

Project Title: *Scientific studies for design of safe blast parameters at M/s G. Jeevith Reddy Stone Quarry, Hyderabad, India.*

Project No.: *SSP/N/376/2019-20*

Executive Summary:

M/s G. Jeevith Reddy Stone Quarry, Hyderabad entrusted CSIR-Central Institute of Mining & Fuel Research (CIMFR), Nagpur to study for design of safe blast parameters at G. Jeevith Reddy Stone Quarry, in view of the proximity of habitats to the quarry workings. CIMFR, Nagpur conducted studies for calculating safe charge pattern design parameters for Jackhammer drill holes and small diameter cartridge explosives. The scope of work comprises providing best drilling geometry & design of optimum charge pattern, monitoring of ground vibrations. The detailed investigations were carried out on the levels of blast induced ground vibrations nearby habitats and structures not belonging to owner of the mine. A vibration attenuation model was developed based on the trial blasts conducted and the safe maximum charge per delay was calculated to restrict permissible peak particle velocity to safe limits.

A total of 10 trial blasts were conducted and vibration levels were monitored with calibrated tri-axial seismographs (Make: Instantel, Canada). The maximum value of ground vibration monitored at 40m from blast site was 4.388 mm/s and the vibration levels near hutments belongs to owner was recorded as 0.809 mm/s at 89 m, which emphasizes the safe blasting practice prevailing at the mine. The maximum ground vibration attenuation equation obtained after analysis of vibration data at 95% confidence is as below:

$$V_{\max} = 5065.7(\text{SD})^{-1.735} \text{ mm/s with coefficient of correlation } (R^2) = 0.88$$

Where,

V_{\max} = 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 10mm/s, conservatively as the majority of the frequencies of blast events are above 25Hz. Blasting up to a distance of 50m from the structures is permissible with maximum explosive charge per delay as 1.87kg, so that the safe ground vibration level do not exceed 10 mm/s. Although the nearest structures belonging to owner as well as non-owner are existing at a distance of 85m from the mine, conservatively it is recommended that maximum charge per delay should not be increased beyond 4.20 kg with 2.4m hole depth. It is recommended to practice the blast design of burden=2.0m, spacing=2.5m and hole depth=2.4m, which was proved to be the safe blast pattern during the trial blasts. These blast parameters along with permissible maximum charge per delay should be religiously followed to restricted ground vibrations and flyrock.