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Techniques for Analysing Energy Dissipation from Particulate Systems Undergoing a Single Particle Crushing Event

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The energy dissipation from particulate systems undergoing particle crushing is often assumed to scale solely with the increase in surface area, irrespective of the strain energy stored in the surrounding media. By analyzing idealized particulate systems undergoing a single particle crushing event, this assumption is questioned and proven invalid. Two analysis types are considered. One represents the particulate system as an idealized assembly and then represents particle contact forces as members belonging to a periodic lattice. The other treats the particulate system as an elastic continuum. Different sizes of two and three dimensional particulate systems are considered, as well as isotropic and anisotropic confining stress states, and compared to a simple one dimensional analogy. By comparing all results generated, the most relevant to gain insights into energy dissipation seems to be from a one dimensional analysis of the force chain containing the most heavily loaded particles.

Keywords: Particle crushing; Granular material; Energy methods; Analytic functions