0302 – Wind Loads on the Building with Duopitch Roof

Description

The verification example compares wind load calculation on the building with duopitch 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_1	6.000	m
	Total Height	h_2	8.300	m
	Length	L	13.500	m
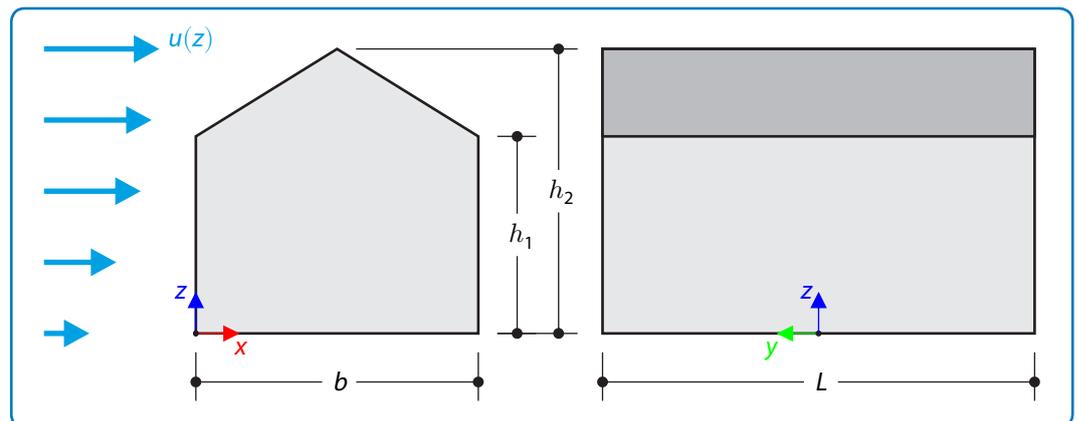
**Figure 1:** Problem sketch
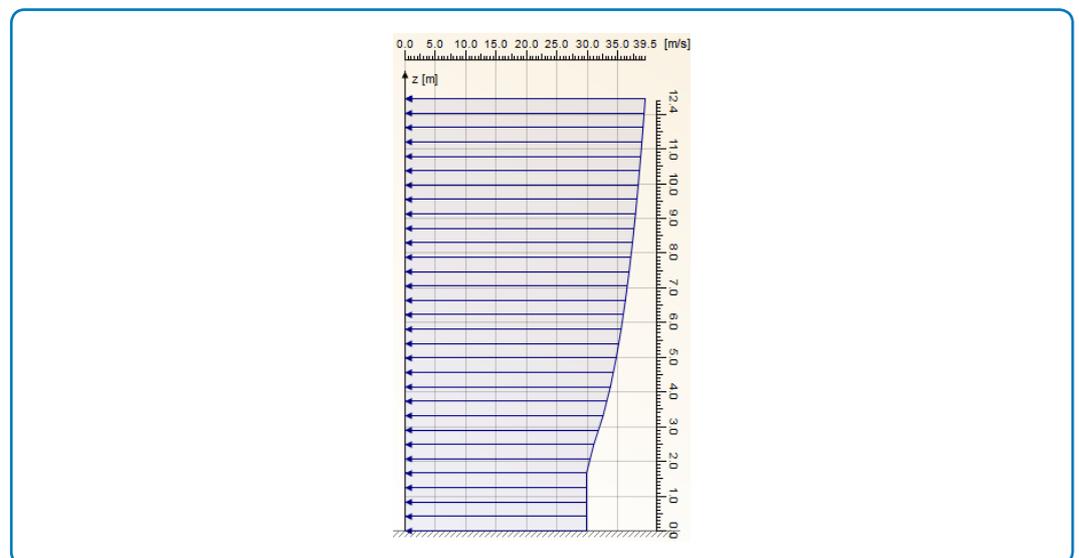
Figure 2: Inflow velocity according EN 1991-1-4 (wind-zone II, terrain category II)

RWIND Simulation Settings

- Modeled in RFEM 5.21 and RWIND Simulation 1.21
- Wind load generator – vertical walls with roof
- Model of turbulence: k-ε
- Lack of correlation according to 7.2.2(3) [1] is 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
0302.01	EN 1991-1-4 (RFEM 5)
0302.02	RWIND Simulation

| Quantity	EN 1991-1-4 (RFEM 5)	RWIND Simulation	Ratio
F_x [kN]	77.71	76.95	0.990
F_y [kN]	0.00	-0.22	-
F_z [kN]	48.02	52.53	1.094
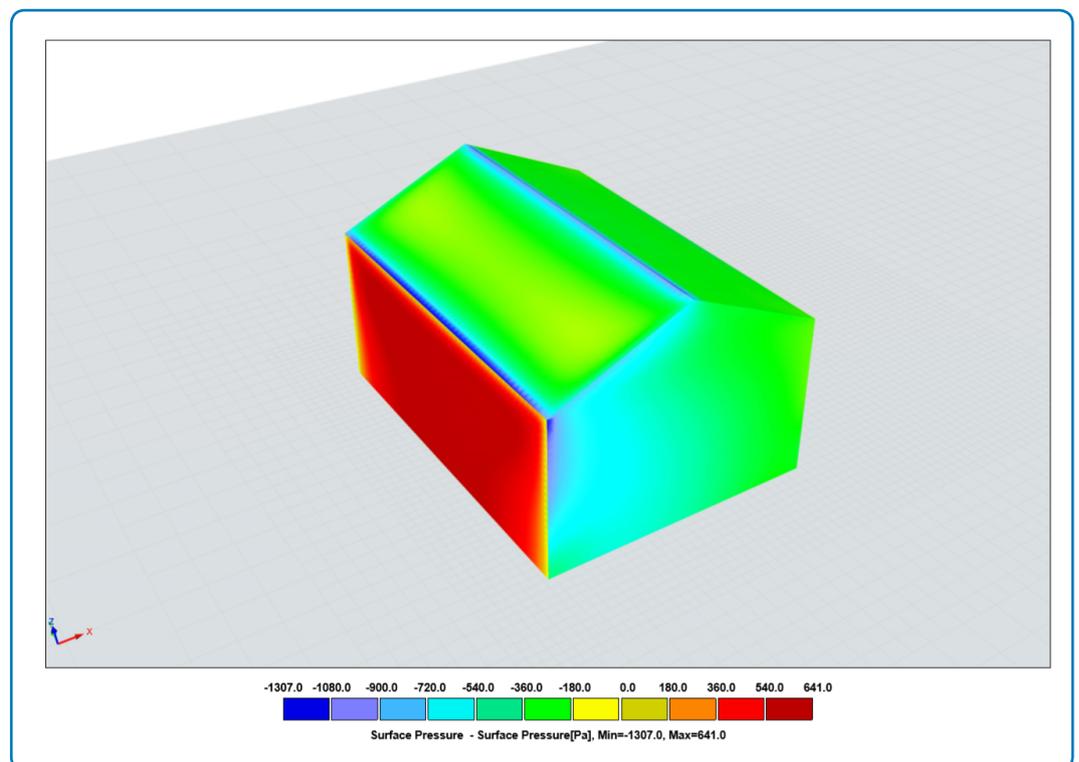
Figure 3: RWIND Simulation – Surface pressure

References

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