Tensile Capacity of Adhesive Anchors in Threaded Perforations

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Introduction
Adhesive anchor are widely used in construction. Adhesive anchors lost their tensile capacities in 2006 accident in Boston and 2012 in Japan. Concrete ceiling panels in two tunnels killed travelers.

Method
The epoxy adhesive is the bonding agent used to connect the anchor with the concrete. A tension load is transferred by mechanical interlock from the threaded rod into the epoxy and by adhesion and/or micro interlock (due to the roughness of the drilled hole) from the epoxy into the concrete.

Based on field study, only the drilled holes are cleaned following the process in a small number of installations. Their capacities are one third of those in clean holes. Adhesive-concrete interface is critical. The solution is creating threads in drilled holes. The laboratory tests have indicated that the threads can change interface mechanism from friction to mechanical interlock and the tensile capacities are greatly increased.

Summary
1. Dusts in drilled hole weaken the adhesive-concrete interface
2. Creating threads in drilled holes
3. The tunnels with concrete ceiling panels are safer.

Reference