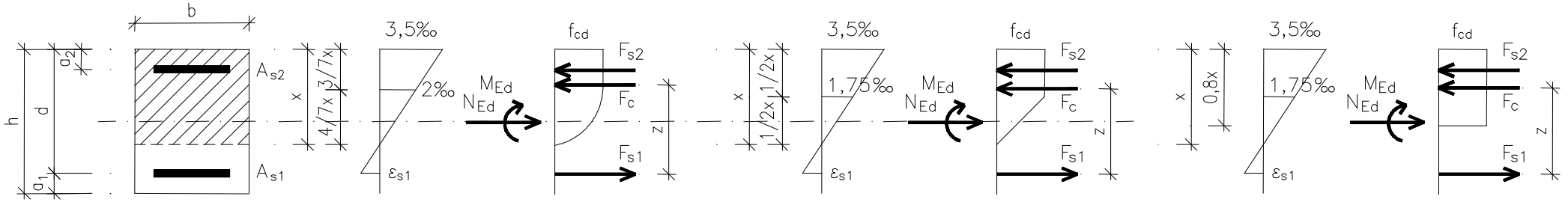
PODSTAWOWE WZORY DO OBLICZANIA PRZEKROJU PROSTOKĄTNEGO

Obliczeniowe zależności $\sigma_c - \varepsilon_c$: (1) paraboliczno-prostokątna;
(2) dwuliniowa;
(3) prostokątna.

Założenia obliczeniowe $f_{ck} \le 50MPa$ $x \le h$

(1) (2) (3)



$x = \xi d$

$F_c = \omega b d f_{cd}$

$z = \zeta d$

$M_{cs} = \mu_{cs} b d^2 f_{cd}$

$F_{s2} = A_{s2} f_{yd}$ jeżeli $\varepsilon_{s2} \ge \varepsilon_{yd}$

$F_{s2} = A_{s2} \varepsilon_{s2} E_s$ jeżeli $\varepsilon_{s2} < \varepsilon_{yd}$

$F_{s1} = A_{s1} f_{yd}$ jeżeli $\varepsilon_{s1} \ge \varepsilon_{yd}$

$F_{s1} = A_{s1} \varepsilon_{s1} E_s$ jeżeli $\varepsilon_{s1} < \varepsilon_{yd}$

$$\varepsilon_{s1} = -3{,}5\frac{1-\xi}{\xi}$$ znak "-" oznacza rozciąganie

$$\varepsilon_{s2} = 3{,}5\frac{\xi - a_2/d}{\xi}$$ znak "+" oznacza ściskanie

Model betonu (1)

$$\omega = \frac{17}{21}\xi$$

$$\mu_{cs} = \frac{17}{21}\xi - \frac{33}{98}\xi^2$$

$$\zeta = 1 - \frac{693}{1666}\xi$$

$$\xi = \frac{49}{33}\left(\frac{17}{21} - \sqrt{\frac{289}{441} - \frac{66}{49}\mu_{cs}}\right)$$

Model betonu (2)

$$\omega = \frac{3}{4}\xi$$

$$\mu_{cs} = \frac{3}{4}\xi - \frac{7}{24}\xi^2$$

$$\zeta = 1 - \frac{7}{18}\xi$$

$$\xi = \frac{12}{7}\left(\frac{3}{4} - \sqrt{\frac{9}{16} - \frac{7}{6}\mu_{cs}}\right)$$

Model betonu (3)

$$\omega = 0{,}8\xi$$

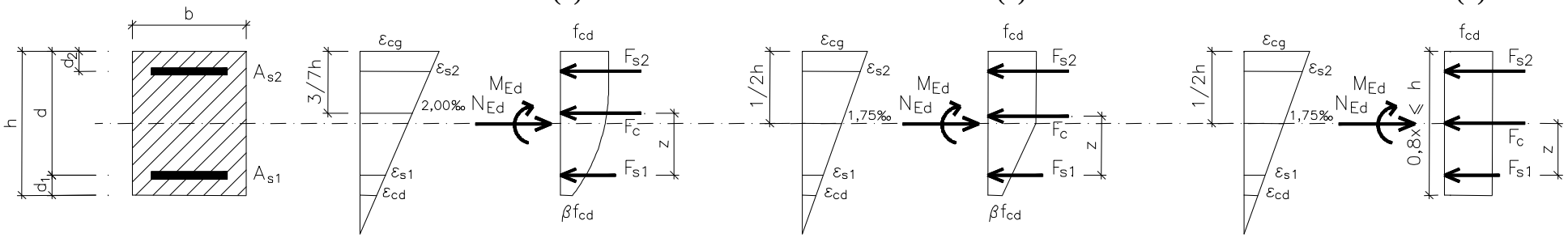
$$\mu_{cs} = 0{,}8\xi - 0{,}32\xi^2$$

$$\zeta = 1 - 0{,}4\xi$$

$$\xi = \frac{0{,}8 - \sqrt{0{,}64 - 1{,}28\mu_{cs}}}{0{,}64}$$

Założenia obliczeniowe $f_{ck} \le 50MPa$ $x > h$

(1) (2) (3)



$x = \xi d$
$F_c = \omega b d f_{cd}$
$z = \zeta d$
$M_{cs} = \mu_{cs} b d^2 f_{cd}$

$F_{s2} = A_{s2} f_{yd}$ jeżeli $\varepsilon_{s2} \ge \varepsilon_{yd}$
$F_{s2} = A_{s2} \varepsilon_{s2} E_s$ jeżeli $\varepsilon_{s2} < \varepsilon_{yd}$

$F_{s1} = A_{s1} f_{yd}$ jeżeli $\varepsilon_{s1} \ge \varepsilon_{yd}$
$F_{s1} = A_{s1} \varepsilon_{s1} E_s$ jeżeli $\varepsilon_{s1} < \varepsilon_{yd}$

Model betonu (1)

$$\xi_h = 1 + a_1 / d$$
$$\varepsilon_{cg} = \frac{14\xi}{7\xi - 3\xi_h}$$
$$\varepsilon_{cd} = \frac{14\xi - 14\xi_h}{7\xi - 3\xi_h}$$
$$\varepsilon_{s2} = \frac{14\xi - 14a_2/d}{7\xi - 3\xi_h}$$
$$\varepsilon_{s1} = \frac{14\xi - 14}{7\xi - 3\xi_h}$$
$$\beta = \frac{7(\xi - \xi_h)(7\xi + \xi_h)}{(7\xi - 3\xi_h)^2}$$
$$\omega = \frac{17}{21}\xi_h + \frac{4}{21}\beta\xi_h$$
$$\mu_{cs} = \frac{17}{21}\xi_h - \frac{33}{98}\xi_h^2 + \frac{4}{21}\beta\xi_h - \frac{8}{49}\beta\xi_h^2$$
$$\zeta = \frac{17\xi_h - \frac{693}{98}\xi_h^2 + 4\beta\xi_h - \frac{168}{49}\beta\xi_h^2}{17\xi_h + 4\beta\xi_h}$$

Model betonu (2)

$$\xi_h = 1 + a_1 / d$$
$$\varepsilon_{cg} = 1{,}75\frac{2\xi}{2\xi - \xi_h}$$
$$\varepsilon_{cd} = 1{,}75\frac{2\xi - 2\xi_h}{2\xi - \xi_h}$$
$$\varepsilon_{s2} = 1{,}75\frac{2\xi - 2a_2/d}{2\xi - \xi_h}$$
$$\varepsilon_{s1} = 1{,}75\frac{2\xi - 2}{2\xi - \xi_h}$$
$$\beta = \frac{2\xi - 2\xi_h}{2\xi - \xi_h}$$
$$\omega = \left(\frac{3}{4} + \frac{1}{4}\beta\right)\xi_h$$
$$\mu_{cs} = \frac{3}{4}\xi_h - \frac{7}{24}\xi_h^2 + \frac{1}{4}\beta\xi_h - \frac{5}{24}\beta\xi_h^2$$
$$\zeta = \frac{3 - \frac{7}{6}\xi_h + \beta - \frac{5}{6}\beta\xi_h}{3 + \beta}$$

Model betonu (3)

$$\xi_h = 1 + a_1 / d$$
$$\varepsilon_{cg} = 1{,}75\frac{2\xi}{2\xi - \xi_h}$$
$$\varepsilon_{cd} = 1{,}75\frac{2\xi - 2\xi_h}{2\xi - \xi_h}$$
$$\varepsilon_{s2} = 1{,}75\frac{2\xi - 2a_2/d}{2\xi - \xi_h}$$
$$\varepsilon_{s1} = 1{,}75\frac{2\xi - 2}{2\xi - \xi_h}$$

$\xi \le 1{,}25\xi_h$	$\xi > 1{,}25\xi_h$
$\omega = 0{,}8\xi$ $\mu_{cs} = 0{,}8\xi(1 - 0{,}4\xi)$ $\zeta = 1 - 0{,}4\xi$	$\omega = \xi_h$ $\mu_{cs} = \xi_h(1 - 0{,}5\xi_h)$ $\zeta = 1 - 0{,}5\xi_h$