

CERN FCC – COST & SCHEDULE UPDATE

8 SHAFT SCHEME

WORKSHOP / 08.08.2023



OPTIMIZATION DISCUSSION - WORK SHOP

General

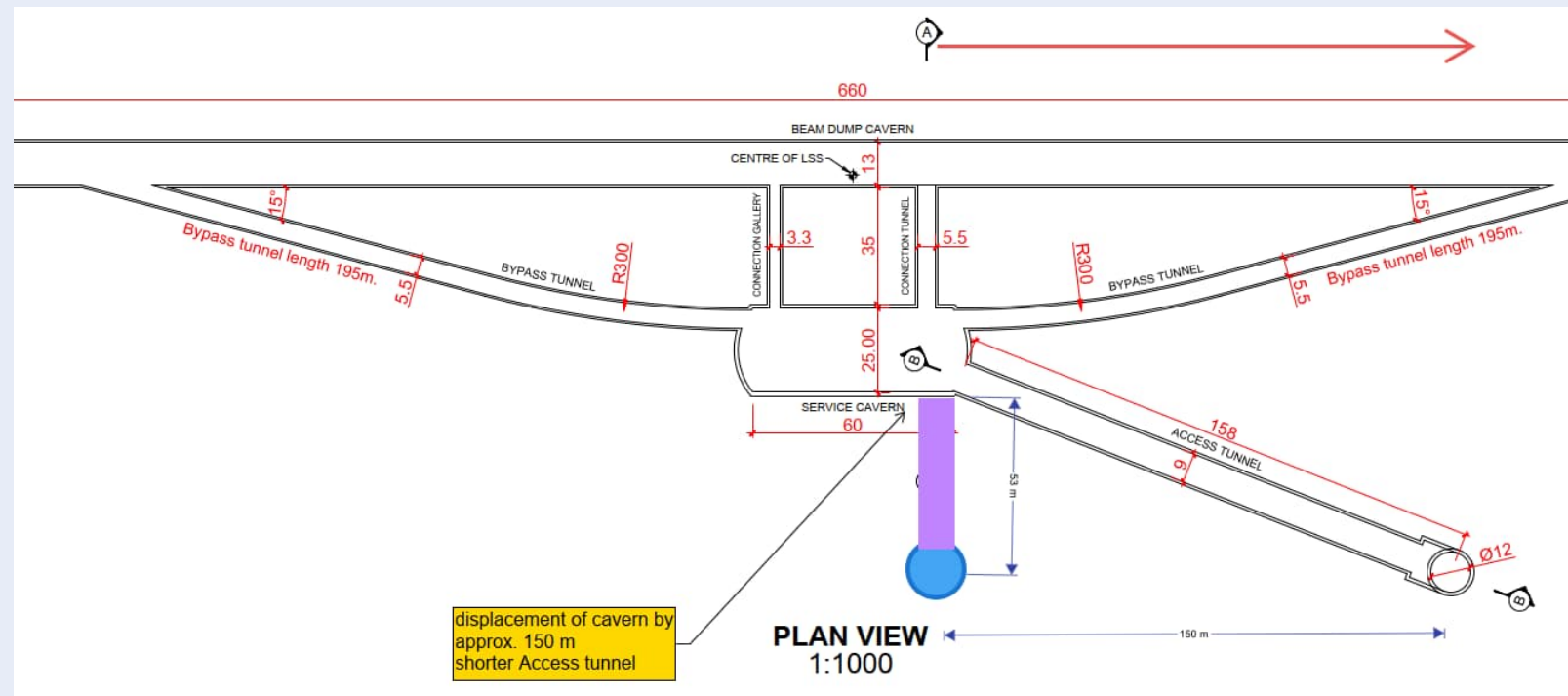
- Following optimizations are not yet included in the schedule and costs.
- Numbers concerning costs and schedule stated are preliminary and a rough estimate.
- Combination and final implementation of the shown optimizations may result in slightly other time results.



OPTIMIZATION DISCUSSION - WORK SHOP

Point B

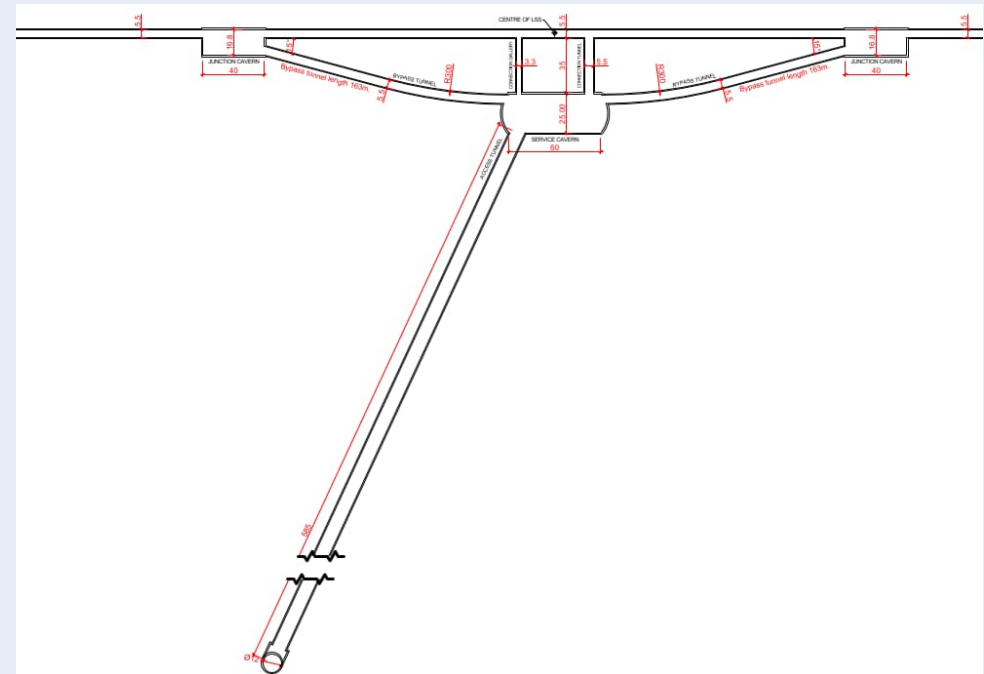
- Move Service Cavern by approx. 150 m to get shorter access tunnel from defined shaft location.
- Interaction point may stay at location where it is
- Cost – 1.0 Mio



OPTIMIZATION DISCUSSION - WORK SHOP

Point F

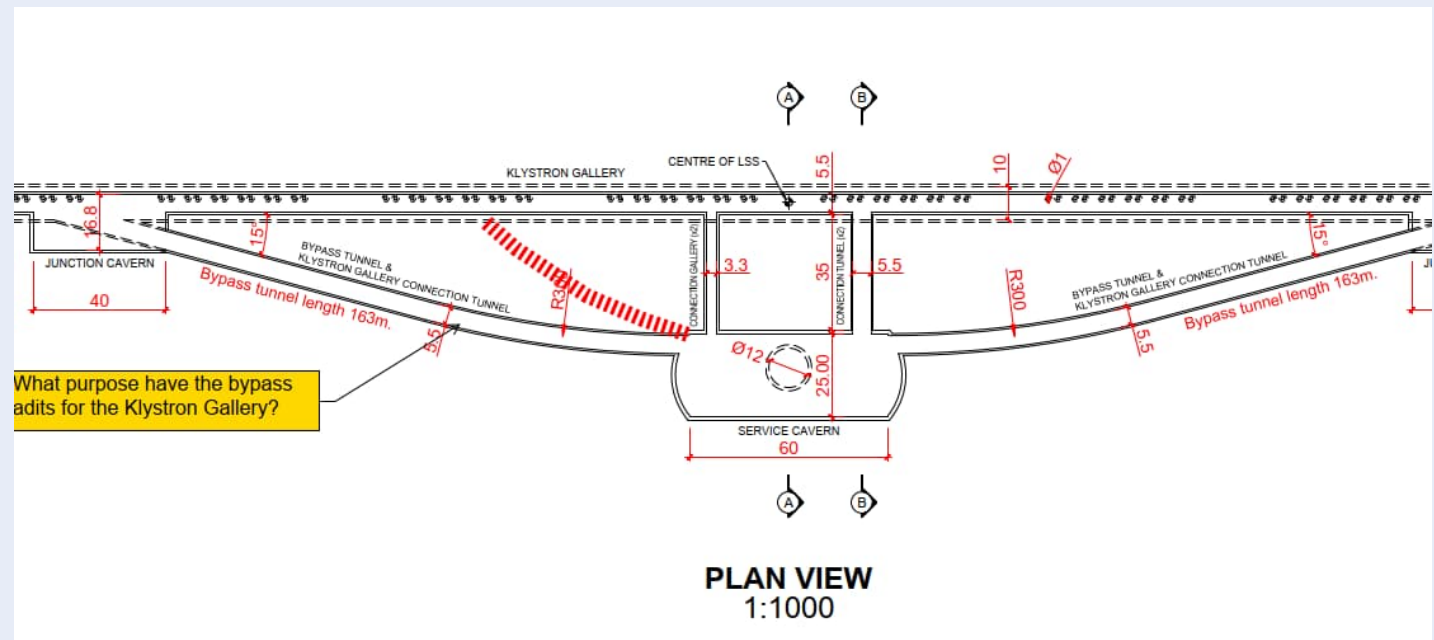
- What slope of access tunnel might be suitable?
10 % would reduce shaft depth by approx. 60 m
15% would reduce shaft depth by approx. 90 m
(15% increases tunnel drive costs)
- In the CDR-study we made some comparisons between 10 and 15%.
- Schedule reduction at this location negligible
- Cost reduction approx. 1.5 Mio. EUR



OPTIMIZATION DISCUSSION - WORK SHOP

Point H and L - Klystrons

- What purpose have the bypass adits for the Klystron Gallery?
- may they be shortened as indicated (if just for Construction purposes, they might be omitted).
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OPTIMIZATION DISCUSSION - WORK SHOP

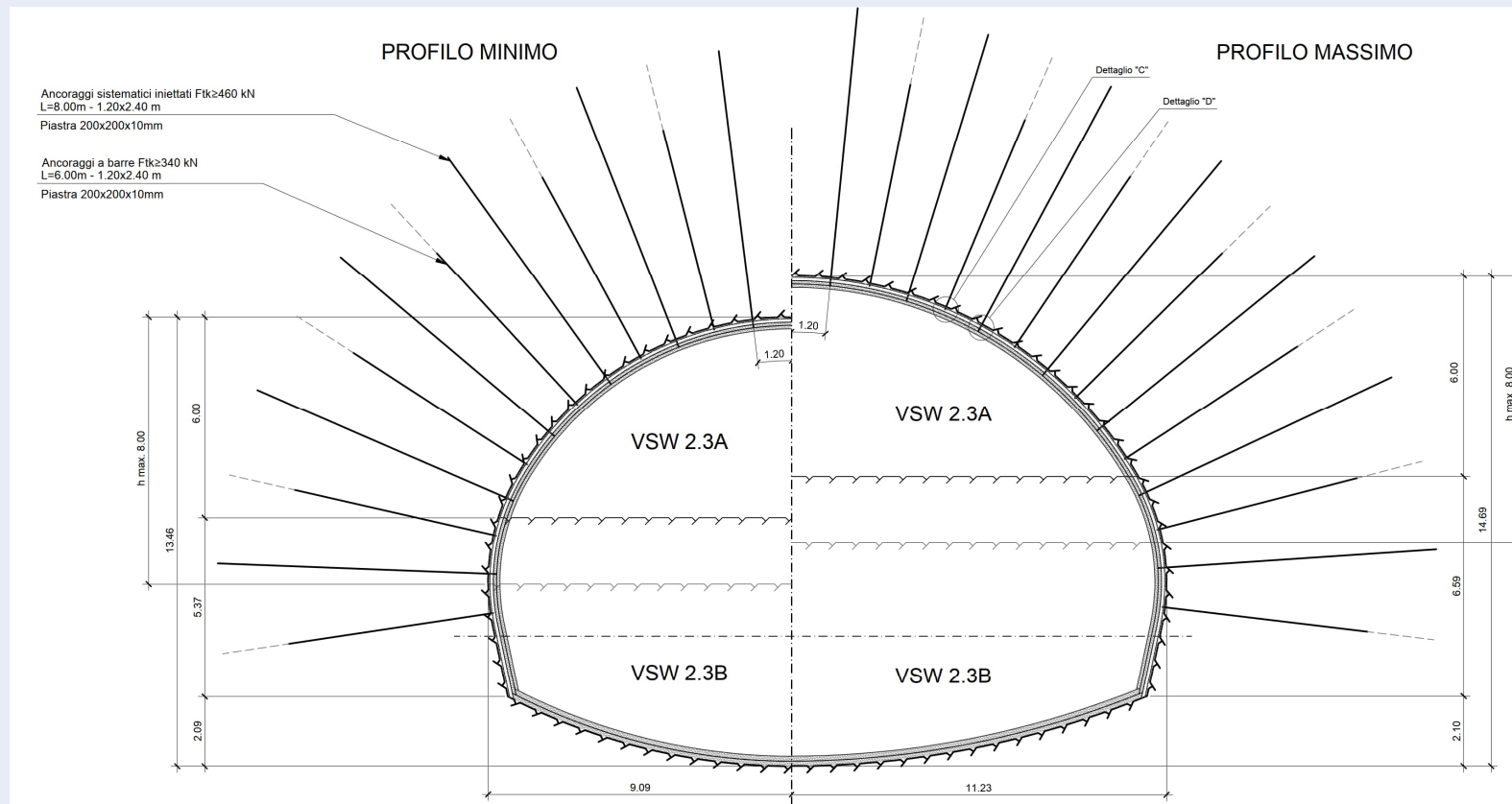
Shaft Diameters

At the moment most advance faces are planned sequential therefore the shaft dia. may be sufficient, in case of acceleration of schedule following shafts might require larger diameter.

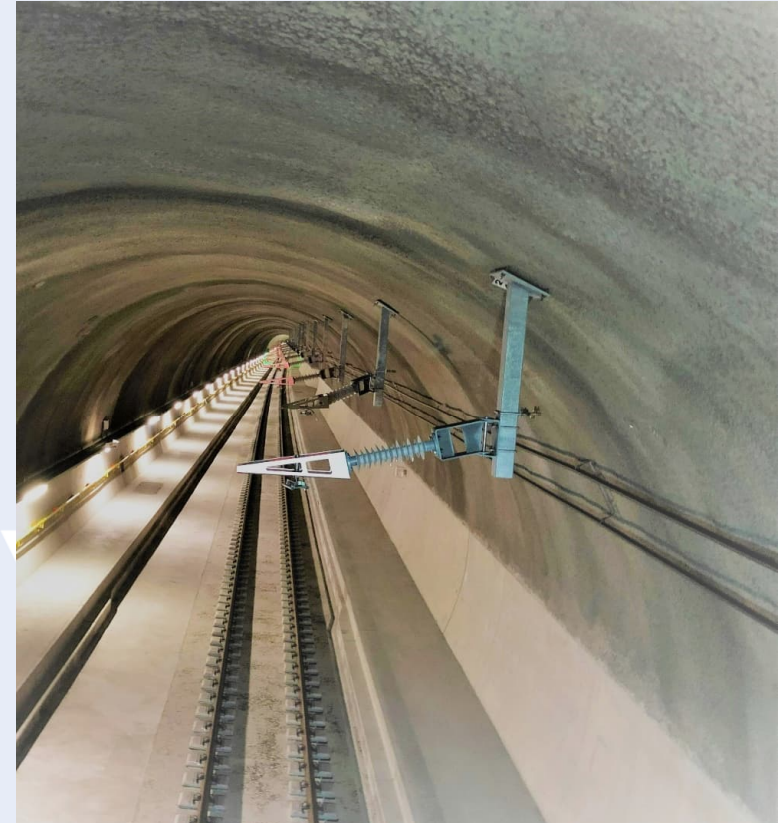
- Point B – 1 TBM advance
shaft dia. 12 m is okay
 - Point L - 1 TBM plus Klystron drives
shaft dia. 12 m ok for sequential advance
- if parallel drives dia. has to be enlarged (15 m)



Single lining – Ceneri Base Tunnel, Crossover caverns



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Single lining – Ceneri Base Tunnel, Crossover caverns

- Cavern span up to 22 m
- Lower part insitu cast concrete with shutter, upper part shotcrete



OPTIMIZATION DISCUSSION - WORK SHOP

Single lining options

Possible drives for single lining shotcrete finish

- Access Tunnel at points B and F
- Tunnel widenings at points A, D, G and J
would also allow continuous enlargement instead of staggered
- Bypass Tunnel linings?
- Klystron Gallery connection tunnels (4 x 163 m)
- Klystron Gallery?
- Clystron Staircase shafts
- Beam Dump Cavern?
- Alcoves?



OPTIMIZATION DISCUSSION - WORK SHOP

Single lining options

- Tunnel widenings at points A, D, G and J would also allow continuous enlargement instead of staggered
- i.e. reduction of schedule for tunnel widenings approx. 6 months,
- Costs rough estimate – 10 Mio. per widening -> 80 Mio.

Bezeichnung				Kosten.Um fertig	Start
Bezeichnung	Sektorenbezeichnung	Vorgangsvorlage	Arbeits meng	Gesamtsumm	Start
45 Tunnel widening A	Tunnel Widening AB	45 tunnel widening	1100	17'436'792.70	27.0
45 Tunnel Widening D	Tunnel Widening DF	45 tunnel widening	1067	16'913'688.92	25.1
45 Tunnel Widening G	Tunnel Widening GH	45 tunnel widening	1100	17'436'792.70	28.0
45 Tunnel widening J	Tunnel Widening JL	45 tunnel widening	1100	17'436'792.70	05.0
45 Tunnel widening A	Tunnel Widening AL	45 tunnel widening	1100	17'436'792.70	07.0
45 Tunnel Widening D	Tunnel Widening DB	45 tunnel widening	1100	17'436'792.70	19.0
45 Tunnel Widening G	Tunnel Widening GF	45 tunnel widening	1100	17'436'792.70	09.0
45 Tunnel widening J	Tunnel Widening JH	45 tunnel widening	1100	17'436'792.70	06.0
72 Tunnel widening lining	Tunnel Widening AB	72 Tunnel widening lining	1067	21'302'731.75	27.0
72 Tunnel widening lining	Tunnel Widening AL	72 Tunnel widening lining	1067	21'302'731.75	13.1
72 Tunnel widening lining	Tunnel Widening GH	72 Tunnel widening lining	1067	21'302'731.75	23.0
72 Tunnel widening lining	Tunnel Widening GF	72 Tunnel widening lining	1067	21'302'731.75	27.0
72 Tunnel widening lining	Tunnel Widening JH	72 Tunnel widening lining	1067	21'302'731.75	23.0
72 Tunnel widening lining	Tunnel Widening JL	72 Tunnel widening lining	1067	21'302'731.75	24.0
72 Tunnel widening lining	Tunnel Widening DB	72 Tunnel widening lining	1067	21'302'731.75	20.0
72 Tunnel widening lining	Tunnel Widening DF	72 Tunnel widening lining	1067	21'302'731.75	19.0

OPTIMIZATION DISCUSSION - WORK SHOP

Diverse

- TBM burial
 - » TBM's arrive each at a shaft and can be easily removed through the shaft
 - » No real time saving

- Smoke extraction duct
 - » Included in costs but not in schedule

- Shaft boring machines
no further info from Herrenknecht so far

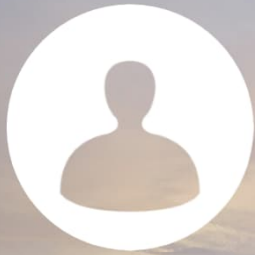


Diverse

- Start of construction at points where no TBM-excavation follows may be delayed to suit the overall programme.
i.e. point F and H



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