

CODE

Table 17.6.5.2.5—Minimum characteristic bond stresses^{[1][2]}

Installation and service environment	Moisture content of concrete at time of anchor installation	Peak in-service temperature of concrete, °C	τ_{cr} , MPa	τ_{uncr} , MPa
Outdoor	Dry to fully saturated	79	1.4	4.5
Indoor	Dry	43	2.1	7.0

^[1]If anchor design includes sustained tension, multiply values of τ_{cr} and τ_{uncr} by 0.4.

^[2]If anchor design includes earthquake-induced forces for structures assigned to SDC C, D, E, or F, multiply values of τ_{cr} by 0.8 and τ_{uncr} by 0.4.

COMMENTARY

interpretation of the terms “indoor” and “outdoor” do not apply. For example, anchors installed before the building envelope is completed may involve drilling in saturated concrete. As such, the minimum characteristic bond stress associated with the outdoor condition in Table 17.6.5.2.5 applies, regardless of whether the service environment is “indoor” or “outdoor.”

Rotary impact drills and rock drills produce non-uniform hole geometries that are generally favorable for bond. Installation of adhesive anchors in core-drilled holes may result in substantially lower characteristic bond stresses. Because this effect is highly product dependent, design of anchors to be installed in core-drilled holes should adhere to the product-specific characteristic bond stresses established through testing in accordance with **ACI 355.4M**.

The characteristic bond stresses associated with specific adhesive anchor systems are dependent on a number of parameters. Consequently, care should be taken to include all parameters relevant to the value of characteristic bond stress used in the design. These parameters include but are not limited to:

- (a) Type and duration of loading—bond strength is reduced for sustained tension
- (b) Concrete cracking—bond strength is higher in uncracked concrete
- (c) Anchor size—bond strength is generally inversely proportional to anchor diameter
- (d) Drilling method—bond strength may be lower for anchors installed in core-drilled holes
- (e) Degree of concrete saturation at time of hole drilling and anchor installation—bond strength may be reduced due to concrete saturation
- (f) Concrete temperature at time of installation—installation of anchors in cold conditions may result in retarded adhesive cure and reduced bond strength
- (g) Concrete age at time of installation—installation in early-age concrete may result in reduced bond strength (refer to R17.2.2)
- (h) Peak concrete temperatures during anchor service life—under specific conditions (for example, anchors in thin concrete members exposed to direct sunlight), elevated concrete temperatures can result in reduced bond strength
- (i) Chemical exposure—anchors used in industrial environments may be exposed to increased levels of contaminants that can reduce bond strength over time

Anchors tested and assessed under ACI 355.4M may in some cases not be qualified for all of the installation and service environments represented in Table 17.6.5.2.5. Therefore, where the minimum values given in Table 17.6.5.2.5 are used for design, the relevant installation and service environments should be specified in accordance with 26.7.1(i), (j), (k), and (l), and only anchors that have been qualified under **ACI 355.4M** for the installation and service environments corresponding to the characteristic bond stress taken from Table 17.6.5.2.5 should be specified.