

Multi-point Rescue Anchor Systems: Drop Testing for Viability with Extreme Forces

Multi-point anchors constructed with removable artificial protection devices (pro) have been employed by many SAR teams for decades. Recent studies, testing multi-point anchors with slow-pull forces, indicate that an individual leg of such an anchor could receive forces greater than 10kN. This force exceeds the maximum force commonly allowed on a single piece of pro by many team's safety procedures.

Our report and testing attempts to answer two questions: Will a multi-point anchor constructed with pro placed in rock survive a dynamic force generated during a worst-case scenario, and, what force could a worst-case scenario actually generate.

We will be constructing ten different four-point pre-equalized pro anchors in rock above cliffs in the Joshua Tree National Park. The anchor points will be connected by various types of commonly used cordage. A steel test mass of 200kg attached to three meters of 11mm "static" rope will be dropped one to three meters on each anchor, creating a fall-factor ranging from about .33 to 1. A load cell will be attached to the focal point of the anchor to record the total force generated on the anchor.

Our expectations are that these anchor systems will survive the force generated by fall-factor drops of up to .6, which is greater than we believe possible during a real incident with a reasonably trained team. We also expect the force generated by such a fall will be significantly less than 20kN. The test results will not be conclusive. They will hopefully motivate further study, and will give SAR teams more information from which to evaluate their practices.