

# - The Bunker Project -

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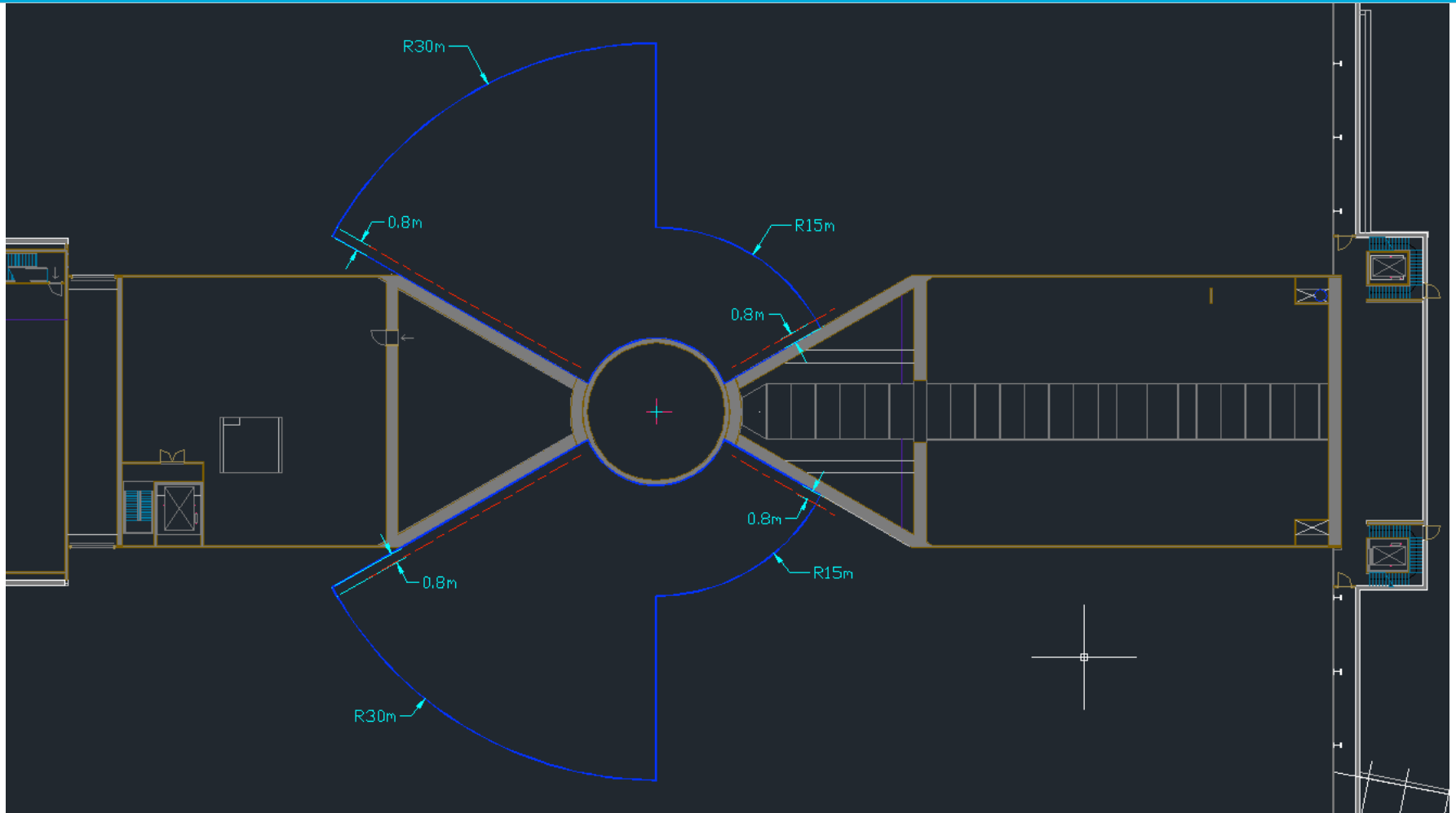
4 June 2015

1. Main requirements that have driven the design;
2. General layout;
3. Supporting structure and loading considerations;
4. Bunker base; layout and design;
5. Bunker upper portion; Layout(s), strategy for stacking/  
unstacking;
6. Bunker layout;
  - Discussion/Questions

# 1. Driven design - drivers

- The bunker profile/outline is given; (satisfying radiation protection requirements);
- Instruments layouts have been iterated, but there are many instruments that are not defined yet;
- Crane servicing the bunker closest to the monolith is now defined;
- Moderators (upper and lower) final position and guide inserts focal points are set;
- Beam port spacing (angular) is established;
- Floor loading set to  $30\text{t/m}^2$ ;

## 2. Driven design – layout (top view)



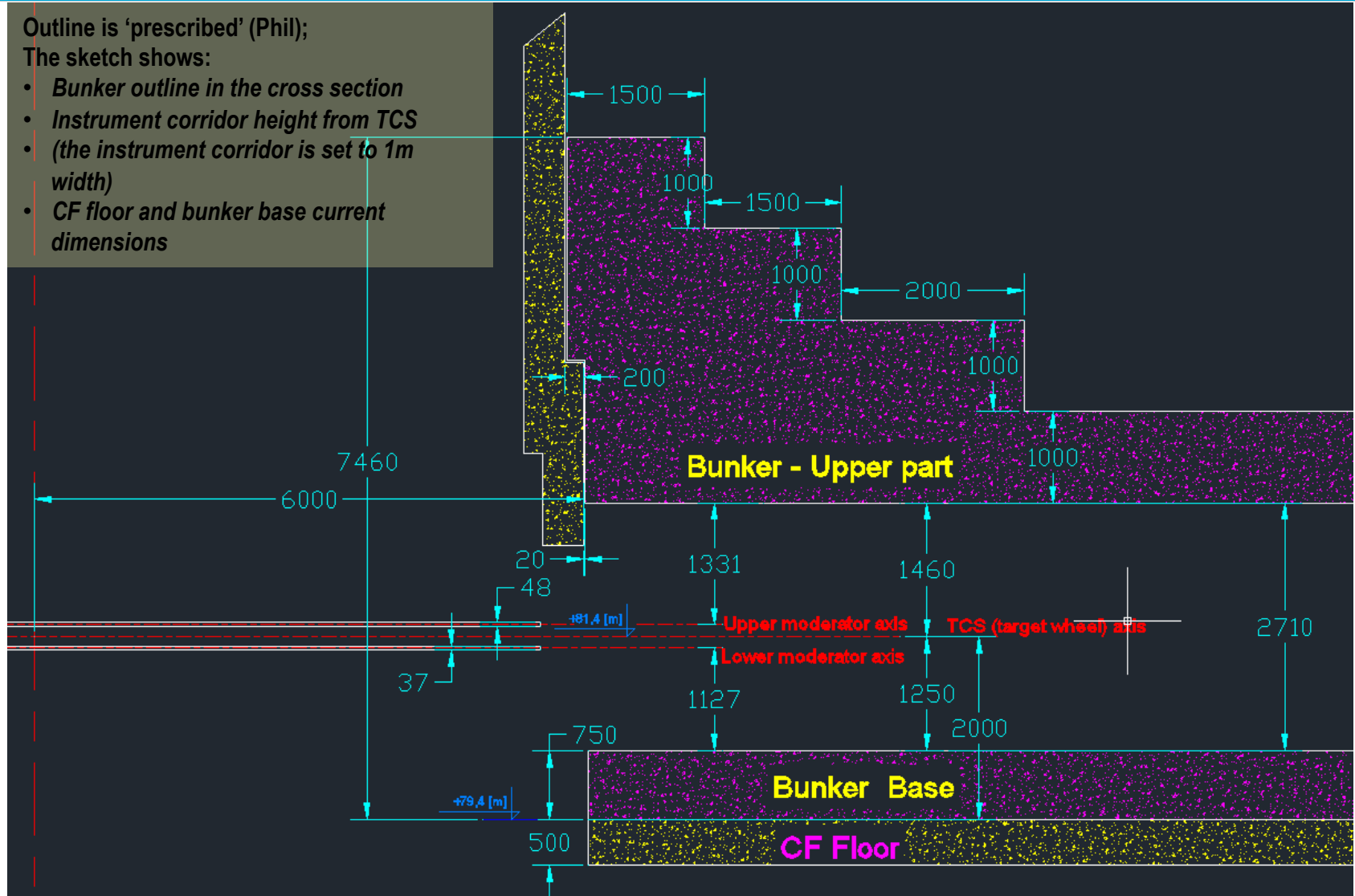
Bunker outline, top view

# 4. Driven design – layout (side view)

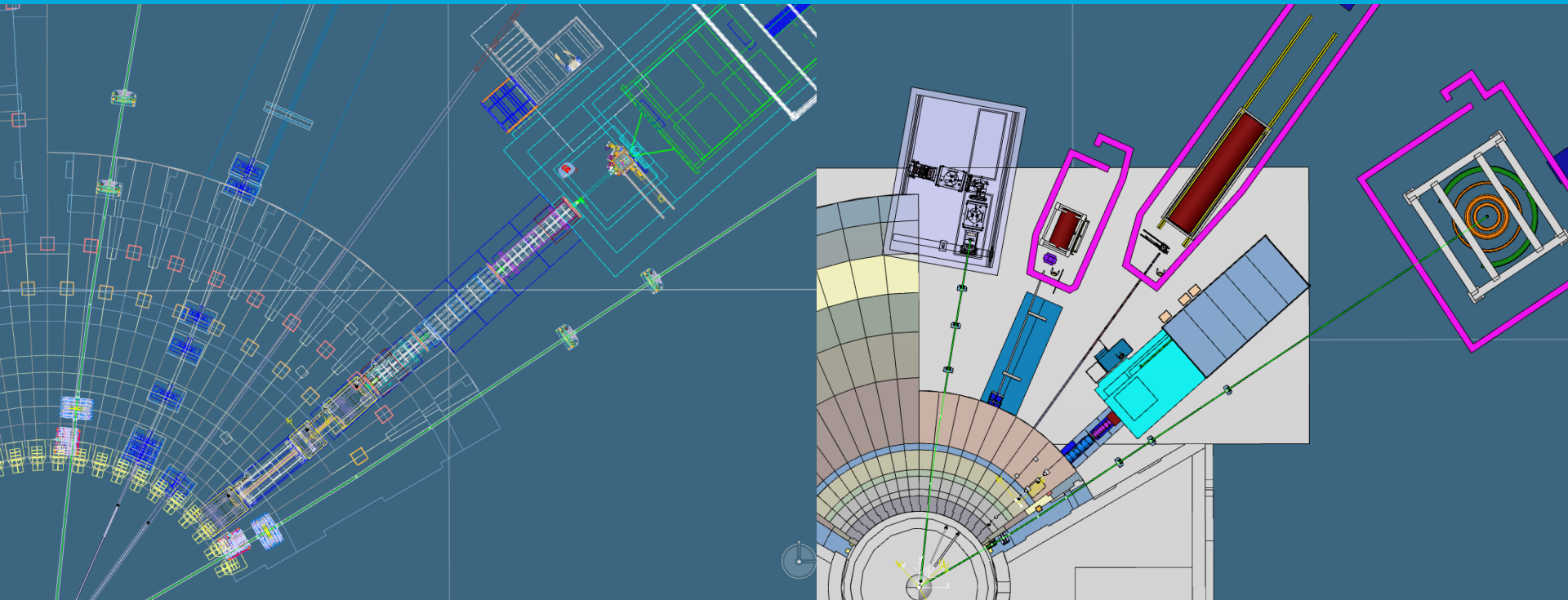
Outline is 'prescribed' (Phil);

The sketch shows:

- *Bunker outline in the cross section*
- *Instrument corridor height from TCS*
- *(the instrument corridor is set to 1m width)*
- *CF floor and bunker base current dimensions*

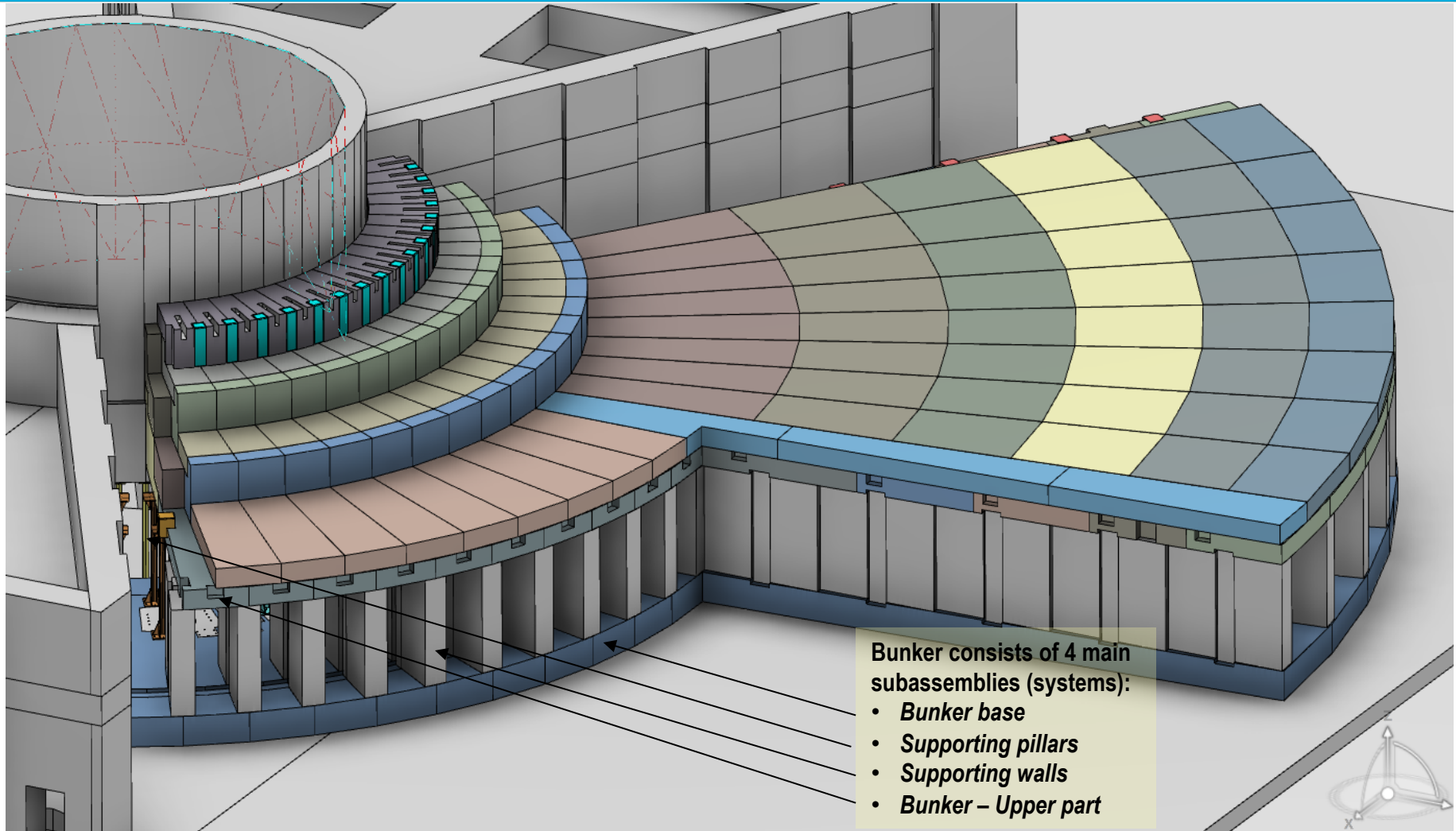


# 5. General layout



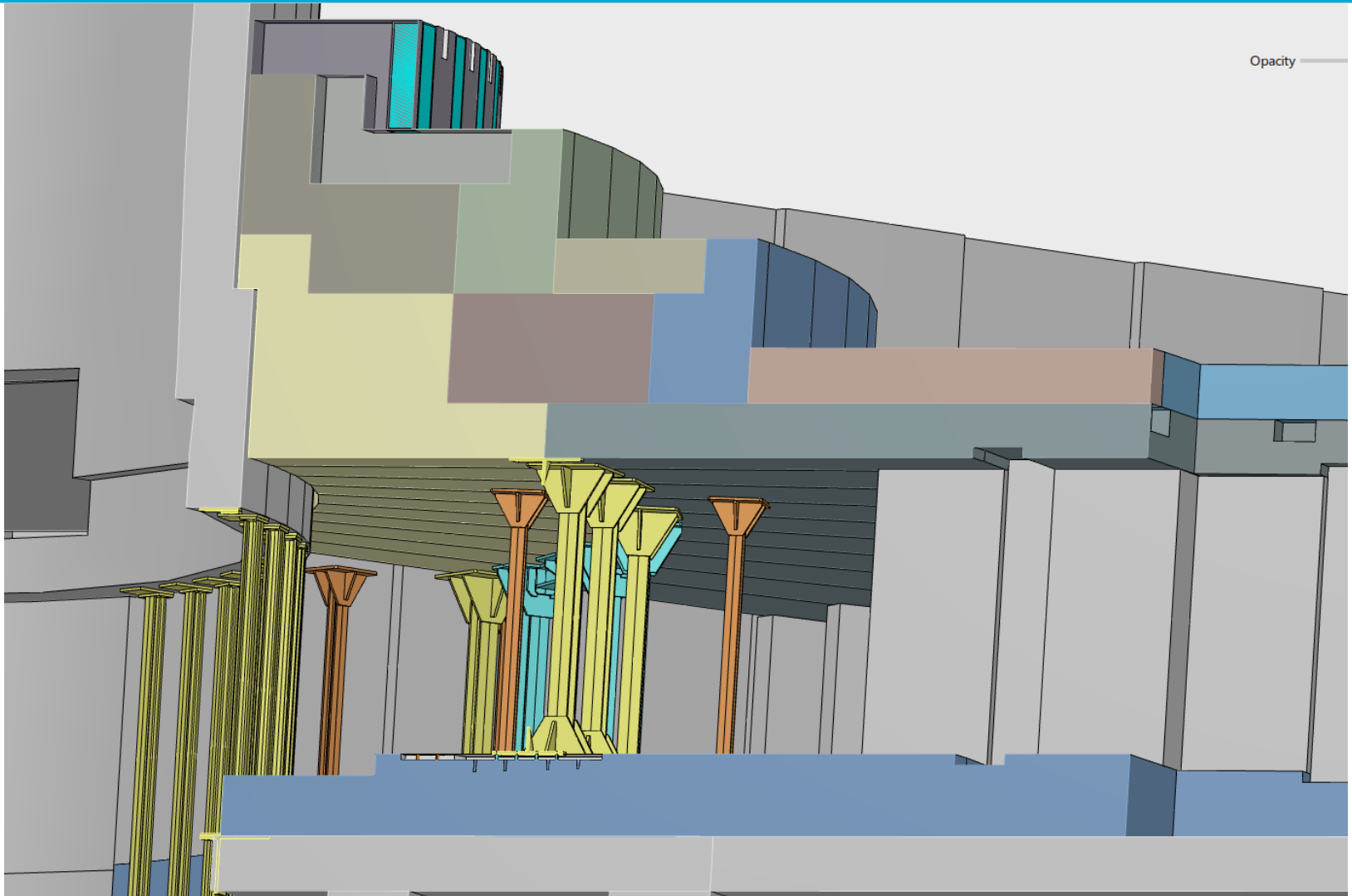
- Many instruments are not defined yet.
- We have to accommodate as many instruments as possible and as many possible instrument variations.
- This requires flexible design where ‘things’ can be rearranged to accommodate for newly required hardware.
- Area closest to the monolith is the most ‘crowded’ area as this is where inter-beam separation is the smallest and there is also a need for large number of choppers in this area.
- This was the driving reason to follow the ‘pillar solution’.
- This solution offers most flexibility for instruments arrangement.

# 6. General layout (1)



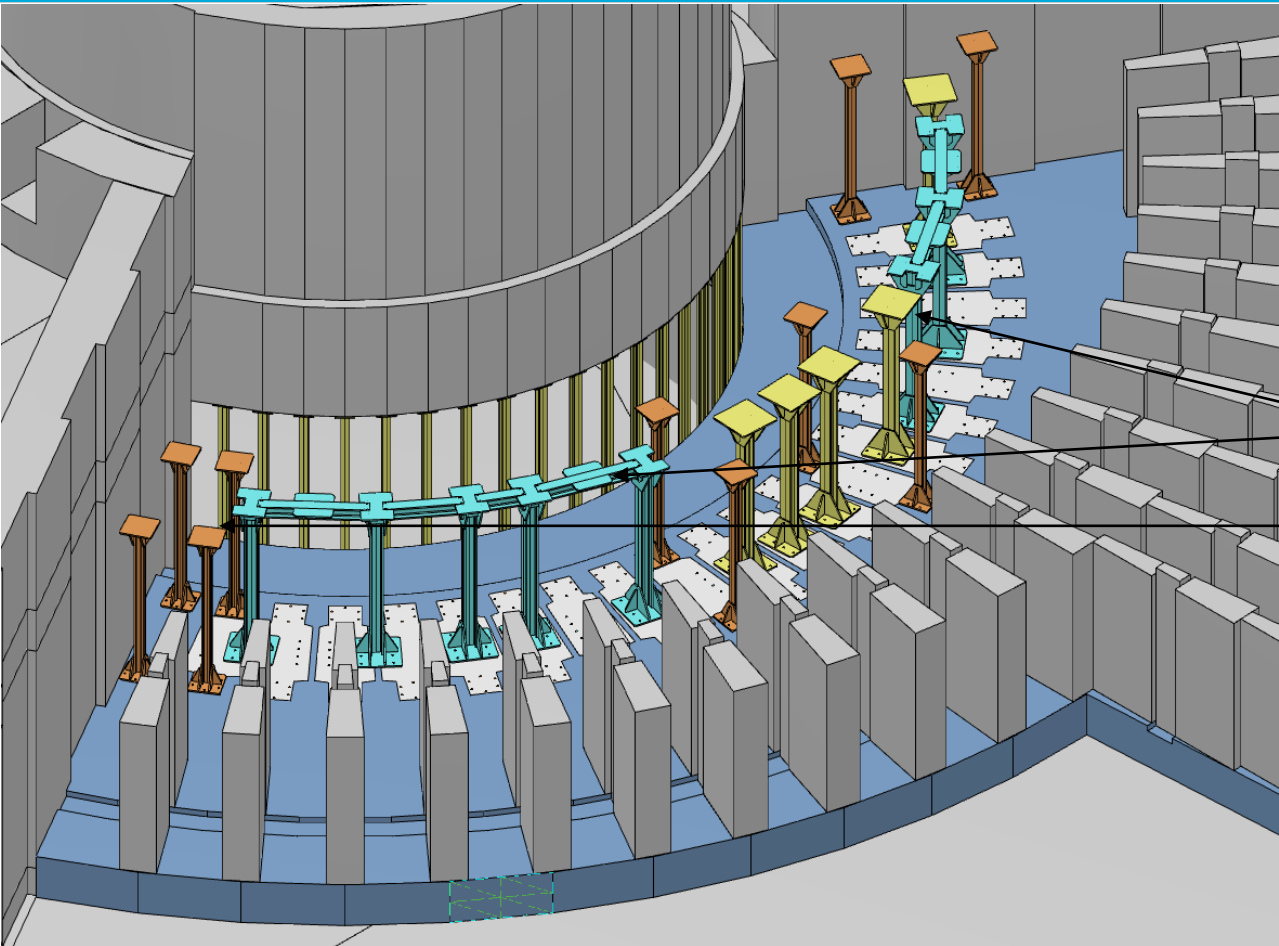
Bunker, general layout (blocks layout 1)

# 7. General layout (2)



Bunker, general layout – Supporting pillars detail (2)

# 8. Supporting pillars - layout



Bunker supports are designed with following main criteria in mind:

- CF floor loading max. 30t/m<sup>2</sup>.
- The supports are de-mountable (all but the first row of pillars between shutters, can be lifted vertically up).

The support pillars can be arranged in few different ways, depending on instrument(s) layout.

- Single pillar at R9m.
- 'Bridging' beam when there is hardware interfering with the pillar.
- The single R9m pillar can be replaced with two smaller ones at R8 and R10m to allow for hardware to be installed at R9m.
- Finally, if the instrument hardware does not allow support pillars, the instrument shielding must be designed so it can take the weight of the bunker.

The anchor plates spread the load onto the bunker base;

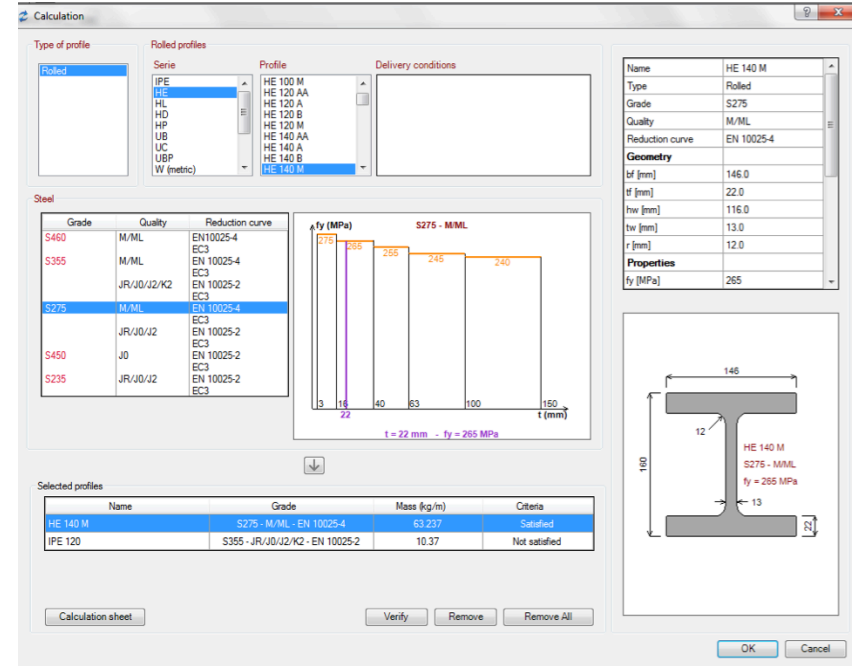
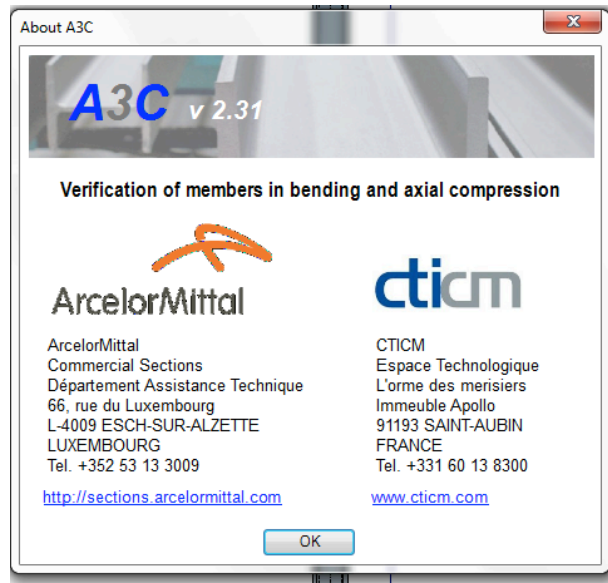
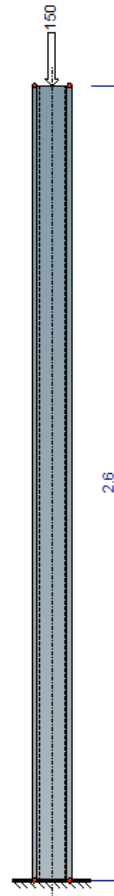
The anchor plates are installed in all alternative positions (no post-installation of anchor plates is needed)

# 9. Supporting frame - sizing

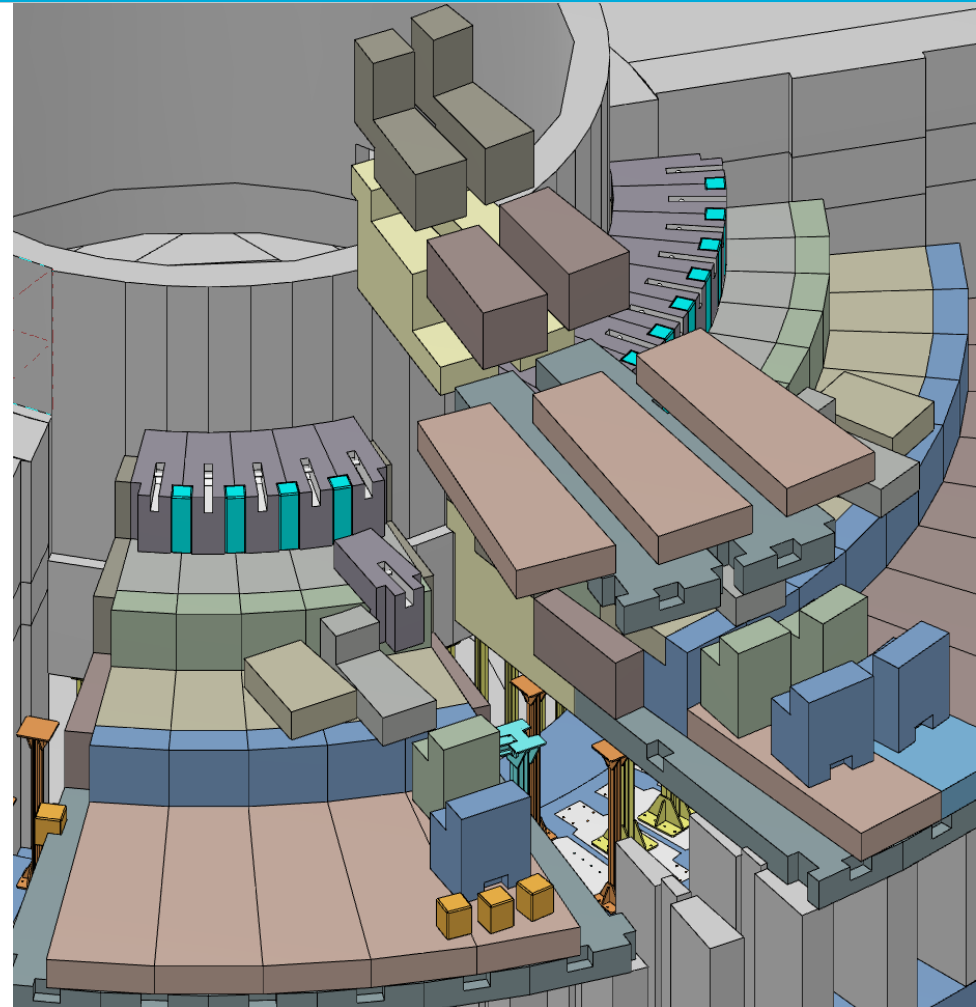
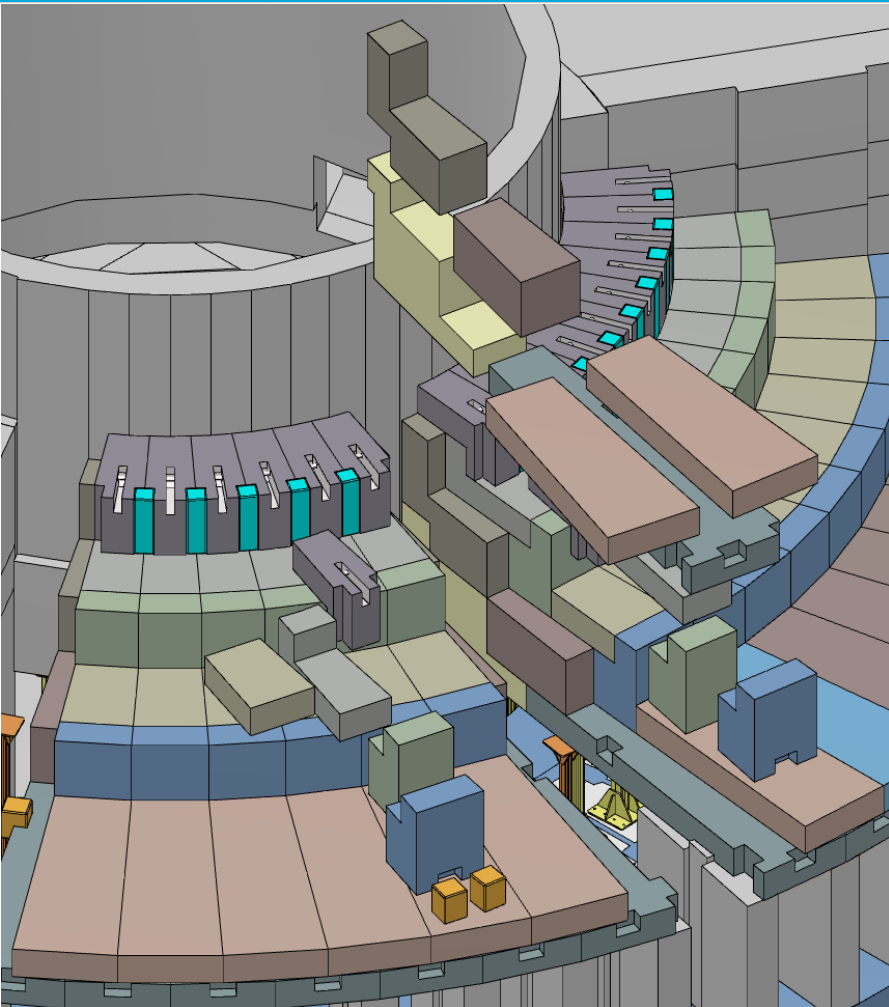
Initial steel beams sizing is done using A3C® software. The loading conditions are specified for each beam.

Further optimisation and calculations verification will be performed as the design advances and the loading conditions get firmly set (also missing from these calculations are seismic requirements)

STEEL ELEMENT



# 10. Bunker upper portion – unstacking (1)

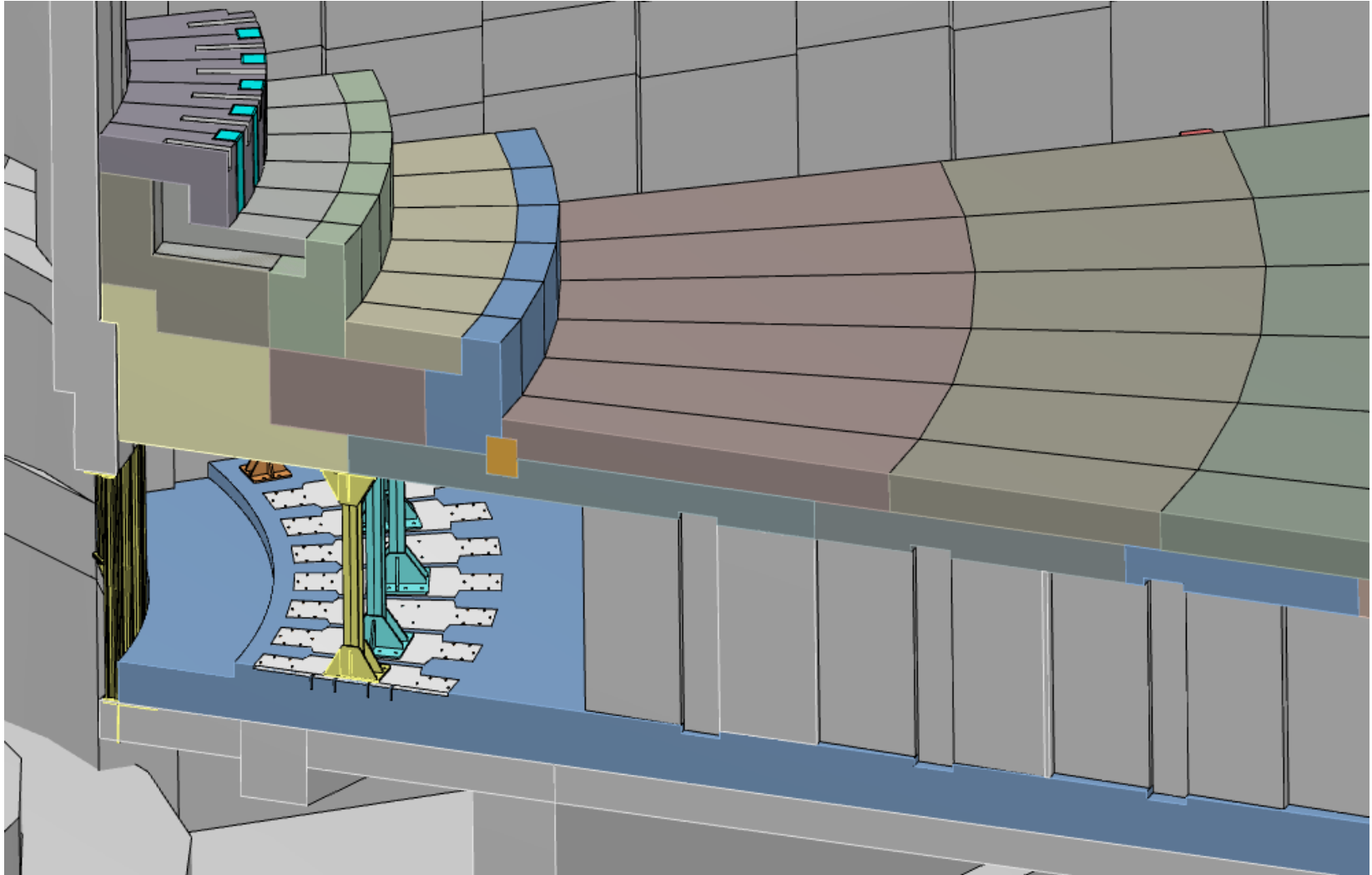


Unstacked one 'wedge' segment - left image

Unstacked 12deg (two 'wedge' segments) – right image

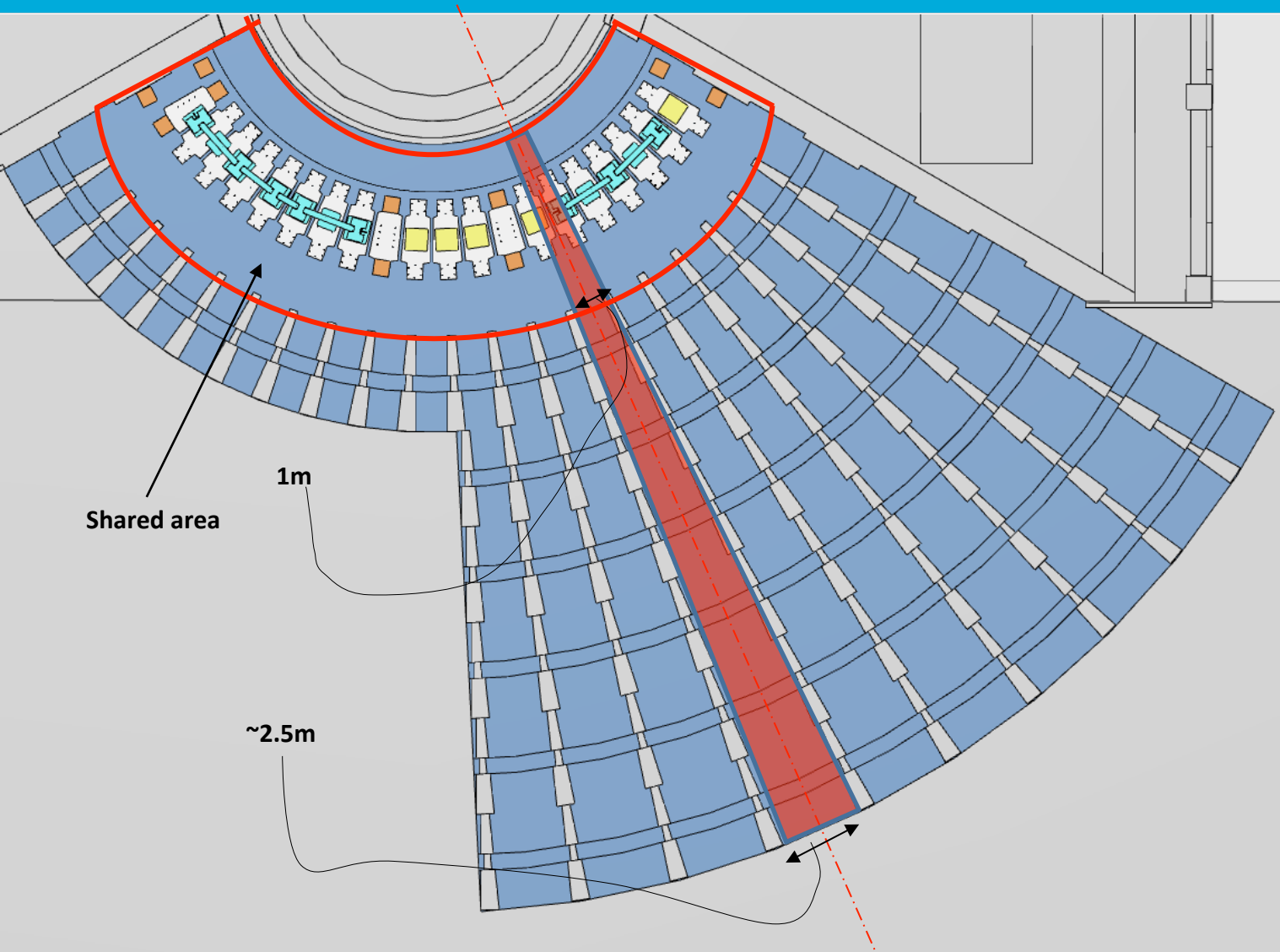
\*smaller size blocks can be placed on the bunker top during the maintenance, larger ones must be craned to a storage area

# 11. Bunker upper portion – streaming



Section through target building civil work and bunker

# 12. Bunker layout – instrument ‘corridor’



Each instrument has designated volume, an instrument corridor.

Corridors are maximized in size at the moment; as the design progresses, exact interface between the bunker and individual instrument projects will be defined.

Indicated in the sketch is the ‘shared area’, where instruments will interact more closely (with wide hardware impinging into the neighboring ‘wedge’).

# 13. Bunker layout – questions/discussion

Thank you.