

# Embedment & Laps

## Required Lap Length -Reinforcing Steel-

-Along with 06 IBC lap calculation method the 07 edition of the Florida Building Code allows the use of the ACI 530-05 method of lap calculation with Florida modified Y (gamma) factors to remove the Seismic influence. This is true for both Working Stress Design and Strength Design.

# CHAPTER 21 MASONRY

## Section 2107.3

**2107.3 ACI 530/ASCE 5/TMS 402, Section 2.1.10.7.1.1, lap splices.** The minimum length of lap splices for reinforcing bars in tension or compression,  $l_{ld}$ , shall be

$$l_{ld} = 0.002d_b f_s \quad (\text{Equation 21-2})$$

$$\text{For SI: } l_{ld} = 0.29d_b f_s$$

but not less than 12 inches (305 mm). In no case shall the length of the lapped splice be less than 40 bar diameters.

**(Note: In High Wind Zones the Fla. Code Requires 48 Bar Dia Minimum)**

where:

$d_b$  = Diameter of reinforcement, inches (mm).

$f_s$  = Computed stress in reinforcement due to design loads, psi (MPa).

In regions of moment where the design tensile stresses in the reinforcement are greater than 80 percent of the allowable steel tension stress  $F_s$ , the lap length of splices shall be increased not less than 50 percent of the minimum required length. Other equivalent means of stress transfer to accomplish the same 50 percent increase shall be permitted to be used.

# Embedment & Laps

Bar Size Specified	Stress in Bar as %	Required Lap Length (72 Bar Diameters per IBC 06)	Bar Size Actually Used	Stress in Bar as %	Lap Length Calculated by $.002 db fs$	Minimum Lap Length (40 db)	Minimum Lap Length in High Wind Zone (48 db)
3	100	27	4	55 < 80	13.2	20	24
4	100	36	5	65 < 80	19.3	25	30
5	100	45	6	70 < 80	25.4	30	36
6	100	54	7	73 < 80	30.8	35	42
7	100	63	7+#4	75 < 80	31.5	35	42
8	100	72	8+#4	79.8 < 80	38.3	40	48
9	100	81.2	9+#5	76 < 80	41.3	45.1	54.1

If your bar is stressed in excess of 80% increasing the bar by one size results in less lap

You can also bundle an additional bar to your specified bar to drop the stress below 80%  
 (Your lap will be 40 bar diameters of the larger bar or 48 bar dia if you are in a high wind zone)

# Embedments & Laps

$l_d = \frac{0.13d_b^2 f_y \gamma}{K \sqrt{f_m}}$

Eq 2-9  
MSJC 05  
pp C-26

$\gamma$

- =1.0 for #3 through #5 bar
- =1.04 for #6 and #7 bars
- =1.2 for #8 and #9 bars

Modified factors for  $\gamma$  (gamma)  
approved in the 07 Florida Building Code

# Embedments & Laps

## Development Lengths ( $l_d$ )

### Assumptions

- $f_y=60,000$  psi
- $f'_m=1,500$  psi
- Bar spacing >  $5d_b$
- Bars centered in cell

Bar Size	8" Masonry		12" Masonry	
	Historic Lap Per MSJC 02 (48 db)	Lap Per MSJC 05 With 07 Fla Code Mods	Historic Lap Per MSJC 02	Lap Per MSJC 05 With 07 Fla Code Mods
3	18.0	15.1	18.0	15.1
4	24.0	20.1	24.0	20.1
5	30.0	25.1	30.0	25.1
6	36.0	42.8	36.0	31.4
7	42.0	59.3	42.0	36.6
8	48.0	91.3	48.0	48.3
9	54.1	118.3	54.1	58.6

### K Chart

Bar Size	5 x db	Cover for 8" Masonry	K for 8" Masonry	Cover for 12" Masonry	K for 12" Masonry
3	1.88	3.63	1.88	5.70	1.88
4	2.50	3.56	2.50	5.66	2.50
5	3.13	3.50	3.13	5.62	3.13
6	3.75	3.44	3.44	5.58	3.75
7	4.38	3.38	3.38	5.54	4.38
8	5.00	3.31	3.31	5.50	5.00
9	5.64	3.25	3.25	5.25	5.25

$$l_d = \frac{0.13d_b^2 f_y Y}{K \sqrt{f_m}}$$

Eq 2-9  
MSJC 05  
pp C-26

**Y**  
=1.0 for #3 through #5 bar  
=1.04 for #6 and #7 bars  
=1.2 for #8 and #9 bars

### Assumptions

- $f_y=60,000$  psi
- $f'_m=1,500$  psi
- Bar spacing  $> 5d_b$
- Bars centered in cell

# Embedments & Laps

## Development Lengths ( $l_d$ )

	40 Bar Dia (Min allow by Fla. Code)	48 Bar Dia (Historic and Min for High Wind Zones)	72 Bar Dia (Max Required under Fla. Code)	40 Bar Dia for One Size Increase of Bar (06 IBC)	48 Bar Dia for One Size Increase of Bar in High Wind Zone (06 IBC)	MSJC 05 with 07 Fla Code Mods
3	15	18.0	27.0	(#4 Bar) 20	(#4 Bar) 24	15.1
4	20	24.0	36.0	(#5 Bar) 25	(#5 Bar) 30	20.1
5	25	30.0	45.0	(#6 Bar) 30	(#6 Bar) 36	25.1
6	30	36.0	54.0	(#7 Bar) 35	(#7 Bar) 42	34.2
7	35	42.0	63.0	(+#4 bar) 35	(+#4 bar) 42	47.4
8	40	48.0	72.0	(+#4 bar) 40	(+#4 bar) 48	73.0
9	45.1	54.1	81.2	(+#5 bar) 45	(+#5 bar) 54	94.6