Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Discrete Element Simulation of Granular Flow in a Modified Couette Cell[1] JEREMY B. LECHMAN, GARY S. GREST, Sandia National Laboratories, Albuquerque, New Mexico 87185 — Slow, dense granular flows often exhibit thin, localized regions of particle motion, called shear bands, separating largely solid-like regions. Recent experiments using a split-bottom Couette cell found that the width of the shear zone grew as the pack height increased and the azimuthal velocities when rescaled fall on a universal curve regardless of the particle properties. Here we present large-scale Discrete Element simulations of a similar system for packs of varying height up to 180,000 monodisperse spheres. The onset and evolution of granular shear flow is investigated as a function of height. We find a transition in the nature of the shear as a characteristic height is exceeded. Below this height there is a central quasi-solid core; above this height we observe the onset of additional axial shear associated with a torsional failure mode of the inner core. Radial and axial shear profiles are qualitatively different: the radial extent is wide and increases with height while the axial width remains narrow and fixed.

[1]Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract No. DE-AC04-94AL85000.

Jeremy Lechman
Sandia National Laboratories

Date submitted: 10 Aug 2005 Electronic form version 1.4