

**Metal Structures**

**ERASMUS**

**Polish National Appendixes**



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## Data in Your project

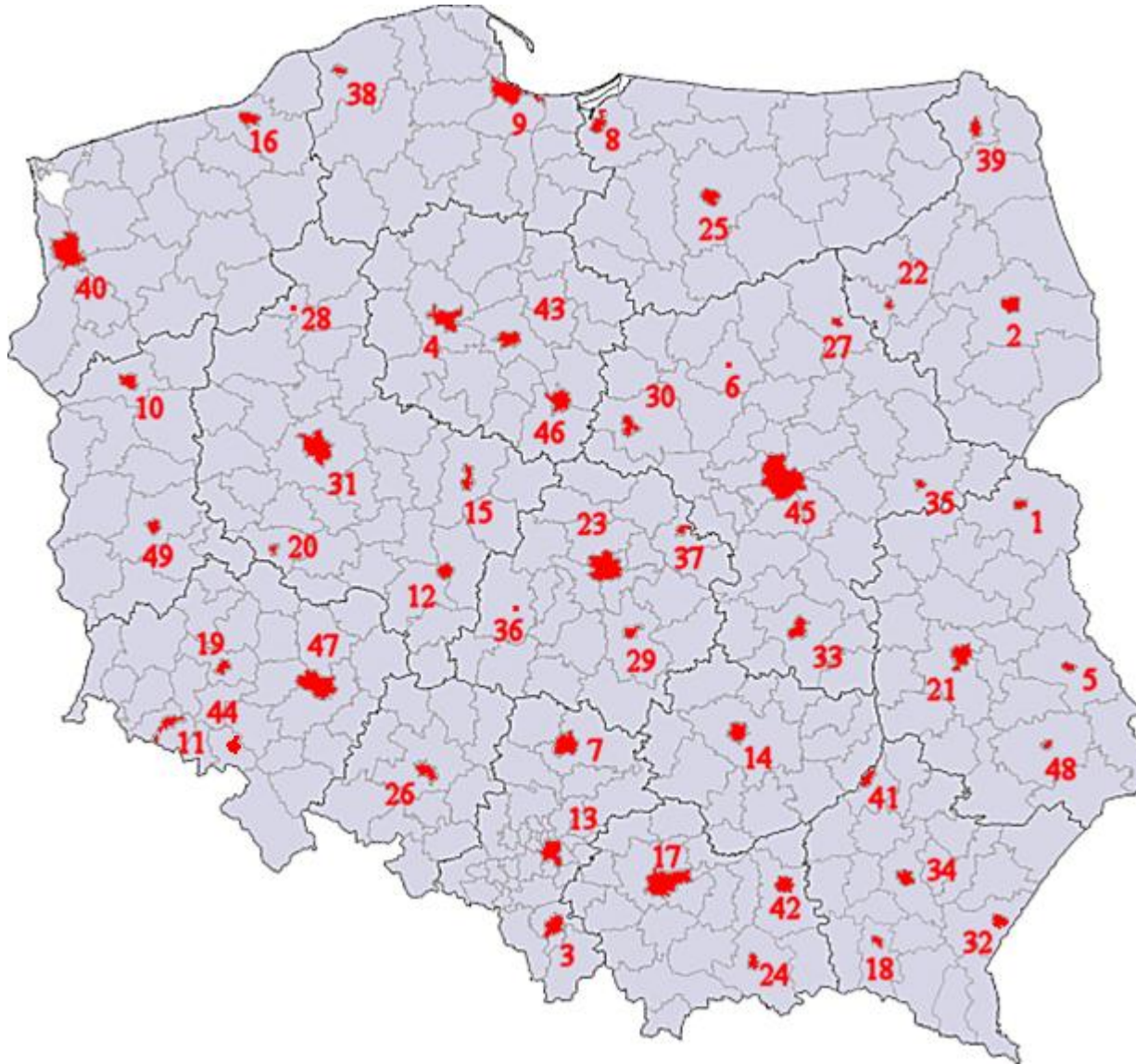


Photo: Author

Town	#	Town	#	Town	#
Biała Podlaska	1	Krosno	18	Siedlce	35
Białystok	2	Legnica	19	Sieradz	36
Bielsko-Biała	3	Leszno	20	Skierniewice	37
Bydgoszcz	4	Lublin	21	Słupsk	38
Chełm	5	Łomża	22	Suwałki	39
Ciechanów	6	Łódź	23	Szczecin	40
Częstochowa	7	Nowy Sącz	24	Tarnobrzeg	41
Elbląg	8	Olsztyn	25	Tarnów	42
Gdańsk	9	Opole	26	Toruń	43
Gorzów Wielkopolski	10	Ostrołęka	27	Wałbrzych	44
Jelenia Góra	11	Piła	28	Warszawa	45
Kalisz	12	Piotrków Trybunalski	29	Włocławek	46
Katowice	13	Płock	30	Wrocław	47
Kielce	14	Poznań	31	Zamość	48
Konin	15	Przemyśl	32	Zielona Góra	49
Koszalin	16	Radom	33		
Kraków	17	Rzeszów	34		

## EN 1991-1-3 Snow loads

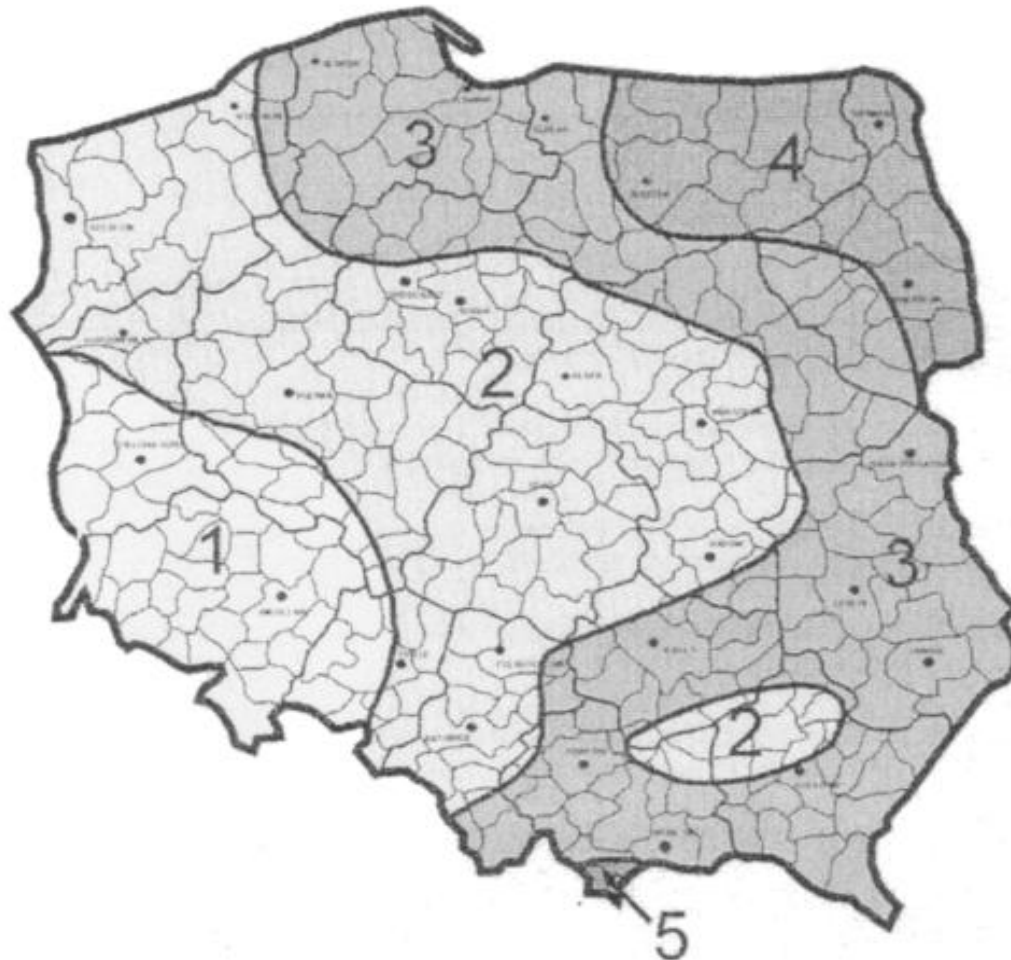


Photo: EN 1991-1-3 fig. B.1

Strefa	$s_k, \text{kN/m}^2$
1	$0,007A - 1,4; \quad s_k \geq 0,70$
2	0,9
3	$0,006A - 0,6; \quad s_k \geq 1,2$
4	1,6
5	$0,93\exp(0,00134A); \quad s_k \geq 2,0$

UWAGA: A = Wysokość nad poziomem morza (m)

EN 1991-1-3 tab. NB1

A - altitude over sea level

	Teren	$C_e$
A	Wystawiony na działanie wiatru <sup>a</sup>	0,8
B	Normalny <sup>b</sup>	1,0
C	Oślonięty od wiatru <sup>c</sup>	1,2

EN 1991-1-3 tab. 5.1

There are five terrain categories for wind and three for snow. There are defined independently for snow (EN 1991-1-3 tab 5.1) and wind (EN 1991-1-4 tab 4.1). Rough comparison looks as follows:

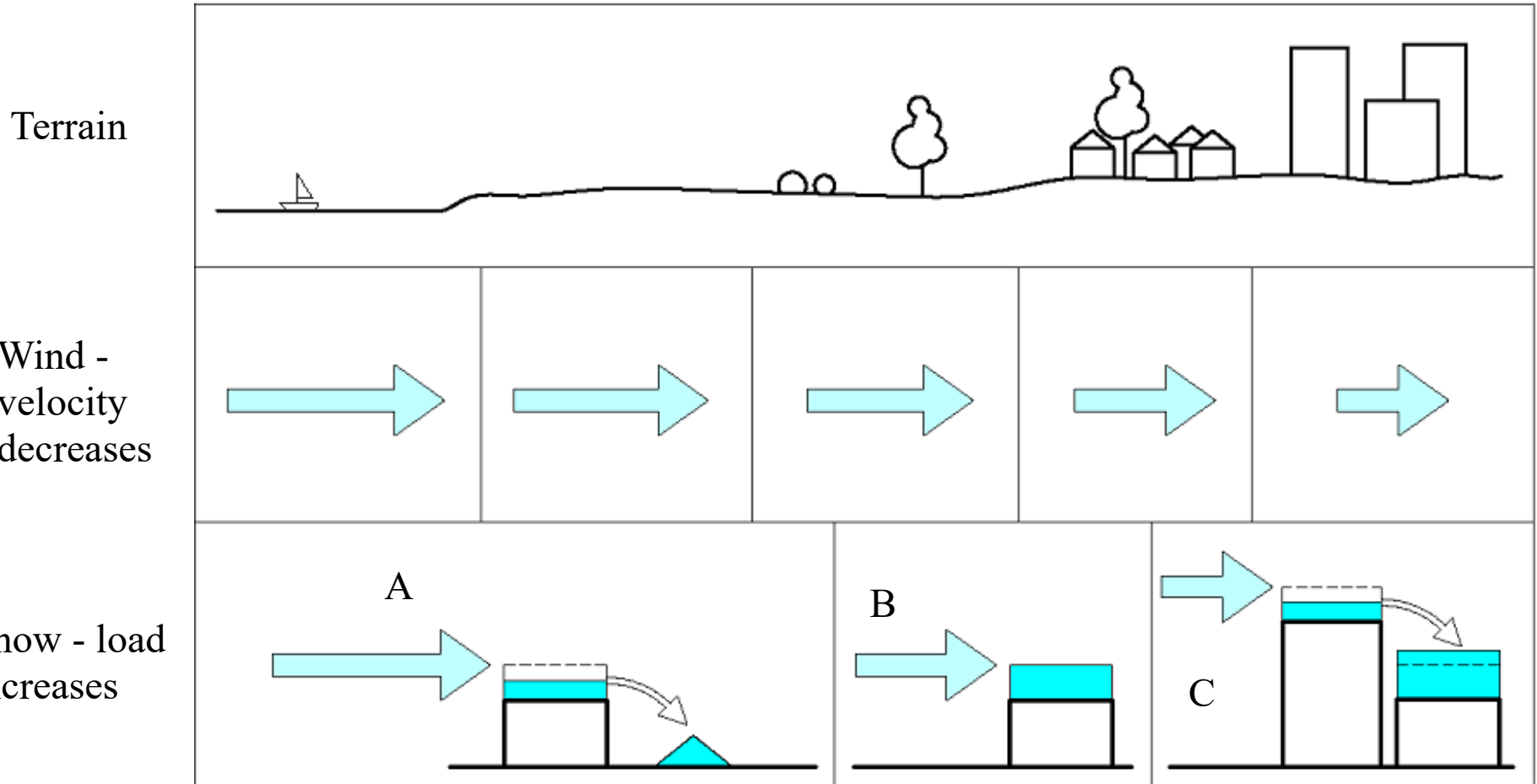


Photo: Author

## EN 1991-1-4 Wind actions



Photo: EN 1991-1-4 fig. NB.1

Strefa	$v_{b,0}$ , m/s	$v_{b,0}$ , m/s	$q_{b,0}$ , kN/m <sup>2</sup>	$q_{b,0}$ , kN/m <sup>2</sup>
	$a \leq 300$ m	$a > 300$ m	$a \leq 300$ m	$a > 300$ m
1	22	$22 \cdot [1 + 0,0006(a - 300)]$	0,30	$0,30 \cdot [1 + 0,0006(a - 300)]^2$
2	26	26	0,42	0,42
3	22	$22 \cdot [1 + 0,0006(a - 300)]$	0,30	$0,30 \cdot [1 + 0,0006(a - 300)]^2 \cdot \left[ \frac{20000 - a}{20000 + a} \right]$

EN 1991-1-4 tab. NB1

a - altitude over sea level

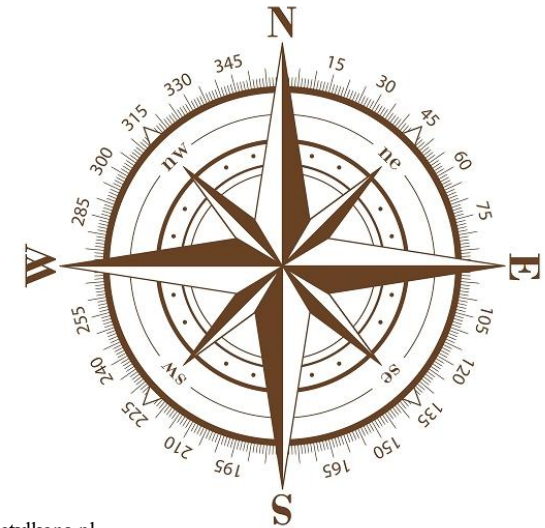


Photo: nietylkona.pl

EN 1991-1-4 tab. NB2

Strefa	Kierunek wiatru (sektor)											
	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,8	0,7						0,8	0,9	1,0		0,9
2	1,0	0,9	0,8	0,7				0,8	0,9	1,0		
3	0,8	0,7				0,9	1,0					

Recommendation:  $c_{dir} = 1,0$

$c_{season} = 1,0$

Kategoria terenu	$c_r(z)$	$c_e(z)$
0	$1,27 \left( \frac{z}{10} \right)^{0,11}$	$2,98 \left( \frac{z}{10} \right)^{0,176}$
I	$1,18 \left( \frac{z}{10} \right)^{0,13}$	$2,78 \left( \frac{z}{10} \right)^{0,205}$
II	$\left( \frac{z}{10} \right)^{0,17}$	$2,29 \left( \frac{z}{10} \right)^{0,265}$
III	$0,81 \left( \frac{z}{10} \right)^{0,19}$	$1,89 \left( \frac{z}{10} \right)^{0,26}$
IV	$0,62 \left( \frac{z}{10} \right)^{0,24}$	$1,47 \left( \frac{z}{10} \right)^{0,30}$

EN 1991-1-4 tab. NB3

z - height of building

There are five terrain categories for wind and three for snow. There are defined independently for snow (EN 1991-1-3 tab 5.1) and wind (EN 1991-1-4 tab 4.1). Rough comparison looks as follows:

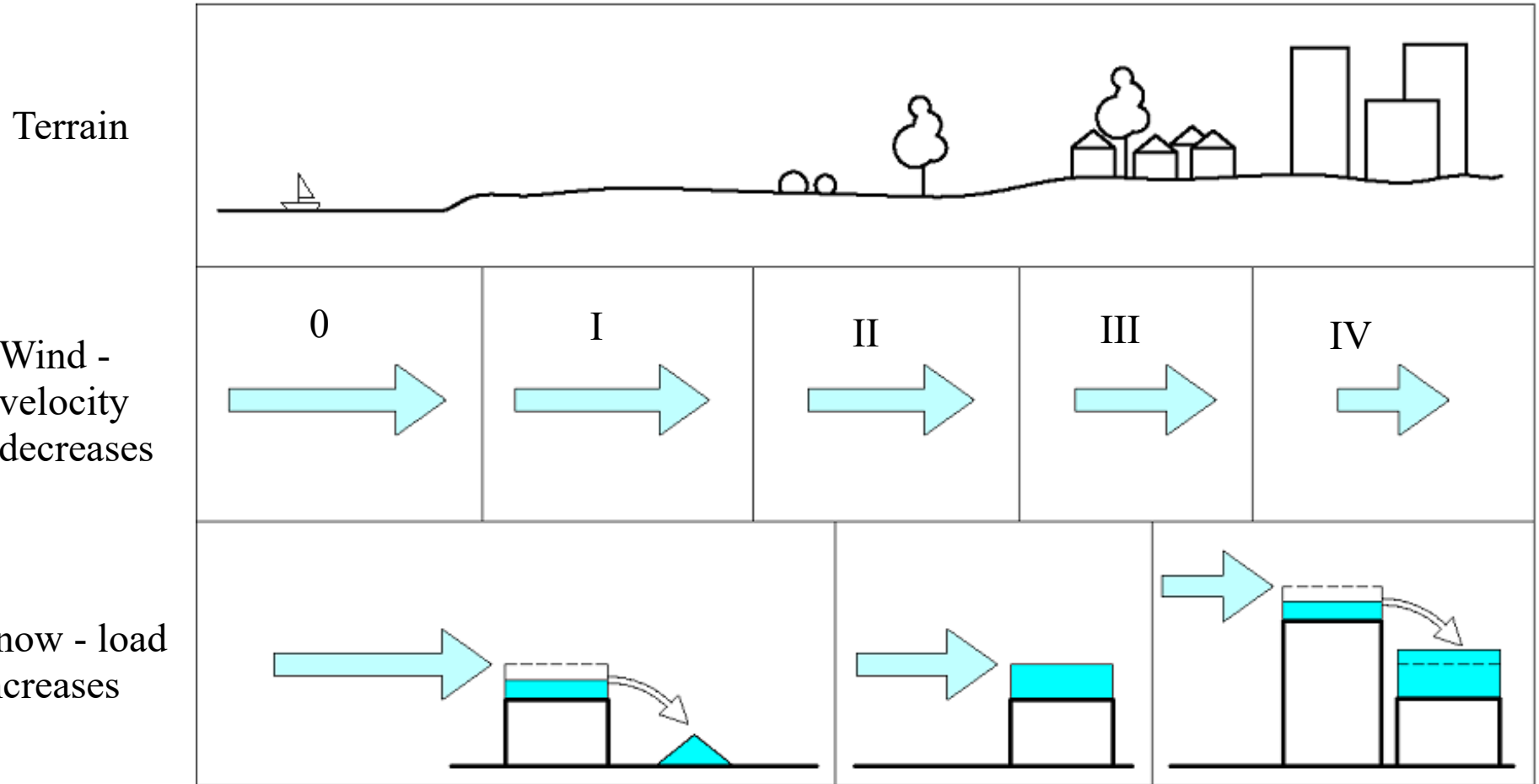


Photo: Author

# EN 1991-1-5 Thermal actions



Difference between temperature of erection and temperature of exploitation

$$\Delta T = T_{\min / \max} - T_0$$

$$T_0 = 8 \text{ }^\circ\text{C}$$

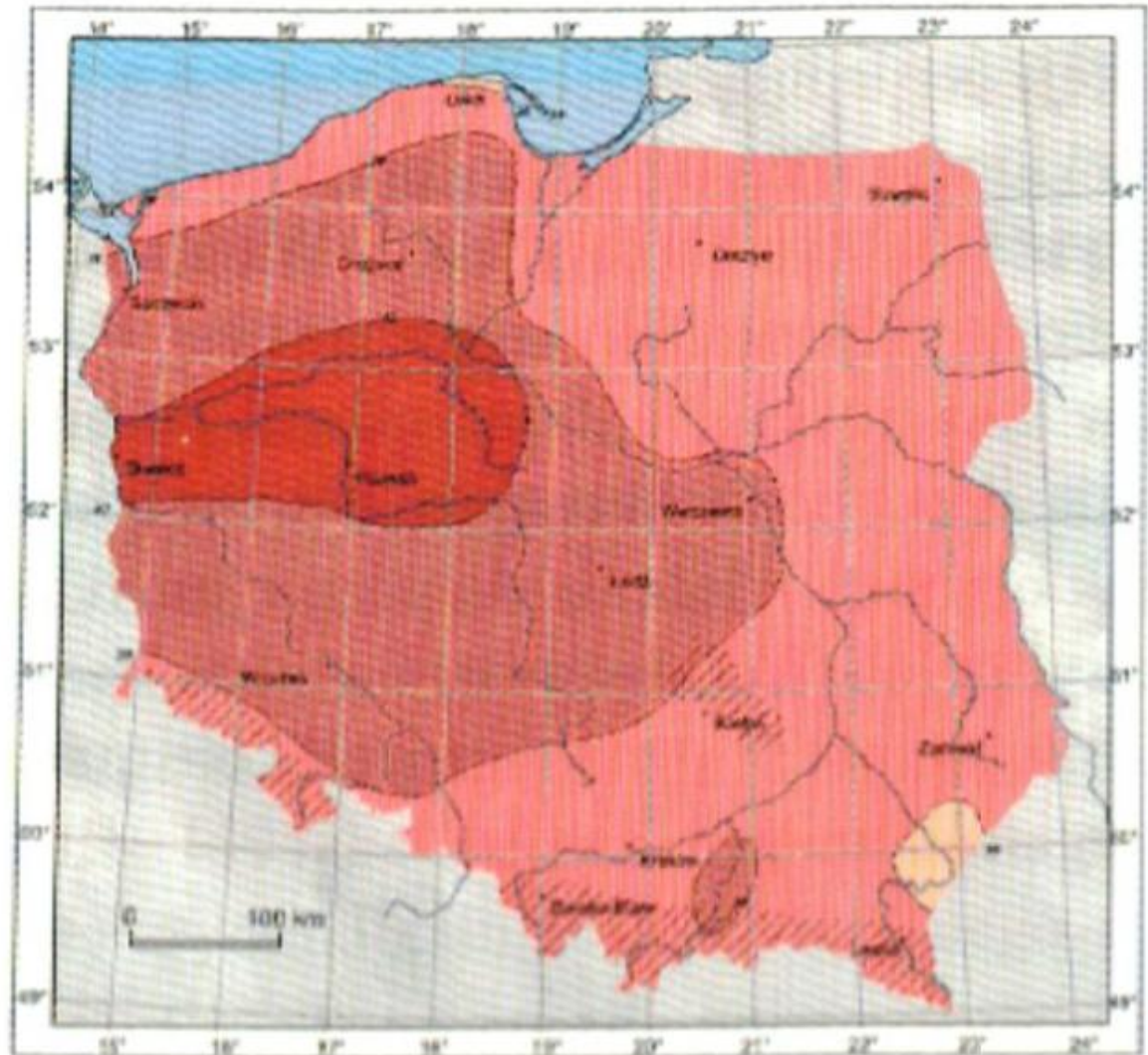


Photo: EN 1991-1-5 fig NB.2

$$T_{\max}(H) = -0,0053 \text{ [}^\circ\text{C / m]} H + T_{\max}$$

H – altitude over sea level



Difference between  
temperature of erection  
and temperature of  
exploitation

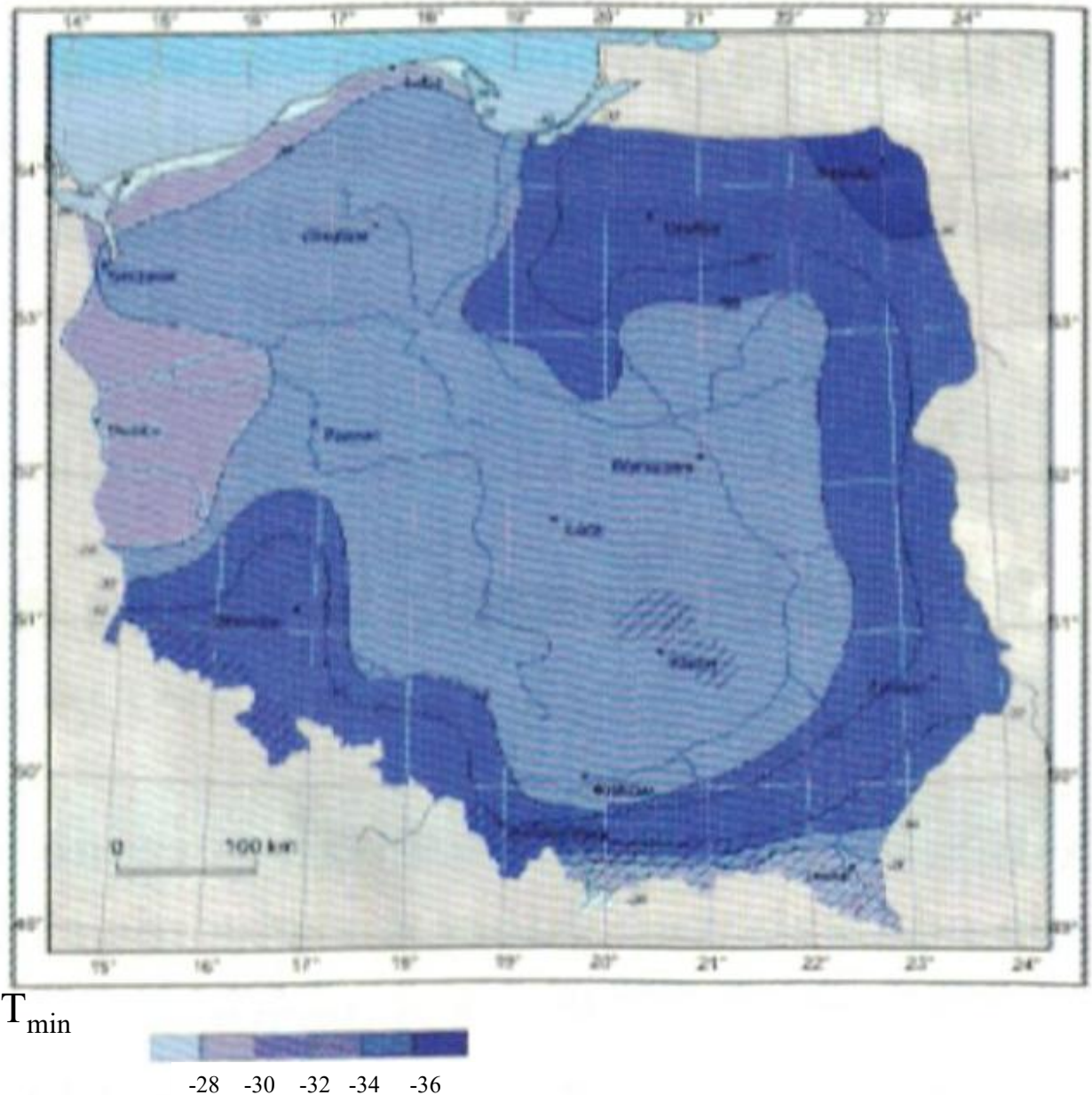
$$\Delta T = T_{\min / \max} - T_0$$

$$T_0 = 8 \text{ }^\circ\text{C}$$

Photo: EN 1991-1-5 fig NB.3

$$T_{\min}(H) = -0,0035 \text{ [}^\circ\text{C / m]} H + T_{\min}$$

H – altitude over sea level



## EN 1993-1-1 N.A. 22 Deflections

Member	$w_{\max}$ or $w_3$
Main roof girder (truss or full-walled)	$L / 250$
Purlin	$L / 200$
Corrugated sheel - roofing	$L / 150$
Floor girder: primary beam secondary beam	$L / 350$ $L / 250$
Door head or window head	$L / 500$
$w_{\max}$ = netto (total - precamber) $w_3$ = from variable actions L -length of beam or 2x length of cantilever	

Full-walled girder



Photo: Setro Metal Group

Truss girder



Photo: nashmetal.com

## Corrugated sheet



Photo: manseametal.com

Purlin



Photo: selector.com

## Window head, door head



Photo: budujesz-kupujesz.pl

## Secondary beam, primary beam



Photo: image.made-in-china.com

Thank you for attention

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