TECHNISCHE UNIVERSITÄT DRESDEN

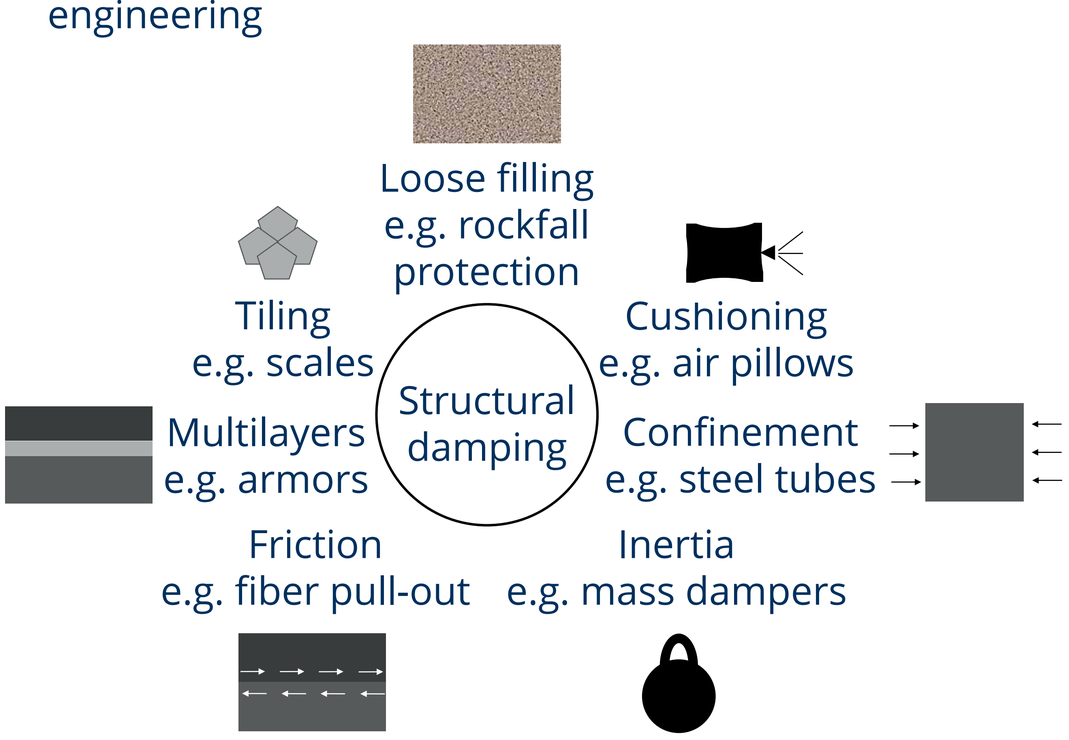
DFG GRK 2250 – Mineral-bonded composites for enhanced structural impact safety

Lena Leicht– Doctoral Project A6/II

CHARACTERIZATION OF MINERAL-BONDED COMPOSITES AS DAMPING LAYERS AGAINST IMPACT LOADING

1 STATE OF THE ART

- Structural damping principles found in nature and engineering



- Open questions
  - Criteria for the choice of damping principles
  - Composition of damping layers
  - Characterization of material damping effects
  - Characterization of impact damage of structures

2 OBJECTIVES

- Reduction of impact damage like perforation through, spalling at the top, and scabbing at the bottom of the specimen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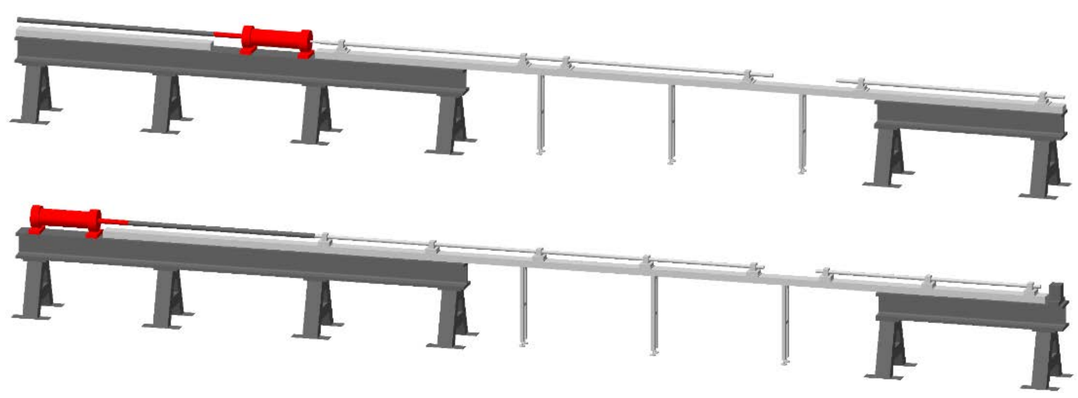
Spalling (top) and scabbing (bottom) damage due to wave propagation in structural members

- Composition, characterization and validation of impact damping layers on impact-facing side of specimens
- Requirements for damping layers: thin, lightweight, and producible on a large scale

3 CONCEPTS

- Structural damping principles applied: multilayer coating, friction, confinement, and loose filling
- Materials for multilayer coating:
  - Textile reinforced concrete and high strength fiber reinforced concrete as strong cover layers
  - Strain-hardening cementitious composites, lightweight aggregate concrete, rubberized concrete, and sand as soft intermediate layers
- Small-scale tests on cylinders in split Hopkinson bar for testing of material strengths and damping properties



Tensile (top) and compressive (bottom) SHB configuration

- Large-scale tests on cuboids and plates in drop tower for testing of damping properties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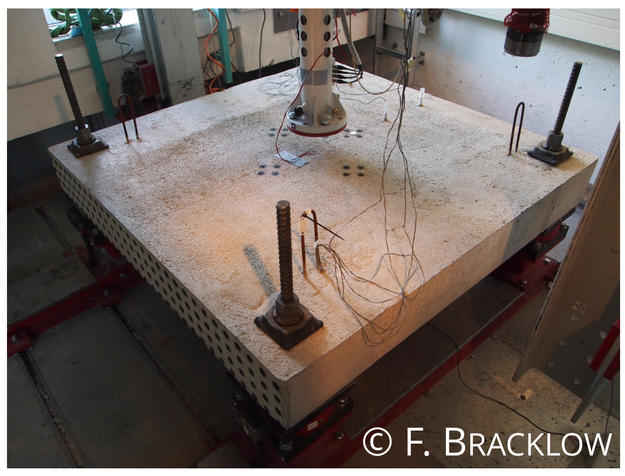
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Cuboid (left) and plate (right) testing in the drop tower

- Damage evaluation with help of measured accelerations, deflections, support forces, penetration depth of the impactor, compression force of the impactor, strains of the reinforcement bars

4 PLANNED COLLABORATIONS

- H. Le Xuan (A1/II): testing of 3D reinforcement structures with integrated sensors
- M.-M. Popa (A2/II) and M. A. B. Beigh (A3/II): application of the developed sustainable SHCC
- F. Bracklow (A5/II): testing of slabs strengthened on both sides
- H. Knobloch (B1/II), J. Stöcker (B3/II) and A. Chihadeh (B4/II): discussions on the structural behavior
- L. C. Duran Vergara (C1/II): application of 3D measurement methods in large scale tests
- I. de Paula Salgado (C2/II): sustainability of materials
- F. Conrad (C3/II): data management and analysis