

S1: Size optimization of 960-bar double grid

The 960-bar is a double layer roof truss which consists of 960 members and 263 joints (see Figure I) Nodes 1, 5, 9, 13, 66, 78, 131, 135, 139, 143 are constrained in all directions. Symmetry is conventionally exploited to reduce the number of design parameters to 251. The sections are selected from a list of 28 steel hollow circular sections (AISC 1989). The structure undergoes the snow load only, with a uniform snow pressure of 754 N/m^2 . Member stress and stability limitations are in accordance with ASD-AISC specifications, and nodal displacements are restricted to a maximum of 10.57 cm in each direction. Design constraints are governed by AISC-ASD specifications (AISC 1989). The following values are used: $F_y=248.21 \text{ MPa}$ (36 ksi), Density= $7,850 \text{ kg/m}^3$ and $E=200 \text{ GPa}$ (29,000 ksi).

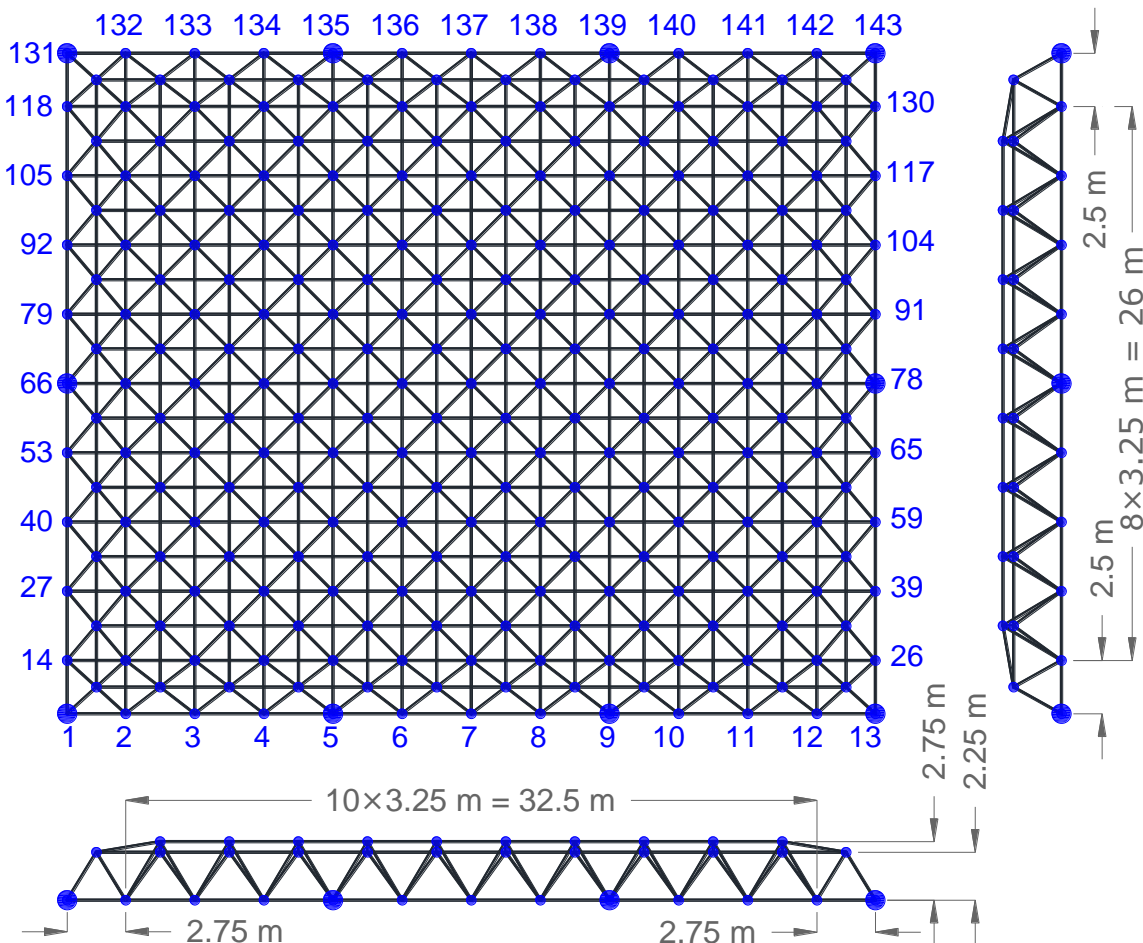


Figure I. Ground structure for the 960-bar problem (front, side, and top views)