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Discharge Coefficients for Irregular Orifices WADE HUEBSCH, DONALD GRAY, GREG THOMPSON, P.J. SPAUR, West Virginia University — The flow of water through an irregular orifice into an air space is of interest as a model for the flow into a submerged tunnel through a rupture of the wall. An experimental study was conducted of the flow though circular and noncircular thin plate orifices. Steady state discharge coefficients (C_d) were measured gravimetrically and photographs of the free jets were taken. Contrary to expectations, C_d increased as the shape deviated from a circle: $C_d = 0.61$ (circle), 0.625 (square), 0.654 (ellipse), and 0.665 (circular-sawtooth). Four irregular orifices had $C_d = 0.657$ (least irregular), 0.661, 0.685, and 0.704 (most irregular). The discharge coefficient for the circular orifice agreed with classical results. The jet from the square orifice showed evidence of the expected inversion from a square cross section to a cross. For the elliptical orifice, C_d was independent of the smoothness of the orifice edge. Discharge coefficients were also measured for extruded tubes of various lengths having circular and two irregular cross sections. In all cases the flow changed from a free jet to one which filled the tube at a dimensionless tube length of 2.

Wade Huebsch
West Virginia University

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