ABSTRACT

A numerical investigation is conducted on the incompressible fluid flow around a square prism symmetrically placed in a rectangular channel. The effect of gap spacing ratio $g/d$ ($= 0.4 – 12.0$) is studied on Strouhal number ($St$), time mean drag coefficients ($C_D$), fluctuating lift coefficients ($C_L'$) and flow structures where $g$ is the spacing between the prism and channel wall and $d$ is the height of the prism. For all simulations, Reynolds number ($Re$) is fixed at 100. It is observed that the $St$ and $C_D$ both increase with decreasing $g/d$. On the other hand, with increasing $g/d$, the $C_L'$ decreases for $0.4 < g/d < 1.0$, increases for $1.0 \leq g/d < 2.0$ and again decreases for $2.0 < g/d \leq 12.0$. Three distinct vortex shedding regimes are observed (a) wall-dominated vortex street ($0.4 \leq g/d < 1.0$), (b) reverse Karman vortex street ($1.0 \leq g/d < 3.5$), and (c) Karman vortex street ($3.5 \leq g/d \leq 12$).