

## **Heritage stones and their deterioration in rock-cut monuments in India**

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**Abstract:** India is dotted with thousands of rock-cut monuments of considerable antiquity having artwork of global importance. It is evident from the location of many of these monuments that knowledge of viable selection of site, geotechnical considerations and amenability to sculptures' chisel was vital for construction of rock-cut monuments and sculptures. These rock-cut structures also represent significant achievements of geotechnical and structural engineering and craftsmanship of contemporary period. The paper deals with some of the sites where natural rock-mass exposures were used to hew the monuments and highlight the deterioration owing to geological and climatic conditions.

The Kailash temple in Ellora and Ajanta rock-cut caves are among the greatest architectural feats which owe their grandeur to amenability and consistency of basalt of Deccan Volcanic Province from which it is hewn. The Kailash Temple was created through a single, huge top-down excavation 100 feet deep down into the volcanic basaltic cliff rock. These ancient rock cut structures are amazing achievements of structural engineering and craftsmanship. The lava flows are nearly horizontal, competent rock medium facilitated the chiseling for the sculptures. The deterioration of these basalts are seen where the amygdule, vesicles and opening in rock discontinuity had the medium of construction or excavation.

The monolithic rock-cut monuments of Mahabalipuram temples are constructed in the form of rathas or chriot and adjoining caves by excavating solid charnockite/granites. The large rock exposures are excavated and cut to perfection with wall decorations and sculptured art. The charnockites are the strongest and the most durable rock, yet quite amenable to fine dressing. These monolithic monuments in charnockite and are cut out of the hillock. The 7th Century monuments now exhibit somewhat rough surface probably due to weathering effect of salt laden winds from the sea side and alteration of feldspars.

The Rock shelters of Bhimbetka, a World Heritage Site, are located within Vindhyan sandstone, yielded primitive tools and decorative rock paintings. The rock-cut caves in twin hills Udayagiri and Khandagiri, contain carvings sculptured in coarse grained grey to buff coloured sandstone of Gondwana group of rocks. The Badami cave temples constructed out of escarpment of the hill in sandstone represent some of the earliest known examples of Hindu temples.

Utilizing in situ rock exposures, natural rocks and landscape of Deccan basalts, granites of peninsular shield, sandstones and limestone for rock cut architecture in India, thus, holds varied examples of rock-cut architectures.