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Powers Fasteners Adhesive Anchor Systems Engineering Statement

Powers Fasteners supplies several adhesive anchoring systems used in construction, industrial and highway transportation projects. These adhesive systems lend themselves to a wide variety of applications in concrete and masonry substrates. Some of these products have been used for structural attachments for over 15 years.

Due to the I-90 connector tunnel accident on July 10, 2006 in Boston, Massachusetts, and the subsequent investigation and report released by the National Transportation Safety Board (NTSB) on July 10, 2007, the functioning and creep resistance characteristics of adhesive anchors have become significant topics for many design professionals. Creep is the continuous yielding of a material under constant stress. Many materials experience creep which is a function of applied stress (load), time and temperature.

Currently, adhesive anchoring is not specifically addressed by building codes. Adhesive anchor suppliers have had the option of sending adhesive anchors through a testing and evaluation process to be qualified for use as an alternative material using International Code Council, Evaluation Services (ICC-ES) Acceptance Criteria 58 (AC58). AC58 includes provisions for an optional creep test for adhesive anchors as a method to evaluate the long-term behavior of an adhesive anchor under a sustained load. This test is conducted on anchors in dry, uncracked concrete at an elevated temperature and with a sustained load while measuring movement over an extended period of time. If adhesive anchors do not pass the specified AC58 creep test (or when the test is not conducted), ICC-ES permits these anchors for use with short-term loads only, such as forces exhibited by wind and seismic events.

The following Powers Fasteners' adhesive anchor products have passed the ICC-ES AC58 specified creep test: AC100 Plus, Chem-Stud Capsules, and Power-Fast *Standard Set*. Based on this test, ICC-ES has deemed these products suitable for sustained long-term allowable loads, such as dead or live loads as indicated in the respective evaluation reports.

Powers is reviewing the basis for the NTSB's conclusions. In the interim, Powers has revised Power-Fast product packaging to clarify the use of *Standard Set* rather than *Fast Set* for long-term loads. *Fast Set* can continue to be considered for use for short-term loads such as earthquake or wind loads. Power-Fast *Standard Set* can be considered for use for short-term loads as well as long-term loads.

It is important that the design professional take into account all aspects of design, including appropriate factors of safety and the direction and types of loads applied to the anchors. Proper installation of adhesive anchors, including hole cleaning and other recommended instructions are critical to the short and long-term performance of the products. Adhesive anchors also experience reduced capacities at elevated temperatures and proper consideration must be given to fire exposure conditions. Other factors such as alternative hole drilling methods, wet holes, environmental effects, corrosion, cracked concrete conditions, shock loading, vibration and fatigue should also be considered.

It should be noted that the AC58 criteria for adhesive anchors in concrete has been replaced by AC308 which is a more comprehensive testing and evaluation criteria and includes a mandatory creep test. Effective January 1, 2008, all issued evaluation reports from ICC-ES for adhesive anchors must show compliance with AC308. Powers has been testing its adhesive anchor systems according to the new AC308 criteria and expects to provide designers with completed evaluation reports including evidence of acceptable creep resistance for injection adhesives in its product line that have passed this new test. In the interim, designers with any concern about long-term sustained loads may want to consider specification of Powers' three products referenced above that meet the AC58 criteria for resistance to creep at elevated temperatures.

Please note that the above recommendations are in no way intended to be a substitute for the judgment of the design professional.