

CODE

25.4.9 Development of deformed bars and deformed wires in compression

25.4.9.1 Development length ℓ_{dc} for deformed bars and deformed wires in compression shall be the greater of (a) and (b)

- (a) Length calculated in accordance with 25.4.9.2
- (b) 200 mm

25.4.9.2 ℓ_{dc} shall be the greater of (a) and (b), using the modification factors of 25.4.9.3:

- (a) $\left(\frac{0.24 f_y \psi_r}{\lambda \sqrt{f'_c}} \right) d_b$
- (b) $0.043 f_y \psi_r d_b$

25.4.9.3 For the calculation of ℓ_{dc} , modification factors shall be in accordance with Table 25.4.9.3, except ψ_r shall be permitted to be taken as 1.0.

Table 25.4.9.3—Modification factors for deformed bars and wires in compression

Modification factor	Condition	Value of factor
Lightweight λ	Lightweight concrete	0.75
	Normalweight concrete	1.0
Confining reinforcement ψ_r	Reinforcement enclosed within (1), (2), (3), or (4): (1) a spiral (2) a circular continuously wound tie with $d_b \geq 6$ mm and pitch 100 mm (3) No. 13 bar or MD130 wire ties in accordance with 25.7.2 spaced ≤ 100 mm on center (4) hoops in accordance with 25.7.4 spaced ≤ 100 mm on center	0.75
	Other	1.0

25.4.10 Reduction of development length for excess reinforcement

25.4.10.1 Reduction of development lengths defined in 25.4.2.1(a), 25.4.6.1(a), 25.4.7.1(a), and 25.4.9.1(a) shall be permitted by use of the ratio $(A_{s,required})/(A_{s,provided})$, except where prohibited by 25.4.10.2. The modified development lengths shall not be less than the respective minimums specified in 25.4.2.1(b), 25.4.6.1(b), 25.4.7.1(b), and 25.4.9.1(b).

25.4.10.2 A reduction of development length in accordance with 25.4.10.1 is not permitted for (a) through (f)

- (a) At noncontinuous supports

COMMENTARY

R25.4.9 Development of deformed bars and deformed wires in compression

R25.4.9.1 The weakening effect of flexural tension cracks is not present for bars and wires in compression, and usually end bearing of the bars on the concrete is beneficial. Therefore, shorter development lengths are specified for compression than for tension.

R25.4.9.2 The constant 0.043 has units of mm^2/N .

The term λ is provided in the expression for development in 25.4.9.2 recognizing that there are no known test data on compression development in lightweight concrete but that splitting is more likely in lightweight concrete.

R25.4.9.3 The development length may be reduced 25 percent when the reinforcement is enclosed within closely spaced spirals, ties, or hoops.

R25.4.10 Reduction of development length for excess reinforcement

R25.4.10.1 A reduction in development length is permitted in limited circumstances if excess reinforcement is provided.

R25.4.10.2 The excess reinforcement factor $(A_{s,required}/A_{s,provided})$, applicable to straight reinforcement is not applicable for hooked or headed bars where force is transferred through a combination of bearing at the hook or head and bond along the bar. Concrete breakout due to bearing at a