

Note on Excavation Volume/Traffic for SSC Tunnel and Interaction Halls

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June 1988

The circumference of the ring for the ISP lattice is 85.698 km; the tunnel cross section is 10 ft in diameter. There is no defined experimental program, but for planning purposes we assume two low-beta and two medium-beta IR halls.

1. Tunnel Excavation:

Current thinking is to muck out at every shaft with a given TBM going in at one shaft and coming out two shafts further along in the clusters and three shafts further along in the arcs. Muck will be coming out of 15 shafts altogether in this plan with a maximum of four shafts working at any one time. See attached figure for drilling sequence.

The finished volume of the tunnel is $V_{\text{tun}} = \pi \cdot (5 \text{ ft})^2 \cdot 281,161 \text{ ft} = 818 \text{ K cu yd}$. The excavated diameter ranges from the finished diameter of 10 ft for an unlined tunnel up to 12 ft for a tunnel requiring a 1 ft liner, so the excavated volume, V_{exc} , may vary over $V_{\text{exc}} = 820\text{--}1200 \text{ K cu yd}$ depending on the site, of which 38–55 K will come out via each working shaft. The volume of muck coming out of the tunnel will be increased by a swelling factor that, again, is site dependent.

Assuming that this swell factor may vary from 30% to 100%, the muck volume from a single working shaft will be:

$$\begin{aligned} V_{\text{muck}} &= 50\text{--}80 \text{ K cu yd/shaft for } 10 \text{ ft } \phi \\ &= 72\text{--}110 \text{ K cu yd/shaft for } 12 \text{ ft } \phi \end{aligned}$$

The assumed advance rate of the TBM is 100 ft/day, driving 5 days/week so:

$$\begin{aligned} V_{\text{muck}}/\text{day} &= 380\text{--}580 \text{ cu yd/day for } 10 \text{ ft } \phi \\ &= 550\text{--}840 \text{ cu yd/day for } 12 \text{ ft } \phi \end{aligned}$$

At 10 cu yd/load for a 10 hour hauling day this implies a truck frequency of:

$$\begin{aligned} \Delta_{\text{truck}} &= 10\text{--}15 \text{ min for } 10 \text{ ft } \phi \\ \Delta_{\text{truck}} &= 7\text{--}10 \text{ min for } 12 \text{ ft } \phi \end{aligned}$$

A given shaft will be active for 6 months for mucking purposes on a 5 day/week basis, 10 hrs/day.

The mucking pattern can be adjusted so that the shafts at which the machines come out, the non-active shafts, are the ones nearest to sensitive areas.

2. IR Halls

Current thinking on IR halls assumes a volume of 25 x 80 x 35 cu m for the large halls and 25 x 50 x 35 cu m for the smaller halls.

The excavation volumes are then:

$$V_{exc} \text{ (low } -\beta) = 70 \text{ K cu m/hall} = 92 \text{ K cu yd/hall}$$

$$V_{exc} \text{ (med } -\beta) = 44 \text{ K cu m/hall} = 58 \text{ K cu yd/hall}$$

For four halls, then the total is:

$$V_{exc} \text{ (total)} = 228 \text{ K cu m} = 298 \text{ K cu yd}$$

of which 184 K cu yd is at the two sites in the near cluster and 116 K cu yd at the two sites in the far cluster.

Allowing for swell, the spoil to be disposed of is in the range:

$$V_{muck} \text{ (total)} = 390\text{--}600 \text{ K cu yd}$$

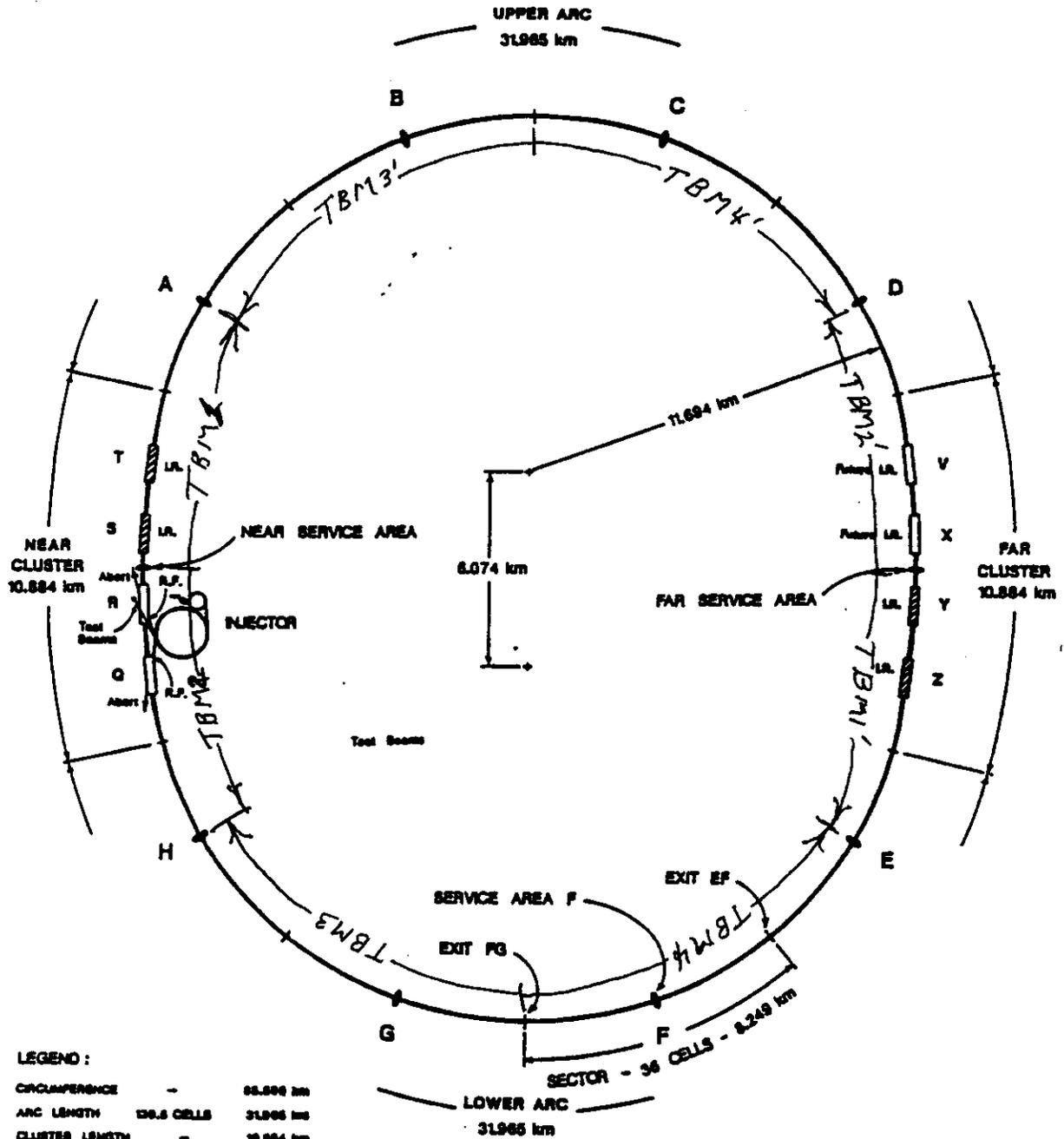
with

$$V_{muck} \text{ (low } -\beta) = 120\text{--}180 \text{ K cu yd}$$

$$V_{muck} \text{ (med } -\beta) = 75\text{--}120 \text{ K cu yd}$$

At each low $-\beta$ hall 12000–18000 loads of spoil will be removed. At 300 loads/week (10 min/load, 10 hrs/day, 5 days/week) this implies 40–60 weeks of hauling from each low $-\beta$ hall. For the med $-\beta$ halls the duration of hauling is 25–40 weeks.

90° Lat. E - S. Gage. (152)



LEGEND :

CIRCUMFERENCE	-	66,800 km
ARC LENGTH	156.8 CELLS	31,985 km
CLUSTER LENGTH	-	10,884 km
CELL LENGTH	-	228.14 m
TOTAL DIPOLES	-	3846
EXPERIMENTAL STRAIGHT	-	1298.37 m
UTILITY STRAIGHT	-	1298.37 m
ARC RADIUS	-	11,694 km

- ▨▨▨▨ EXPERIMENTAL STRAIGHT
- ▭▭▭▭ UTILITY STRAIGHT
- ⊕ SERVICE AREA
- ⊖ EXIT AREA

SSC SITE LAYOUT
90° OPTION #4

90(4)



SSC CENTRAL DESIGN GROUP	
NO. 84A200	TITLE SITE LAYOUT, 90° OPTION #4
DATE	DATE
BY	BY
CHKD	CHKD