

HLRF Single Tunnel Impact

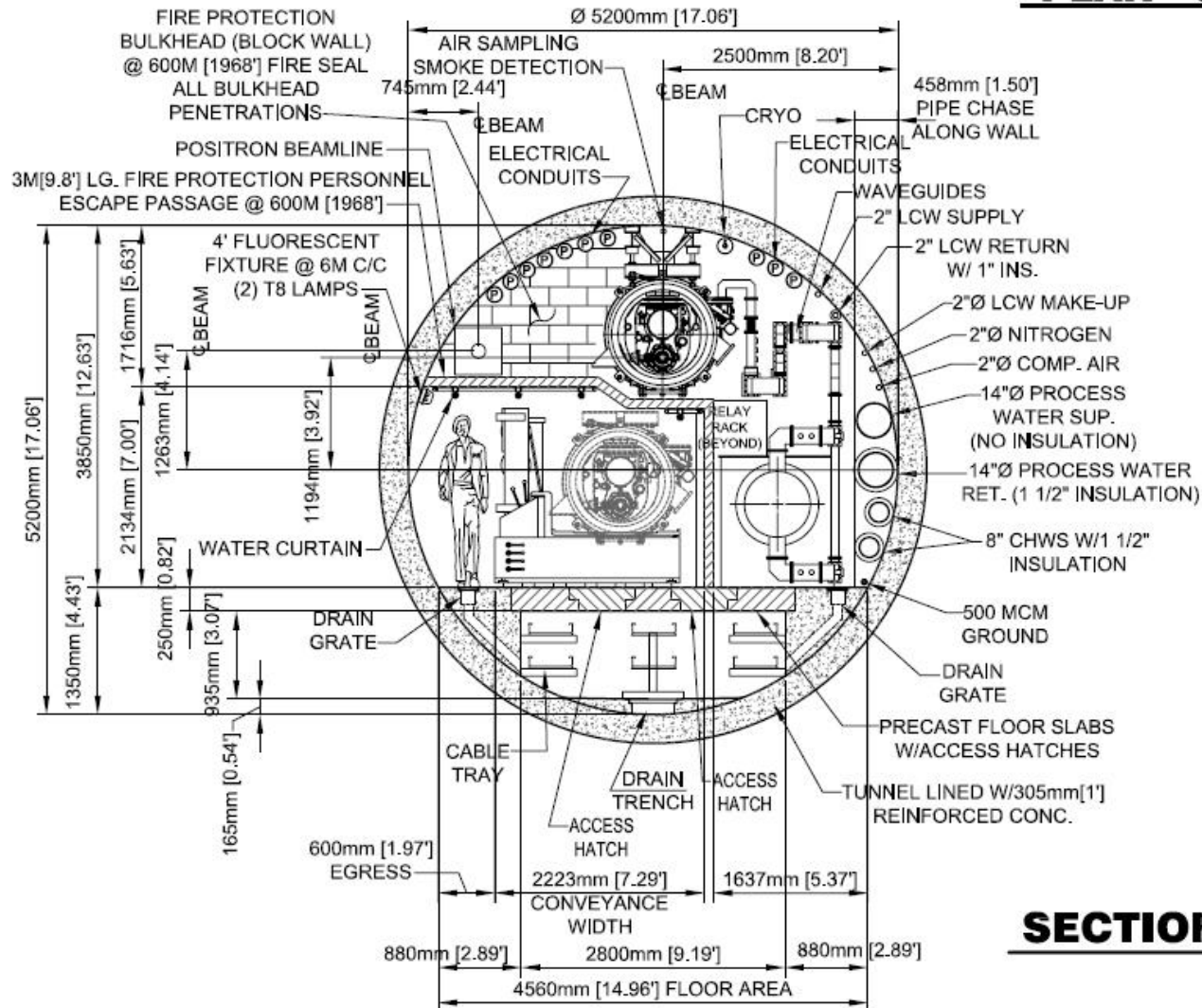
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5.2m

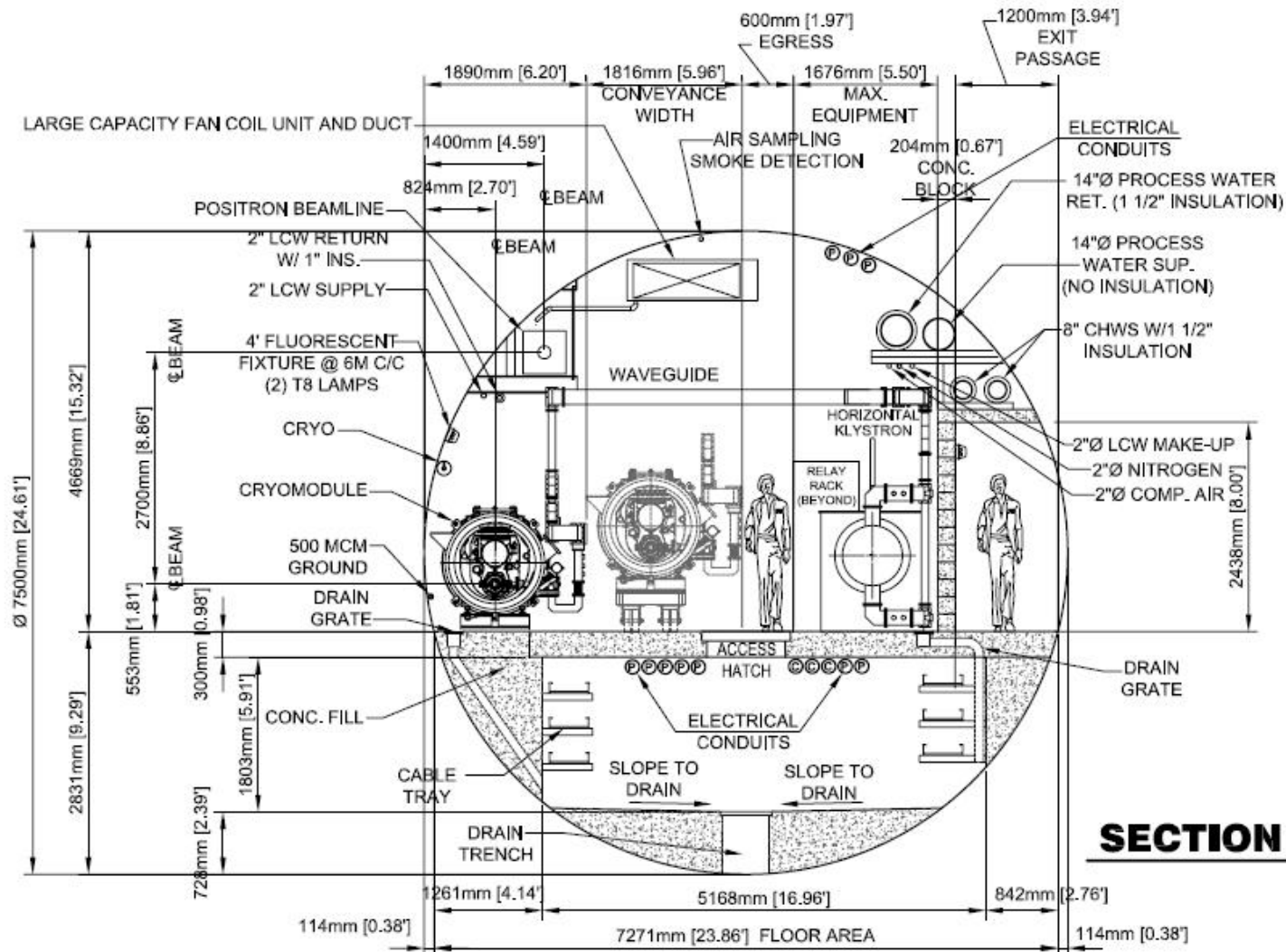
PLAN - 5.2M



SECTION

7.5m

PLAN - 7.5M SINGLE TUNNEL



Issues

- Radiation protection
- Space constraints
- Reliability-Availability
- Operating Temperature
 - Equipment
 - Modulator, Klystron, Waveguide
 - Support Racks
 - LLRF, Controls, Interlocks, Vacuum, Motor drivers, Power supplies – Solenoid and Heater, Power-supplies – Correctors & Quads

Radiation Protection

- **10Gy/yr = 1Krad/yr**
 - Rough estimate of ambient in tunnel
 - Accidental beam dump would be catastrophic to unprotected electronics
 - Modulator IGBTs especially vulnerable
 - Power supplies next
 - LLRF and controls electronics vulnerability depends on technology
 - Bipolars, diodes, analog most vulnerable
 - 10Krad integrated dose likely limit (10Gy for 10 years)
- **Assume all electronics shielded adequately.**
 - Requires space for concrete and/or lead
 - Alternately requires continuous shield wall or alcoves for Modulator, all racks
 - Repair access much more difficult

Space Constraints

- Modulator-Klystron Power Train maximum width of 1.3m agreed
- Water cooled rack footprint is $w \times d = 800 \times 1100$ mm
- Front, rear clearance for doors and workspace must be 914mm (3 ft)
- Depth is ~ 330mm (13 in.) deeper than air-cooled rack
- To fit in 5.2m tunnel would need to use single racks turned sideways so d dimension is along beamline, provided enough linear space.
- Need 13.0m for 6 racks arranged linearly $((1100+914)*6+914)$
- In 36m total available per RF station, charger, modulator, klystron, pulse transformer limited to 23m.

Summary 5.2m Tunnel

- Space model with WC racks needs to be worked out.
- Shielding space not included in present drawings.
- Lateral space insufficient for WC racks
- Have not looked in detail at 7.5m tunnel but obviously better.
 - Shielding considerations will impact

Reliability-Availability

- Access model degrades availability
- Needs to be worked out in simulator
- Reliability of components in tunnel will need to be much higher to compensate
- Will increase development time, production costs accordingly
- Improved diagnostics especially important, additional time and costs, hard to quantify

Temperature Issues

- See presentation on Racks study by Robert Downing.
- To be continued....