| **Project Title**: Scientific studies for design of safe blast parameters at M/s Metarock Pvt. Ltd., Thiruvananthapuram, Kerala

Project No.: SSP/N/377/2019-20 | **Executive Summary:**

M/s Metarock Pvt. Ltd. is operating a granite stone mine at Aruvikkara village of Nedumangad taluk, Thiruvananthapuram Dist., Kerala. It is a medium size private mining industry. Industrial structures such as crushers, large numbers of dwelling units and village are close to the mine working. Therefore, it is important to conduct blasting study for investigating its impact on nearby vicinity and optimize the blast design parameters in safe and productive manner using scientific methods.

M/s Metarock Pvt. Ltd., Kerala referred the investigation of designing a safe and productive blast pattern to control blast induced ground vibration, air overpressure and flyrock (vide letter dated 29/09/2018**)** at **Metarock Granite Quarry,** Thiruvananthapuram   to CSIR-Central Institute of Mining & Fuel Research, (erstwhile CMRI) Nagpur Research Centre.

CSIR-CIMFR Nagpur accepted the request and team visited twice to Metarock Granite Stone Quarry, conducted a total of 20 experimental blast and and monitored blast induced ground vibration and air over pressure in various sensitive locations around the mine area by using three numbers of calibrated tri-axial seismographs (Make: Instantel, Canada).

During field investigations, it was found that the maximum blast induced ground vibration level (PPV) recorded was 11.36 mm/s at 61 m distance within the lease area of mine. Blast fragmentation was very good and back break was limited.

All the recorded ground vibration in form of PPV (mm/s) and air over pressure (dBL) data were statistically analysed using regression analysis. The prediction model for Blast induced ground vibration with 95% Confidence Level is given below:
$Vmax = 1928.4\,(SD)^{-1.9}$ mm/s --------------------(i)
$R^2 = 0.89$

where,

$Vmax$ = Peak Particle Velocity in mm/s;
SD= Scaled Distance (D/$\sqrt{Q}$) in $m/kg^{0.5}$
D = Distance of seismograph from blast site in m
Q = Maximum explosive charge per delay in kg

The safe permissible peak particle velocity as per the relevant DGMS circular is considered as 5mm/s. As no sensitive structure is present within 177 m, the allowable maximum charge per delay was calculated as 76 kg. These blast parameters along with permissible maximum charge per delay should be religiously followed to restricted ground vibrations, air overpressure and flyrock. |