MATERIALS, MECHANICS, MANAGEMENT & DESIGN (3MD) DEPARTMENT



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Faculty of Civil Engineering and Geosciences





Department 3MD



TUDelft

- Broad in scope and deep in approach
- Healthy mix of fundamental and application-oriented research
- Strong competence in modelling & experimental mechanics
- Strong link with the department of Engineering Structures, with whom we shared tasks for education and lab activities.

Department 3MD



Durable, smart, self-healing and selfsensing concrete (new structures).

- 'Ready to be applied' and 'under development' products:
 - Fibre reinforced SHCC concretes
 - Self healing concretes (bacteria-based, polymers, porous network)
 - Self sensing concretes







Materials & Environment

TUDelft

Durable, smart, self-healing concrete repair. (existing structures)

• Different strategies for different applications:

- Bacteria based (Jonkers, Wiktor, startup: Basilisk)
- SHCC based repair and strengthening (Lukovic, Schlangen, Ye)
- Asphalt smart pot-hole repair (Schlangen, Megala, startup: Epion)











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Self healing asphalt.

Asphalt surface layers with improved durability by using:

- steel-wool fibres and induction energy
- encapsulated rejuvenators

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3D printing at different scales.

- Cementitious micro architectures
- Material development for 3D printing









• Crystal houses facade - structural glass/cast glass



Challenges:

- Cast bricks with desired structural performance
- Clear adhesives with good bonding and transparancy properties

• Computational modelling of degrading and failure processes: Novel/robust FE-techniques (XFEM) for arbitrary crack propagation (left) and multiple/competing fracture mechanisms in composites (right)



 Computational multi-scale modelling techniques: DEM to FEM modelling of damage in porous micro-structure cement (left) adequate computational homogenization schemes for failure analysis (right)





Groups/research themes:

- Computational modelling of structures (Jan Rots)
- (mechanics-based) Structural design (Rob Nijsse)
- Computational mechanics of materials (Bert Sluys)

Relevance for SE and BE students:

- Research portfolio with scientifically challenging and societally relevant topics
- Challenging topics for MSc-thesis projects and internships
- MSc-projects often linked with PhD-projects
- U-BASE can help you to connect and support