



## HILTI TECHNICAL BULLETIN

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**Subject: Design parameters for Hilti HIT-RE 500 V3 for concrete strengths up to 13,000 psi (90 MPa)**

ACI 318 Chapter 17 and CSA A23.3 Annex D limit the design of post-installed anchors to concrete strengths to a maximum of 8,000 psi and 55 MPa, respectively. ESR-3814 and ELC-3814 for Hilti HIT-RE 500 V3 provide data with the same concrete strength limitations for design in accordance with ACI 318 and CSA A23.3.

Hilti has performed tests of HIT-RE 500 V3 in external test laboratories in concrete strengths up to 13,000 psi (90 MPa). Tests have shown no decrease in bond strength in concretes between 8,000 psi (55 MPa) and 13,000 psi (90 MPa) concrete. Tests have also shown the concrete strength up to 10,000 psi (70 MPa) can be used for concrete breakout failure modes, similar to cast-in anchors. This document expands the relevant design parameters in ACI 318 and CSA A23.3 for Hilti HIT-RE 500 V3 up to concrete strengths of 13,000 psi (90 MPa).

### Tensile loading parameters for $f'_c$ between 8,000 psi and 13,000 psi (between 55 MPa and 90 MPa for CSA A23.3 design)

Parameter	ACI 318-14	CSA A23.3-14	Recommendation
Steel capacity	§17.4.1	§D.6.1	Independent of concrete strength
Concrete breakout capacity	§17.4.2	§D.6.2	$k_c$ factors in ESR-3814 and ELC-3814 valid using $f'_c$ up to 10,000 psi (70 MPa) for calculation.
Bond capacity	§17.4.5	§D.6.5	Increase factors in ESR-3814 and ELC-3814 limited to 8,000 psi (ACI 318 design) and 55 MPa (CSA A23.3 design) concrete.
$\phi$ (ACI and CSA) $R$ (CSA only)	§17.3.3	§D.5.3	Factors in ESR-3814 and ELC-3814 valid.

### Shear loading parameters for $f'_c$ between 8,500 psi and 13,000 psi (between 55 MPa and 90 MPa for CSA A23.3 design)

Parameter	ACI 318-14	CSA A23.3-14	Recommendation
Steel capacity	§17.5.1	§D.7.1	Independent of concrete strength
Concrete breakout capacity	§17.5.2	§D.7.2	Calculations valid using $f'_c$ up to 13,000 psi (90 MPa).
Concrete pryout capacity	§17.5.3	§D.7.3	$k_c$ factors in ESR-3814 and ELC-3814 valid using $f'_c$ up to 13,000 psi (90 MPa) for calculation.
$\phi$ (ACI and CSA) $R$ (CSA only)	§17.3.3	§D.5.3	Factors in ESR-3814 and ELC-3814 valid.

**Treatment of other parameters for  $f'_c$  between 8,500 psi and 13,000 psi (between 55 MPa and 90 MPa for CSA A23.3 design)**

<b>Parameter</b>	<b>ACI 318-14</b>	<b>CSA A23.3-14</b>	<b>Recommendation</b>
Minimum edge distances, spacings, and concrete thicknesses	§17.7	§D.9	Equivalent to published values in ESR-3814 and ELC-3814
Installation	n/a	n/a	Same as ESR-3814 and ELC, but the only installation conditions permitted are in dry and water-saturated concrete. (Design with water-filled holes and submerged concrete not permitted above 8,500 psi [55 MPa].)

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