

5.11.2.1.1 TENSION DEVELOPMENT LENGTH

Grade 60 reinforcement; 4000 psi concrete

	3	4	5	6	7	8	9	10	11	14	18
	Development Length - inches										
Basic L_{d_b}	27	36	45	54	63	72	82	92	102	122	163

MODIFICATION FACTORS

Increase L_d . Refer to Article 5.11.2.1.2 of the 2015 Interims

Decrease L_d . Refer to Article 5.11.2.1.3 of the 2015 Interims

Commentary

The 2015 Interims revised the tension development length calculations. Modification factors that increase or decrease the basic development length shall be used in accordance with Articles 5.11.2.1.2 and 5.11.2.1.3.

Revisions

Mar 2015 Revised to conform to the 2015 Interims.

5.11.2.2.1 COMPRESSION DEVELOPMENT LENGTH

MODIFICATION FACTORS

(1)	Basic development length	1.00
(2)	Enclosed by spiral with diam > 0.25" & pitch <= 4"	0.75

Grade 60 reinforcement; 4000 psi concrete

	3	4	5	6	7	8	9	10	11	14	18
	Development Length - inches										
(1)	8	10	12	15	17	19	22	25	27	32	43
(2)	8	8	9	11	13	15	16	19	20	24	32

5.11.2.4 STANDARD HOOKS IN TENSION

Grade 60 reinforcement; 4000 psi concrete

MODIFICATION FACTORS FOR PLAIN BARS

(1)	Basic hooked development length	1.00
(2)	For #11 bar and smaller, hooks with side cover normal to plane of hook not less than 2.5", and for 90° hook with cover on the bar extension beyond hook not less than 2.0"	0.80
(3)	For 90° hooks of #11 and smaller bars that are either enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than 3 ϕ along the development length of the hook; or enclosed within ties or stirrups parallel to the bar being developed spaced not greater than 3 ϕ along the length of the tail extension of the hook plus bend, and in both cases the first tie or stirrup enclosing the bent portion of the hook is within 2 ϕ of the outside of the bend	0.80
(4)	For 180° hooks of #11 and smaller bars that are enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than 3 ϕ along the development length of the hook, and the first tie or stirrup enclosing the bent portion of the hook is within 2 ϕ of the outside of the bend	0.80

PLAIN BARS

	3	4	5	6	7	8	9	10	11	14	18
3*Db	1.125	1.5	1.875	2.25	2.625	3	3.384	3.81	4.23	5.079	6.771
2*Db	0.75	1	1.25	1.5	1.75	2	2.256	2.54	2.82	3.386	4.514
	Development Length - inches										
(1)	8	10	12	15	17	19	22	25	27	33	43
(2)	6	8	10	12	14	16	18	20	22		
(3)	6	8	10	12	14	16	18	20	22		
(4)	6	8	10	12	14	16	18	20	22		
(2) & (3)	6	7	8	10	11	13	14	16	18		
(2) & (4)	6	7	8	10	11	13	14	16	18		

MODIFICATION FACTORS FOR EPOXY BARS

(1)	Basic hooked development length	1.00
(2)	For #11 bar and smaller, hooks with side cover normal to plane of hook not less than 2.5", and for 90° hook with cover on the bar extension beyond hook not less than 2.0"	0.80
(3)	For 90° hooks of #11 and smaller bars that are either enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than 3 ϕ along the development length of the hook; or enclosed within ties or stirrups parallel to the bar being developed spaced not greater than 3 ϕ along the length of the tail extension of the hook plus bend, and in both cases the first tie or stirrup enclosing the bent portion of the hook is within 2 ϕ of the outside of the bend	0.80
(4)	For 180° hooks of #11 and smaller bars that are enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than 3 ϕ along the development length of the hook, and the first tie or stirrup enclosing the bent portion of the hook is within 2 ϕ of the outside of the bend	0.80
	Epoxy Bar	1.20

EPOXY BARS

	3	4	5	6	7	8	9	10	11	14	18
3*d _e	1.125	1.500	1.875	2.250	2.625	3.000	3.384	3.810	4.230	5.079	6.771
2*Db	0.75	1	1.25	1.5	1.75	2	2.256	2.54	2.82	3.386	4.514
	Development Length - inches										
(1)	9	12	15	18	20	23	26	29	33	39	52
(2)	7	10	12	14	16	19	21	24	26		
(3)	7	10	12	14	16	19	21	24	26		
(4)	7	10	12	14	16	19	21	24	26		
(2) & (3)	6	8	10	11	13	15	17	19	21		
(2) & (4)	6	8	10	11	13	15	17	19	21		