

## Material Choice for Seismic Resistant Structures

### Project Overview

▪ **Research Facility:**

RFCS

▪ **Operational Time:**

01.07.2013 – 30.06.2016

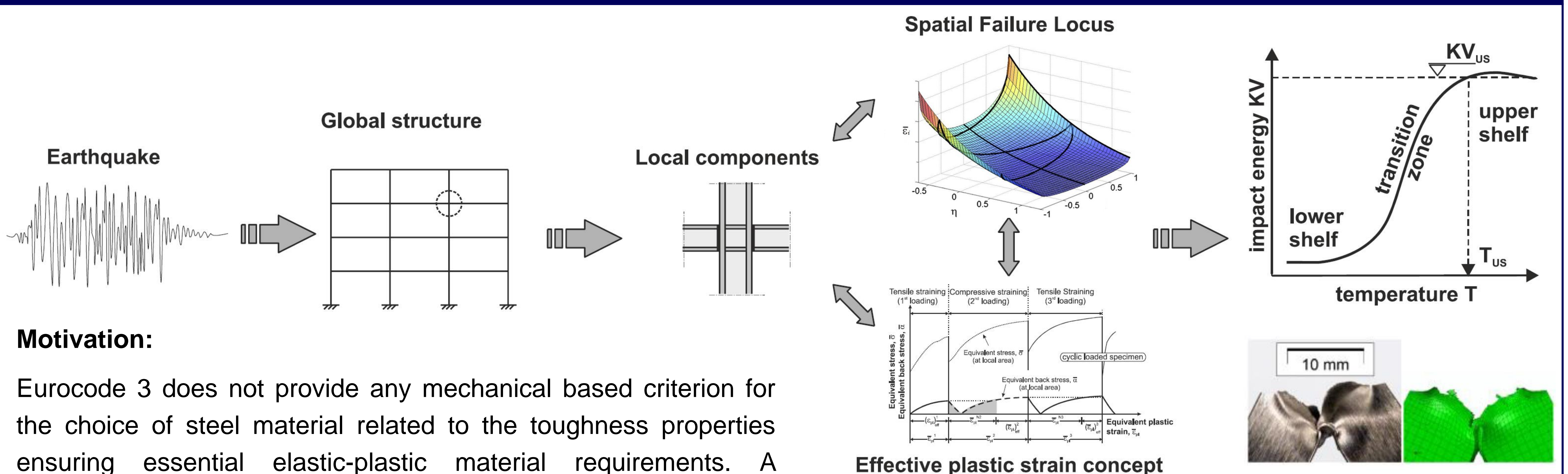
▪ **Objectives:**

To develop a simplified toughness assessment for the choice of material steel based on a damage mechanics approach for extreme ultra-low-cycle-fatigue conditions as occurring during seismic events

### Participating Institutes



### Project Description



**Motivation:**

Eurocode 3 does not provide any mechanical based criterion for the choice of steel material related to the toughness properties ensuring essential elastic-plastic material requirements. A specification of a minimum upper-shelf toughness value applies for ultimate limit states under cyclic loads will benefit the material choice for seismic resistant steel structures.

**Goals:**

- Investigate representative earthquake scenarios and representative building structures to establish a macro-model which allows a simplified determination of the local plastic strain histories responsible for the onset and the evolution of ductile failure
- Apply and modify damage mechanics models in order to derive toughness demands for typical structural details

- Develop a consistent procedure for the derivation of minimum toughness properties to ensure upper shelf behavior and to avoid brittle fracture despite of preceding stable crack growth
- Link the toughness requirement with elementary Charpy energy determined by impact tests
- Apply the new toughness-based assessment model to different structural details with various seismic load levels resulting in a simplified engineering design procedure that allows for the derivation of minimum toughness requirements for different steel grades

**Address:**

Zentrum Metallische Bauweisen  
Seffenter Weg 198  
52074 Aachen - Melaten  
homepage: [www.zmb-aachen.de](http://www.zmb-aachen.de)

**Contact Persons:**

M. Sc. Yidu Di  
Institut für Eisenhüttenkunde  
Intzestraße 1  
52072 Aachen  
Tel.: 02 41 / 80 - 25430  
e-mail: [yidu.di@iehk.rwth-aachen.de](mailto:yidu.di@iehk.rwth-aachen.de)

Dipl.-Ing. Simon Schaffrath  
Institut für Stahlbau  
Mies-van-der-Rohe Str. 1  
52074 Aachen  
Tel.: 02 41 / 80 - 26243  
e-mail: [schaffrath@stb.rwth-aachen.de](mailto:schaffrath@stb.rwth-aachen.de)