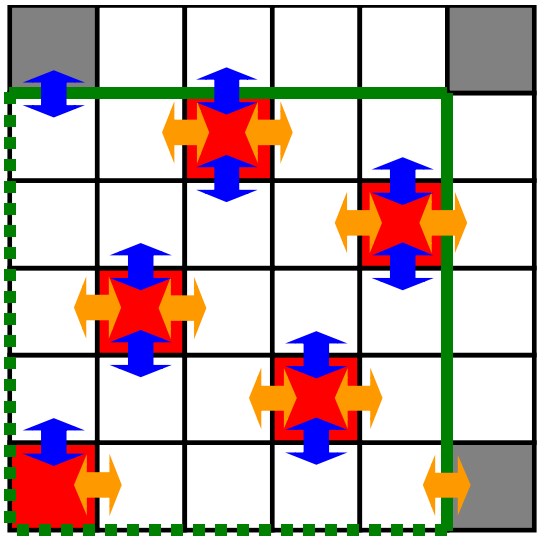
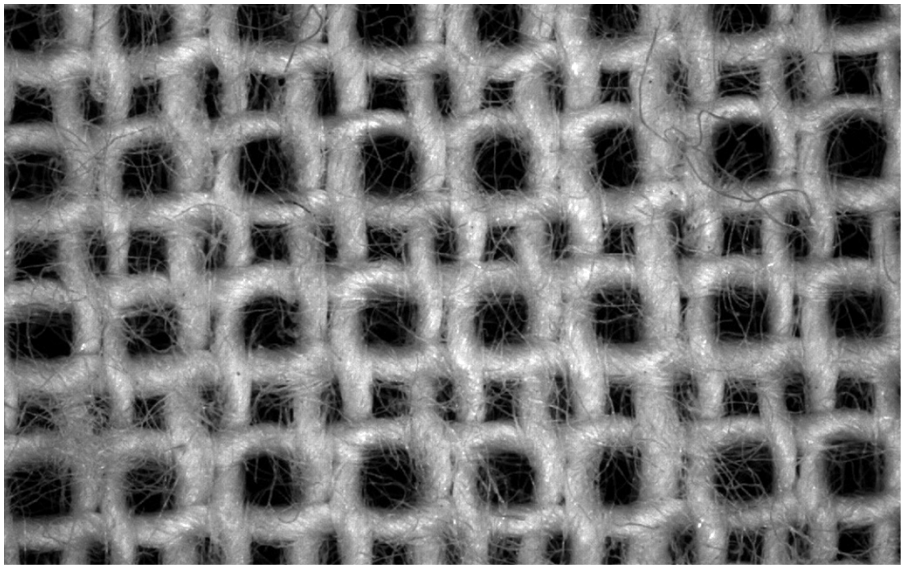
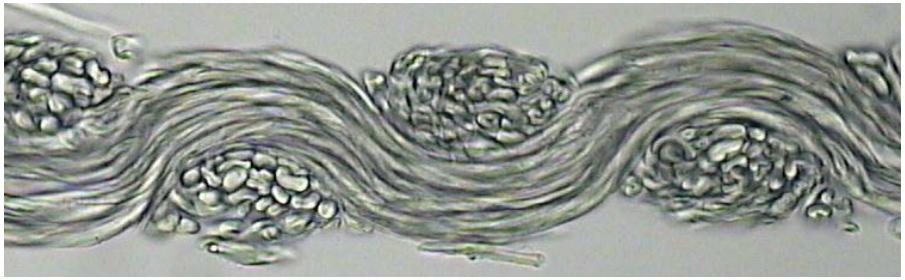
WOVEN FABRIC

„DEFINITIONS, RELATIONS“







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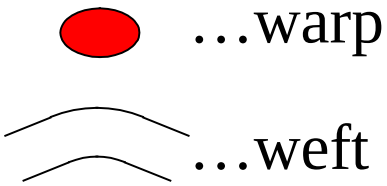
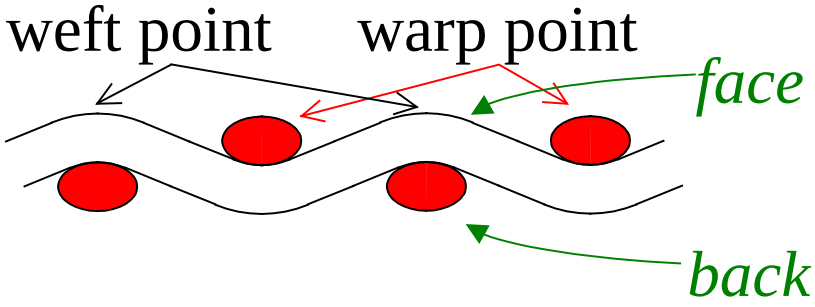
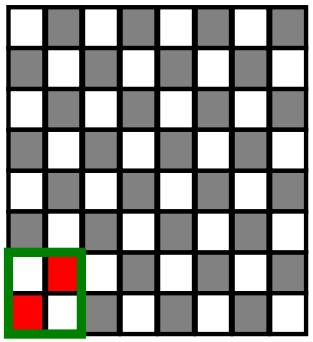
Woven fabric – basic parameters

– input parameters for woven fabric structure description

Warp yarn – count (linear density) T_o [tex], material ρ_o [kgm^{-3}] (fiber density)
Weft yarn – count T_u [tex], material ρ_u [kgm^{-3}] (fiber density)
Weave, pattern
Warp sett D_o [1/cm], [1/m]
Weft sett D_u [1/cm], [1/m]







Crossing factor of fabric

are the ratio of crossed segments in relation to number of all segments:

number of crossed segments of warp z_o, or weft z_u

$$z_u \in \langle 4, v \rangle$$

$$z = (z_o + z_u) \in \langle 8, 2v \rangle$$

- Warp crossing factor…

$$\kappa_o = z_o / v \leq 1$$

- Weft crossing factor…

$$\kappa_u = z_u / v \leq 1$$

- Crossing factor of fabric…

$$\kappa = \frac{\kappa_o + \kappa_u}{2}$$

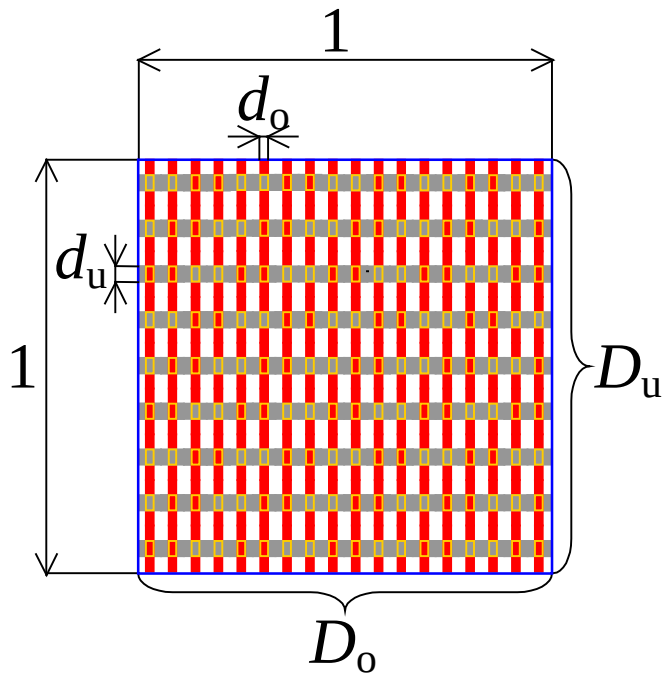
- Number of all binding points in the pattern

$$v = n_o n_u$$

Areal covering

diameter of the warp yarn…d_o

diameter of the weft yarn…d_u



covered area by all warp yarns

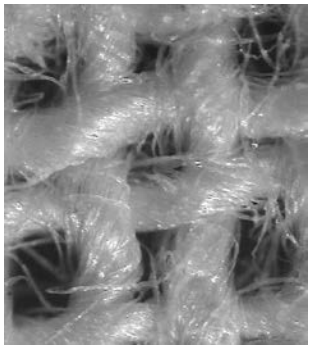
covering by warp… $Z_o = D_o d_o$

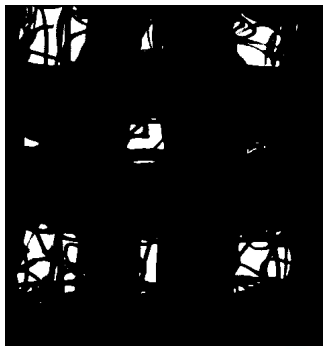
covered area by all warp yarns

covering by weft… $Z_u = D_u d_u$

Total covering of fabric…

$$Z = Z_o + Z_u - Z_o Z_u$$





Cover Factor

Warp cover factor …

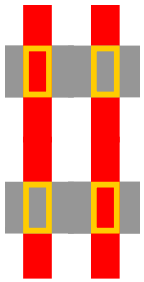
$$C_{f,o} = D_o \sqrt{T_o}$$

Weft cover factor …

$$C_{f,u} = D_u \sqrt{T_u}$$

Total cover factor …

$$C_f = C_{f,o} + C_{f,u}$$



Yarn crimp

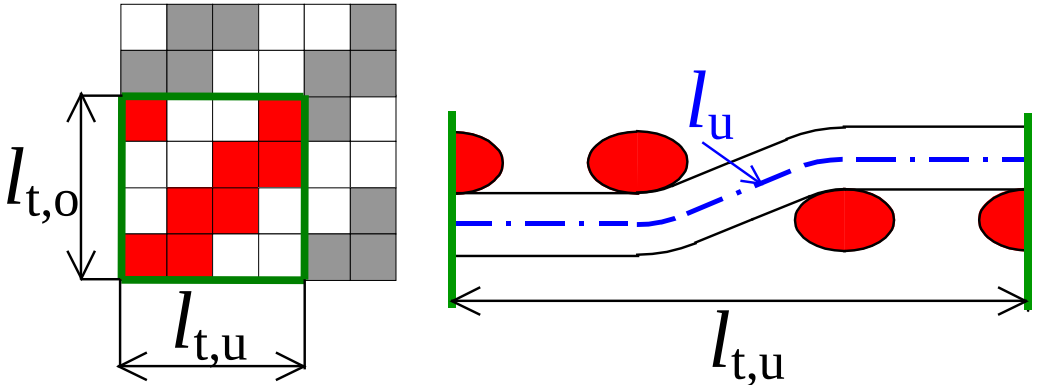
The crimp expresses the proportional elongation of the yarn pulled from the fabric.

Dimensions of repeat

- in warp… $l_{t,o}$
- in weft… $l_{t,u}$

Length of yarn in repeat

- warp… l_o , $l_o > l_{t,o}$
- weft… l_u , $l_u > l_{t,u}$



Warp crimp…

$$s_o = \frac{l_o - l_{t,o}}{l_{t,o}}$$

$$l_o = l_{t,o}\left(1 + s_o\right)$$

Weft crimp…

$$s_u = \frac{l_u - l_{t,u}}{l_{t,u}}$$

$$l_u = l_{t,u}\left(1 + s_u\right)$$

Areal mass

Areal mass expresses the mass of areal unit of fabric.

Areal mass of warp…

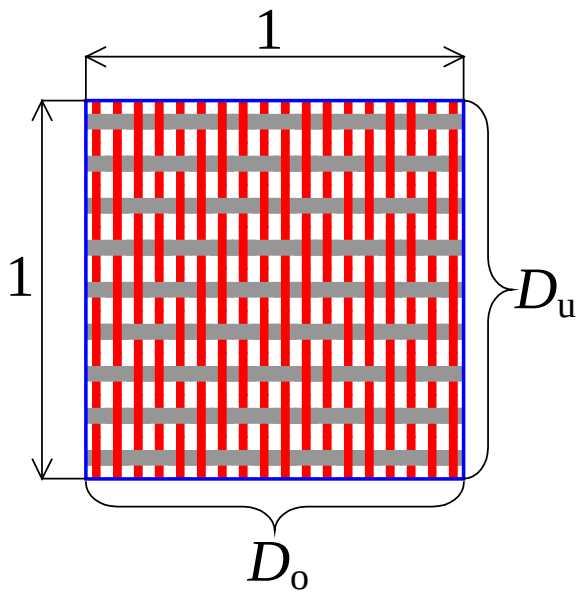
$$G_o = D_o T_o \left(1 + s_o\right)$$

Areal mass of weft…

$$G_u = D_u T_u \left(1 + s_u\right)$$

Areal mass of fabric…

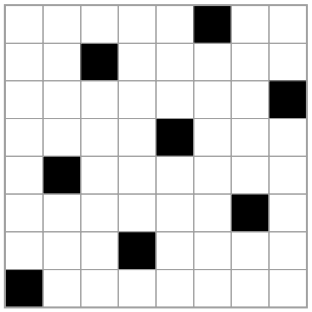
$$G = D_o T_o \left(1 + s_o\right) + D_u T_u \left(1 + s_u\right)$$

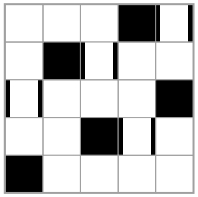


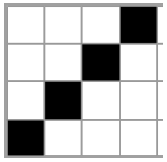
Task 1

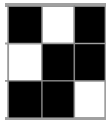
Spočti koeficient provázání pro vazby:

a)

b) 



c) 

d) 

Task 2

Z osnovy délky 860m jsme vyrobili 800m tkaniny. Určete setkání osnovy.

$$s_o = \frac{l_o - l_{t,o}}{l_{t,o}} = \frac{860 - 800}{800} * 100\% = 7{,}5\%$$

Task 3

Z délky tkaniny 30cm jsme vypárali osnovní nit dlouhou 34,5cm. Určete procento setkání osnovy.

$$s_o = \frac{l_o - l_{t,o}}{l_{t,o}} = \frac{34{,}5 - 30}{30} * 100\% = 15\%$$

Task 4

Jak dlouhou osnovu potřebujeme na výrobu dílce tkaniny dlouhého 120m, je-li setkání osnovy 4.8%.

$$s_o = \frac{l_o - l_{t,o}}{l_{t,o}} \Rightarrow l_o = l_{to} \cdot (s_o + 1)$$

$$l_o = 120 \cdot \left(\frac{4{,}8}{100} + 1 \right) = 125{,}76m$$

Task 5

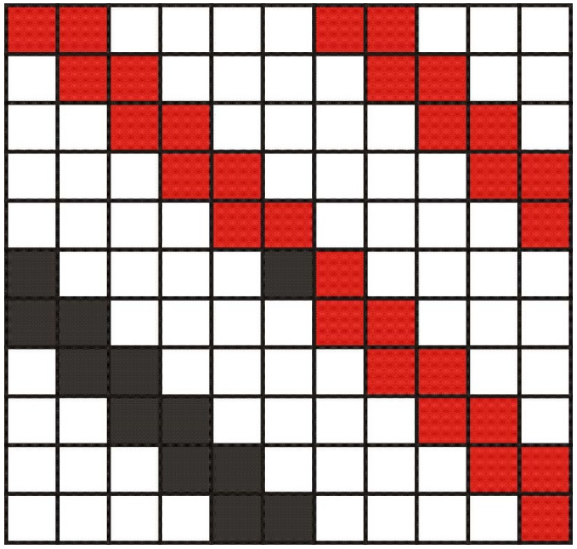
The woven fabric is given:

$$K\frac{2}{4}S$$

Warp sett D_o = 24 cm^{-1}
Weft sett D_u = 22 cm^{-1}
Warp yarn count d_o = 262 μm
Weft yarn count d_u = 181 μm
Warp yarn diameter T_o = 45 tex
Weft yarn diameter T_u = 20 tex
Warp crimp s_o = 1,96 %
Weft crimp s_u = 3,69%

Draw repeat of pattern and calculate basic parameters always for warp, weft and whole woven fabric:

Crossing factor of fabric κ [–], covering *Z* [%], cover factor C_f [$tex^{1/2}mm^{-1}$], mass of fabric *G* [g m^{-2}].



Crossing factor of fabric

$$\kappa_o = \frac{z_o}{v} = \frac{12}{n_o\, n_u} = \frac{12}{36} = 0{,}3\overline{3}$$

Number of crossed segments of warp

$$\kappa_u = \frac{z_u}{v} = \frac{12}{n_o\, n_u} = \frac{12}{36} = 0{,}3\overline{3}$$

Number of crossed segments of weft

$$\kappa = \frac{\kappa_o + \kappa_u}{2} = \frac{0{,}3\overline{3} + 0{,}3\overline{3}}{2} = 0{,}3\overline{3}$$

Covering

$$Z_o = D_o\, d_o = 0{,}6288 = 62{,}88\%$$

$$Z_u = D_u\, d_u = 0{,}3982 = 39{,}82\%$$

$$Z = Z_o[\%] + Z_u[\%] - Z_o[\%]\, Z_u[\%]/100 = 77{,}66\%$$

Cover Factor

$$C_{f,o} = D_o \sqrt{T_o} = 16{,}10\,\mathrm{mm}^{-1}\mathrm{tex}^{1/2}$$

$$C_{f,u} = D_u \sqrt{T_u} = 9{,}84\,\mathrm{mm}^{-1}\mathrm{tex}^{1/2}$$

Mass

$$G_o[\mathrm{g\,m^{-2}}] = D_o[mm^{-1}]\, T_o[\mathrm{tex}](1 + s_o[-])$$

$$G_o = 110{,}12\,\mathrm{g\,m^{-2}}$$

$$G_u = 45{,}62\,\mathrm{g\,m^{-2}}$$

$$\Big\} \quad G = G_o + G_u = 155{,}74\,\mathrm{g\,m^{-2}}$$