The open(outflow) boundary condition ("O") arises as a natural boundary condition from the variational formulation of Navier Stokes. We identify two situations

- In the non-stress formulation, open boundary condition ('Do nothing')

$$[-p\mathbf{I} + \nu(\nabla \mathbf{u})] \cdot \mathbf{n} = 0 \tag{1}$$

- In the stress formulation, free traction boundary condition

$$[-p\mathbf{I} + \nu(\nabla \mathbf{u} + \nabla \mathbf{u}^T)] \cdot \mathbf{n} = 0 \tag{2}$$

- the symmetric boundary condition ("SYM") is given as

$$\begin{aligned} \mathbf{u} \cdot \mathbf{n} &= 0 \,, & (3) \\ (\nabla \mathbf{u} \cdot \mathbf{t}) \cdot \mathbf{n} &= 0 & (4) \end{aligned}$$

  where $\mathbf{n}$ is the normal vector and $\mathbf{t}$ the tangent vector. If the normal and tangent vector are not aligned with the mesh the stress formulation has to be used.

- the periodic boundary condition ("P") needs to be prescribed in the .rea file since it already assigns the last point to first via $\mathbf{u}(\mathbf{x}) = \mathbf{u}(\mathbf{x} + L)$, where L is the periodic length.

- the wall boundary condition ("W") corresponds to $\mathbf{u} = 0$.