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

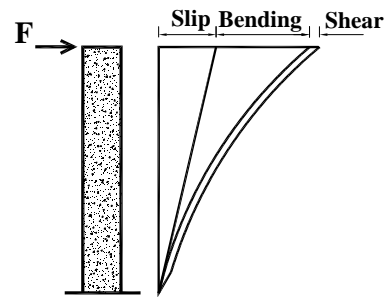
$$\Delta = \Delta_b + \Delta_s + \Delta_v$$

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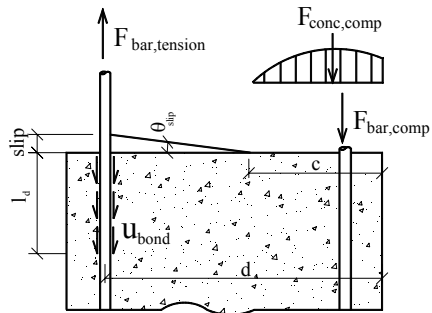
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Δ_b

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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

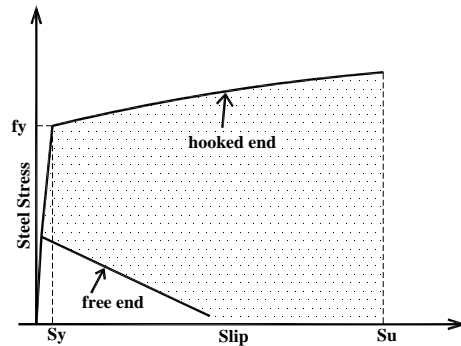
$$E_s \quad d_b \quad f_s \quad ()$$

u_b

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F. Micheal Bartlett Lisa R.Feldman

P_max

P_res

u_res

u_max

l_d

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

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

u_res u_max

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

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

$$A_s = \pi \frac{d^2}{4} \quad p_d = \pi d_b \quad ()$$

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

$$u_{res} = [(0.042 + 0.009k_{sz} - 0.007k_{sh})\sqrt{R_y} + (-1.65 \times 10^{-5} + 1.41 \times 10^{-5} k_{sh}) \cdot l_d R_y] \sqrt{f'_c} \quad (1)$$

$$P(s) / \sqrt{f'_c} = \beta_0 + \beta_1 \log s \quad (2)$$

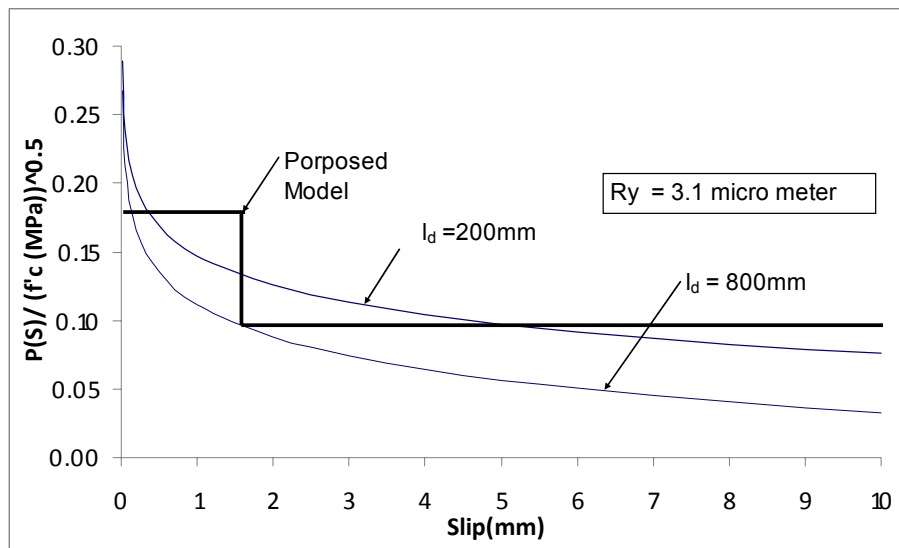
$$\beta_0 = \frac{2P_{res} + P_{max}}{3\sqrt{f'_c}} \quad (3)$$

$$\beta_1 = \frac{P_{res} - P_{max}}{3\sqrt{f'_c}} \quad (4)$$

$$u = \begin{cases} 0.17\sqrt{f'_c} & f_s \leq f_y \\ 0.08\sqrt{f'_c} & f_s > f_y \end{cases} \quad (5)$$

Giovanni Fabbrocino,
Gerado 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)

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

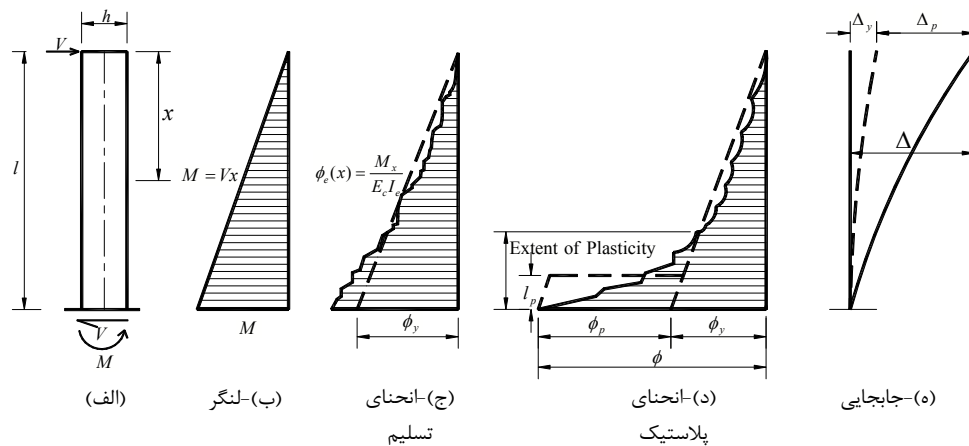
L

f_y

d_b

$$\phi_e(x) \quad ()$$

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(الف)

(ب) - لنگر

(ج) - انحنای تسلیم

(د) - انحنای پلاستیک

(هـ) - جابجایی

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Lehman

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Mohele

[] 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

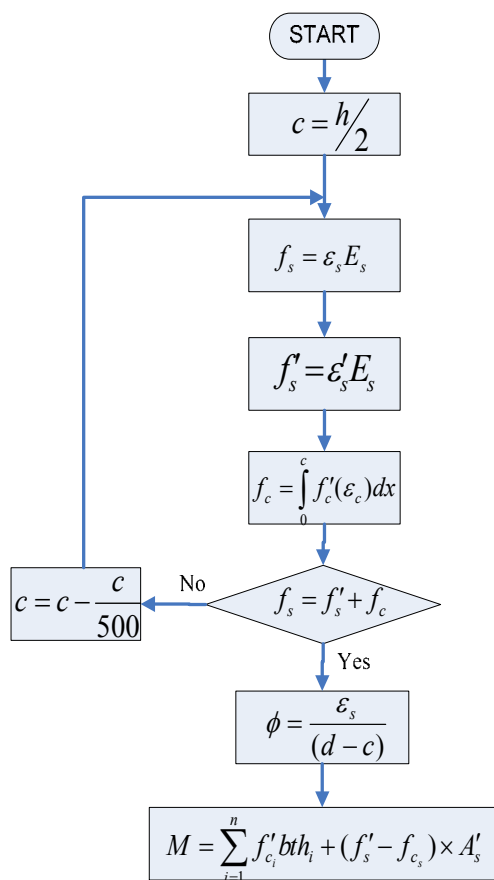
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[] Mander

Kunnath

Mohele Lehman

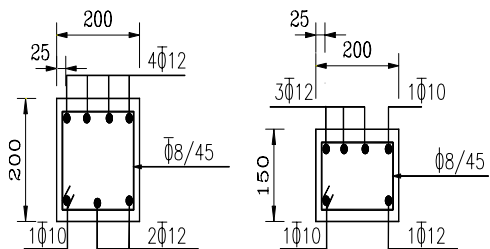


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SPC-6

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SPC-6 & SPC-7

SPC-8

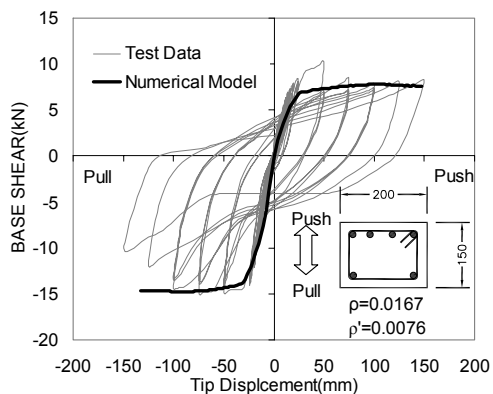
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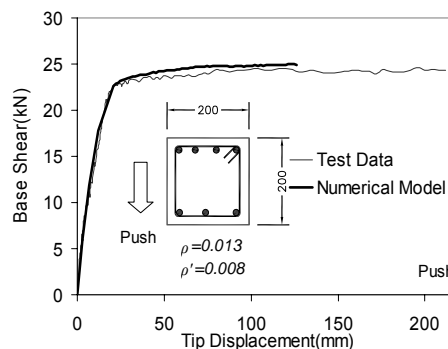
	f_c MPa	MPa	0.0017	GPa	MPa		MPa		MPa	
SPC-6	29	356	0.0017	205	485	0.18	465	0.0023	620	0.23
SPC-7	25	356	0.0017	205	485	0.18	465	0.0023	620	0.23
SPC-8	25	356	0.0017	205	485	0.18	465	0.0023	620	0.23

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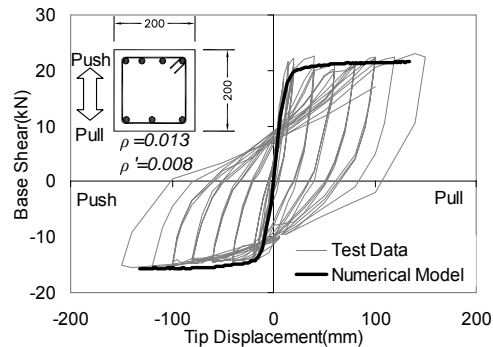
SPC-8



.SPC-8



.SPC-6



.SPC-7

[] FEMA (356)

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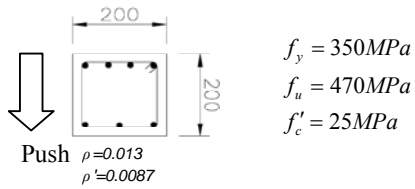
SPC-6

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

% []

FEMA(356)

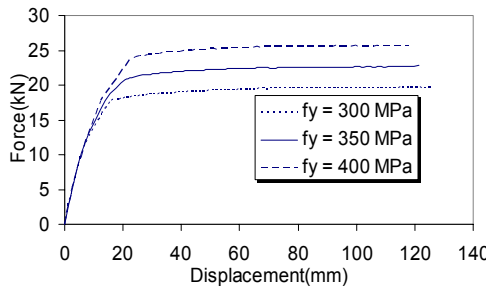
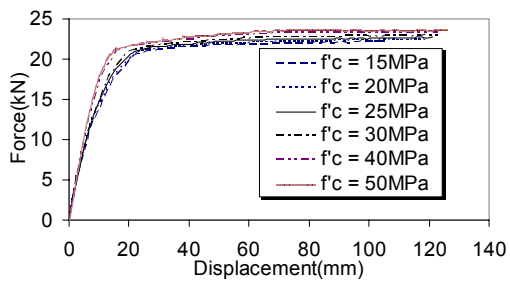
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	K_e (kN/mm)		$K_e / K_{(gross)}$	
SPC-6	1.48	1.48	0.24	0.24
SPC-7(PUSH)	0.98	1.11	0.16	0.18
SPC-7(PULL)	1.45	1.36	0.24	0.23
SPC-8(PUSH)	0.62	0.69	0.24	0.27
SPC-8(PULL)	0.57	0.48	0.22	0.19

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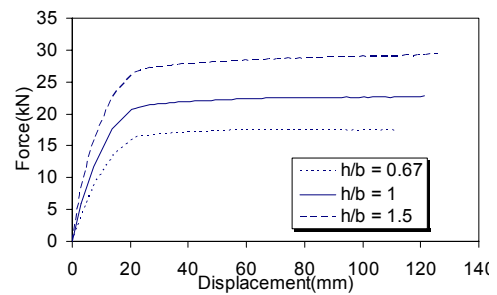
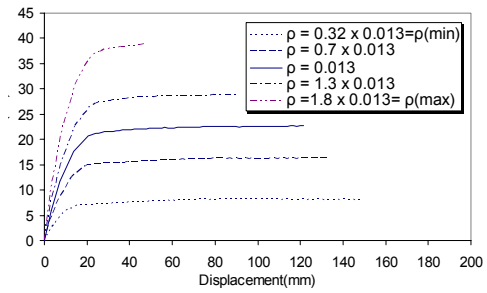
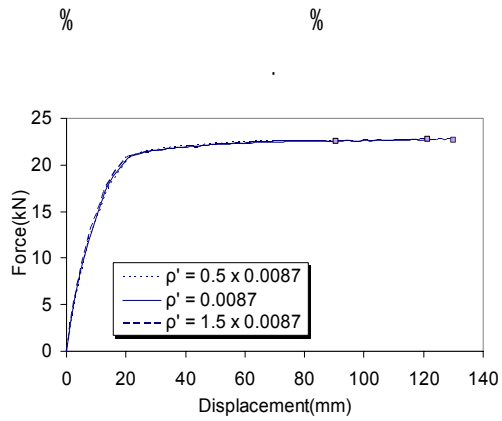
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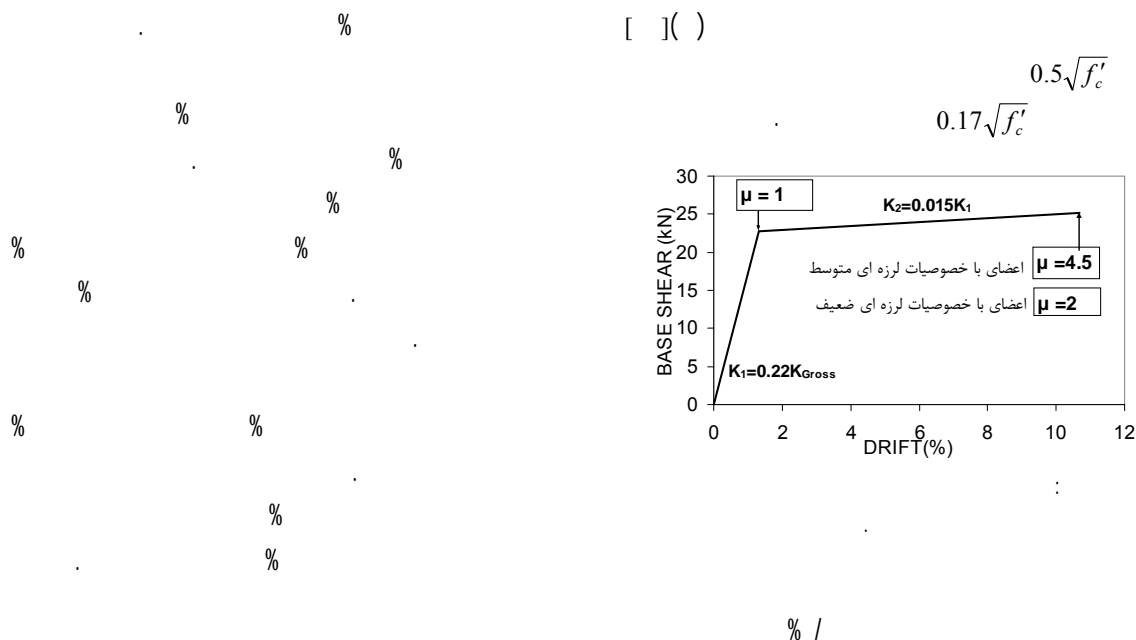
	Push		Pull	
SPC-6	13.7	8.2		
SPC-7	10.0	10.2	10.0	9.0
SPC-8	7.8	7.07	4.8	4.9

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