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Steady 2d Detonations and the DSD Theory SERGEY N. LUBYATINSKY, B.G. LOBOIKO, V.P. FILIN, O.V. KOSTITSYN, E.B. SMIRNOV, Russian Federal Nuclear Center Institute of Technical Physics, P. O. Box 245, Snezhinsk, Chelyabinsk region, 456770 Russia — The simplest Detonation Shock Dynamics (DSD) theory assumes that the detonation normal velocity D is determined by the total front curvature k and that the edge angle, the angle between the normal to the front and the explosive edge, has a unique value for each explosive and confinement material combination. This model has been used to derive the ordinary differential equations describing steady 2D detonation front shapes in slab, cylinder and rib geometries. It was found that one solution (a steady detonation front shape) corresponds to several combinations of the confinement material and the defining charge dimension (slab thickness, cylinder radius, or inner rib radius). Comparing experimental data for these combinations and analyzing the shape difference at the edge provide valuable information on the D(k) relation at low D corresponding to forced detonation regimes. The analysis of the experimental data on IHE ribs detonation indicates that as D decreases k tends to a limit of about 0.05 1/mm, i.e., of the order of reciprocal critical diameter. This revises the present view of the D(k) relation making the DSD theory consistent with the experimentally observed critical diameter.

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