A passive grid-generated turbulence technique for generating turbulent inflow conditions in large-eddy simulation (LES) is developed on moderate number of mesh cells and the results are compared with synthetic methods and wind tunnel experiments performed at Reynolds (Re) number of order 100 (based on Taylor microscale). Consistent with previous investigations, it is found that the synthetic methods turbulence dissipate the turbulence kinetic energy very quickly while the present technique represents this decay more accurately. However, this pre-computation method usually requires considerable computational cost. The aim of this study is, therefore, to decrease the computational cost by employing a relatively coarse mesh resolution accompanied with an appropriate wall modelling approach in the solid boundary. The results are within an acceptable accuracy and, therefore, offer a cost-effective solution to generate inflow turbulence parameters for their use in different aerodynamic applications at low Re numbers.