CODE

COMMENTARY

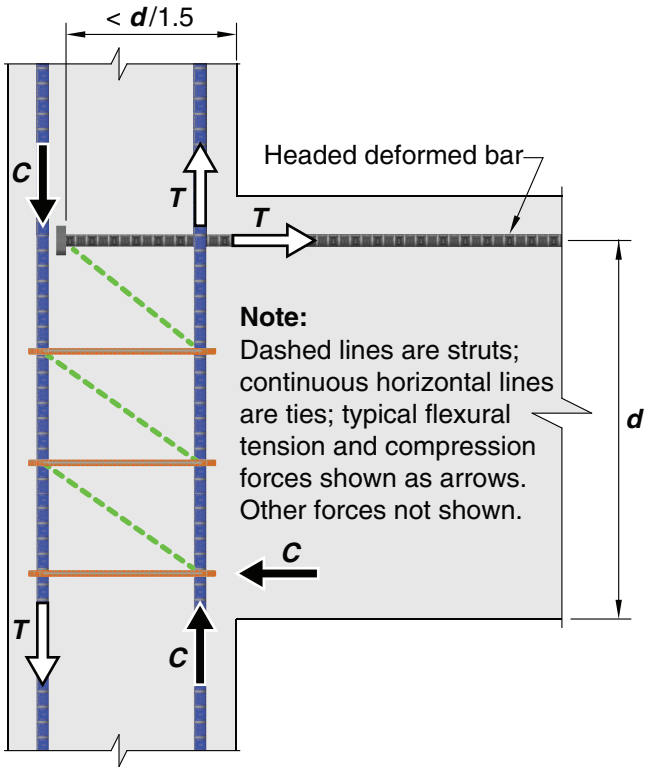

***Fig. R25.4.4.2d**—Breakout failure precluded in joint by providing transverse reinforcement to enable a strut-and-tie mechanism.*

25.4.4.3 For the calculation of ℓ_{dt}, modification factors ψ_e, ψ_p, ψ_o, and ψ_c shall be in accordance with Table 25.4.4.3.

Table 25.4.4.3—Modification factors for development of headed bars in tension

Modification factor	Condition	Value of factor
Epoxy ψ_e	Epoxy-coated or zinc and epoxy dual-coated reinforcement	1.2
	Uncoated or zinc-coated (galvanized) reinforcement	1.0
Parallel tie reinforcement ψ_p	For No. 36 and smaller bars with $A_{tt} \geq 0.3A_{hs}$ or s[1] $\geq 6d_b$[2,3]	1.0
	Other	1.6
Location ψ_o	For headed bars: (1) Terminating inside column core with side cover to bar $\geq$ 65 mm; or (2) With side cover to bar $\geq 6d_b$	1.0
	Other	1.25
Concrete strength ψ_c	For $f_c' < 42$ MPa	$f_c'/105 + 0.6$
	For $f_c' \geq 42$ MPa	1.0

[1]s is minimum center-to-center spacing of headed bars.

[2]d_b is nominal diameter of headed bar.

[3]Refer to 25.4.4.5.

R25.4.4.3 The epoxy factor 1.2 is based conservatively on the value used for epoxy-coated standard hooks. The location factor ψ_o accounts for the confinement provided by the reinforcement within columns and large side cover for other members.

The factor ψ_p for headed reinforcement is similar to the confining reinforcement factor for hooked bars (Shao et al. 2016). Unlike hooked bars, however, test results indicate that only tie or hoop reinforcement parallel to headed bars contributes to anchorage strength and reduces development length (Thompson et al. 2005, 2006a,b).