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Forced Convection from Square Cylinder Placed Near a Wall Using Variable Resolution Turbulence Modelling PRITANSHU RANJAN, ANUPAM DEWAN, Indian Institute of Technology New Delhi — The effect of wall proximity on flow and heat transfer around a square cylinder placed inside a channel is numerically investigated. This flow configuration is a fundamental problem and is widely encountered in several engineering applications. The presence of wall close to the cylinder can alter the shedding process and this in turn can affect the thermal transport in the wake region. Many researchers have studied this phenomenon experimentally but the heat transfer characteristics around a square cylinder placed inside a channel still remain an open question. We present here an insight into this problem. The simulations were carried out for a Reynolds number of 37,000 (based on cylinder diameter, D) and as a function of gap height, G/D, at different blockage ratios. A variable resolution modelling approach (PANS SST k-ω model) was used to study turbulence structures. The results are presented in terms of pressure coefficient, drag coefficient, thermal fluctuations and local and average Nusselt number (Nu). The results obtained showed that, for $G/D < 0.5$ very weak shedding process at random time intervals occurs suggesting the suppression of vortex shedding due to wall. Thus, the local and average Nu decrease as the cylinder is moved towards wall at all blockage ratios.

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