Tunnelling Milestone Reached On Colaba-Seepz Line, Controlled Explosions Make Way For Platforms At 3 Stops

# 800 'SILENT' BLASTS PREPARE PITCH FOR UNDERGROUND METRO STATIONS

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As tunnel boring machines (TBMs) slowly clear the path for the 33km-long Colaba-Seepz Metro-III line, another Herculean task underway is preparation for building large stations 56-60 feet underground.

Hard basaltic formations at an average depth of 3-4 metres means manual digging would take ages. But conventional rock blasting—like the technique used in hills and quarries—would pose risks of flying splinters, ground vibrations, air blasts and dust. The solution: controlled blasting.

So far 800 such blasts have taken place at three station areas— MIDC, Cuffe Parade and Seepz—and at the Pali Ground TBM site over the past 10 months. So far over 4 lakh tonnes of earth material (soil, rocks) have been excavated through controlled blasting at the four sites.

The blasts are so muffled that barely anyone overground would know.

Akshay Bhargave, a Marol Naka resident who lives next to the construction site, said when his relatives from Raigad were visiting him and he told them about the blasts underground, they were surprised. "They wondered what kind of blasts they were as they could not hear anything or even feel any vibrations when standing near the site," he said.

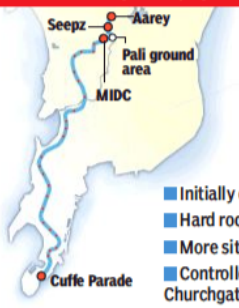
Mumbai Metro Rail Corporation (MMRC) project director S K Gupta said the safest norm for vibrations from blasts is 5 mm per second whereas the actual vibration levels measured for each blast has not even crossed the 3 mm per second level.

The contractors, Larsen & Toubro-STEC, have appointed CSIR-Central Institute of Mining & Fuel Research (CIMFR), Nagpur as a consultant for design and monitoring of the controlled blasting.

The rock excavation required at each station is approximately over one lakh cubic meters, about 2.41 lakh tonnes.

Dr Pradeep Singh, director of CIMFR, explained that every blast is measured on a seismography instrument installed near the blast site and vibrations have not crossed requisite limits till date. "Thick muffles are put so that noise and tremors are not felt on the ground. Besides, blasting is done in a confined state," said Dr Ramulu More of CIMFR, who is heading the team at the site.

## 4 BLASTING SITES SO FAR




| | Total blasts Around 800 |
|---|---|
| Pali ground area | 380 |
| MIDC | 270 |
| Cuffe Parade | 100 |
| Seepz | 50 |

- Initially control blasting at 4 sites
- Hard rock found at these sites
- More sites to be covered later
- Controlled blasting at Marol Naka, Churchgate, Hutatma Chowk soon

**EXCAVATION**
Hard rock excavated through controlled blasts so far:

**4 lakh tons**

It's enough to fill Shivaji Park up to a height of 2.6 mtrs

Sanjay Hadkar

Workers prepare for controlled blasting at a metro station site

## TECHNIQUES TO REDUCE SPLINTERS, VIBRATIONS DURING AN EXPLOSION

### HOW IT'S DONE

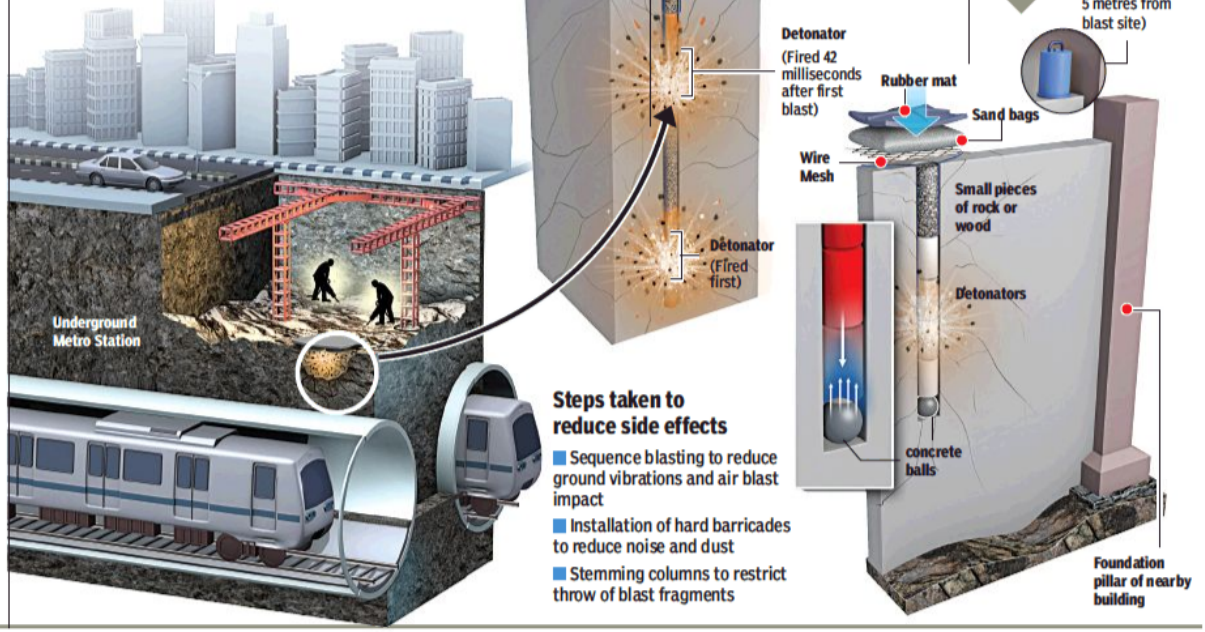
- A seismography instrument is installed near blast site
- 70-80 holes made into the rock in close proximity
- Tubes containing explosives (detonators) are inserted
- Detonators triggered from a distance through blast initiators or live wires

**1 Air-decking:** Pieces of rock/wood placed between detonators and at end for air-decking

- This improves fragmentation and reduces blast charge

**Scattering delay sequence:** Delayed firing of blast holes reduces vibrations

- This further reduces peak particle velocity by 20-25%




### Steps taken to reduce side effects

- Sequence blasting to reduce ground vibrations and air blast impact
- Installation of hard barricades to reduce noise and dust
- Stemming columns to restrict throw of blast fragments