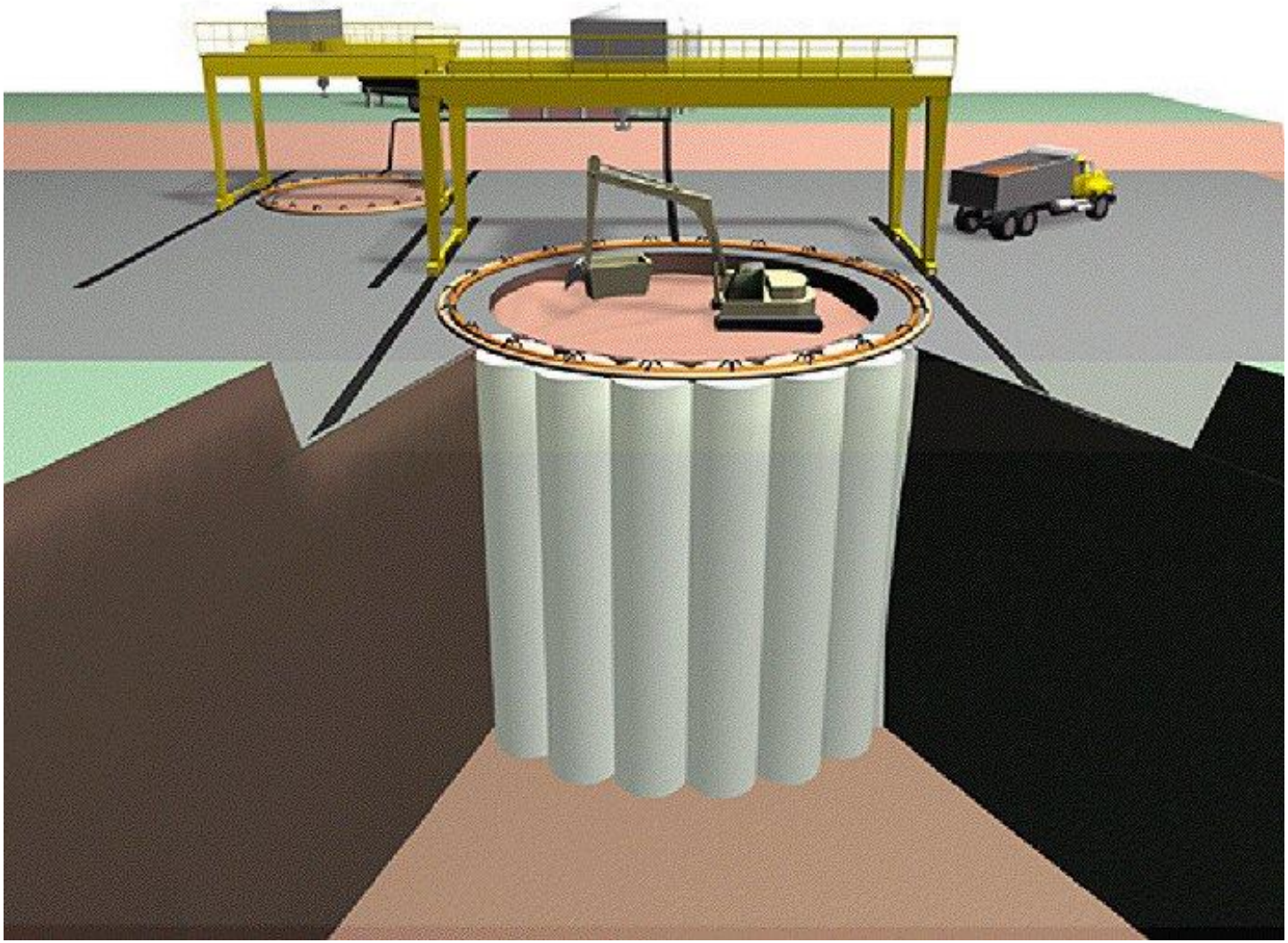
CMS – Surface buildings



- **CMS assembly building staged construction**

CMS – Surface buildings

Ground Freezing for CMS shaft excavation

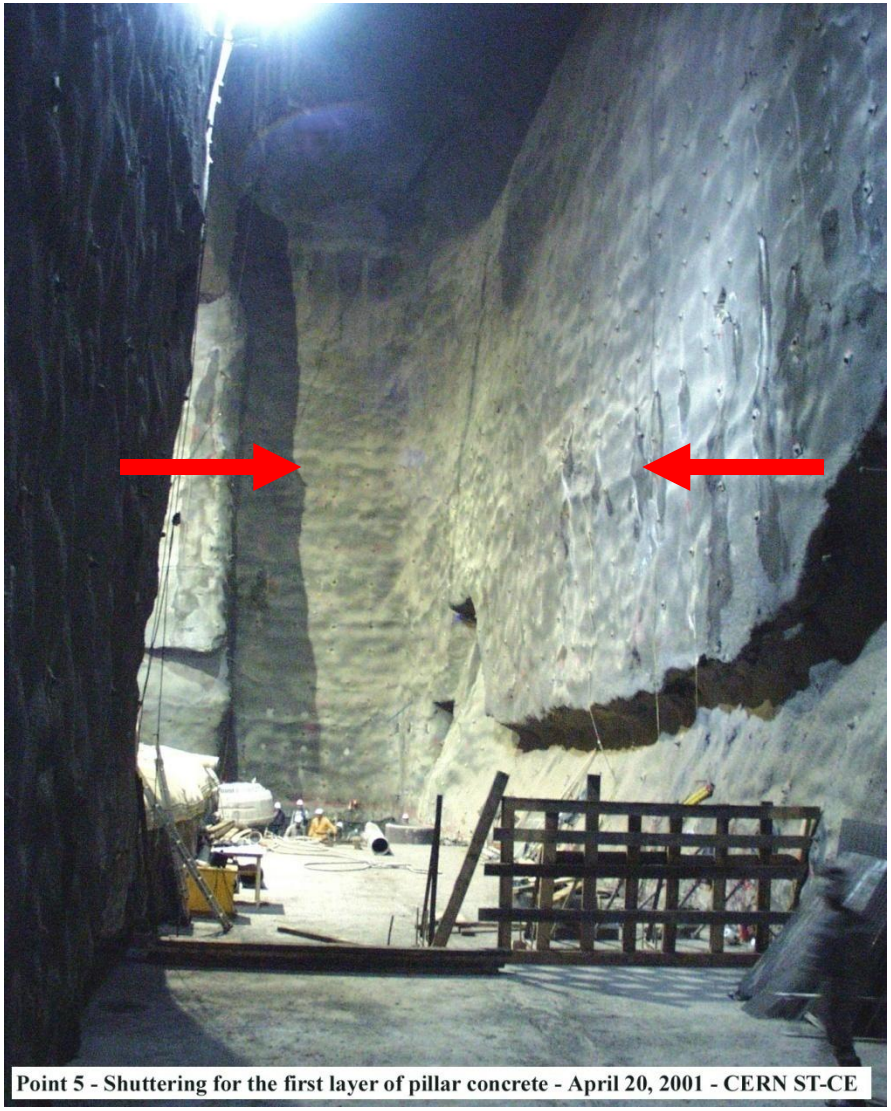


Ground Freezing for CMS shaft excavation

Point 5 -Excavation commencement of PM54 shaft - July 09, 1999 - CERN ST-CE

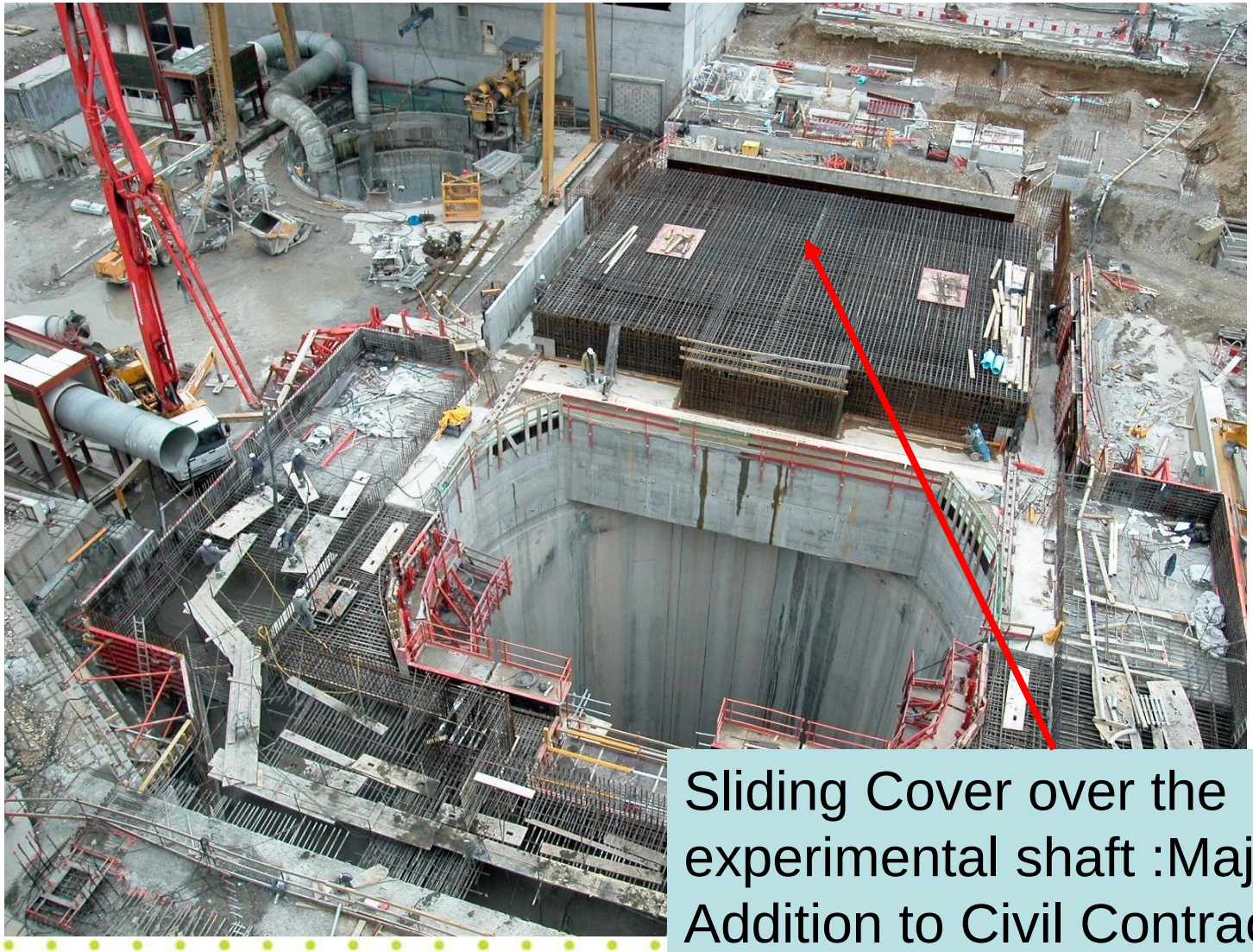
Hydraulic Breakers used for Rock Excavation

Typical Problem encountered during construction



Excessive Horizontal Displacements of the Rock during Pillar excavation :

Contract Flexibility required



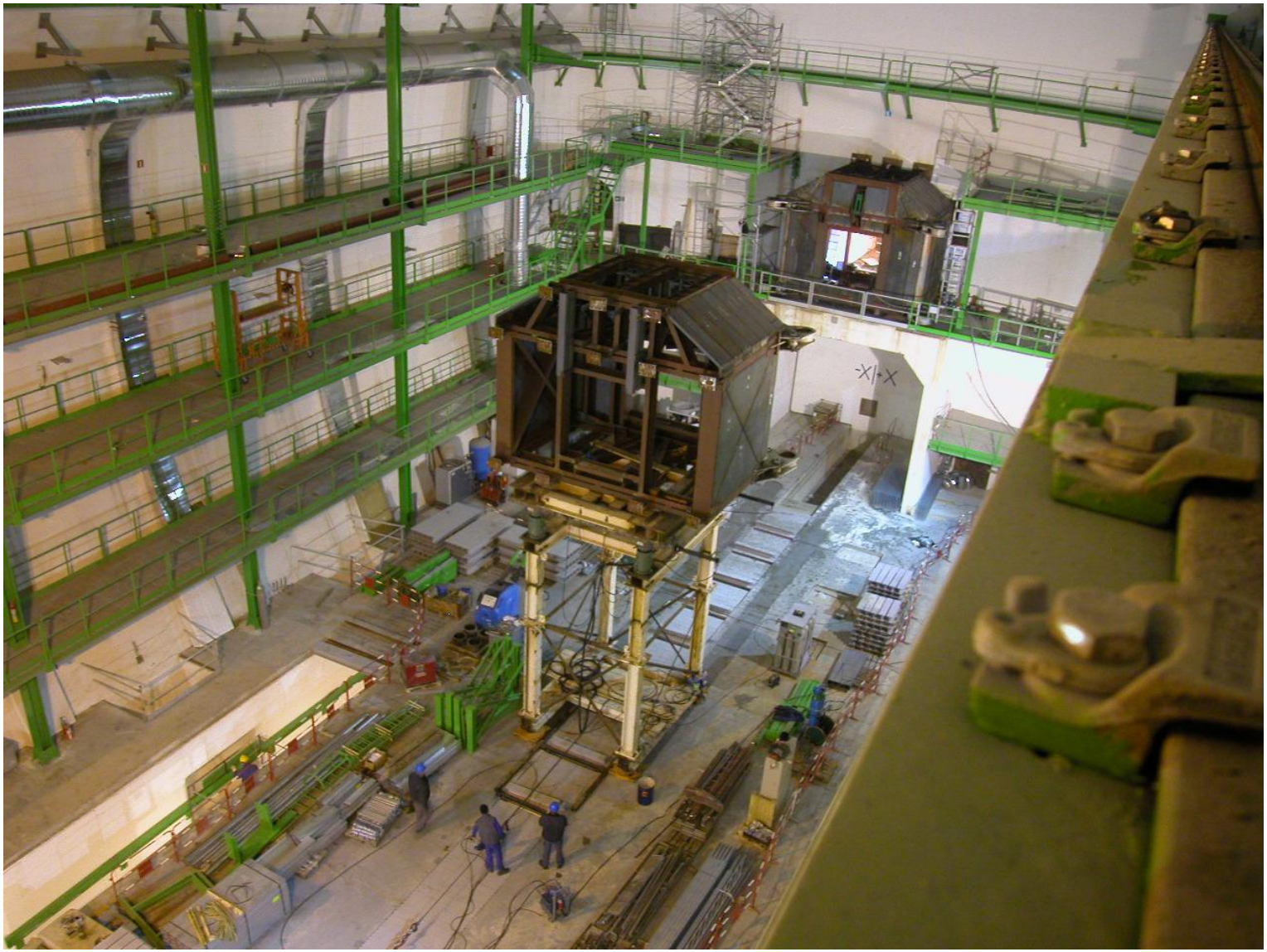
Sliding Cover over the experimental shaft :Major Addition to Civil Contract

Sliding Cover complete prior to completion of Phase 2 of experimental building

Steel anchorages for Blockhouse shielding cast into concrete

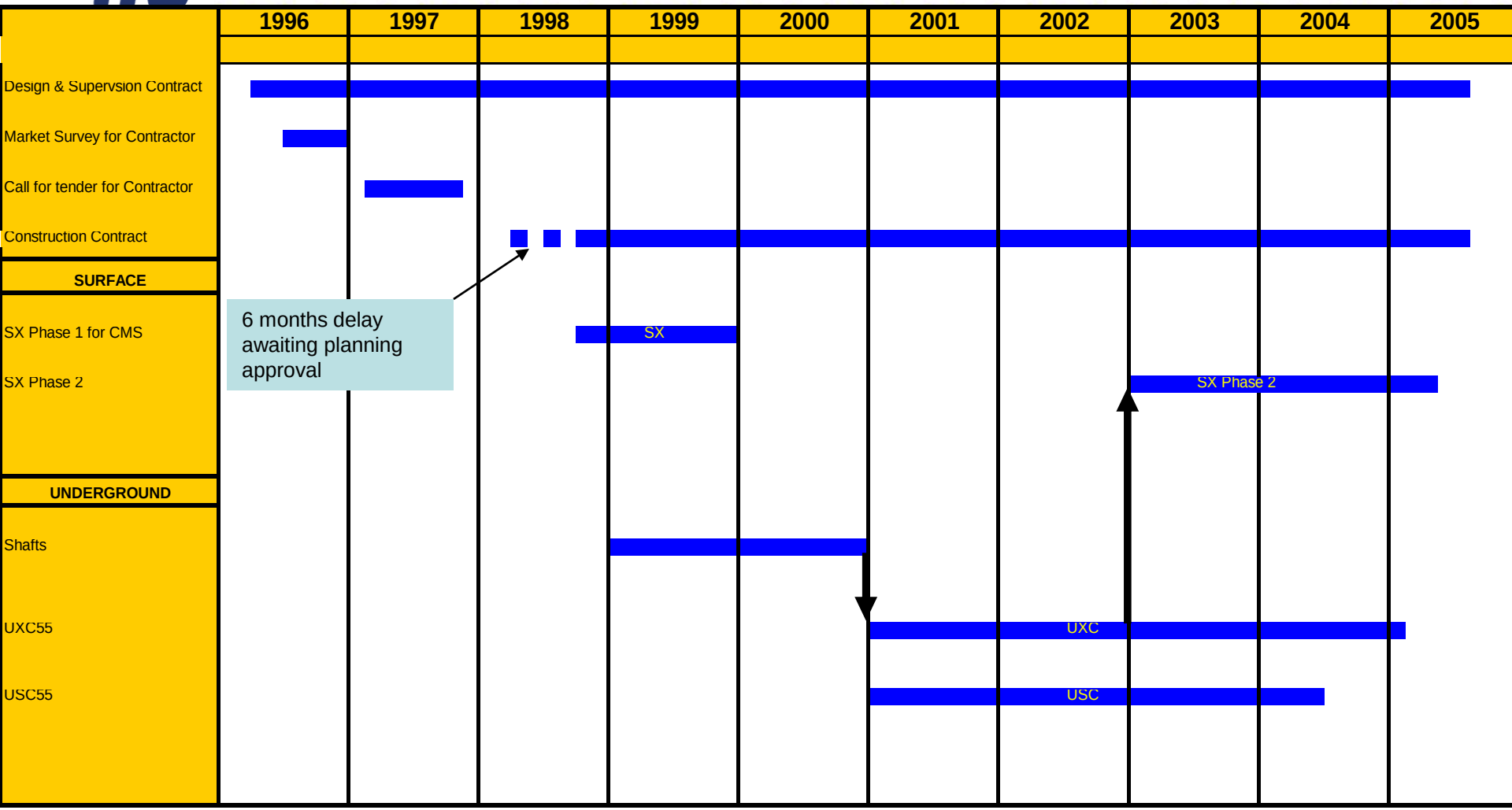
CMS cavern 53m long, 27m wide by 25m high

Blockhouse Installtion



CMS Rotating Shielding installation in cavern

LHC CIVIL ENGINEERING AS-BUILT FOR CMS



J.Osborne October 2006

Expected Cavern Movements

- For LHC civil engineering predicted that some cavern movements could be expected during/after construction.
- For example for ATLAS Cavern* predictions :
  - **Up to 2mm settlement after floor concreting**
  - **Up to 5.5mm settlement predicted after ATLAS in place (during first 6 months)**
  - **In the order of 1mm uplift per year thereafter**
- Monitoring of cavern movements on-going.
- These factors need to be considered at an early stage in detector/machine designs

***Extract from CERN EDMS Doc. *ATC-T-ER-0004* by C.Lasseur, D. Lissauer, M.Hatch**

Current Geometry