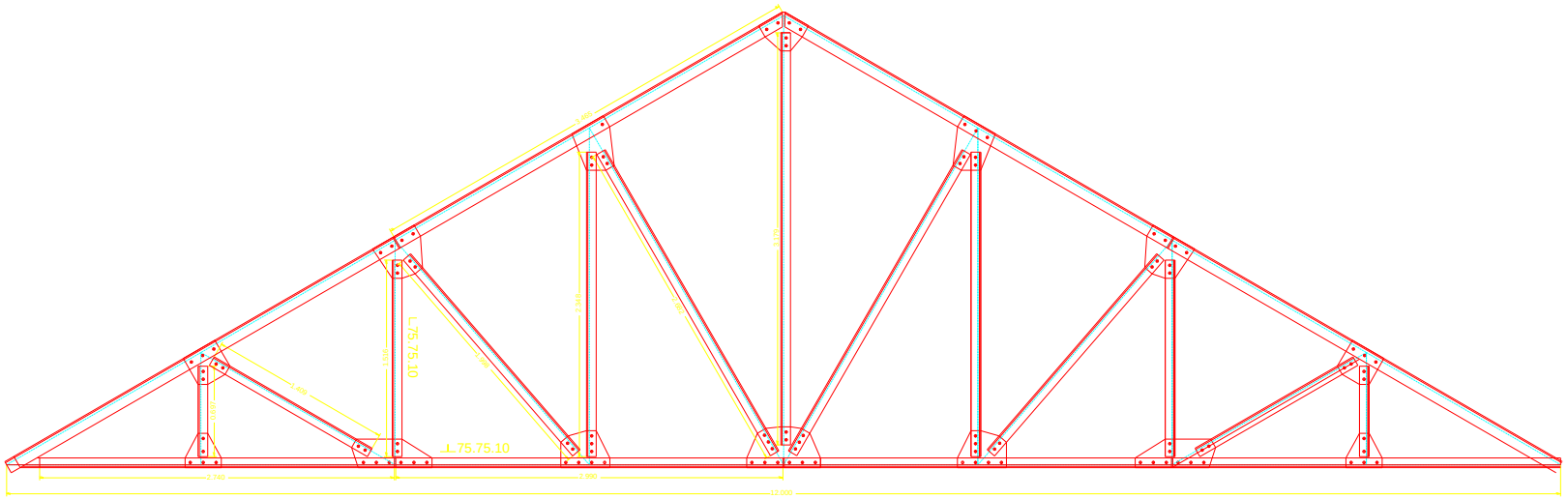
KUDA-KUDA RANGKA BAJA



Tahapan Perencanaan

1. Perhitungan dimensi gording.
2. Perhitungan dimensi batang tarik
3. Perhitungan dimensi ikatan angin
4. Perhitungan dimensi kuda-kuda
5. Perhitungan konstruksi perletakan
6. penggambaran

1. Perhitungan dimensi gording

Gording diletakkan di atas beberapa kuda-kuda dan tegak lurus thd bidang atap.
Biasanya gording menggunakan profil ☯, I, 👍

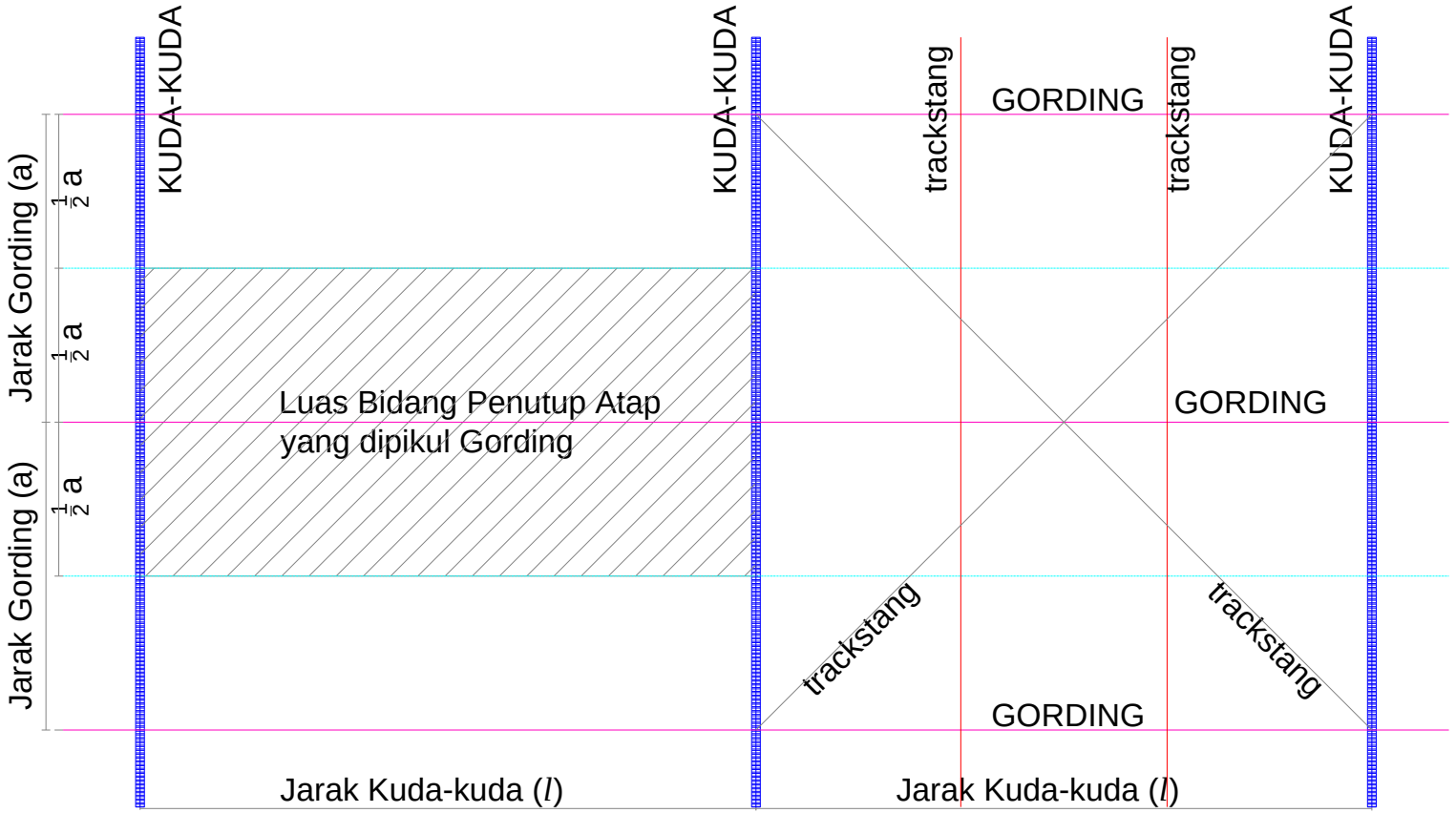
Pembebanan:

1. Beban mati (B.S. gording + penutup atap)
2. Beban berguna/hidup
3. Beban angin

1. Beban mati

a. Penutup atap

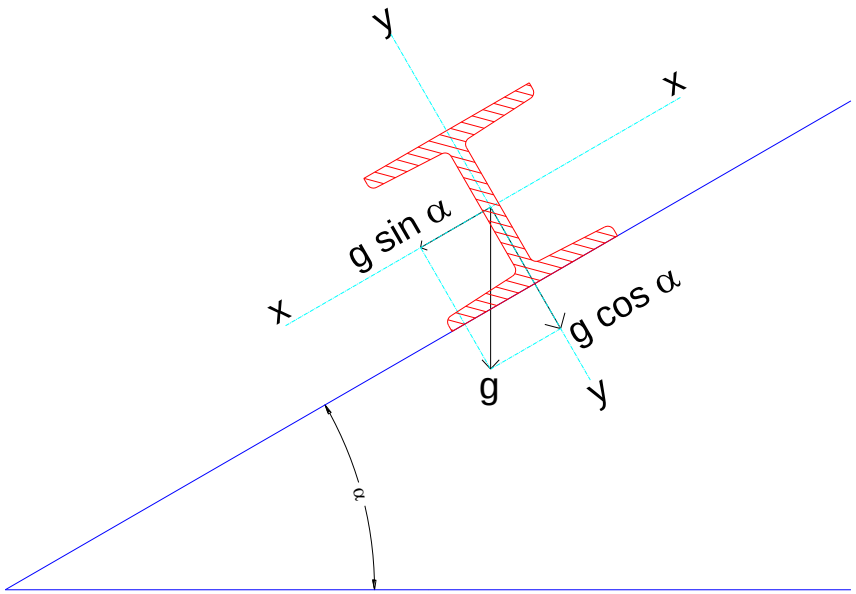
g_1 = a x berat penutup atap per m^2 [kg/m']



b. BS. Gording (diperoleh dgn menaksir dahulu dimensi gording - dari tabel profil didapat berat per m' gording.

Berat sendiri gording = g_2 [kg/m']

Beban mati = beban penutup ata + bs. gording ⇨ g = $g_1 + g_2$ kg/m'



Gording merupakan balok menerus di atas beberapa tumpuan.

Untuk memudahkan perhitungan dapat dianggap sbg balok di atas dua tumpuan (statis terntentu) dengan mereduksi momen lentur (sebesar 20 %)

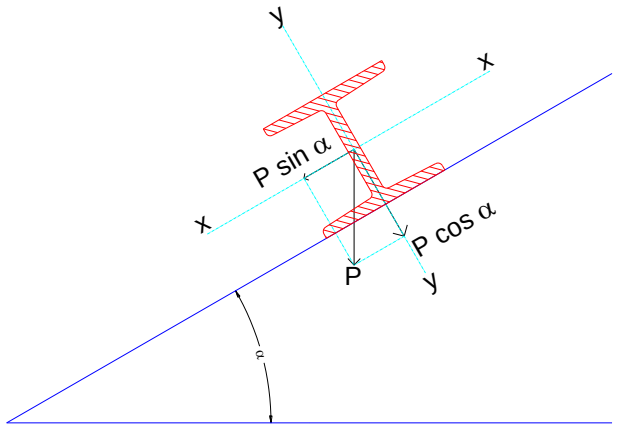
Jadi $M_{maks} = 0{,}80\ (1/8\ g.l^2)$

akibat $g_x \Rightarrow M_{x1} = 0{,}80 .1/8.\ g.\sin \alpha.l^2$

akibat $g_y \Rightarrow M_{y1} = 0{,}80 .1/8.\ g.\cos \alpha.l^2$

2. Akibat Beban Berguna

Beban berguna (P) bekerja di tengah-tengah bentang gording



$M_{maks} = 0{,}80\ (1/4\ P.l\ )$

akibat $P_x \Rightarrow M_{x2} = 0{,}80\ .1/4.\ P.\sin\ \alpha.l$

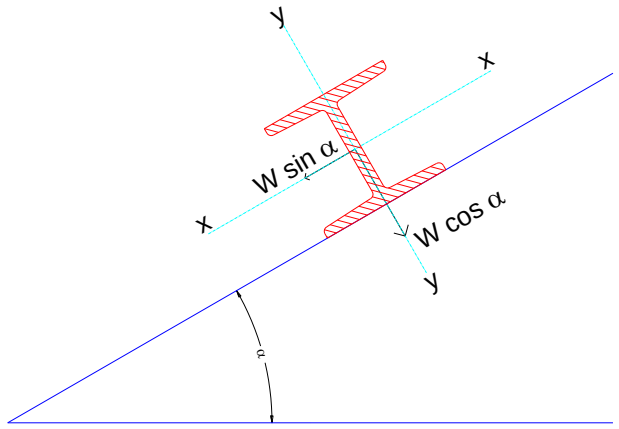
akibat $P_y \Rightarrow M_{y2} = 0{,}80\ .1/4.\ P.\cos\ \alpha.l$

2. Akibat Beban Angin

Beban angin dianggap bekerja tegak lurus bidang atap.

Beban angin yang ditahan gording:

W = a . Tekanan angin per m^2 [kg/m']



$M_{maks} = 0{,}80\ (1/8\ W.l^2)$

akibat $W_x \Rightarrow M_{x3} = 0{,}80\ .1/8.\ W.\sin\ \alpha.l^2 = 0$

akibat $W_y \Rightarrow M_{y3} = 0{,}80\ .1/8.\ W.\cos\ \alpha.l^2$

Kombinasi Pembebanan:

I Beban mati + beban berguna

$$M_{x\ total} = M_{x1} + M_{x2}$$

$$M_{y\ total} = M_{y1} + M_{y2}$$

II Beban mati + beban berguna + beban angin

$$M_{x\ total} = M_{x1} + M_{x2}$$

$$M_{y\ total} = M_{y1} + M_{y2} + M_{y3}$$

Kontrol Tegangan

Kombinasi I:

$$\sigma = \frac{M_{x\ total}}{W_y} + \frac{M_{y\ total}}{W_x} \leq \bar{\sigma}$$

$$Note: \text{kalau } \sigma > \bar{\sigma} \Rightarrow \text{dimensi gording diperbesar}$$

Kombinasi II:

$$\sigma = \frac{M_{x\ total}}{W_y} + \frac{M_{y\ total}}{W_x} \leq 1{,}25\bar{\sigma}$$

$$Note: \text{kalau } \sigma > 1{,}25\bar{\sigma} \Rightarrow \text{dimensi gording diperbesar}$$

Kontrol Lendutan

Akibat beban mati:

$$f_{x1} = \frac{5 g_x . l^4}{384 E I_y} (cm)$$

$$f_{y1} = \frac{5 g_y . l^4}{384 E I_x} (cm)$$

Akibat beban berguna:

$$f_{x2} = \frac{P_x . l^3}{48 E I_y} (cm)$$

$$f_{y2} = \frac{P_y . l^3}{48 E I_x} (cm)$$

Akibat beban angin:

$$f_{x3} = 0$$

$$f_{y1} = \frac{5 W_y . l^4}{384 E I_x} (cm)$$

Kontrol Lendutan

$$f_{x_{total}} = (f_{x_1} + f_{x_2}) \leq \bar{f}$$

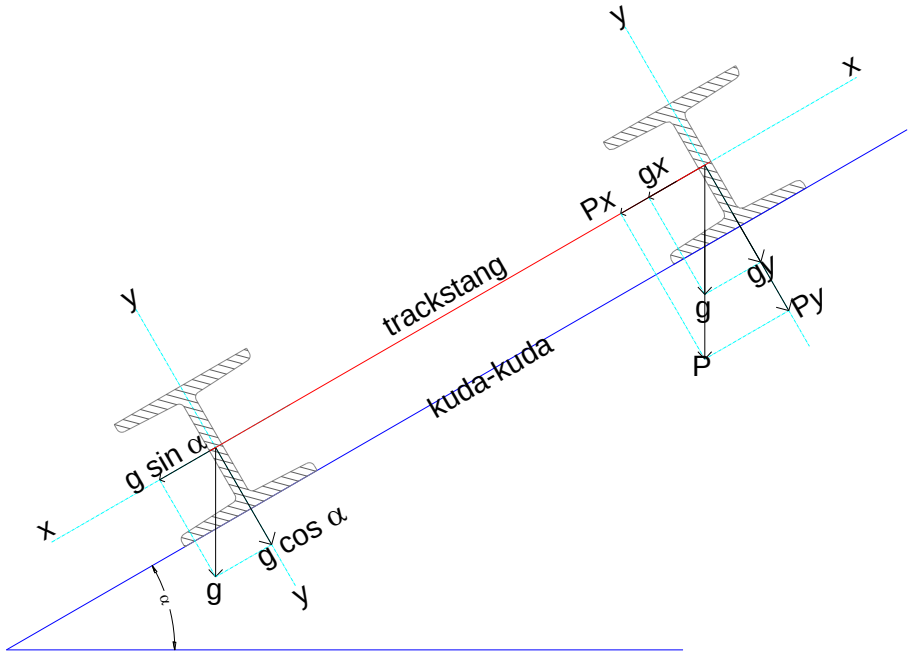
$$f_{y_{total}} = (f_{y_1} + f_{y_2} + f_{y_3}) \leq \bar{f}$$

$$f_i = \sqrt{f_{x_{total}}^2 + f_{y_{total}}^2} \leq \bar{f}$$

Note : kalau $f \leq \bar{f} \Rightarrow$ dimensi gording diperbesar

2. Perhit. Batang Tarik (Trackstang)

Batang tarik berfungsi utk mengurangi lendutan gording pada arah sb-x (miring atap) dan sekaligus utk mengurangi teg. lentur yg timbul pada arah sb-x



Trackstang menahah gaya tarik g_x dan P_x

$P = g_x + P_x$

Trackstang dipasang 2 buah.

Jadi gaya P untuk 1 trackstang:

$P = (g_x + P_x)/2$

$$\sigma = \frac{P}{F_n} \leq \bar{\sigma} \Rightarrow \text{ambil } \sigma \leq \bar{\sigma}$$

$$F_n = \frac{P}{\bar{\sigma}}$$

$F_{br} = 1.25\ F_n$

F_n = luas penampang neto

F_{br} = luas penampang bruto

$$f_{br} = \tfrac{1}{4}\pi d^2$$

d = diameter trackstang