# CLIC PiP – Civil Engineering, Infrastructure and Siting Chapter

## CLIC Project Meeting #30
## 27 June 2018

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# Agenda

1. **Status Update**
2. **Concerns**
3. **Future Steps**

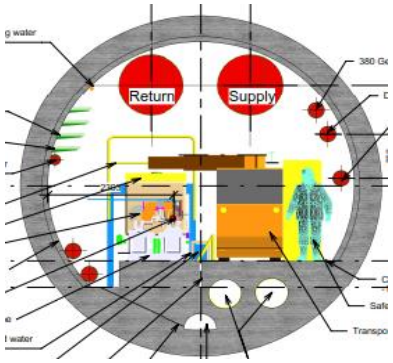
Civil Engineering
Electrical Supply
Cooling and Ventilation
Transport and Installation
Safety Systems
Radiation Studies
Cryo (not currently applicable)

| Chapter | Discipline | Pages | Comments | Responsible person |
|---|---|---|---|---|
| **CEIS** | | | | |
| | Civ. Eng | 5 | Pages increased to 5 for CE | John Osborne/Matt Stuart |
| | Electicity supply | 3 | | Davide Bozzini |
| | CV | 3 | | Mauro Nonis |
| | Transport and Installation | 3 | | Ingo Ruehl/Michael Czech |
| | Safety systems | 3 | incl. enviroment and access | Simon Marsh |
| | Radiation studies | 3 | | Markus Widorski |
| | ~~Cryo~~ | 3 | ~~in case of SC solenoid, check~~ | ~~Dimitri Delikaris~~ |

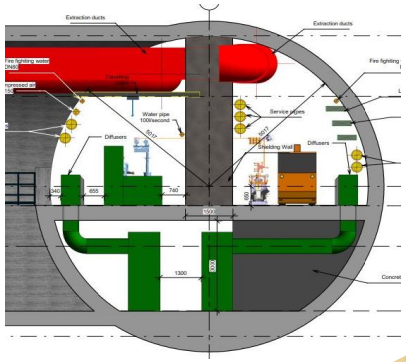
# Status Update – Civil Engineering

Two options are considered in the PiP for Civil Engineering:

- Drive beam option with 5.6m ID.
- Klystron option with 10m ID.



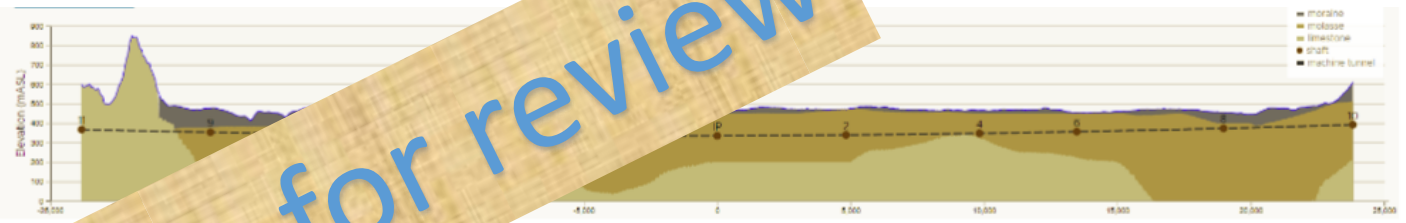

**Drive beam cross section**



**Klystron cross section**

The PiP identifies and proposed a **New alignment** option for an optimised 380 GeV machine.

- 380 GeV machine with easy upgrade possibilities.
- Reduced overall shaft depth.
- Adequate siting for all surface sites.



## Next Steps

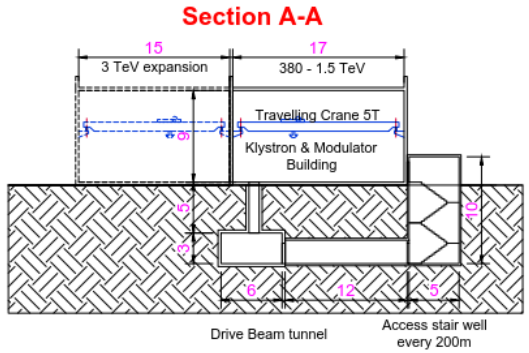
- Integration with CV has began – needs to
- Site investigations required before

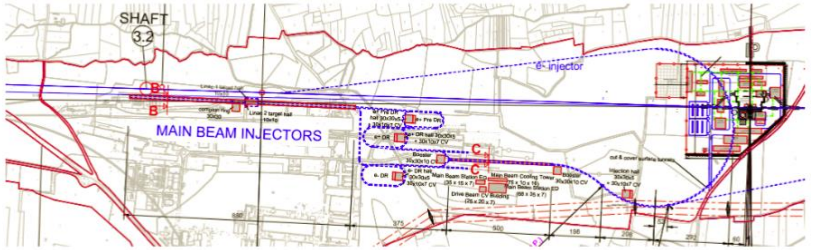
**Klystron**

- Shielding wall thick ed still – accessibility requirements?
- Access between the tu nnel compartments for transport required

pdated and optimised in the option:

- beam injection complex with reduced drive beam building
- Klystron injection complex, removal of the drive beam injection facility.






**Latex Status: Civil Engineering has been completed and uploaded into Latex, drawings still have the potential to change**

# Status Update – Cooling and Ventilation

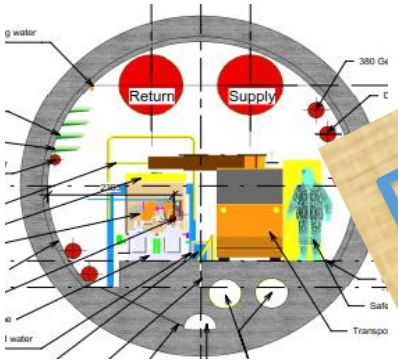
## Drive Beam Option

### Air Conditioning

- 2 AHUs required per alcove (Redundancy?)

### Cold Water Supply:

- AHUs (Alcoves + Tunnel)
  - Cooling towers (CT) only or CT + refrigeration cycle.
  - Pipes below the tunnel invert
- Accelerator
  - CT only
  - Pipes running within the tunnel



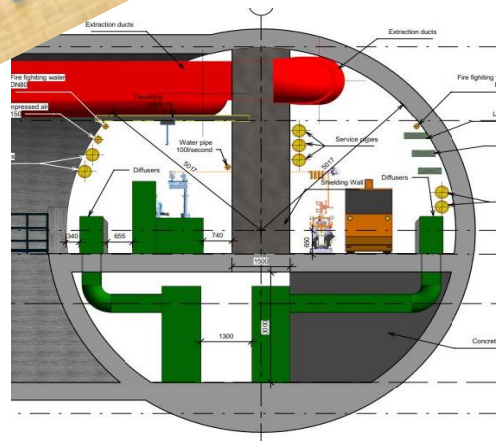

## Klystron Option

### Air Conditioning

- Air is extracted and discharged in the tunnel via diffusers and extraction ducts
- Refrigeration units cool air before drivi… …he diffusers

### Cold Water Supply:

- AHUs (Alcoves)
  - Cooli… … + refrigeration cycle.
  - R… …ing structures




Partially completed

## Concerns

- Unable to describe a global solution yet
- Not all required data is available (ex. Heat loads alcoves)
- Smoke extraction being studied by CV – hot smoke to be extracted from klystron and beam module compartments to the lower compartment at every UTRA and UTRC.

## Next Steps for both options:

- Investigate the heat loads in the alcoves (missing!)
- Suitable CV design for the BDS.
- Integration with civil engineering
- Smoke extraction ducts to be added and integrated into cross-section.

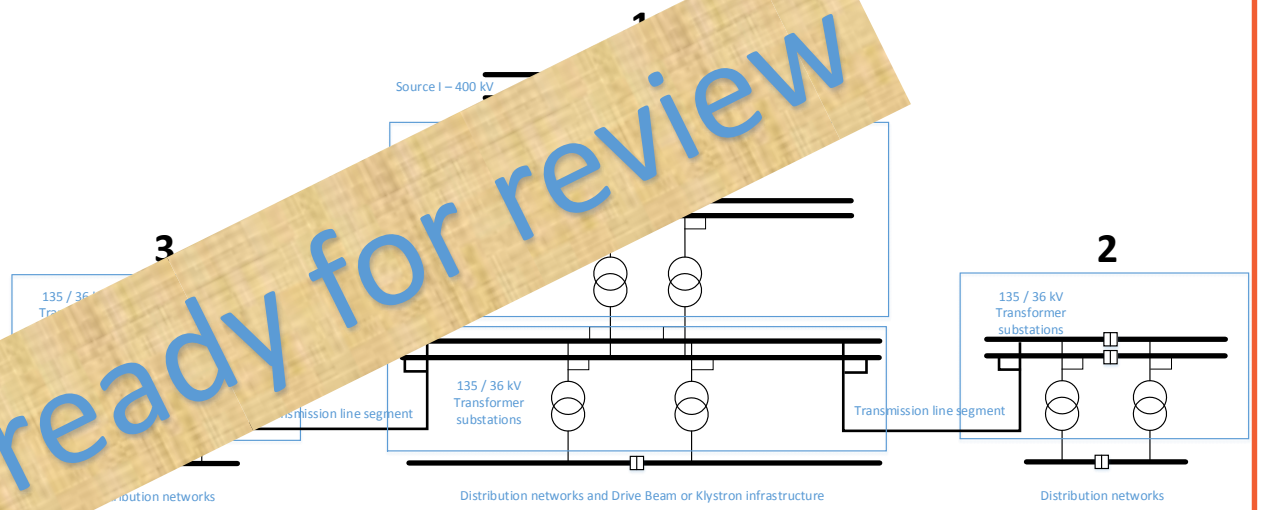
**Latex Status: CV partially written, Main linac solution described, other areas need more detail.**

# Status Update – Electrical Equipment

## Transmission Network

PiP DB and Klystron Option:

- 3 power sources currently available.
- Transmission network – 1 main substation at central point and 2 satellite substations located at points 2 and 3.
- These substations will supply th
  Distribution network.






### Next Steps

- Define the ...tion of power throughout the main tunnel.

### Concerns

- No major concerns.

**Latex Status: Nothing Received.**

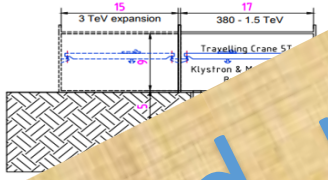
# Status Update – Transport and handling

## Drive Beam Option

PiP identifies all the significant changes in the drive beam option:

- Shaft design.
- No. of transported modules.
- Integration of Transport and DB Injector building
- Cranes for surface buildings

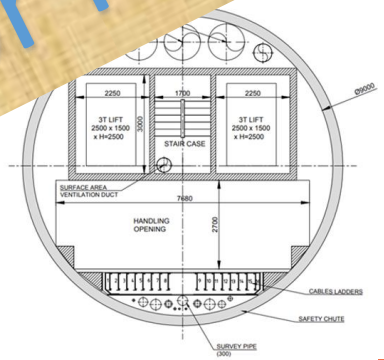
| Building Type: | Crane load capacity (tonnes) |
|---|---|
| • Detector Assembly | 2x80 (CMS approach) + strand jacks |
| • Cooling Tower and Pump Station | 3.2 |
| • Cooling and Ventilation | 20 |
| • Cryogenic Warm compressor | 20 |
| • Cryogenic Surface Cold Box | 20 |
| • Workshop | 10 |
| • Central Area Machine Cooling Towers | 5 |
| • Shaft Access | 20 |
| • *Drive Beam Injectors* | |

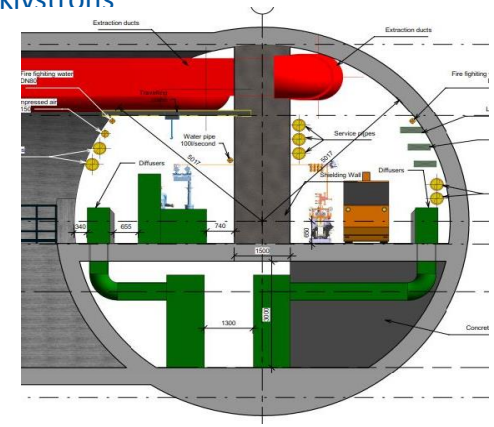



## Klystron Option

PiP identifies all requirements objectives for the Klystron design:

- Tunnel cross-section a methods.
- Installation of on and machine side of tunnel.
- Tran klystrons




## Next Steps

- Study machine on for the Klystron option.
- Obtain and integ ctions of the ancillary tunnels.
- Continuously upda the equipment tables for the Klystron and DB options.
- Produce a complete list of all the buildings that require cranes.

## Concerns

- Equipment dims and weights inside the DB injector buildings not defined.
- Not enough space between the racks on the klystron side of the tunnel for transport vehicles.
- Naming convention (the same as that of other CERN buildings) for surface buildings preferred to identify where cranes are required

**Latex Status: Transport & handling word document received, subheadings uploaded into Latex.**

Completed, ready for review

# Status Update – Safety Systems

## Safety Systems

A detailed safety strategy was produced for the CLIC CDR, therefore, the PiP for safety systems has focussed on the identification of hazards in the below area:

5 Safety Systems

5.1 Mechanical Hazards

5.2 Chemical Hazards

5.3 Fire Safety

5.4 Environmental Hazard

5.5 Electrical Haza

5.6 Biologic

5.7 N Hazards

5. ards

5.9 al Safety

Completed, ready for review

## Next Steps

A hazard register has … up to categorise such hazards all hazards:

- … throughout the lifecycle of the project.
- … equire further mitigation.
- … vironmental impact of surface cooling towers.

## Concerns

Fire safety within the klystron tunnel needs to be reviewed, new CV solution as well as klystron modules within the tunnel.

- Fire safety for the Klystron design requires further study due to the large quantities of oil located in the tunnel – **fire safety now considered**
- New CV solution needs integrating with fire safety compartments – **almost complete**

**Latex Status: Safety Systems word document received, subheadings uploaded into Latex.**

# Status Update – Radiation Protection

## Klystron Option

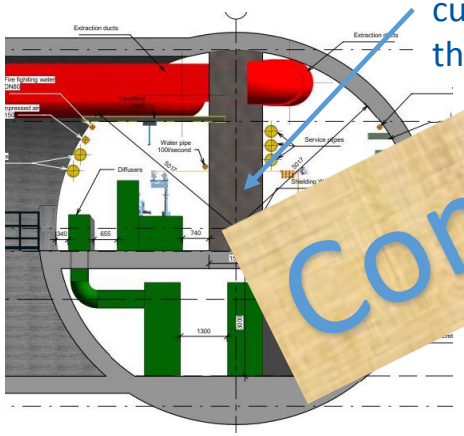
*Note: Minimal changes to the drive beam option*

For the radiation protection aspects of the klystron option the PiP has considered the following:

- Klystron gallery running parallel to the main tunnel.
- Gallery to remain accessible under certain operational conditions.
- Minimum shielding required for radiation protection during access driving factor is the dark current.

1.5m thick shielding w
currently assum
thickness

for RP



**adiation Protection**

**6.1 Particle Beam Operation**

**6.2 Activated Solids, Liquids and Gases**

**6.3 Parasitic X-Ray Emitters**

Completed, ready for review

### Next Steps

- Thickness of t ds to be confirmed if the galleries are to remain a nal conditions.
- k equirements for the klystron design.
- d to understand its contribution to the radiological act.
- the activation of water in the closed water cooling circuits (not a concern)

### Concerns

- Study into the dark current generated by the electric field in the cavities difficult as it will require an in depth study.

**Latex Status: Radiation protection word document received, subheadings uploaded into Latex.**

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| | ~~Cryo~~ | 3 | ~~in case of SC solenoid, check~~ | ~~Dimitri Delikaris~~ | ~~NA~~ | |

## Further Questions

**Latex Comments:** How will comments on each chapter be submitted? Through discussion with FCC editors, the best solution to this is to add comments to an extracted pdf and allow the writers to make changes to the latex file un-obstructed by comments strewn throughout.

- Link for CEIS chapter on overleaf >>>> **CEIS**
- Link for CE Drawing repository >>>>> **CEIS Drawings**