Pick-up, impact, and peeling. HARMEET SINGH, JAMES HANNA, Virginia Tech — We consider a class of problems involving a one-dimensional, inextensible body with a propagating discontinuity (shock) associated with partial contact with a rigid obstacle providing steric, frictional, or adhesive forces. This class includes the pick-up and impact of an axially flowing string or cable, and the peeling of an adhesive tape. The dynamics are derived by applying an action principle to a non-material volume. The resulting boundary conditions provide momentum and energy jump conditions at the shock. These are combined with kinematic conditions on velocities and accelerations to obtain families of steady-state solutions parameterized by the shock velocity and momentum and energy sources. We find relationships between the jump in stress, injection of momentum, and dissipation of energy, which we apply to specific cases, and compare with other results in the literature on chain fountains, falling folded chains, and impulsively loaded cables. Time permitting, we will briefly discuss the possibility of using kinematic conditions and information about accelerating or otherwise unsteady forms of the adjoining bulk solutions to construct an equation of motion of the shock.

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