## ABSTRACT

The Laboratory Drilling investigations carried out aimed at to know the optimum range for thrust and air pressure for a given bit-rock combination in percussive drilling. Laboratory drilling experiments were conducted on six different rock types namely, Bronzite gabbro, Soda granite, Granite, Dolerite, Quartz chlorite schist and Dolomite using eleven (33, 35, 38 and 40 mm diameter Integral steel Chisel; Threaded type Chisel and Cross bits of 38 and 48 mm and spherical button bit of 48 mm diameter; Taper type spherical button bit of 38 mm and Conical button bit of 43 mm diameter) bits. In all the cases, it was found that optimum thrust varied depending upon the level of air pressure for a given bit-rock combination. The physico-mechanical properties (ten in number) of all rocks were determined with a view to find the relationship between rock properties and penetration rate. An attempt was made to estimate the temperature at the bit-rock interface at the stoppage of drilling operation.

Indentation tests, both static and impact, were carried on different rock types namely, Bronzite Gabbro, Soda Granite, Granite, Quartz Chlorite Schist, Dolomite and Sandstone to compare the specific energy required and to study the influence of index angle on specific energy.

Theoretical investigations were carried out to know the displacement and compressive stress using 48 mm diameter Chisel, Cross and Spherical button bits on the same rock types used in static indentation tests to compare the displacement (Penetration) values obtained in FEM analysis (ANSYS software) and static indentation tests. The displacement obtained by theoretical (FEM) analysis was found to be less when compared to the values obtained during static indentation tests and the error is generally varied between 27 to 41%.

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The field drilling investigations were carried out to study the effect of air pressure, flushing medium (dry or wet) and flushing rate ( in case of wet drilling) on penetration rate at two mine sites namely, at a granite quarry of M/s Premium Granites Limited at Chimakurty of Andhra Pradesh and at Narwapahar underground Uranium mine of M/s Uranium Corporation of India Limited at Narwapahar in Bihar. The results shoed that penetration is higher in wet drilling when compared to dry drilling and the flushing rate should be more than 3 1/min. The penetration rate increased as flushing rate increased from 1 1/min to 4 1/min.

Key Words : Laboratory Percussive Drilling, Air Pressure, Thrust, Penetration rate, Chisel, Cross and Spherical Button Bit, Indentation Tests, Static Indentation Tests, Impact Indentation Tests, Indexing Angle, Specific Energy, FEM Analysis (ANSYS Software), Displacement, Field Drilling Investigations, Flushing Medium, Flushing Rate.