



Si D in 14mrad/14mrad/z=0 ILC

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SiD Advisory Group
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Change Requested

- **Current**
 - 2mrad/20mrad layout with IPs separated by $x=21\text{m}$, $z=138\text{m}$
 - Linacs point at 20mrad IP
 - Soft bend to 2mrad IP
- **Request**
 - 14mrad/14mrad layout with IPs separated by $x=28\text{m}$, $z=0$
 - Linacs point at one of the 14mrad IPs
 - Soft bend to the other

Crossing Angle

- **20mrad→14mrad is good for e+e- in every respect**
 - $\gamma\gamma$ upgrade to ≥ 25 mrad will require digging new extraction line tunnels
- **Arguments surrounding low (0,2) vs high (14,20,25) are well documented**
 - **Low Crossing Angle**
 - Increased hermiticity at low angles
 - SUSY search for stau will low Δm
 - Lower (x2) backgrounds from backscattered e+e- beamstrahlung-produced pairs
 - Larger aperture magnets and required to support diagnostic chicanes lead to 62MW power req.
 - Separate photon dump and high power (>250 kW, depending on parameter set) collimators required
 - Longer extraction line
 - Crab cavity not essential
 - **High Crossing Angle**
 - Cleaner extraction, especially at higher energy, higher disruption beam parameters with modest magnets, minimal collimation, & shorter beamlines
 - Cleaner measurements of Energy and Polarization of disrupted beam
 - Crab cavity essential
 - DID desirable for polarization compensation & orbit correction, (anti-DID) for directing e+e- to exit aperture to avoid backscattered e+e- debris
 - **Symmetric 14/14 vs. low/high**
 - Matter of taste
 - Increased emittance dilution at IP protected by the 14 mrad “Big Bend”

IPs at a Common z

Advantages

- Remove “Stretch” in linac introduced to accommodate timing constraints required by $\Delta z=138\text{m}$
- PRESUMED cost savings due to shared facilities

Disadvantages

- Interference between detector construction, installation, operations and maintenance

Confusions

- CURRENT Baseline not well described to detector community
 - Underground hall designs are regional (and therefore different)
 - Above ground cost model is CMS at LHC
- No design of common z halls & structures available yet
- Future change request to mandate CMS style above ground assemble has been advertised

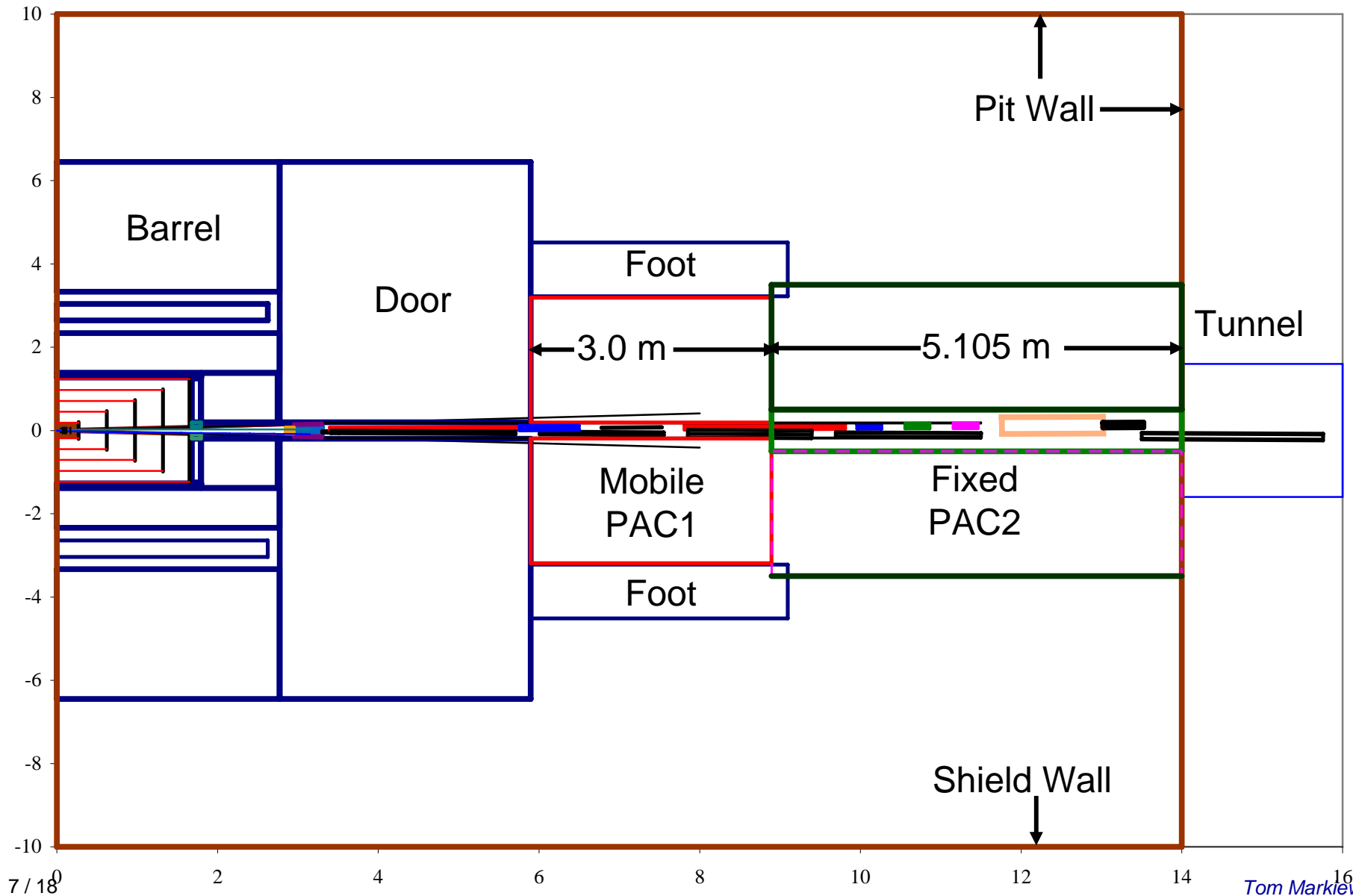
2005.10.11 Discussion of Si D Underground Hall Space Requirements shown 2005-12-16 Talk at Si D Collaboration Meeting

- **SiD Dimensions from 2005-05 files**
 - Barrel radius=6.450m
 - Barrel half-length=2.775m
 - EC Yoke=3.12m thick
 - EC Yoke ends at 5.895m=2.775+3.120m
- **Garage assembly requirements**
 - **3m shielding wall between beamline position & garage**
 - Assuming self-shielding [which seems OK: see L. Keller, 2005.12.13 SLAC BDS mtg.] wall needed for commissioning only
 - **5m free space between shield wall & rotated barrel yoke**
 - 2m free + 2m assembly fixture+1m free
 - **4m free space between rotated barrel yoke & rotated barrel HCAL**
 - 1m free + 2m assembly fixture+1m free
 - **5m free space between rotated barrel HCAL & pit wall**
 - 2m free + 2m assembly fixture+1m free

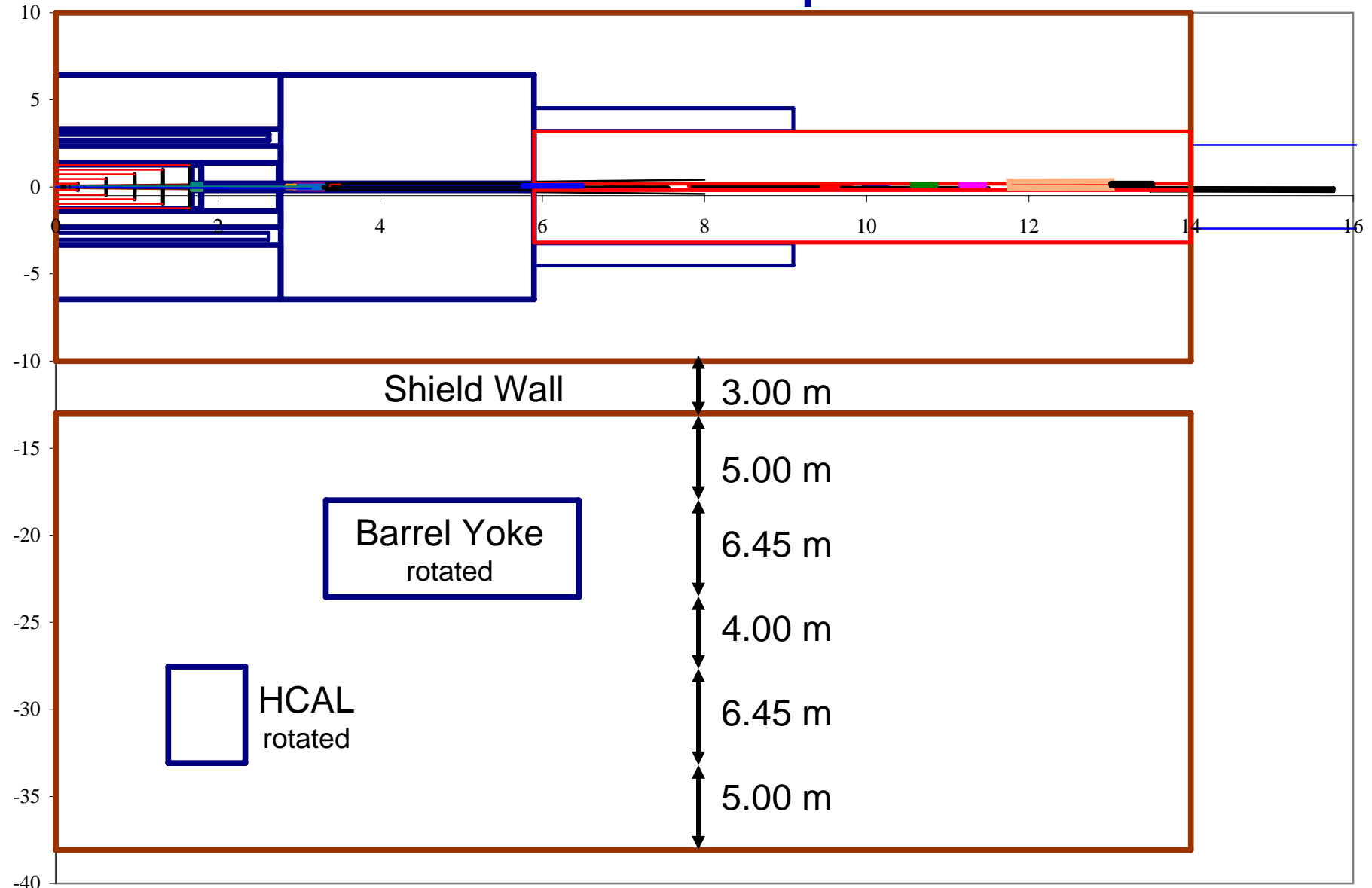
Detector Access Guesstimates

- **Door support leg overhang=**
 - 3.2m~25% door height (=barrel diameter=12.9m)
- **Door opening=**
 - 3.0m
- **Free space to walk around door ends=**
 - 1.9m
- **Reserved radius =**
 - 8.0m (6.45 iron +1.55m services)
- **Free space between dressed barrel & pit walls=**
 - 2.0m
- **PACMAN annulus=**
 - 3.0m [1m Fe, 2m concrete]
- **Other**
 - Tunnel diameter 3.2m
 - Assumed beam height=Barrel radius + 1m

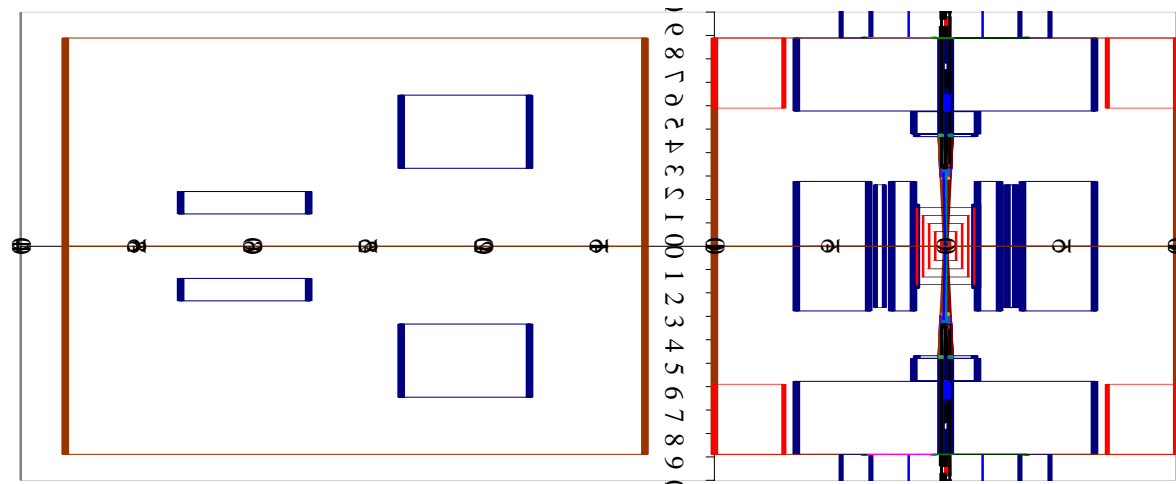
SiD closed, on beamline, in 20m x 28m



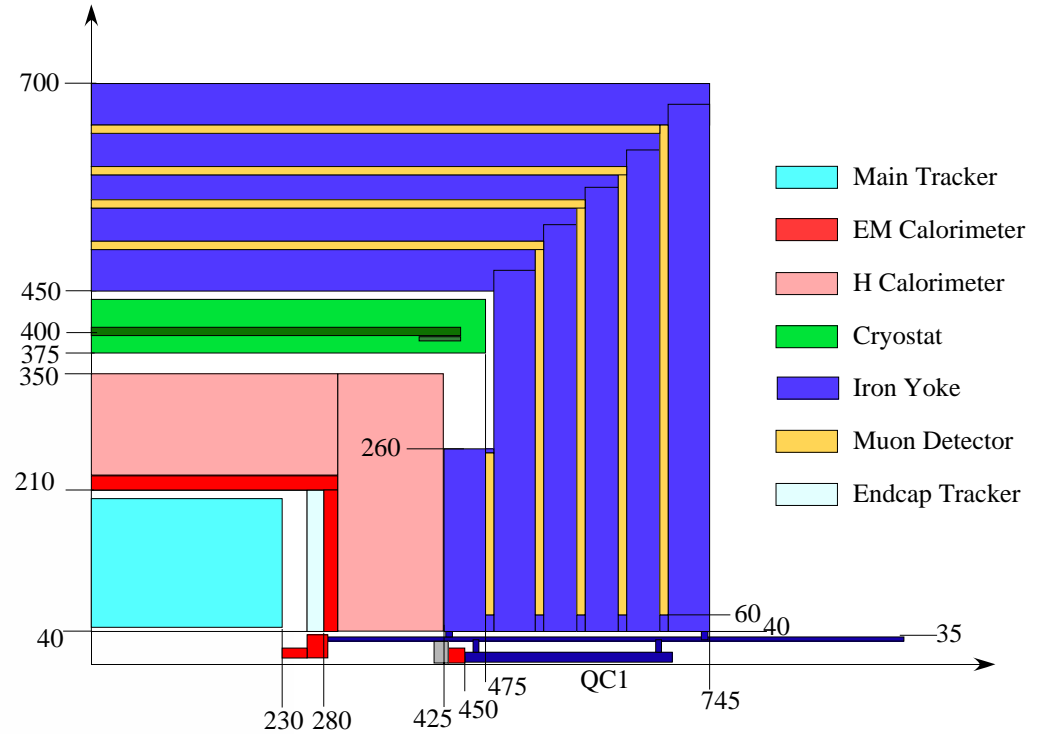
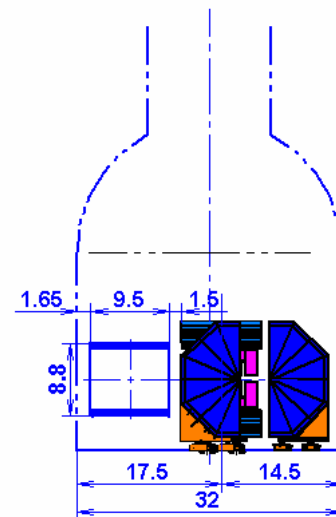
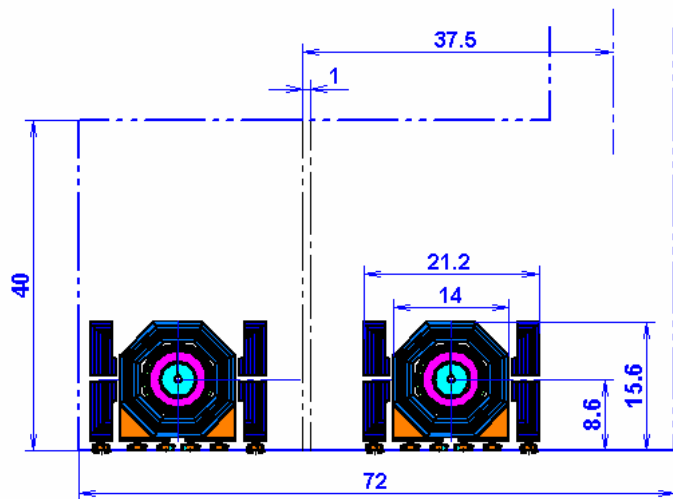
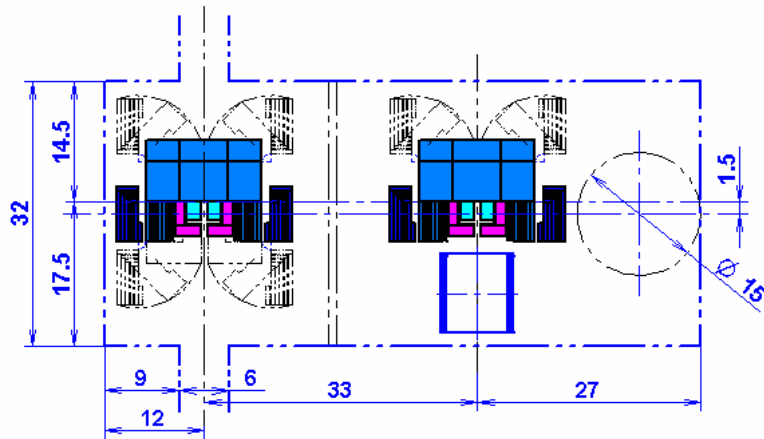
Half SiD in 48m x 28m IR anamorphic scale



SiD (open) in 48m x 18m IR X scale = y scale



GLD



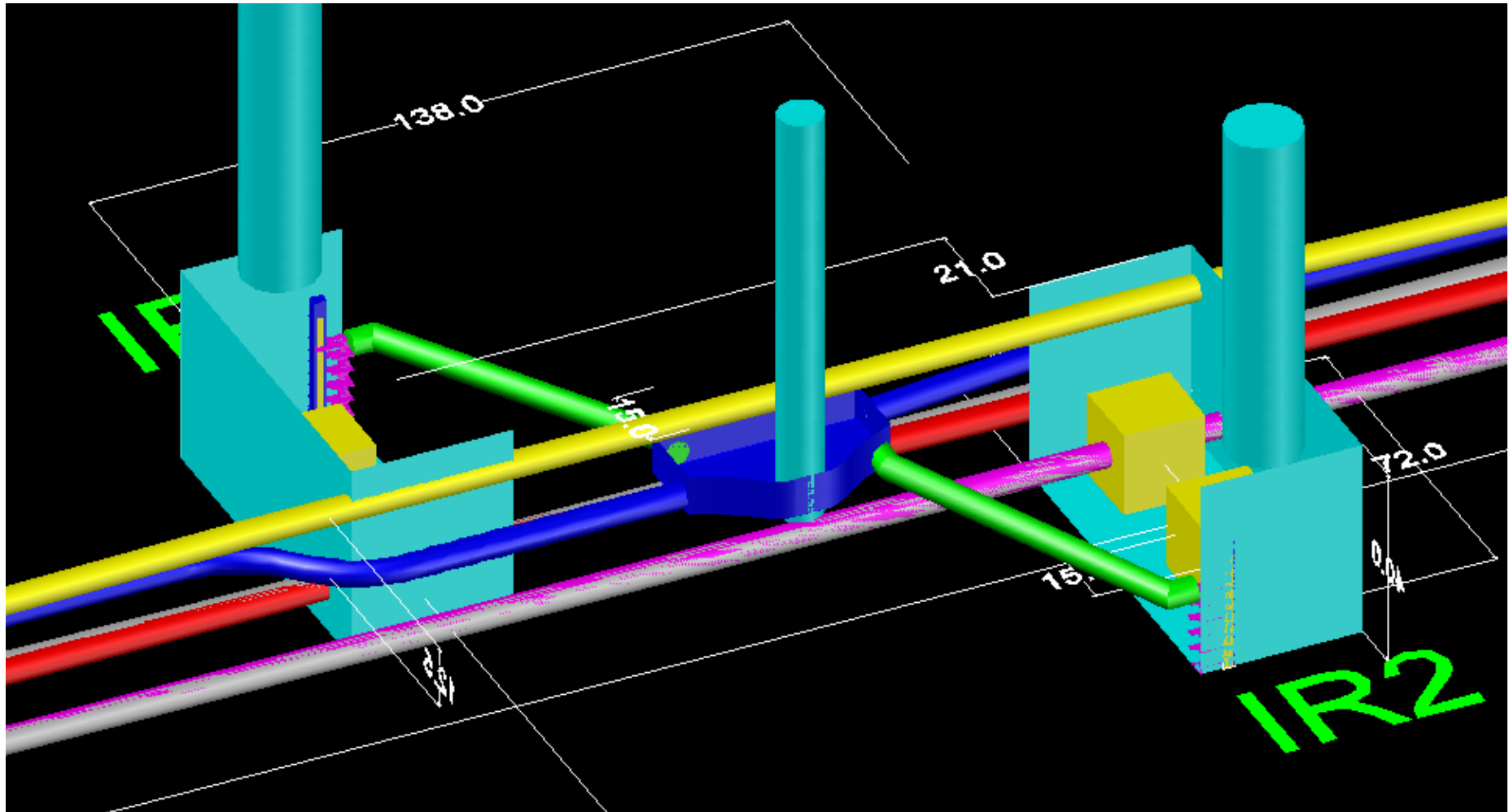
14.9x14.0x14.0 m³ in 32m (z) x 72m (x) x 40m (y) cavern with 15m ϕ access shaft

Assembly from "bottoms-up" in "garage"

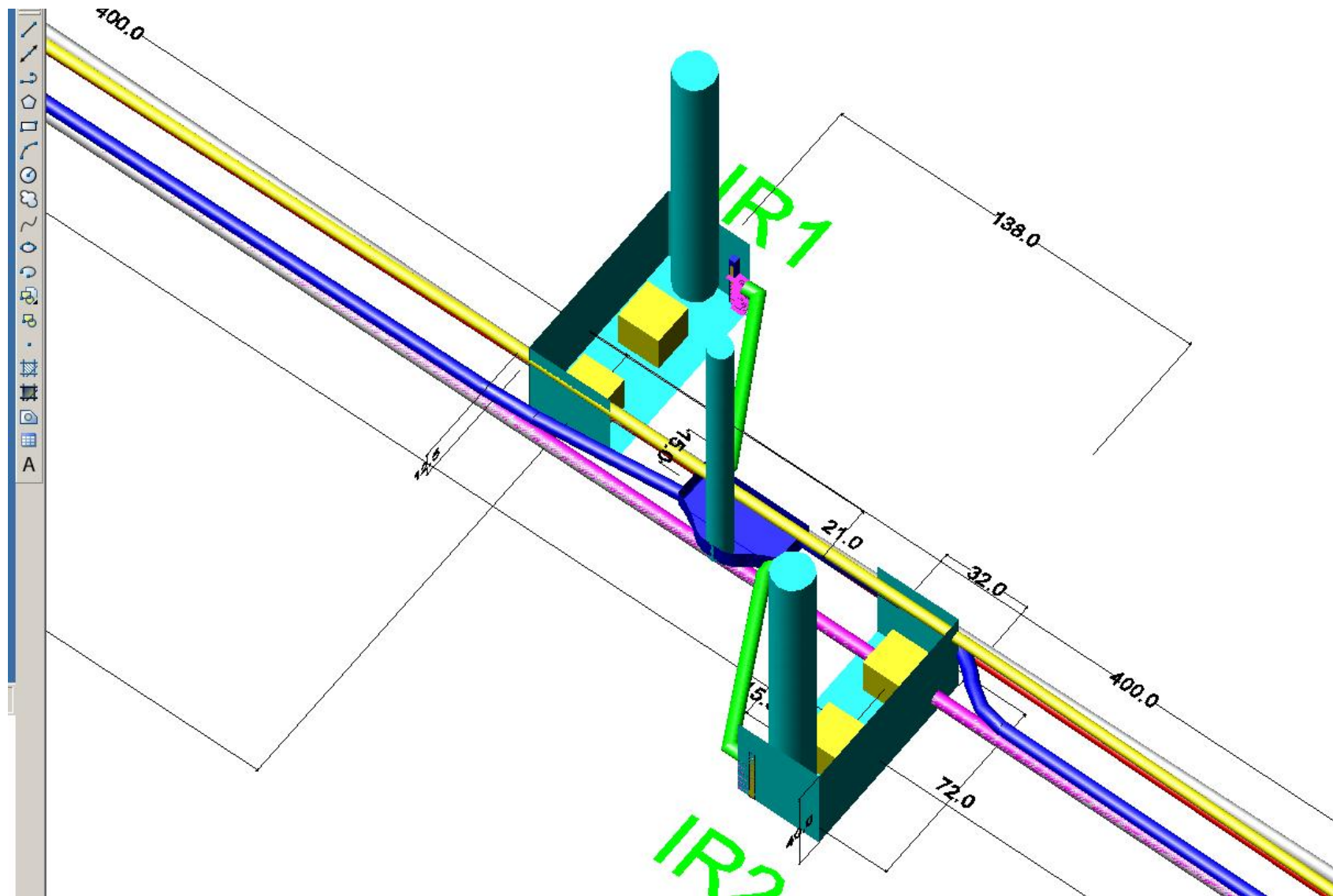
Repair access by transverse door motion

TPC slides along beam line to access VXD

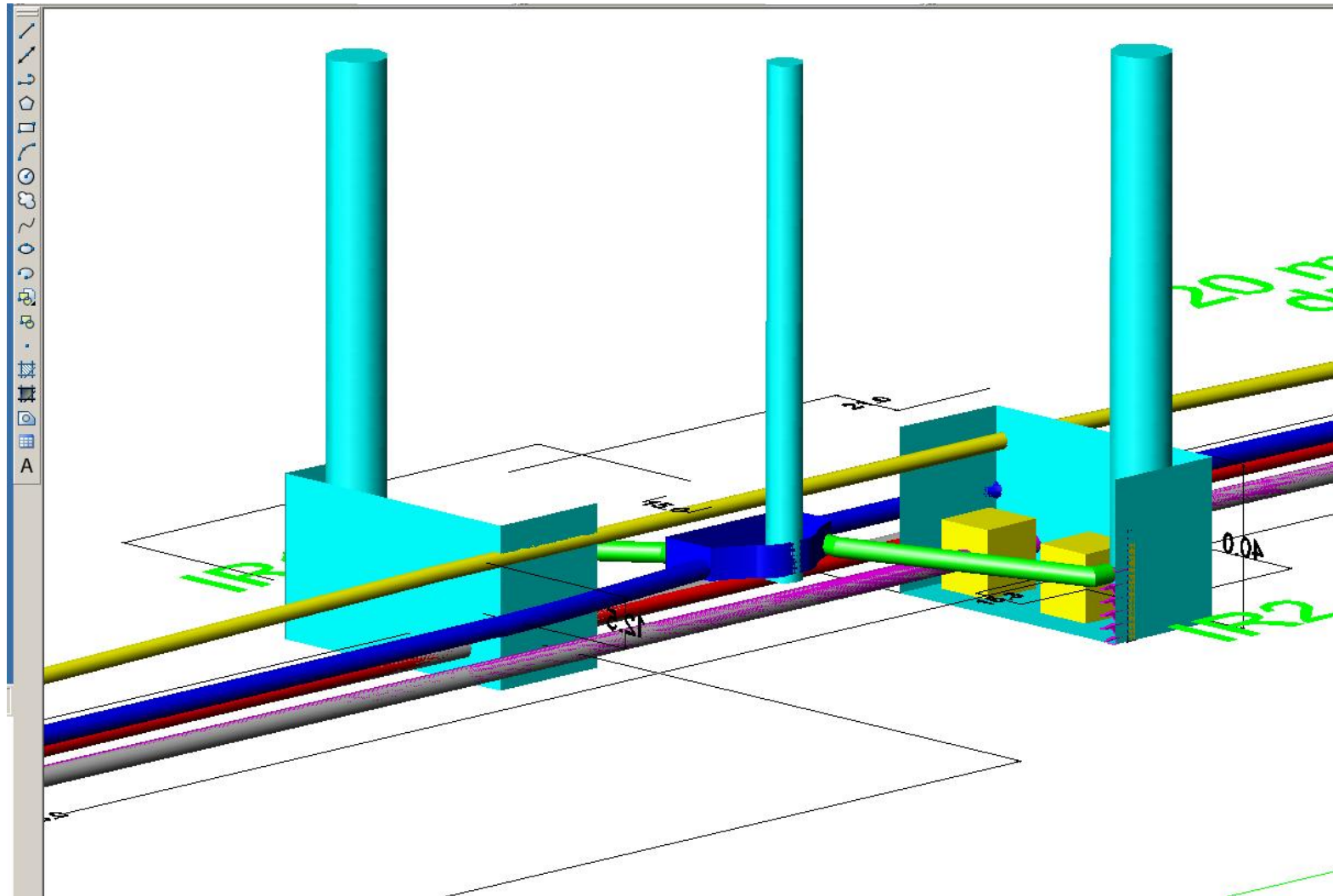
Americas CF&S conceptual layout



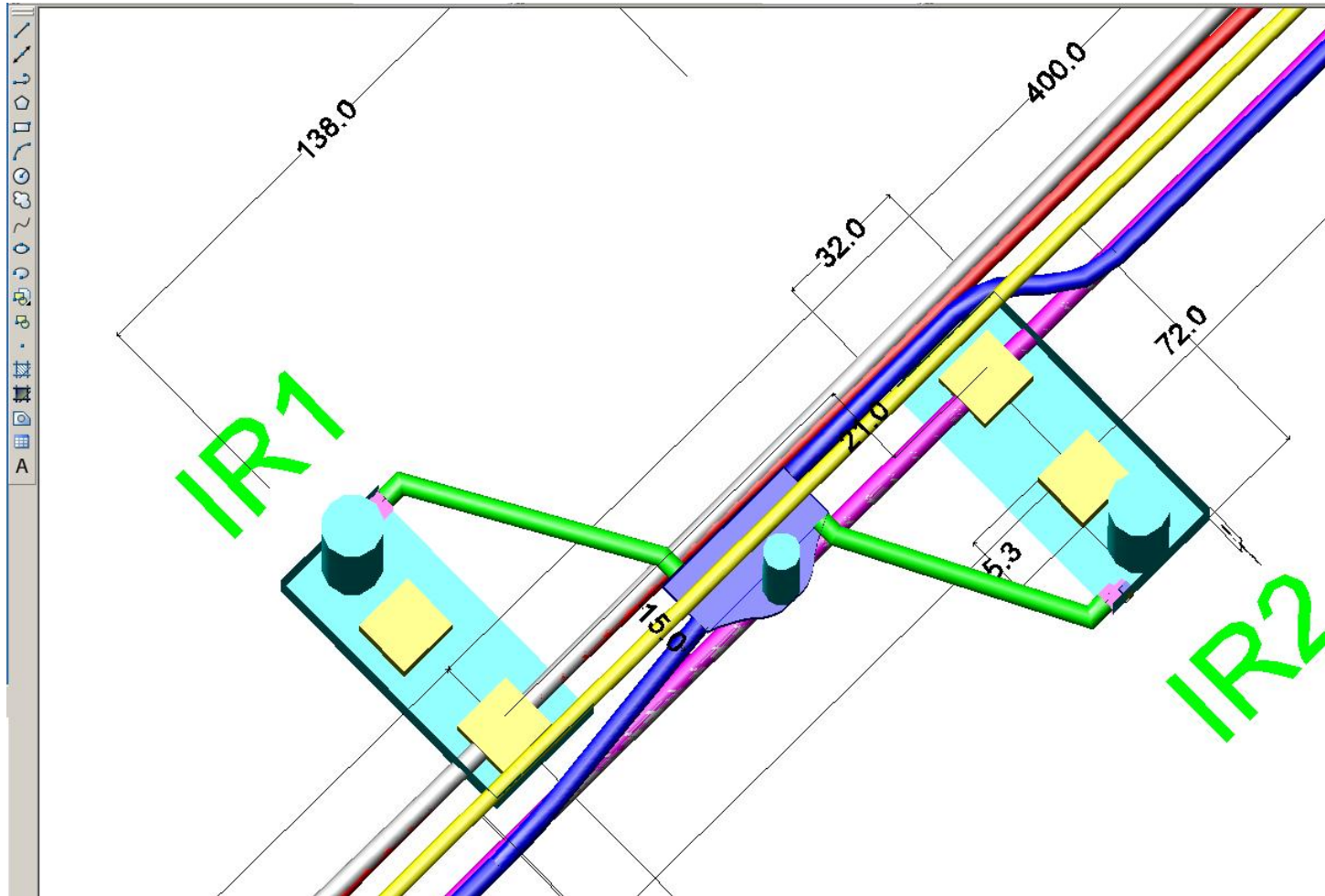
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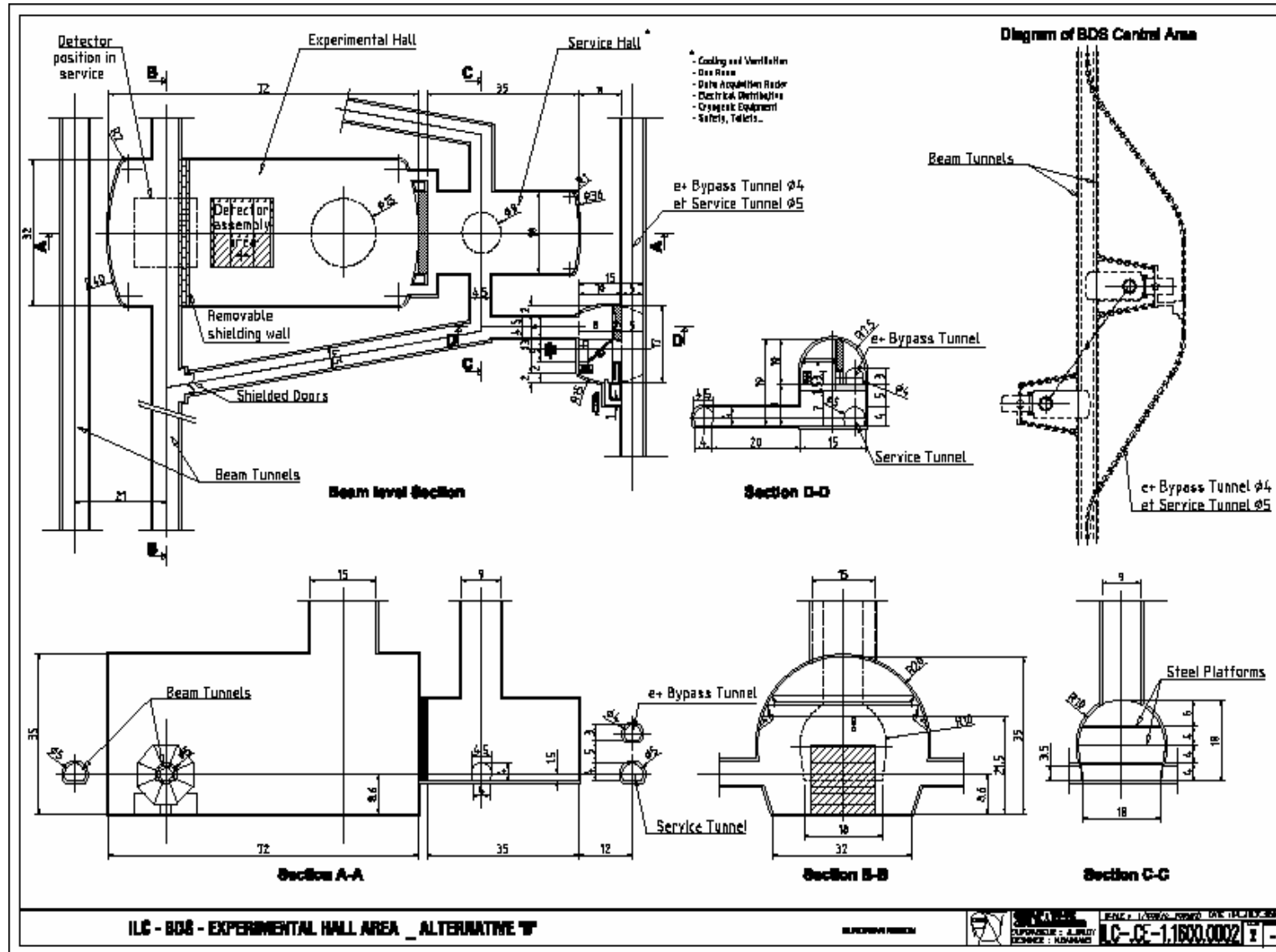
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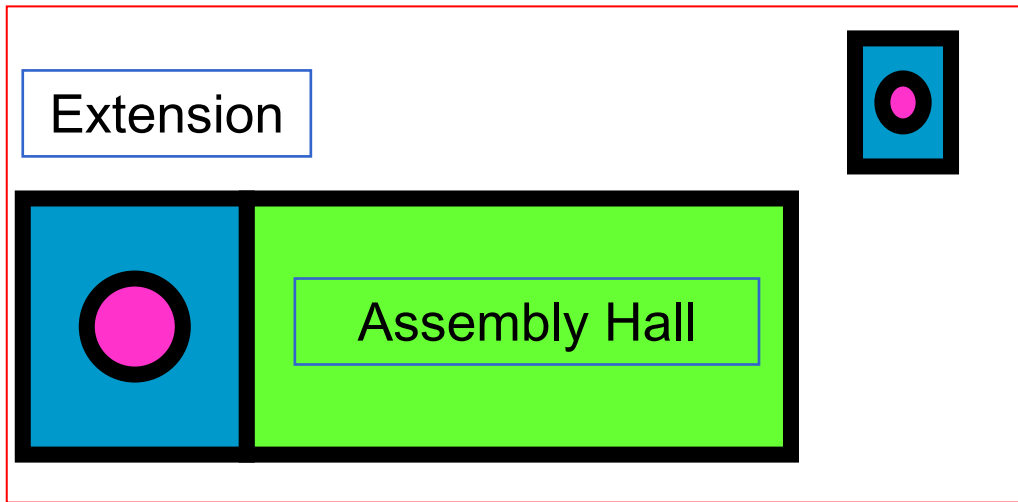
Americas CF&S conceptual layout



CERN Underground Cavern Scheme

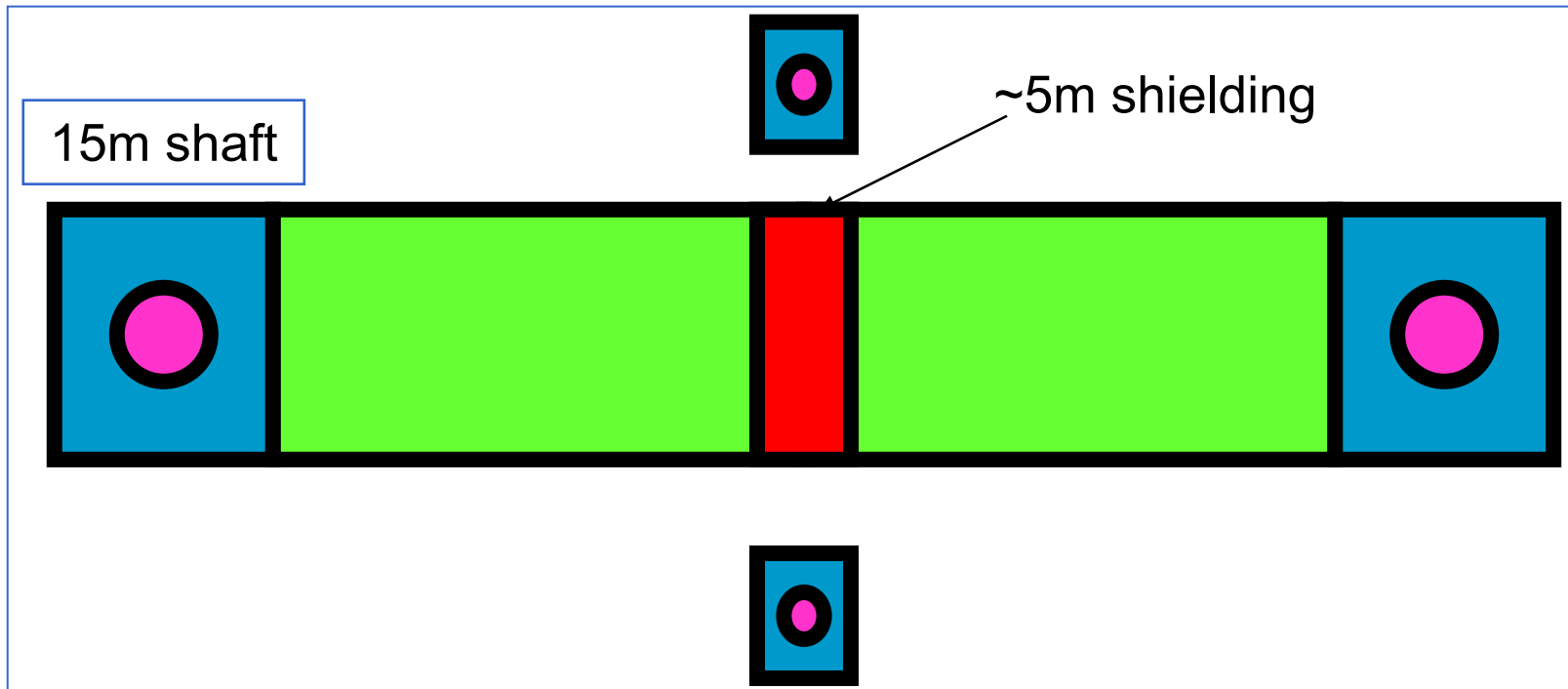


Above Ground Footprints



Baseline: Footprint
Aboveground equals
footprint belowground

This Change Request:
Double Up



Comments to Si D Exec regarding reply to WWS on 14mr/14mr/z=0 Baseline Change Request

- **By allowing CF&S to cost 32x72x40m caverns high cost was guaranteed**
- **By designing 2mrad magnets for 1 TeV high disruption beam parameters WITH diagnostic chicanes high power dipoles were guaranteed**
- **Reducing either of these design constraints and keeping 2mrad would also be a possibility**
- **Nonetheless, from an SLC experience point of view, 14mrad should result in a more robust and cost effective machine**
- **I would recommend supporting the 14/14mr part of the CR**
- **The experimental community has NOT been told exactly what is in/not in the design so it is hard to comment quantitatively on z=0 part of CR. Nonetheless you are meant to think that, relative to baseline, you will not lose anything at this stage, so why not.**
 - **Next CR regarding CMS style installation and any efforts to reduce costs by sharing facilities between detectors needs to be looked at.**