UTC Project Information	
Project Title	MPC-645 – Seamless Comparative Modeling of Natural Hazards Using the Material Point Method
University	Colorado State University
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Brief Description of Research Project	At present, there are a wide variety of modeling approaches used to simulate and represent the threats of natural hazards on transportation infrastructure. One disadvantage of this approach is that direct comparisons between both methods and disparate threats lack consistency and continuity. Hence, practitioners hoping to determine levels of threat and system response must use a specific method depending on the system and the type of hazard. Clearly, input parameters for varying threats are part of the inherent nature of the hazard. But the modeling approach should be consistent. In this work, a seamless modeling approach will be used to develop what amounts to a single modeling tool that can represent soils, fluids, solids, and their combination including concepts, for example, as fluid- structure interaction. The Material Point Method (MPM) has seen limited but successful development in modeling these types of systems but in this work the natural threat rubric will be incorporated under a single modeling domain. This will allow for consistency threat assessment, the development of a single computational tool, and the ability to effectively rank the seriousness and potential damage caused using a single platform.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	Our developed MPM models are being further extended and used for related applications involving similar scenarios that include rockfall events and the mechanics of highway barriers to slow vehicles traveling at high speed.

Impacts/Benefits of Implementation (actual, not anticipated)	The MPM is still in its infancy, and the varied nature of our results will provide more visibility to this class of method. Additionally, the numerical behavior of this method is still not well understood, and some of the work being accomplished will help to buttress physically meaningful results with more rigorous numerical comparisons.
Web Links Reports Project Website 	MPC Final Report – <u>Seamless Comparative Modeling of Natural</u> <u>Hazards Using the Material Point Method</u>