

Program: RFEM 5, RWIND Simulation

Category: Fluid Mechanics

Verification Example: 0303 – Wind Loads on the Building with Flat Roof

0303 – Wind Loads on the Building with Flat Roof

Description

The verification example compares wind load calculation on the building with flat roof by means of the standard EN 1991-1-4 [1] and by means of CFD simulation in RWIND Simulation. The building is defined according to **Figure 1** and the inflow velocity profile is taken according the standard EN 1991-1-4, see **Figure 2**. The problem is described by the following table.

Fluid Properties	Kinematic Viscosity	ν	1.5×10^{-5}	m^2/s
	Density	ρ	1.250	kg/m^3
Geometry	Width	b	10.000	m
	Height	h	6.000	m
	Length	L	13.500	m

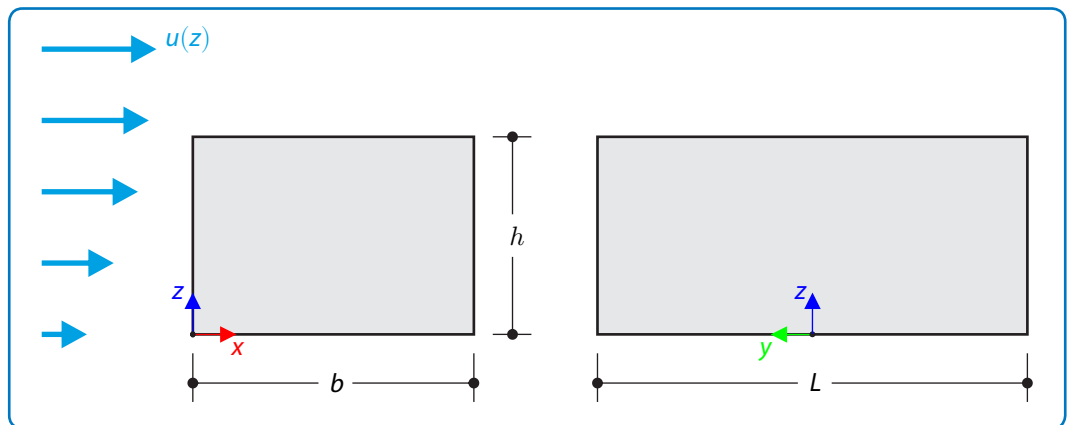


Figure 1: Problem sketch

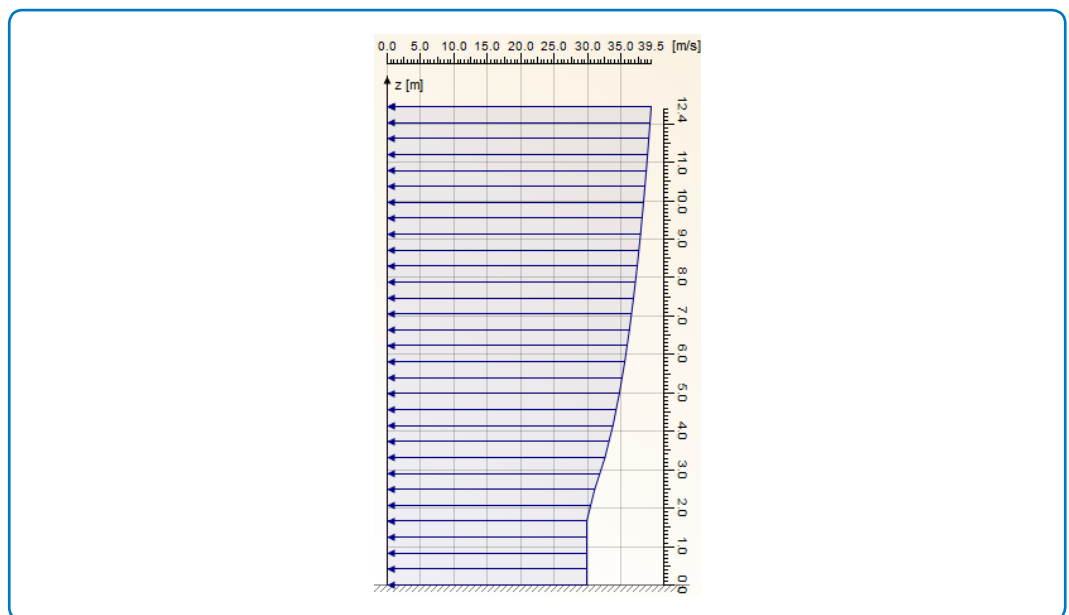


Figure 2: Inflow velocity according EN 1991-1-4 (wind-zone II, terrain category II)

RWIND Simulation Settings

- Modeled in RFEM 5.21 and RWIND Simulation 1.21
- Wind load generator – vertical walls with roof
- Model of turbulence: $k-\varepsilon$
- Lack of correlation according to 7.2.2(3) [1] is not taken into account in RFEM 5
- All the coefficients $c_{pe,10}$ according to Table 7.2 [1] are taken negative

Remark: The parameters of calculation according to EN 1991-1-4 are chosen so that the best correlation with the CFD analysis is obtained.

Results

Structure Files	Program
0303.01	EN 1991-1-4 (RFEM 5)
0303.02	RWIND Simulation

Quantity	EN 1991-1-4 (RFEM 5)	RWIND Simulation	Ratio
F_x [kN]	73.48	71.86	0.978
F_y [kN]	0.00	0.02	-
F_z [kN]	63.60	74.52	1.174

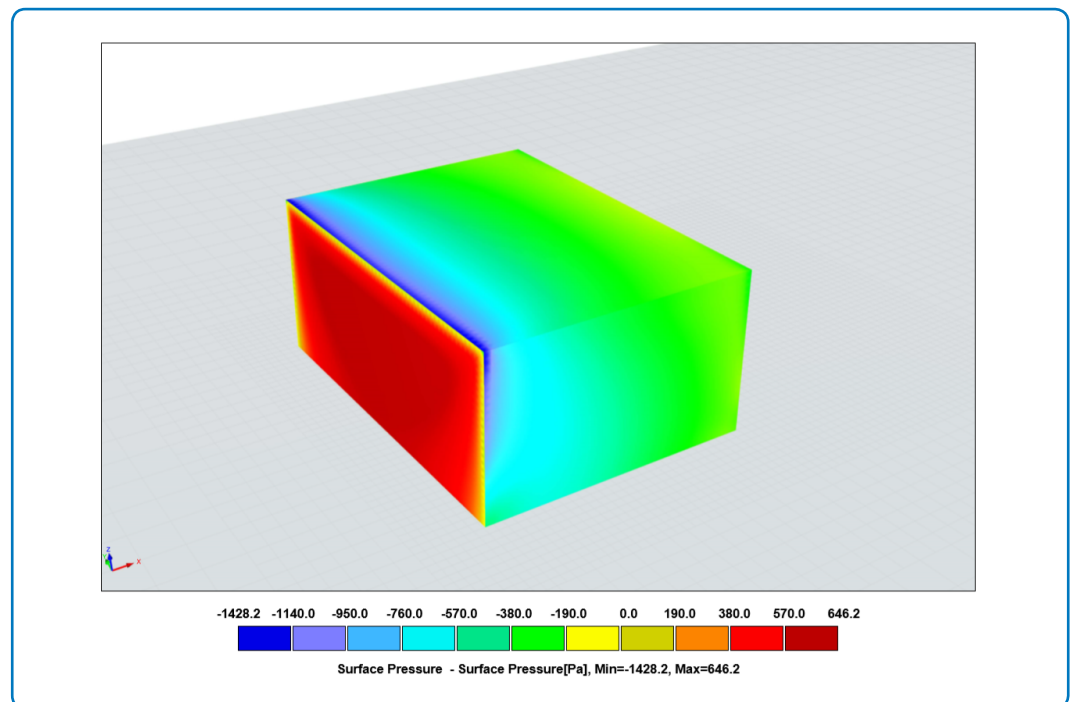


Figure 3: RWIND Simulation – Surface pressure

References

- [1] Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions. Standard, The European Union Per Regulation, 2005.