Example 28: Verifying plane truss

1 Description of the problem

To verify the mathematical model of *ELPLA* for analyzing plane trusses, results of plane truss introduced by *Werkle* (2001), Example 3.1, page 61, are compared with those obtained by *ELPLA*.

A plane truss of 4 nodes and 6 members is considered as shown in Figure 66. Members 5 and 6 are unconnected in their intersection point. The truss is subjected to vertical and horizontal point loads at node 2, each of 10 [kN].

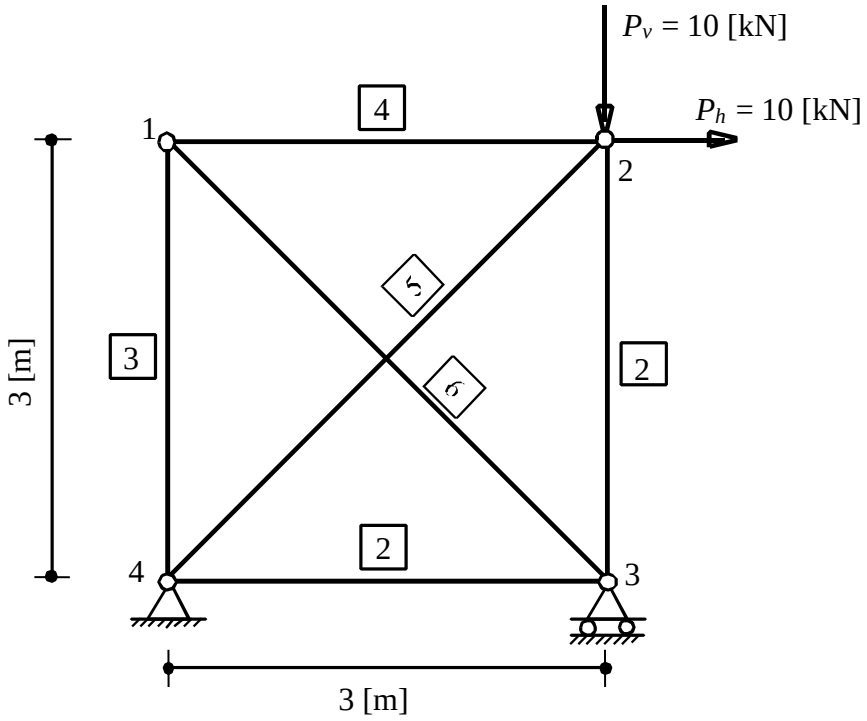

Figure 66 Statical system of plane truss with dimensions and loading

2 Truss properties

The truss has the following properties:

Young's modulus	E_b	$= 2.1 \times 10^8$	[kN/m^2]
Cross-section area of the member	A	$= 0.004$	[m^2]
Moment of inertia of the member	I	$= 0.0016$	[m^4]

3 Results

Results obtained by *Werkle* (2001) and *ELPLA* are listed in Table 39 and Table 40. Table 39 shows displacements and reactions in nodes, while Table 40 shows normal forces in members. Both results are the same.

Table 39 Displacements and reactions obtained by *Werkle* (2001) and *ELPLA*

Node	*x*-Displacement [mm]	*y*-Displacement [mm]	*x*-Reaction [kN]	*y*-Reaction [kN]
1	0.086	0.018	-	-
2	0.104	-0.054	-	-
3	0.018	-	-	20
4	-	-	-10	-10

Table 40 Normal forces obtained by *Werkle* (2001) and *ELPLA*

Member	1	2	3	4	5	6
Normal force *N* [kN]	5	-15	5	5	7	-7