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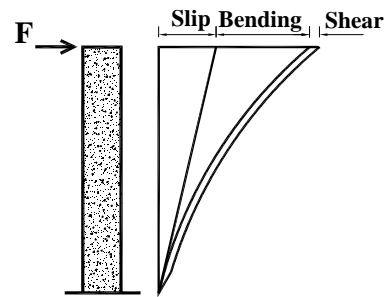
(تاریخ دریافت ۸۶/۶/۲۷، تاریخ تصویب ۸۹/۲/۴)

$$\Delta = \Delta_b + \Delta_s + \Delta_v$$

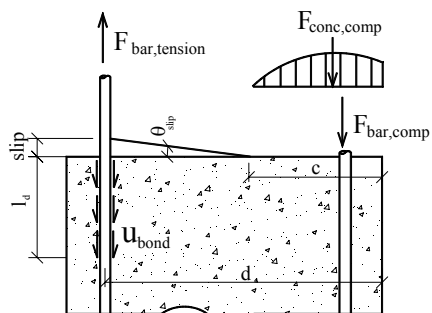
$\Delta_b$

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$$Slip = \frac{\epsilon_s l_d}{2} = \frac{f_s l_d}{2E_s} = \frac{f_s^2 d_b}{8E_s u_b} \quad ( )$$

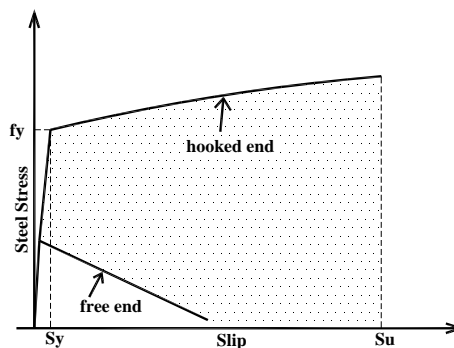
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$$\Delta_{Slip} = \frac{f_s^2 d_b}{8E_s u_b} \times \frac{L}{(d-c)} \quad ( )$$

L

$$E_s \quad d_b \quad f_s \quad ( )$$

$u_b$



[ ]

F. Micheal Bartlett Lisa R.Feldman

$P_{max}$

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$P_{res}$

$u_b$

$u_{res}$

$u_{max}$

$l_d$

[ ]

$$u_{max} = \frac{P_{max}}{\pi d_b l_d} \quad ( )$$

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$$u_{res} = \frac{P_{res}}{\pi d_b l_d} \quad ( )$$

$$F_s = f_s A_s = u_b p_d l_d \quad ( )$$

$u_{res} \quad u_{max}$

$$A_s = \pi \frac{d^2}{4}$$

$$p_d = \pi d_b$$

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$$u_{max} = [(0.19 - 0.07k_{sz} + 0.05k_{sh})\sqrt{R_y} + (-2.7 \times 10^{-5} + 4.0 \times 10^{-5}k_{sz} - 3.0 \times 10^{-5}k_{sh})l_d R_y] \sqrt{f'_c} \quad ( )$$

$$l_d = \frac{f_s d_b}{4u_b} \quad ( )$$

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$$u_{res} = [(0.042 + 0.009k_{sz} - 0.007k_{sh})\sqrt{R_y} + (-1.65 \times 10^{-5} + 1.41 \times 10^{-5} k_{sh}) \cdot l_d R_y] \sqrt{f'_c} \quad ( )$$

$$0.2\sqrt{f'_c} \quad 0.1\sqrt{f'_c} \quad k_{sh} \quad k_{sz} \quad R_y \quad l_d$$

$$0.1\sqrt{f'_c} \quad 0.15\sqrt{f'_c} \quad 0.2\sqrt{f'_c} \quad [ ] \quad ( )$$

$$P(s) / \sqrt{f'_c} = \beta_0 + \beta_1 \log s \quad ( )$$

$$\beta_0 = \frac{2P_{res} + P_{max}}{3\sqrt{f'_c}} \quad ( )$$

$$\beta_1 = \frac{P_{res} - P_{max}}{3\sqrt{f'_c}} \quad ( )$$

$$0.1\sqrt{f'_c} \quad 0.13\sqrt{f'_c} \quad 0.12\sqrt{f'_c} \quad ( )$$

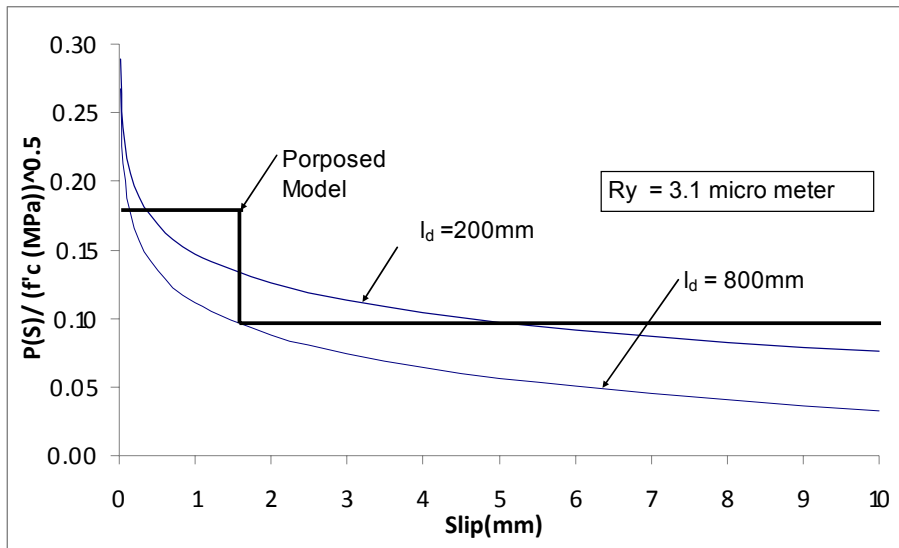
$$0.08\sqrt{f'_c} \quad 0.05\sqrt{f'_c} \quad ( )$$

$$u = \begin{cases} 0.17\sqrt{f'_c} & f_s \leq f_y \\ 0.08\sqrt{f'_c} & f_s > f_y \end{cases} \quad ( )$$

Giovanni Fabbrocino,  
 Gerardo M. Verderame, Geatano Manfredi

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$P(s)$	Model No	Reber Size	$f'_c$	$l_d$	$f_y$	$Slip_{hook}$	$Slip_{bond}$	Slip
$0.2\sqrt{f'_c}$	1	25	20	800	350	0.38	1.40	1.78
	2	25	25	200	300	0.98	0.30	1.28
	3	20	20	800	350	0.25	1.40	1.65
	4	20	25	200	300	0.89	0.30	1.19
	5	16	20	800	350	0.13	1.40	1.53
	6	16	25	200	300	0.78	0.30	1.08
	7	12	20	800	350	0.03	1.40	1.43
	8	12	25	200	300	0.62	0.30	0.92
$0.15\sqrt{f'_c}$	9	25	20	800	350	0.56	1.40	1.96
	10	25	25	200	300	1.09	0.30	1.39
	11	20	20	800	350	0.42	1.40	1.82
	12	20	25	200	300	1.01	0.30	1.31
	13	16	20	800	350	0.29	1.40	1.69
	14	16	25	200	300	0.92	0.30	1.22
	15	12	20	800	350	0.13	1.40	1.53
	16	12	25	200	300	0.78	0.30	1.08
$0.1\sqrt{f'_c}$	17	25	20	800	350	0.79	1.40	2.19
	18	25	25	200	300	1.19	0.30	1.49
	19	20	20	800	350	0.67	1.40	2.07
	20	20	25	200	300	1.14	0.30	1.44
	21	16	20	800	350	0.54	1.40	1.94
	22	16	25	200	300	1.07	0.30	1.37
	23	12	20	800	350	0.36	1.40	1.76
	24	12	25	200	300	0.97	0.30	1.27
Average								1.52

$$\Delta_y = \int_0^L \phi(x) x dx = \int_0^L \frac{\phi_y x}{L} x dx = \frac{\phi_y L^2}{3} \quad ( )$$

$$\sigma_{hook}(s) = f_u \cdot \left( \frac{S_{hook}}{3.9} \right)^{0.3} \quad ( )$$

$$\Delta_e = \int_0^L \phi(x) x dx = \int_0^L \frac{\phi x}{L} x dx = \frac{\phi L^2}{3} \quad ( )$$

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$$\phi_p = \phi - \phi_y \quad l_p$$

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$$\begin{aligned} \Delta_p &= \int_{L-l_p}^L \phi(x) x dx \\ &= \int_0^L (\phi - \phi_y) x dx = \frac{(\phi - \phi_y)}{2} [x^2]_{L-l_p}^L \\ &= \frac{(\phi - \phi_y)}{2} [L^2 - (L^2 + l_p^2 - 2Ll_p)] \\ \Delta_p &= (\phi - \phi_y) l_p (L - 0.5l_p) \end{aligned} \quad ( )$$

$$\Delta_b = \int_0^L \phi(x) x dx \quad ( )$$

**Priestley(1996)**

$$\begin{aligned} l_p &= 0.08L + 0.022 F_y d_b \\ , l_p &> 0.044 F_y d_b \quad (mm, Mpa) \end{aligned} \quad ( )$$

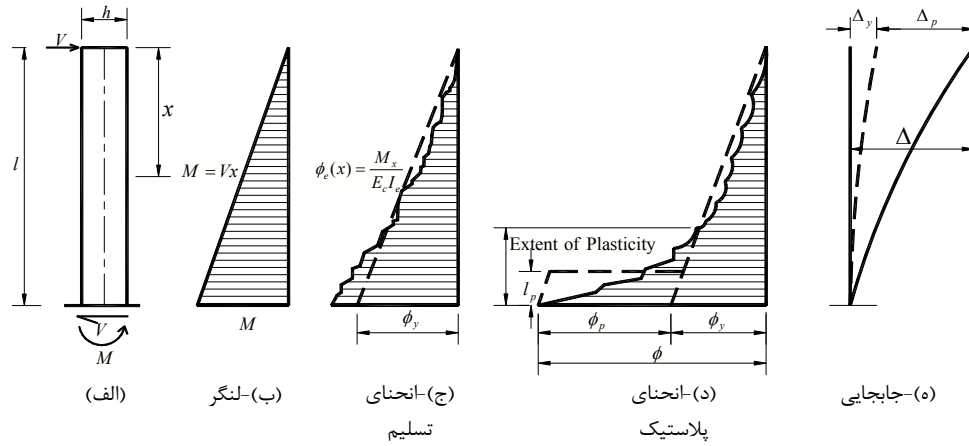
L

f<sub>y</sub>

d<sub>b</sub>

$$\phi_y \quad ( )$$

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Lehman ( ) Mohele  
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[ ] Mohele Lehman

407	1.5 in.	-0.008
415	1.5 in.	-0.008
430	1.5 in.	-0.01
815	5.25 in.	-0.009
1015	7.5 in.	-0.008

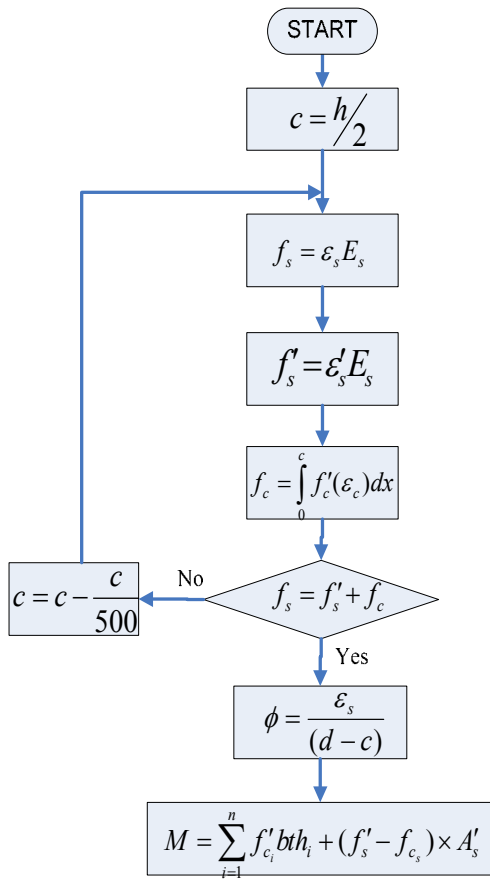
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Mohele Lehman

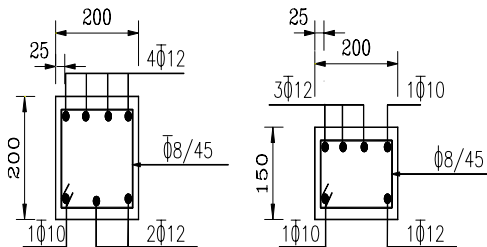


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SPC-6

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SPC-6 & SPC-7

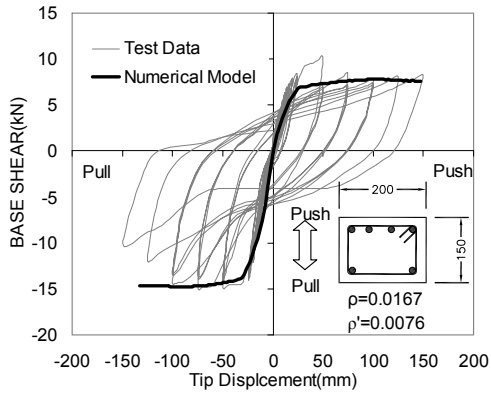
SPC-8

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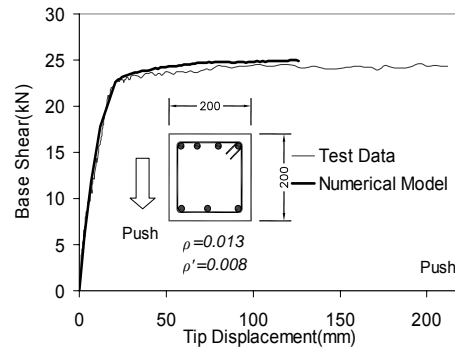
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	$f_c$ MPa	MPa	0.0017	GPa	MPa		MPa		MPa	
SPC-6	29	356	0.0017	205	485	0.18	465	0.0023	620	0.23
SPC-7	25	356	0.0017	205	485	0.18	465	0.0023	620	0.23
SPC-8	25	356	0.0017	205	485	0.18	465	0.0023	620	0.23

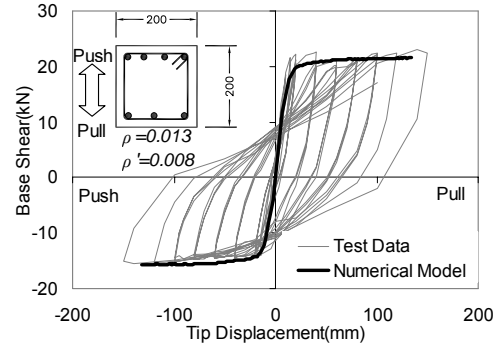
SPC-8



.SPC-8



.SPC-6



.SPC-7

[ ] FEMA (356)

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SPC-6

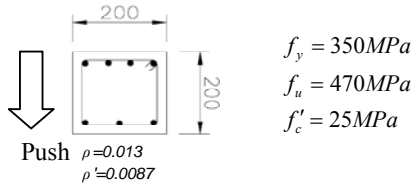
ACI (318-02) % [ ] FEMA (356)

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FEMA(356)

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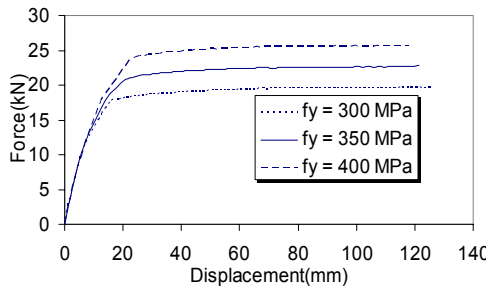
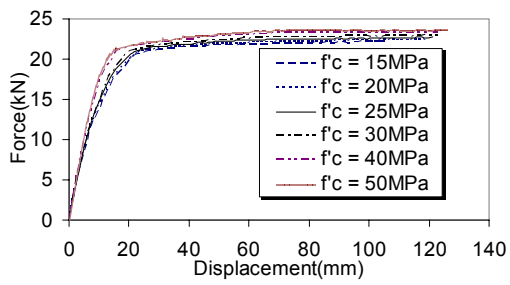




	$K_e$ (kN/mm)		$K_e / K_{(gross)}$	
<b>SPC-6</b>	1.48	1.48	0.24	0.24
<b>SPC-7(PUSH)</b>	0.98	1.11	0.16	0.18
<b>SPC-7(PULL)</b>	1.45	1.36	0.24	0.23
<b>SPC-8(PUSH)</b>	0.62	0.69	0.24	0.27
<b>SPC-8(PULL)</b>	0.57	0.48	0.22	0.19

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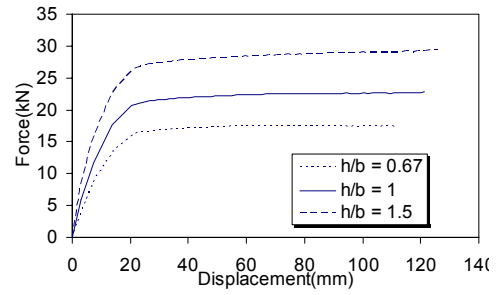
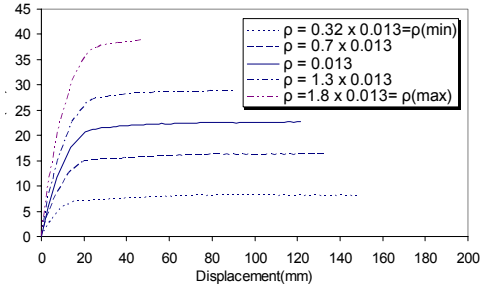
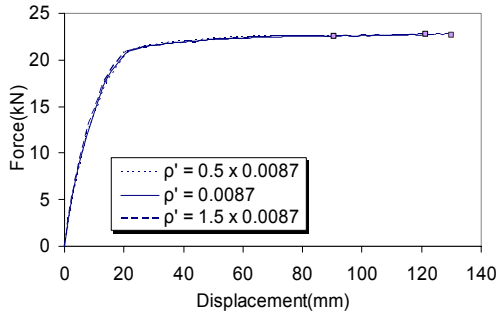
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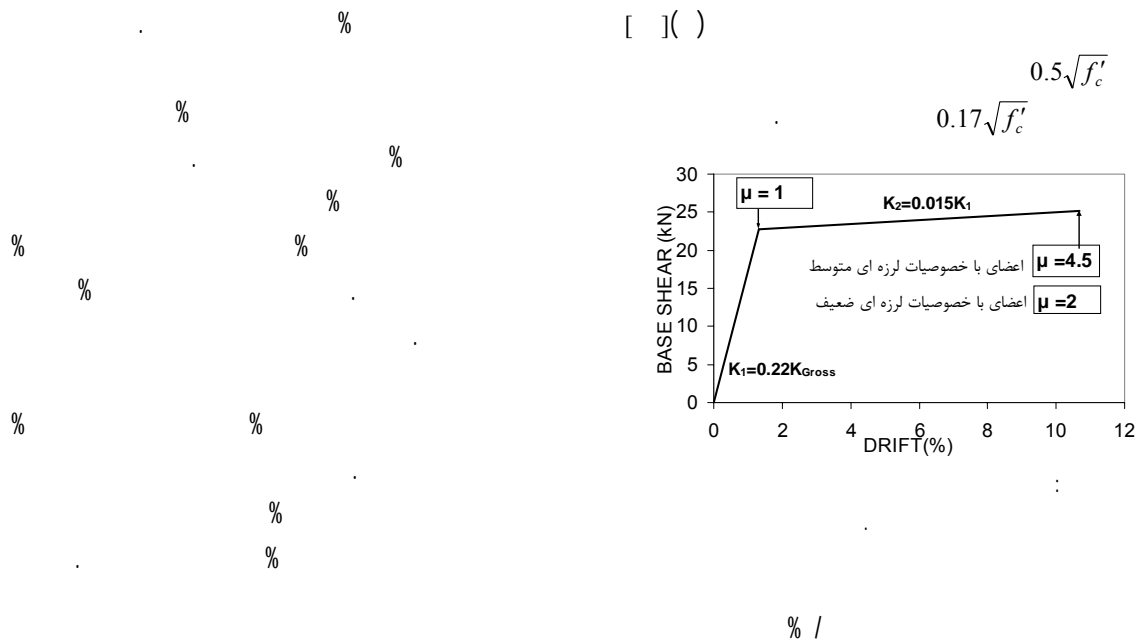
	<i>Push</i>		<i>Pull</i>	
<b>SPC-6</b>	13.7	8.2		
<b>SPC-7</b>	10.0	10.2	10.0	9.0
<b>SPC-8</b>	7.8	7.07	4.8	4.9

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