(5) The reference area A_{ref} is:

$$A_{ref} = lb \tag{A.15}$$

(6) The reference height z_e is equal to the height above ground of the section being considered

A.8.2 Force Coefficients

(1) The force coefficient c_f, for a finite circular cylinder is given by:

$$c_f = c_{f,o} \, \psi_\lambda \tag{A.16}$$

where $c_{f,o}$ force coefficient of cylinder with infinite slenderness (see Fig. A.23)
c_λ slenderness reduction factor (see A.12).

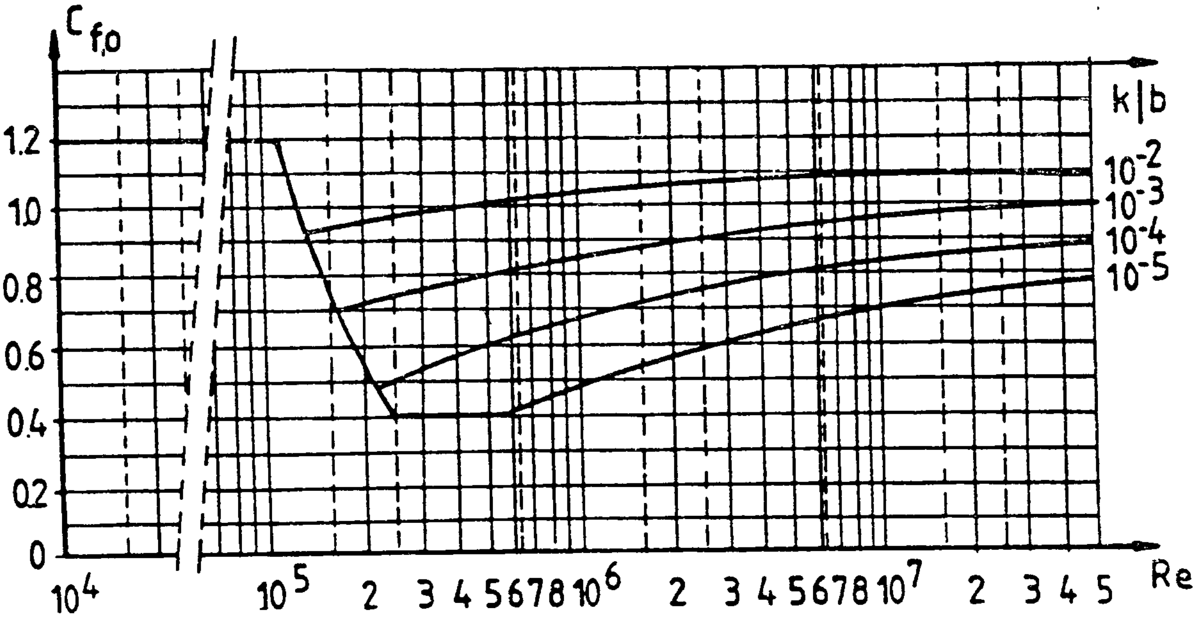


Figure A.23 Force Coefficient $C_{1,}$*0* for Circular Cylinders with Infinite Slenderness Ratio and for Different Equivalent Roughness *K/B*

(2) Values of equivalent surface roughness k are given in Table A.12

(3) For stranded cables $c_{l,o}$ is equal to 1.2 for all values of the Reynolds number R_e.

Table A.12 Equivalent Surface Roughness k

Type of surface	Equivalent roughness k(mm)	Equivalent roughness k(mm)	Equivalent roughness k(mm)
glass	0.0015	galvanised steel	0.2
polished metal	0.002	smooth concrete	0.2
finè paint	0.006	rough concrete	1.0
spray paint	0.02	rust	2.0
bright steel	0.05	brickwork	3.0
cast iron	0.2		

(3) The reference area A_{ref} is:

$$A_{ref} = lb \qquad (A.17)$$

(4) The reference height z_e is equal to the height above ground of the section being considered.

(5) For cylinders near a plane surface with a distance ration $z_g/b < 1.5$ (see Fig. A.24) special advice is necessary.

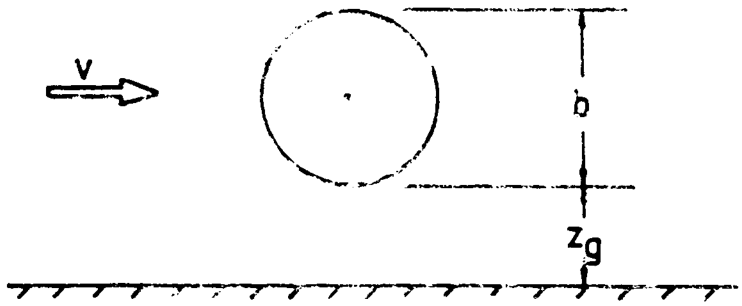


Figure A.24 Cylinder near a Plane Surface

A.9 SPHERES

(1) The alongwind force coefficient $c_{f,x}$ of spheres is given in Fig. A.25 as a function of the Reynolds number Re (see A.8.1) and the equivalent roughness K/b (see Table A.12)

(2) The values in Fig. A.25 are limited to values $z_g > b/2$, where z_g is the distance of sphere from a plain surface, b iş the diameter, Fig. A.26 For $z_g < b/2$ the force coefficient $C_{f,x}$ shall be multiplied by a factor 1.6.

) The vertical force coefficient $c_{f,z}$ of spheres shall be assumed to be:

$$c_{f,z} = 0 \qquad \text{for } z_g > b/2 \tag{A.18}$$

$$c_{f,z} = +0.6 \qquad \text{for } z_g > b/2$$

4) In both cases the reference area A_{ref} is:

$$A_{ref} = \frac{\pi b^2}{4} \tag{A.19}$$

5) The reference height should be taken as: (A.20)

$$z_e = z_g + b/2$$

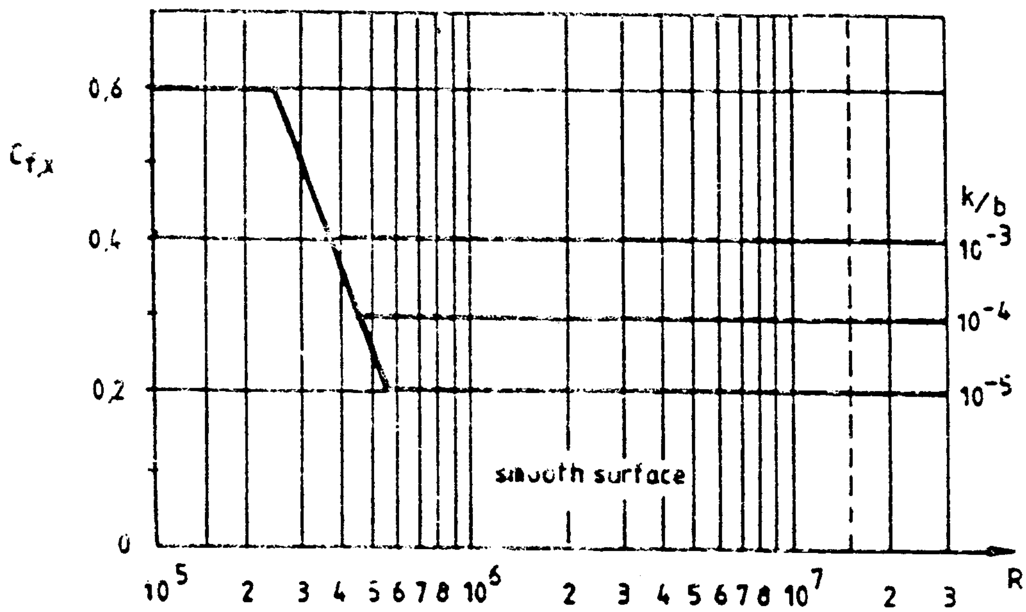


Figure A.25 Alongwind Force Coefficient of a Sphere

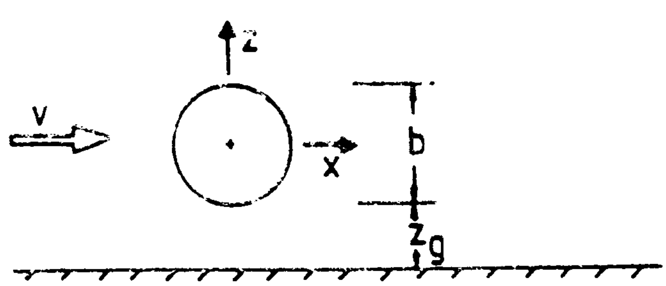


Figure A.26 Sphere near a Plain Surface

A.10 Lattice Structures and Scaffoldings

(1) The force coefficient c_f, of lattice structures and scaffoldings is given by:

$$c_f = c_{f,o}\ \psi_\lambda\ \psi_{sc} \tag{A.21}$$

where $c_{f,o}$ force coefficient of lattice structures and scaffoldings with infinite slenderness λ ($\lambda = lb$, l =length, b = width, Fig. A.27). It is given by Figs. A.28 to A.30 as a function of solidity ratio φ (2) and Reynolds number Re

re Reynolds number given by Eq. A.12 and calculated using the member diameter b_i

ψ_λ slenderness reduction factor (see A.12)

ψ_{sc} reduction factor for scaffolding without-air tightness devices and affected by solid building faces (see Fig. A.31) plotted as a function of the obstruction factor Φ_B.

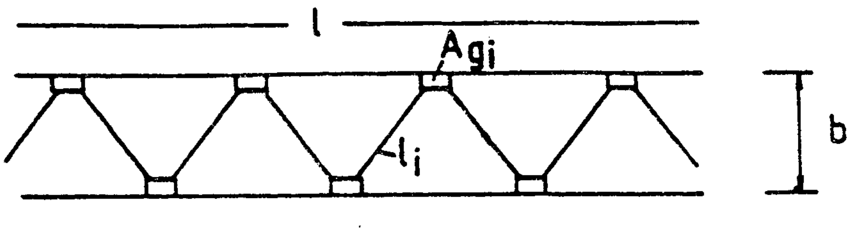


Figure A.27 Lattice Structures or Scaffolding

(2) The obstruction factor is given by:

$$\phi_B = \frac{A_{B,n}}{A_{B,g}} \qquad \text{(A.22)}$$

where $A_{b,n}$ net area of the face

$A_{B,g}$ gross area of the face

(3) Solidity ratio, is defined by:

$$\varphi = A/A_c \qquad \text{(A.23)}$$

where A Sums of the projected area of the members and gusset plates of the face = $\Sigma_j b_i l_i + \Sigma A_{gi}$

A_c the area enclosed by the boundaries of the face projected normal to the face = b

l length of the lattice

b width of the lattice

$b_i l_i$ width and length of the individual member i

A_{gi} area of the gusset plate i

(4) The reference area A_{ref} is defined by:

$$A_{ref} = A \qquad \text{(A.24)}$$

(5) The reference height z_e is equal to the height of the element above ground.

A.11 Friction Coefficients c_{fr}

(1) Friction coefficients c_{fr}, for long walls and roof surfaces are given in Table A.13

(2) The reference areas swept by the wind A_{ref} are given Fig. A.32

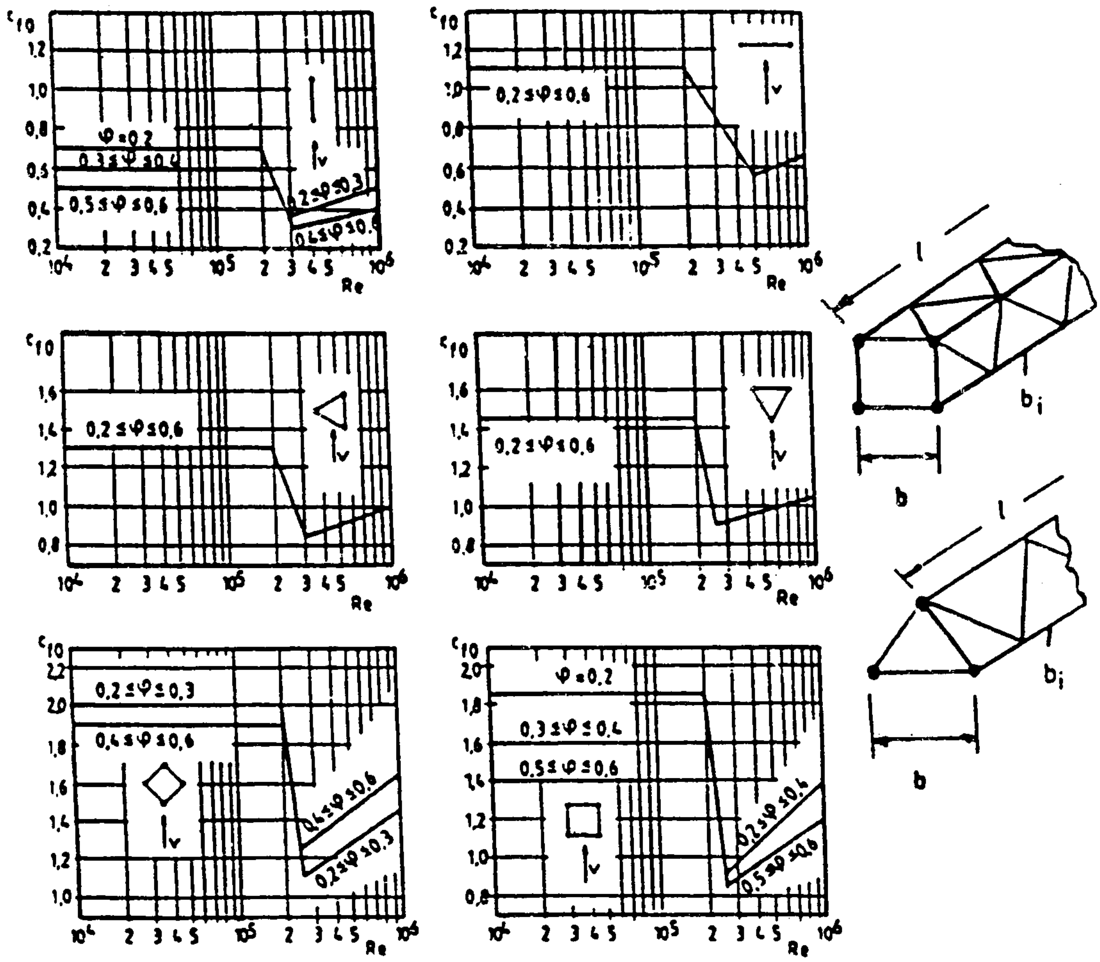
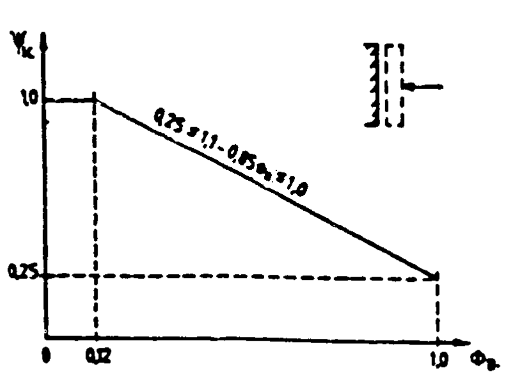


Figure A.30 Force Coefficient $c_{f,0}$ for Plane and Spatial Lattice Structure with Members of Circular Cross-Section



	ψ_{sc}
with protecting walls	0,03
with tilts	0,1
with nets	0,2

Figure A.31 Reduction Factors for the Force Coefficients of Scaffoldings without Air-Tightness Devices, Affected by Solid Building-Face Versus Obstruction Factor Φ_B

(3) The reference height z_e should be taken into account according to Fig. A.32

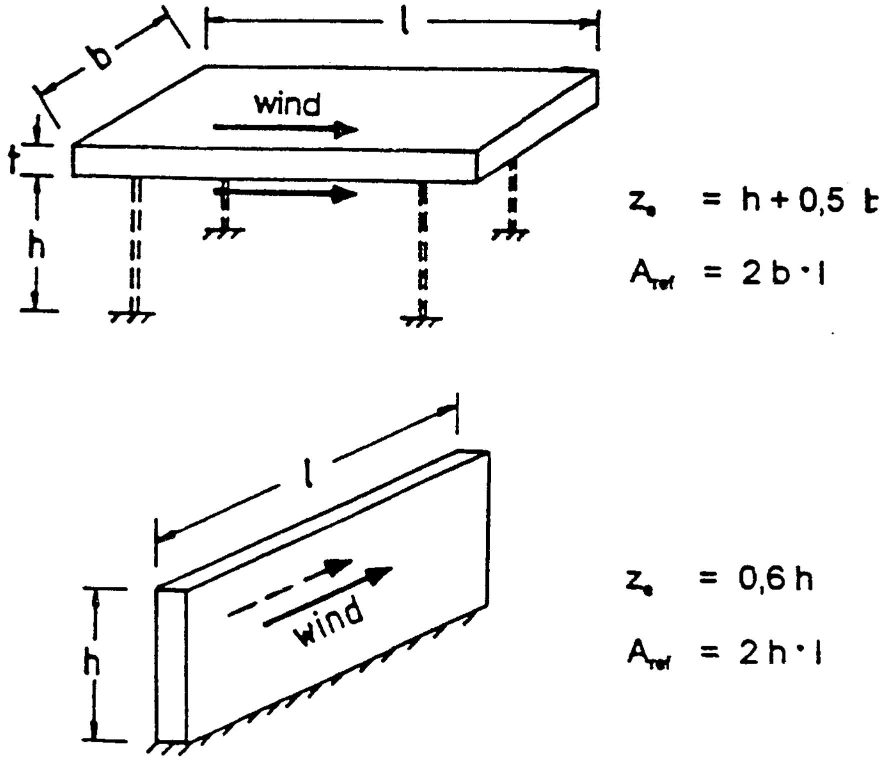


Figure A.32 Key to Reference Area A_{ref} for Walls and Roof Surfaces

Table A.13 Frictional Coefficients c_{fr} for Walls and Roof Surfaces

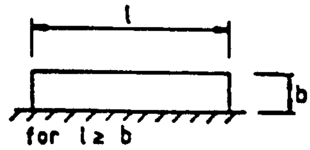
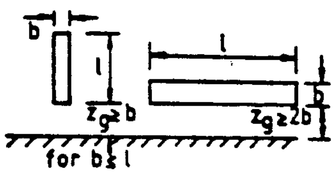
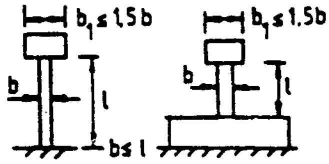
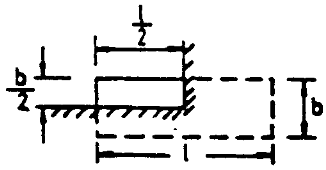
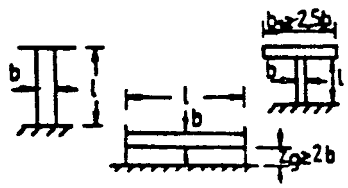
Surface	Friction coefficient C_{fr}
smooth (i.e. steel, smooth concrete	0.01
rough (i.e rough concrete, tar boards)	0.02
very rough (i.e. ripples, ribs, folds)	0.04

A.12 EFFECTIVE SLENDERNESS λ AND SLENDERNESS REDUCTION FACTOR ψ_λ

(1) The effective slenderness λ is defined in Table A.14

(2) The slenderness reduction factor ψ_λ, versus the effective slenderness λ and for different solidity ratios φ is given in Fig. A.33.

Table A.14 Effective Slenderness λ for Cylinders, Polygonal Sections, Rectangular Sections, Sign Boards, Sharp Edged Structural Sections and Lattice Structures

No	Position of the structure, wind normal to the plane of the page	Effective slenderness λ
1		l/b
2		
3		$l/b \leq 70$
4		
5		$l/b \geq 70$

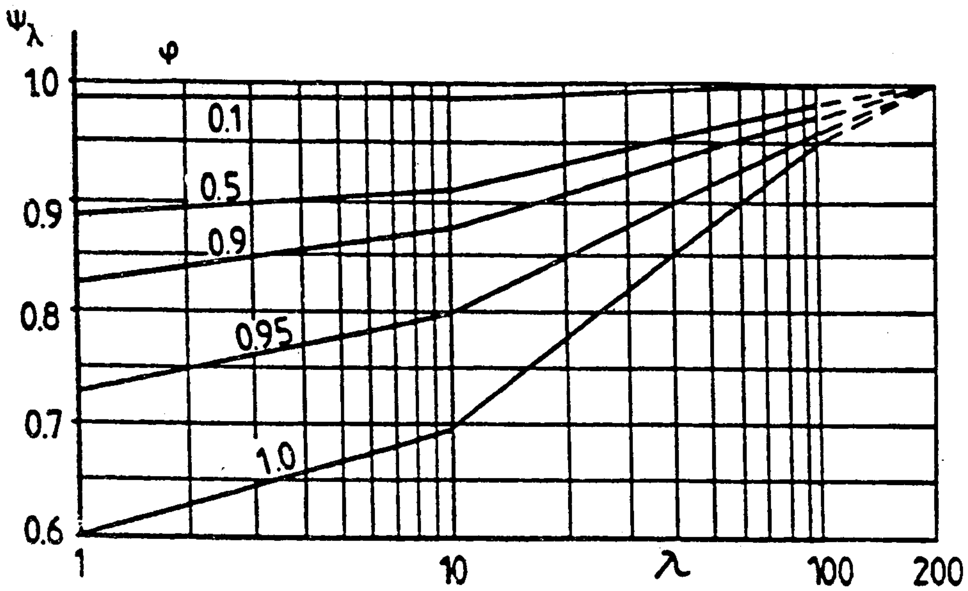


Figure A.33 **Slenderness Reduction Factory $\psi\lambda$ as a Function of Solidity Ratio φ Versus Slenderness λ**

(3) The solidity ratio φ is given by (see Fig. A.34):

$$\varphi = A/A_c \tag{A.24}$$

where A sum of the projected areas of the members
A_c enclosed area $A_c = lb$

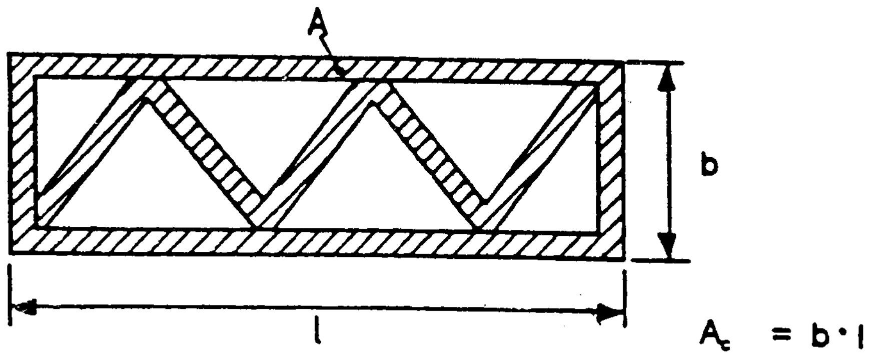


Figure A.34 Definition of Solidity Ratio φ

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