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Classification of the Flow Produced by an Oscillating Fence in a Laminar Boundary Layer MICHAEL HIND, WILLIAM LINDBERG, JONATHAN NAUGHTON, University of Wyoming — Flow visualization has revealed that an oscillating fence produces a range of vortical structures in a flat plate laminar boundary layer. The structure can be classified by the ratio ϕ_0 of the fence oscillation frequency to the fundamental shedding frequency of the static fence. Particle image velocimetry was used to quantitatively investigate the flow structures of each classification regime. Fences operating in the subcritical flow regime ($\phi_0 < 0.1$) shed vortices due to vortex saturation behind the fence. The vortices of the critical flow regime ($\phi_0 \sim 1$) strengthen during the fence upstroke and are forced to shed once the fence begins to descend. The vortices of the supercritical flow regime ($\phi_0 > 1$) are shed once per fence oscillation cycle and coalesce to form larger vortices at the fundamental shedding frequency of the static fence. For the transitional flow regime ($\phi_0 \sim 0.1 - 1$), the structures are two-dimensional during the fence upstroke that become three-dimensional once the fence begins to descend. Through this classification system, it is possible to determine the frequency required for a given flow to produce the desired type of structure. By varying the fence frequency, the structure can be made to change dramatically.

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