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The Effect of Relative Submergence and Shape on the Wake of a Low-Aspect-Ratio Wall-Mounted body SEYED MOHAMMAD HAJIMIRZAIE, CRAIG WOJCIK, JAMES BUCHHOLZ, The University of Iowa — Wall-mounted bodies in boundary layer flows are ubiquitous in nature and engineering applications and significantly enhance momentum and scalar transport in their vicinity. In this experimental study we evaluate the role of relative submergence (the ratio of flow depth to obstacle height) and shape on the wakes around four different wall-mounted obstacles. We consider four obstacle geometries: semi-ellipsoids with the major and minor axes of the base ellipses aligned in the streamwise and transverse directions, and two cylinders with matching aspect ratios D/H (where D is the maximum transverse dimension and H is the obstacle height). The aspect ratios considered are 0.67 and 0.89. DPIV was used to interrogate the flow. Streamwise structures observed in the mean wake include tip, base, and horseshoe vortex pairs as well as additional structures apparently not previously observed. The presence of a base vortex for such low-aspect-ratio obstacles is unexpected, and its strength increases with decreasing relative submergence. We will discuss hypotheses on the mechanisms of generation of the base and tertiary structures and their interconnection with the rest of the vortex skeleton.

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