


OBLICZENIA STATYCZNE

mgr inż. Marek Manjura
Uprawnienia budowlane do
projektowania bez ograniczeń w
specjalności: konstrukcyjno-budowlanej
nr ewid.: 345/01



Poz. 1. DACH $\alpha = 41^\circ$, $\alpha = 31^\circ$ Poz 1.1. DACH - OBLICZENIA* 1 STAKE

DACHÓWKA METALOWA

$0,10 \text{ kN/m}^2$

DESKOWANIE PEKNE 0,032 x 0,50 =

$0,25 \text{ kN/m}^2$

TECHNOLOGICZNE

$0,08 \text{ kN/m}^2$

$$g_k^1 = 0,43 \text{ kN/m}^2$$

$$0,43 \div \cos \alpha =$$

$$g_k = 0,57 \text{ kN/m}^2$$

* 1 ŚNIEG PN-80/B-02010/A21:2006STRONA 2

$$S_k = 0,90 \text{ kN/m}^2$$

$$C_1 = 0,51$$

 \rightarrow

$$0,90 \times 0,51 =$$

$$S_k^1 = 0,46 \text{ kN/m}^2$$

$$C_2 = 0,76$$

 \rightarrow

$$0,90 \times 0,76 =$$

$$S_k^2 = 0,68 \text{ kN/m}^2$$

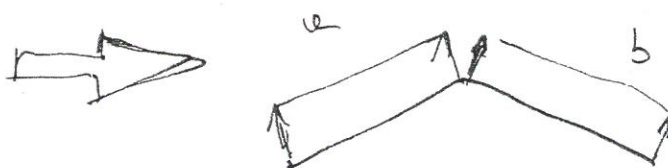
XI WINTER PN-B-02011: 1977/Az 1 Lipiec 2009STREFA I $\rightarrow q_k = 0.30 \text{ kN/m}^2$

$$C_e = 1.00$$

Z1-9 / I

a) $C = 2.00$

b) $C = 0.00$

Z1-9 / II

a) $C = 0$

b) $C = 0$

I)

NAWIESTRZNA

$$0.30 \times 1.00 \times 2.00 \times 1.80 =$$

ZAWIESTRZNA

$$p_k^N = 1.08 \text{ kN/m}^2$$

$$p_k^Z = 0.00 \text{ kN/m}^2$$

*1 ŚNIEGA

$\alpha = 31^\circ$

STRONA 2 $\rightarrow q_k = 0,90 \text{ kN/m}^2$

$C_1 = 0,77 \rightarrow 0,90 \times 0,77 =$

$S_k^1 = 0,69 \text{ kN/m}^2$

$C_2 = 1,16 \rightarrow 0,90 \times 1,16 =$

$S_k^2 = 1,04 \text{ kN/m}^2$

*1 WIAŃ

$\alpha = 31^\circ$

STRONA 1 $\Rightarrow q_k = 0,30 \text{ kN/m}^2$

$\alpha = 31^\circ$

I) ~~a)~~ $C = 2,00$

b) $C = 0,2$

II) a) $C = 0,00$

b) $C = 0,00$

Poz 1.2. KROKWIŚPoz 1.2.1. KROKWIŚ $L_0 = 3.75 + 1.32 \text{ m}$ $\alpha = 41^\circ$ OBLICZENIA

*1 STAKE

$$g_k = 0.43 \text{ kN/m}^2$$

*1 ŚNIEG

$$s_k^1 =$$

$$0.46 \text{ kN/m}^2$$

$$s_k^2 =$$

$$0.68 \text{ kN/m}^2$$

*1 WIEŹ

$$p_k^w = 1.08 \text{ kN/m}^2$$

Poz 1.2. KROKWIĘPoz 1.2.1. KROKIEW $L_0 = 3,75 + 1,32 \text{ m}$ $\alpha = 41^\circ$ OBLICZENIA

*) STAKE

$$g_k = 2,43 \text{ kN/m}^2$$

*) ŚNIEG

$$s_k^1 =$$

$$0,46 \text{ kN/m}^2$$

$$s_k^2 =$$

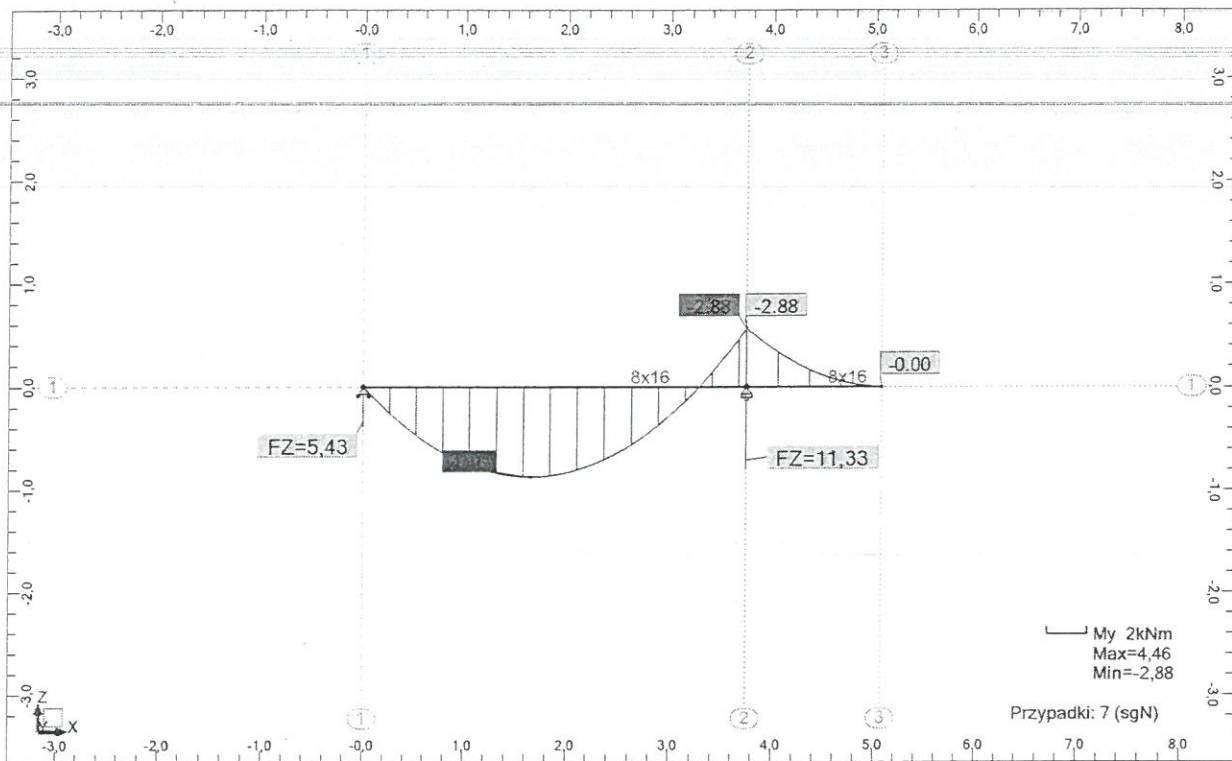
$$0,68 \text{ kN/m}^2$$

*) WIEZE

$$p_k^w = 1,08 \text{ kN/m}^2$$

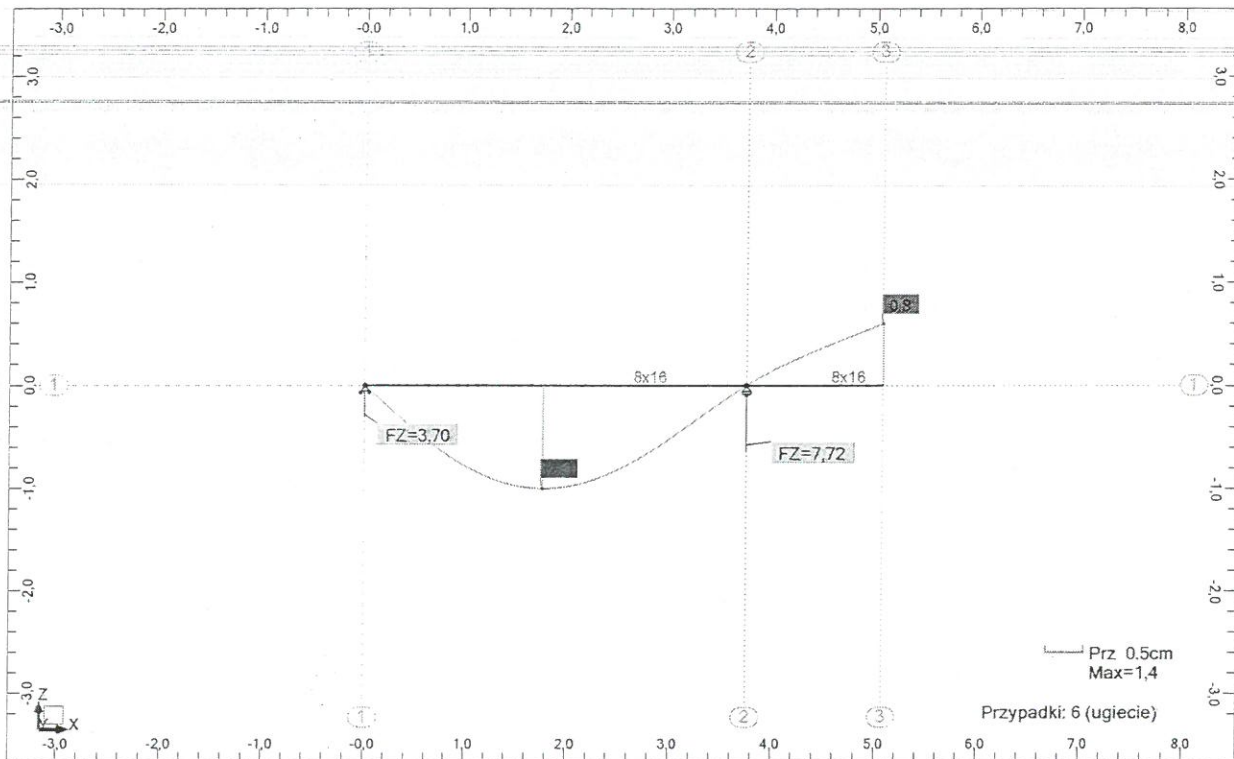
-5-

Widok - MY; Reaction forces(kN); Reaction moments(kN*m); Przypadki: 7 (sgN)



-6-

Widok - Exact deformation(s); Reaction forces(kN); Reaction moments(kN*m); Przypadki: 6 (ugiecie)



C_k	0.81	1.69
S_k	1.12	2.33
P_k	1.77	3.70

TIMBER STRUCTURE CALCULATIONS

CODE: PN-EN 1995-1:2005/A1:2008
ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 1 POINT: COORDINATE: $x = 0.44 L = 1.65 \text{ m}$

LOADS:

Governing Load Case: 7 sgN $(1+2)*1.35+(3+4)*1.50$

MATERIAL C24

$g_M = 1.30$	$f_{m,0,k} = 24.00 \text{ MPa}$	$f_{t,0,k} = 14.00 \text{ MPa}$	$f_{c,0,k} = 21.00 \text{ MPa}$
$f_{v,k} = 2.50 \text{ MPa}$	$f_{t,90,k} = 0.50 \text{ MPa}$	$f_{c,90,k} = 2.50 \text{ MPa}$	$E_{0,\text{moyen}} = 11000.00 \text{ MPa}$
$E_{0,05} = 7400.00 \text{ MPa}$	$G_{\text{moyen}} = 690.00 \text{ MPa}$	Service class: 1	Beta c = 1.00



SECTION PARAMETERS: 8x16

$h_t = 16.0 \text{ cm}$	$A_y = 42.67 \text{ cm}^2$	$A_z = 85.33 \text{ cm}^2$	$A_x = 128.00 \text{ cm}^2$
$b_f = 8.0 \text{ cm}$	$I_y = 2730.67 \text{ cm}^4$	$I_z = 682.67 \text{ cm}^4$	$I_x = 1870.5 \text{ cm}^4$
$t_w = 4.0 \text{ cm}$	$W_{ely} = 341.33 \text{ cm}^3$	$W_{elz} = 170.67 \text{ cm}^3$	
$t_f = 4.0 \text{ cm}$			

STRESSES

$\text{Sig}_{m,y,d} = M_Y/W_y = 4.46/341.33 = 13.07 \text{ MPa}$

$\text{Tau}_{z,d} = 1.5 * -0.02/128.00 = -0.00 \text{ MPa}$

ALLOWABLE STRESSES

$f_{m,y,d} = 16.62 \text{ MPa}$

$f_{v,d} = 1.73 \text{ MPa}$

Factors and additional parameters

$k_m = 0.70$ $k_h = 1.13$ $k_{mod} = 0.90$ $K_{sys} = 1.00$



LATERAL BUCKLING PARAMETERS:

$l_{ef} = 3.70 \text{ m}$ $\text{Lambda}_{rel m} = 0.68$
 $\text{Sig}_{cr} = 52.17 \text{ MPa}$ $k_{crit} = 1.00$

BUCKLING PARAMETERS:

☒ About Y axis:

☒ About Z axis:

VERIFICATION FORMULAS:

$\text{Sig}_{m,y,d}/f_{m,y,d} = 13.07/16.62 = 0.79 < 1.00$ (6.11)

$\text{Sig}_{m,y,d}/(k_{crit} * f_{m,y,d}) = 13.07/(1.00 * 16.62) = 0.79 < 1.00$ (6.33)

$\text{Tau}_{z,d}/f_{v,d} = 0.00/1.73 = 0.00 < 1.00$ (6.13)

LIMIT DISPLACEMENTS



Deflections

$u_{fin,y} = 0.0 \text{ cm} < u_{fin,max,y} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing load case: $1(1+0.6)*1 + 1(1+0.6)*2 + 1(1+0.6)*3 + 1(0.6+0.6)*4$

$u_{fin,z} = 1.3 \text{ cm} < u_{fin,max,z} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing load case: $1(1+0.6)*1 + 1(1+0.6)*2 + 1(1+0.6)*3 + 1(0.6+0.6)*4$ $u_{inst,y} = 0.0 \text{ cm} < u_{inst,max,y} = L/300.00 = 1.3 \text{ cm}$ Verified

Governing load case: $1*3 + 1*4$

$u_{inst,z} = 1.1 \text{ cm} < u_{inst,max,z} = L/300.00 = 1.3 \text{ cm}$

Verified

Governing load case: $1*3 + 1*4$

Governing load case: $1*3 + 1*4$



Displacements

Section OK !!!

TIMBER STRUCTURE CALCULATIONS

CODE: PN-EN 1995-1:2005/A1:2008
ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 2

POINT:

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 7 sgN (1+2)*1.35+(3+4)*1.50

MATERIAL C24

$g_m = 1.30$	$f_{m,0,k} = 24.00 \text{ MPa}$	$f_{t,0,k} = 14.00 \text{ MPa}$	$f_{c,0,k} = 21.00 \text{ MPa}$
$f_{v,k} = 2.50 \text{ MPa}$	$f_{t,90,k} = 0.50 \text{ MPa}$	$f_{c,90,k} = 2.50 \text{ MPa}$	$E_{0,moyen} = 11000.00 \text{ MPa}$
$E_{0,05} = 7400.00 \text{ MPa}$	$G_{moyen} = 690.00 \text{ MPa}$	Service class: 1	Beta c = 1.00



SECTION PARAMETERS: 8x16

$h_t = 16.0 \text{ cm}$	$A_y = 42.67 \text{ cm}^2$	$A_z = 85.33 \text{ cm}^2$	$A_x = 128.00 \text{ cm}^2$
$b_f = 8.0 \text{ cm}$	$I_y = 2730.67 \text{ cm}^4$	$I_z = 682.67 \text{ cm}^4$	$I_x = 1870.5 \text{ cm}^4$
$t_w = 4.0 \text{ cm}$	$W_{ely} = 341.33 \text{ cm}^3$	$W_{elz} = 170.67 \text{ cm}^3$	
$t_f = 4.0 \text{ cm}$			

STRESSES

$\text{Sig}_{m,y,d} = M_y/W_y = -2.88/341.33 = -8.44 \text{ MPa}$

$\text{Tau}_{z,d} = 1.5 \cdot 4.36/128.00 = 0.51 \text{ MPa}$

ALLOWABLE STRESSES

$f_{m,y,d} = 16.62 \text{ MPa}$

$f_{v,d} = 1.73 \text{ MPa}$

Factors and additional parameters

$k_m = 0.70$ $k_h = 1.13$ $k_{mod} = 0.90$ $K_{sys} = 1.00$



LATERAL BUCKLING PARAMETERS:

$l_{ef} = 1.11 \text{ m}$ $\text{Lambda}_{rel m} = 0.37$
 $\text{Sig}_{cr} = 173.97 \text{ MPa}$ $k_{crit} = 1.00$

BUCKLING PARAMETERS:



About Y axis:



About Z axis:

VERIFICATION FORMULAS:

$\text{Sig}_{m,y,d}/f_{m,y,d} = 8.44/16.62 = 0.51 < 1.00$ (6.11)

$\text{Sig}_{m,y,d}/(k_{crit} \cdot f_{m,y,d}) = 8.44/(1.00 \cdot 16.62) = 0.51 < 1.00$ (6.33)

$\text{Tau}_{z,d}/f_{v,d} = 0.51/1.73 = 0.30 < 1.00$ (6.13)

LIMIT DISPLACEMENTS



Deflections

$u_{fin,y} = 0.0 \text{ cm} < u_{fin,max,y} = L/200.00 = 0.7 \text{ cm}$

Verified

Autodesk Robot Structural Analysis Professional 2011
Autor: Marek Manjura

Plik: Poz.1.2.1. krokiew 3750+1320.rtd
Projekt: ~~XXXXXXXXXX~~

WYDZIAŁ ARCHITEKTURY I BUDOWNICTWA

Governing load case: $1(1+0.6)*1 + 1(1+0.6)*2 + 1(1+0*0.6)*3 + 1(0.6+0*0.6)*4$

$u_{fin,z} = 0.0 \text{ cm} < u_{fin,max,z} = L/200.00 = 0.7 \text{ cm}$

Verified

Governing load case: $1(1+0.6)*1 + 1(1+0.6)*2 + 1(1+0*0.6)*3 + 1(0.6+0*0.6)*4$ $u_{inst,y} = 0.0 \text{ cm} < u_{inst,max,y} = L/300.00 = 0.4 \text{ cm}$ Verified

Governing load case: $1*3 + 1*4$

$u_{inst,z} = 0.0 \text{ cm} < u_{inst,max,z} = L/300.00 = 0.4 \text{ cm}$

Verified

Governing load case: $1*3 + 1*4$



Displacements

Section OK !!!

KONIEC OBLICZEN STATYCZNYCH
PROJEKTU BUDOWLANEGO

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