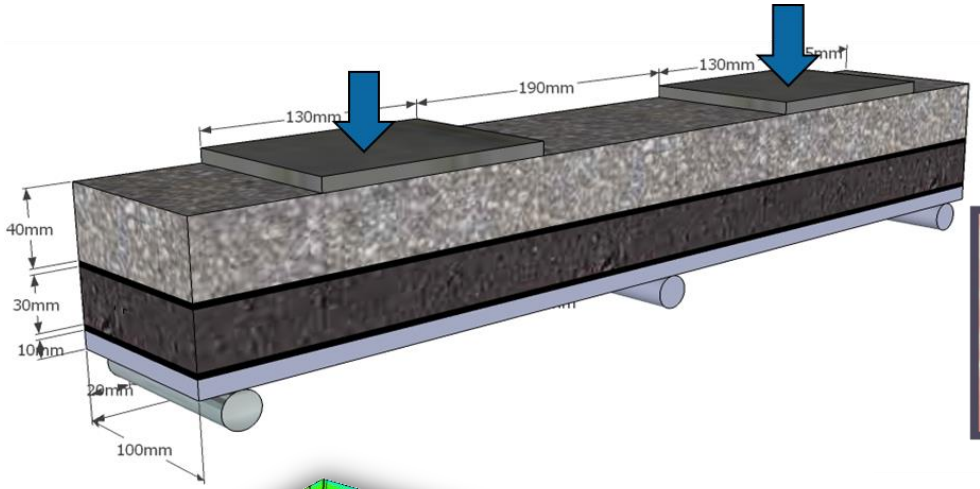
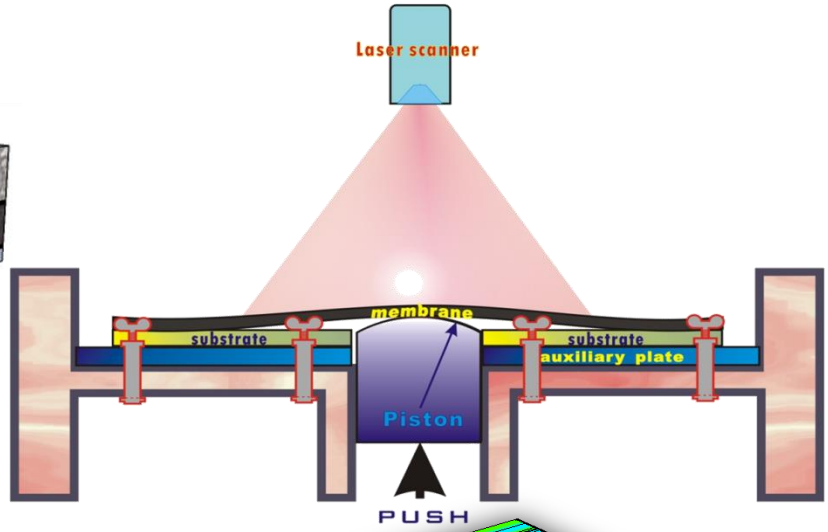
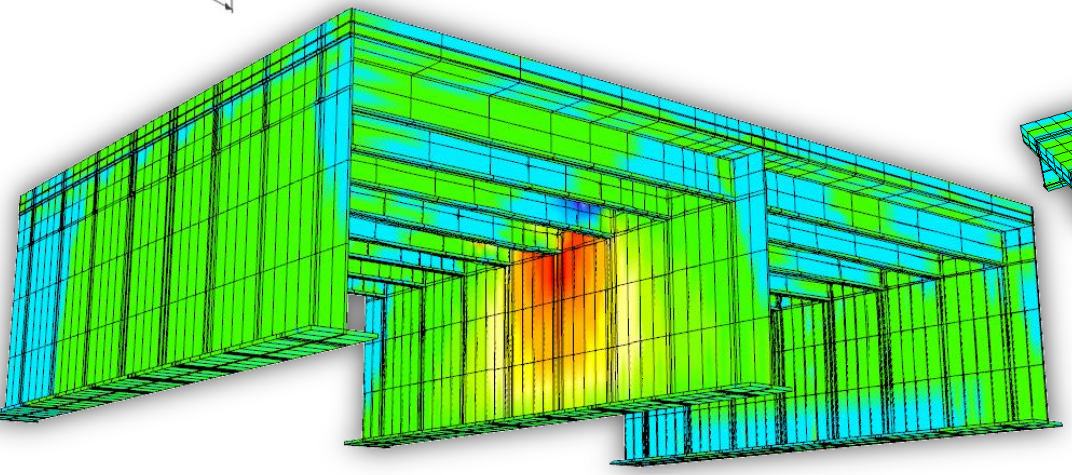
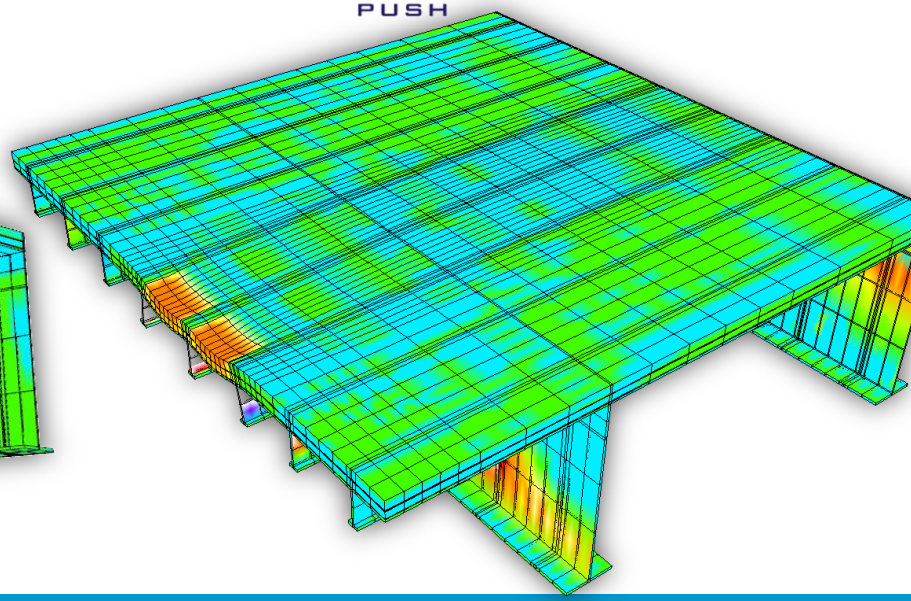
Numerical and Experimental Study of Multilayer Surfacing Systems on Orthotropic Steel Bridge Decks

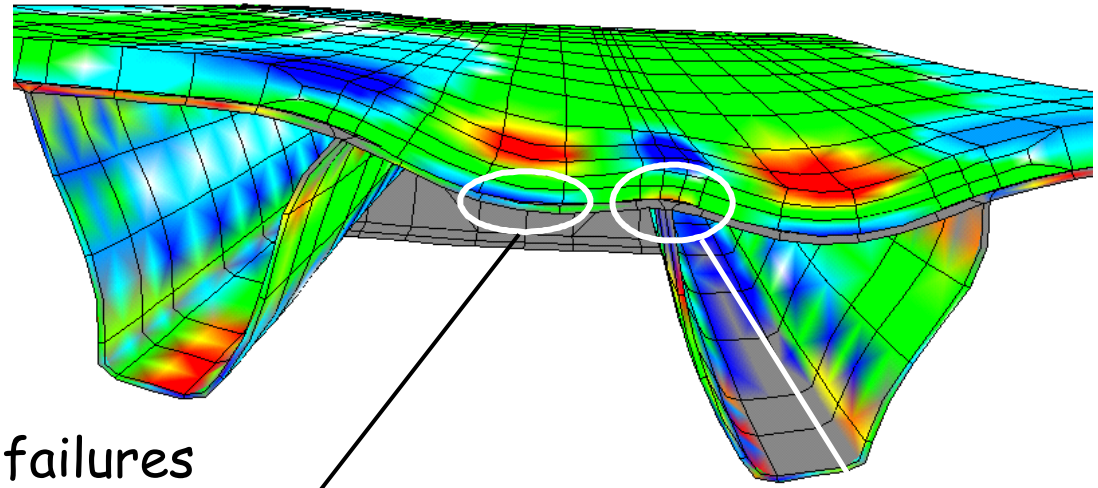




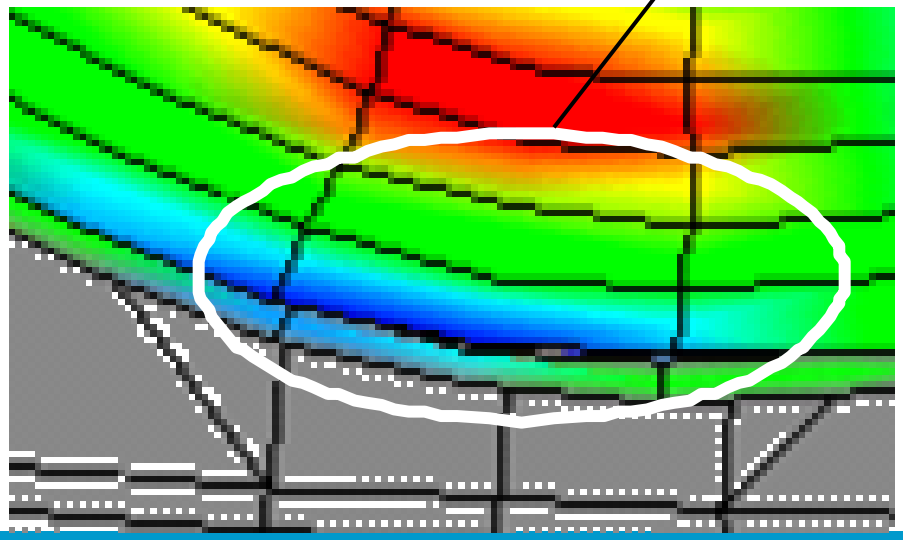


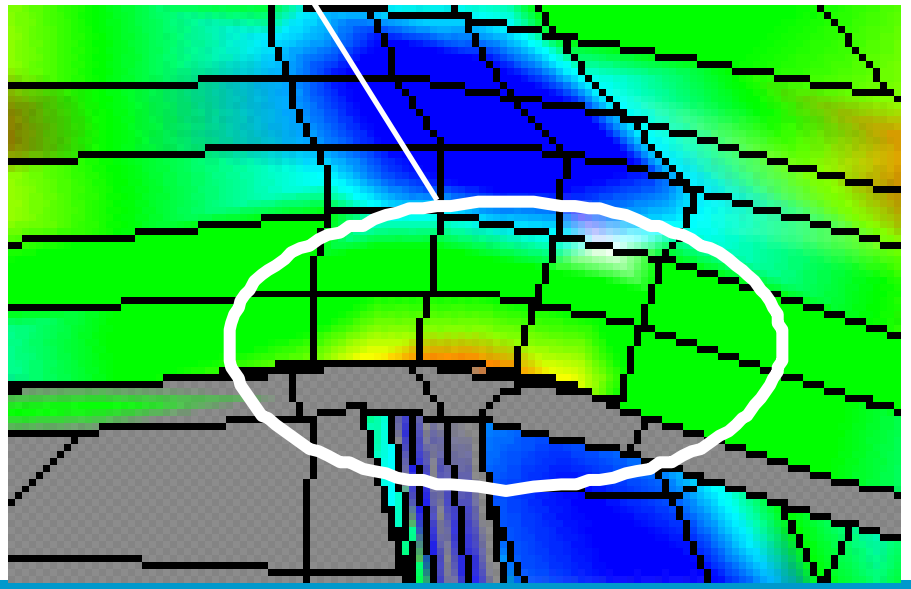


Asphalt Surfacings on Steel Deck Bridges

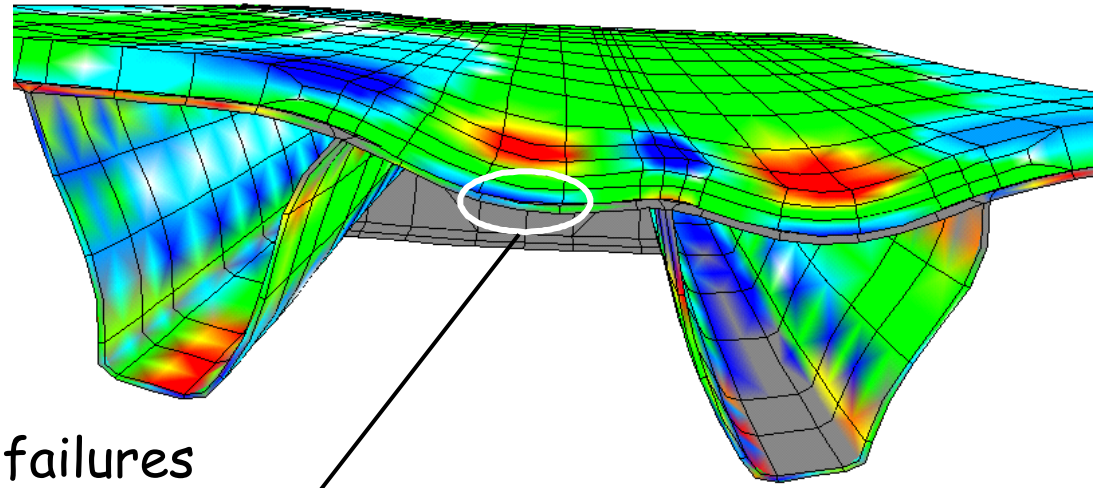


Adhesive failures

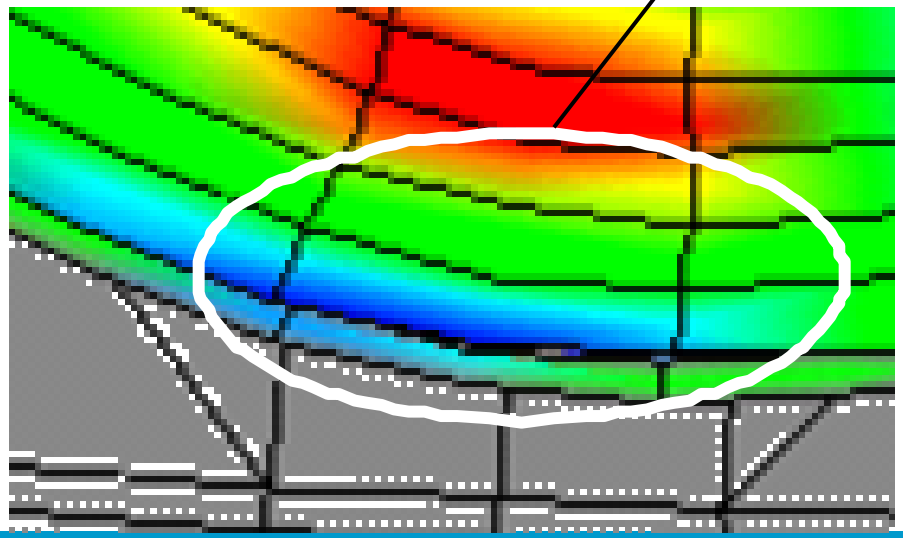




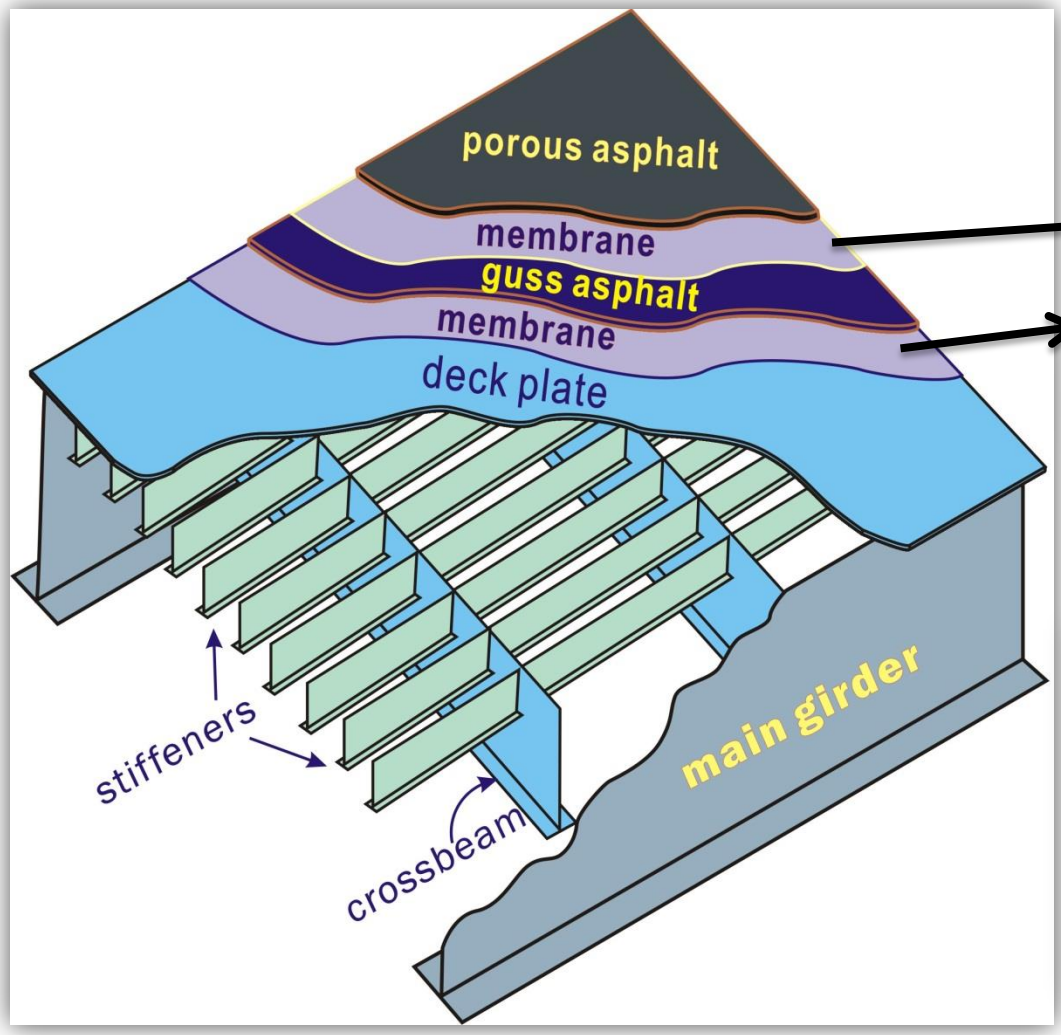
Asphalt Surfacings on Steel Deck Bridges

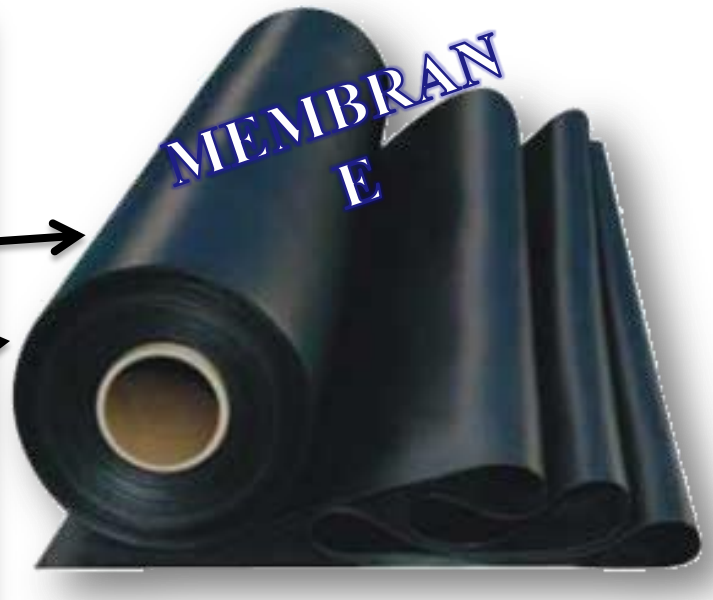


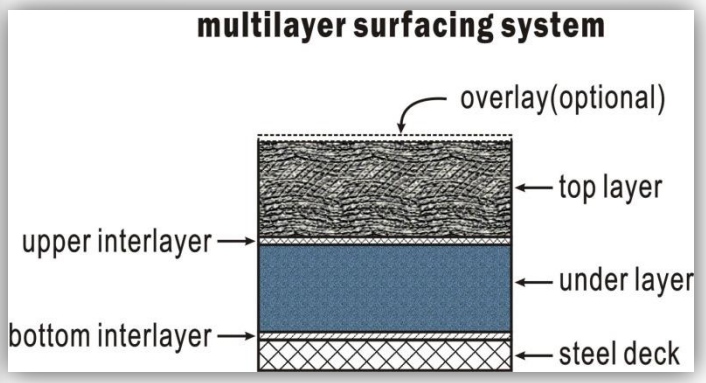
Adhesive failures



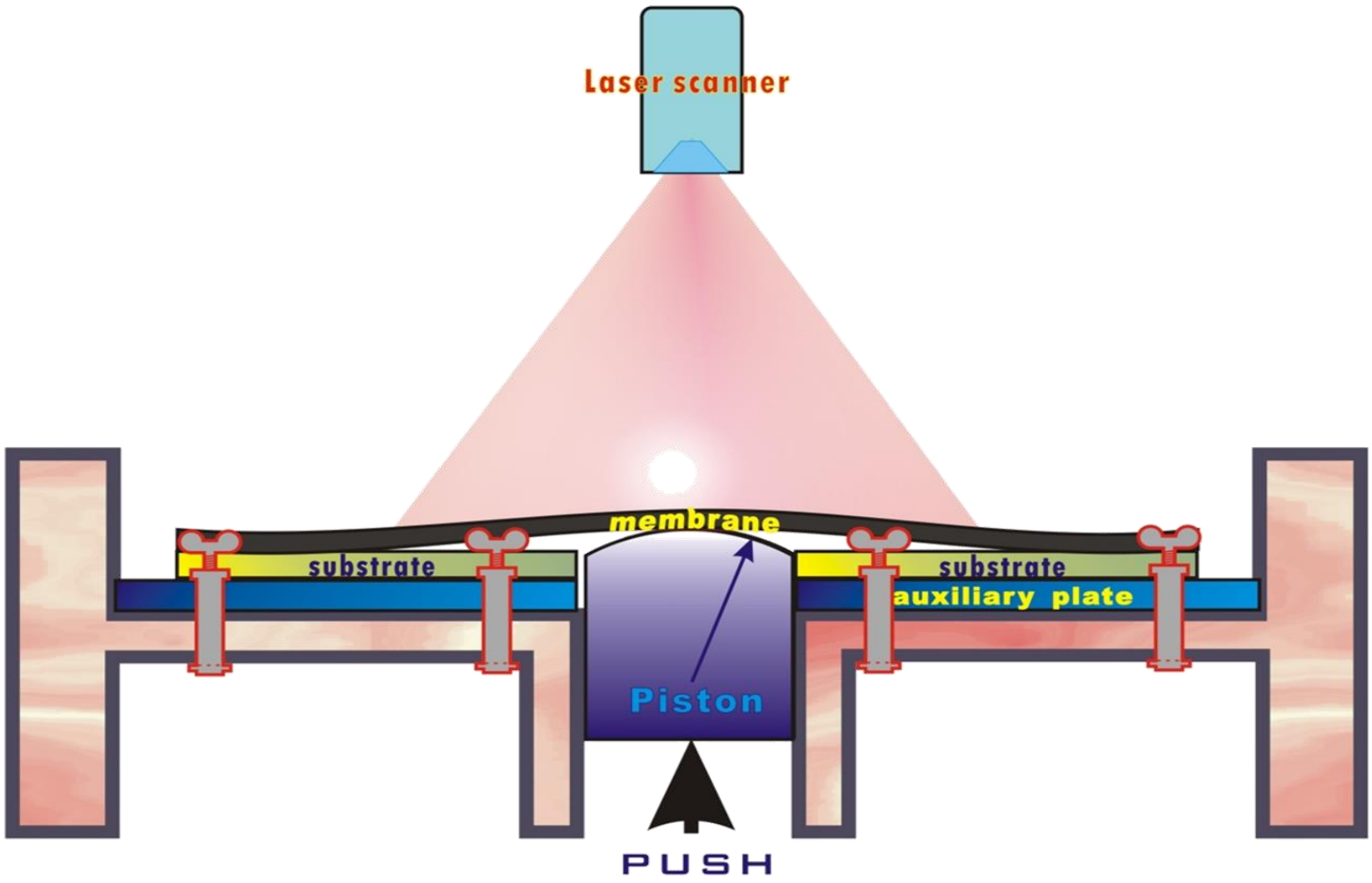
Multilayer surfacings of steel bridges







➢ Membrane Adhesion Testing device



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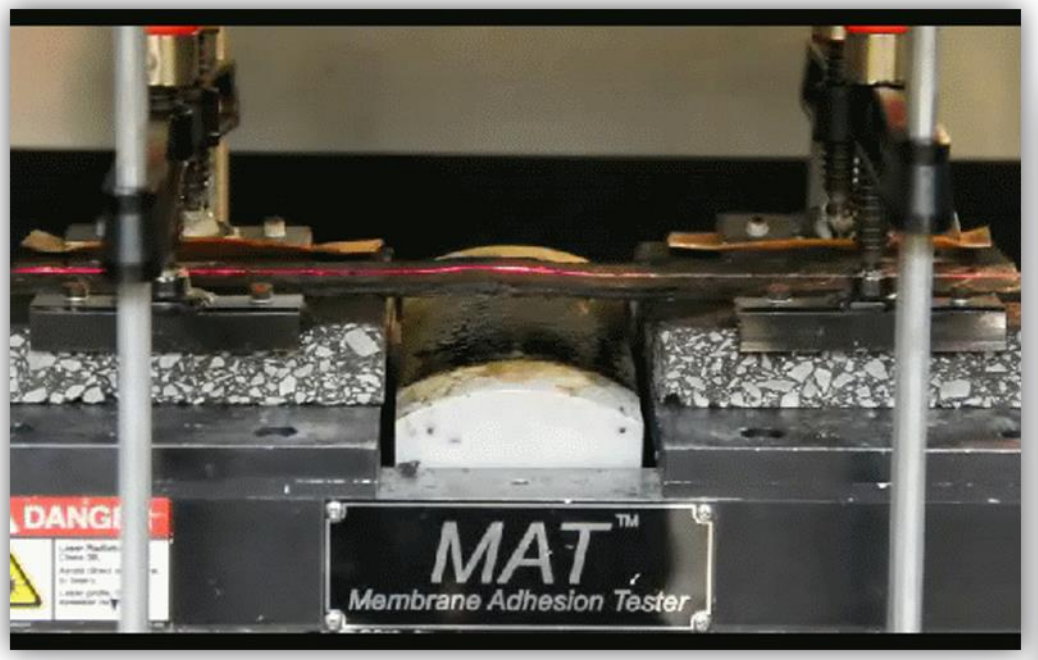
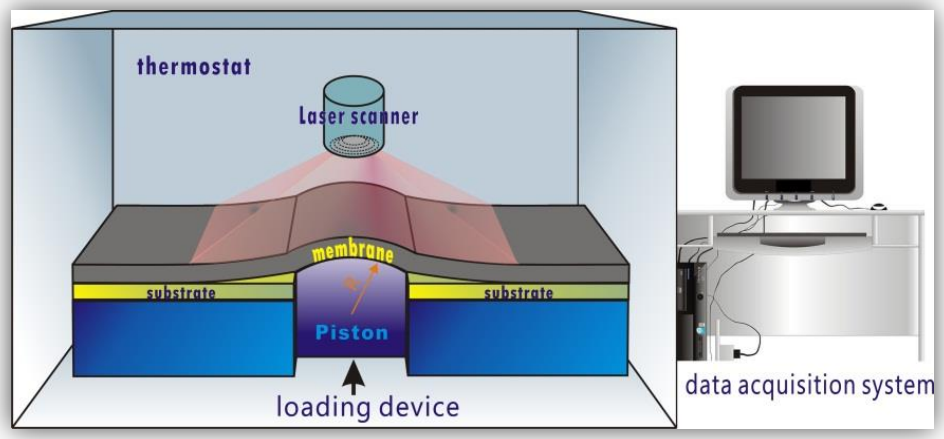
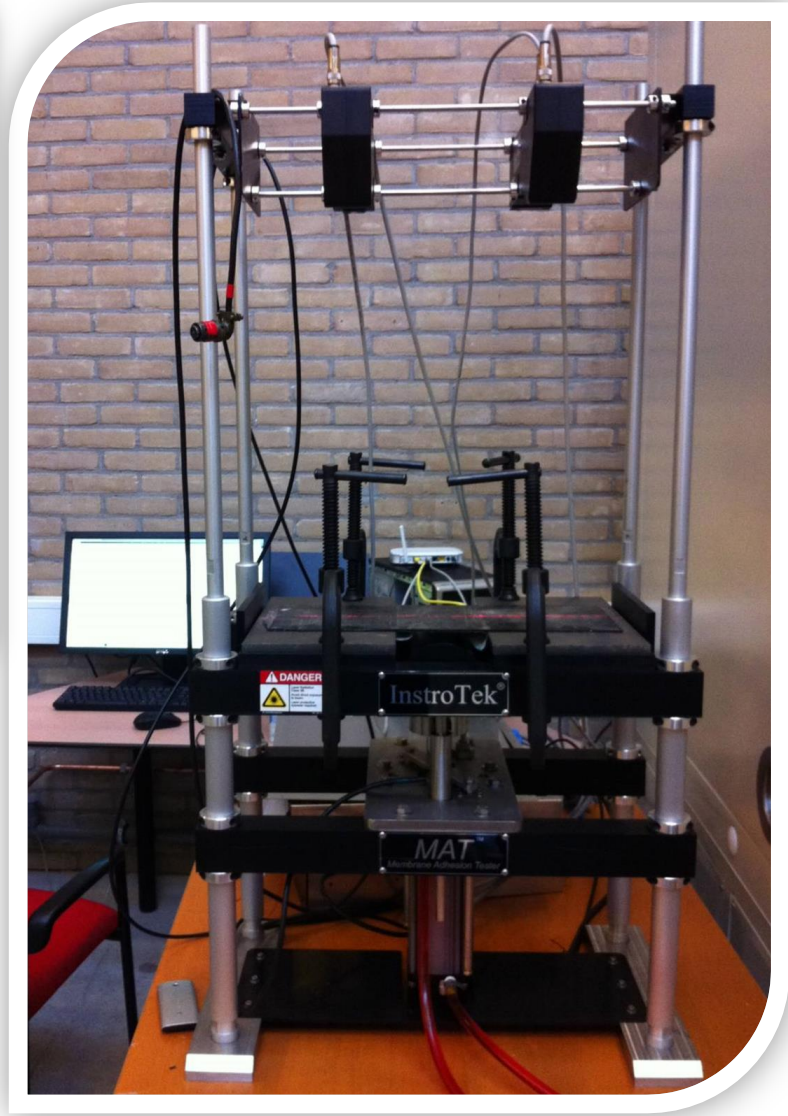
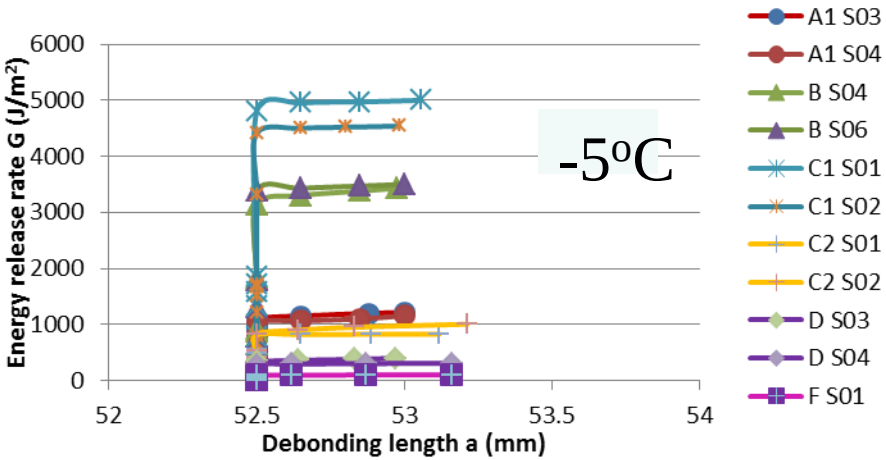
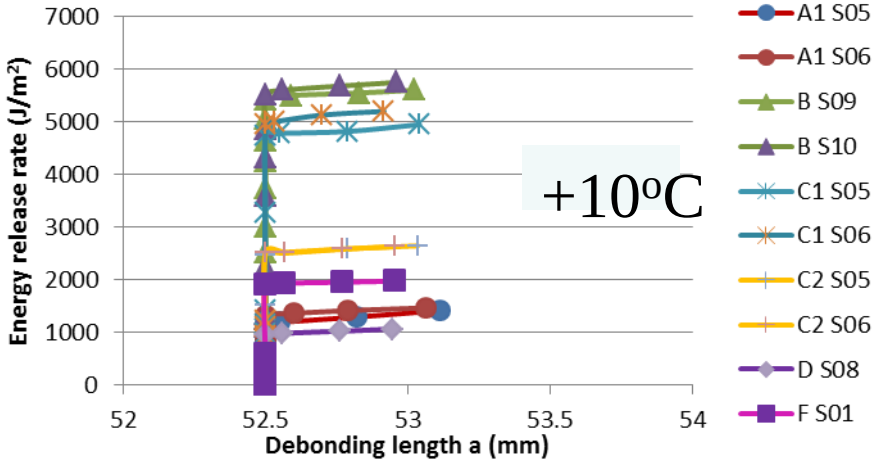


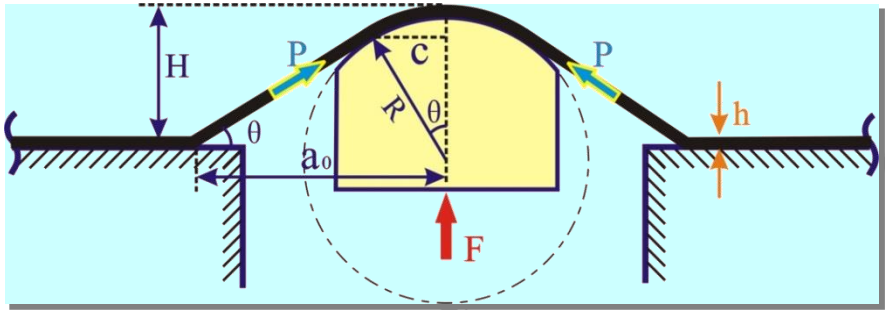




Membrane Adhesion Testing (ranking method)



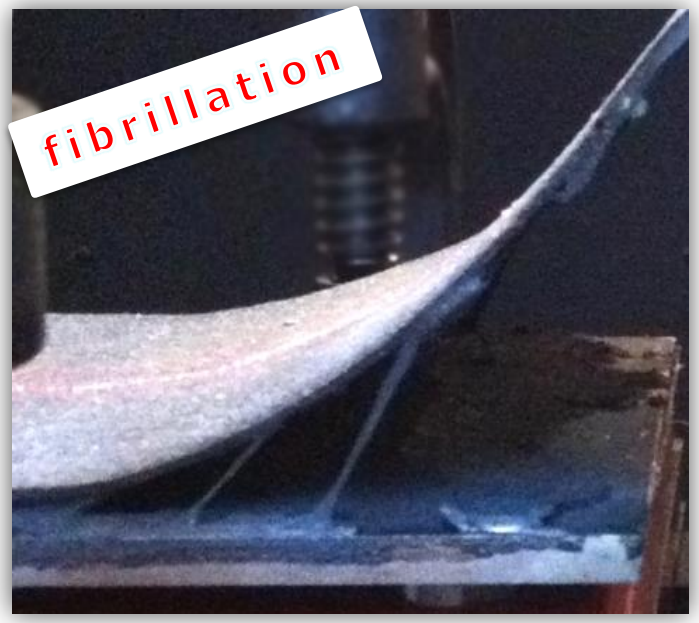




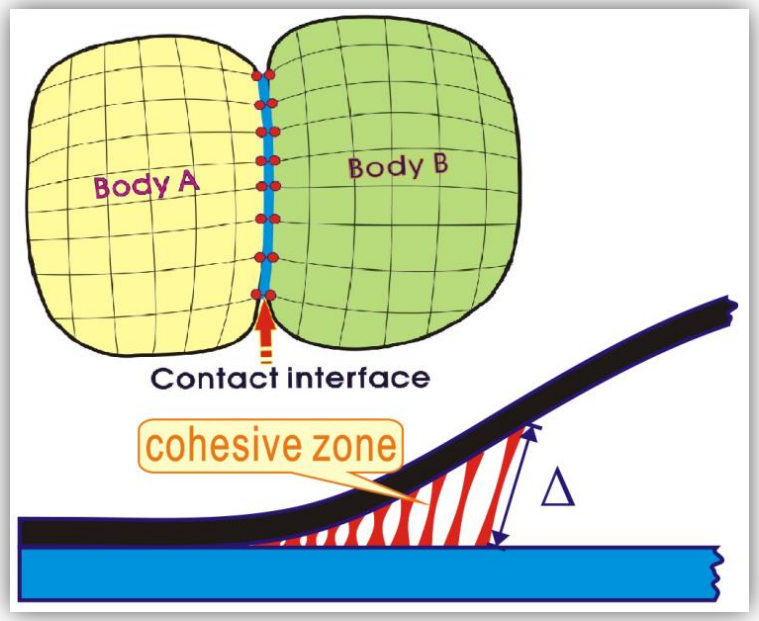
$$G = \frac{d}{dA}\left(U_{ext} - U_s - U_d\right)$$

Interfacial fibrillation

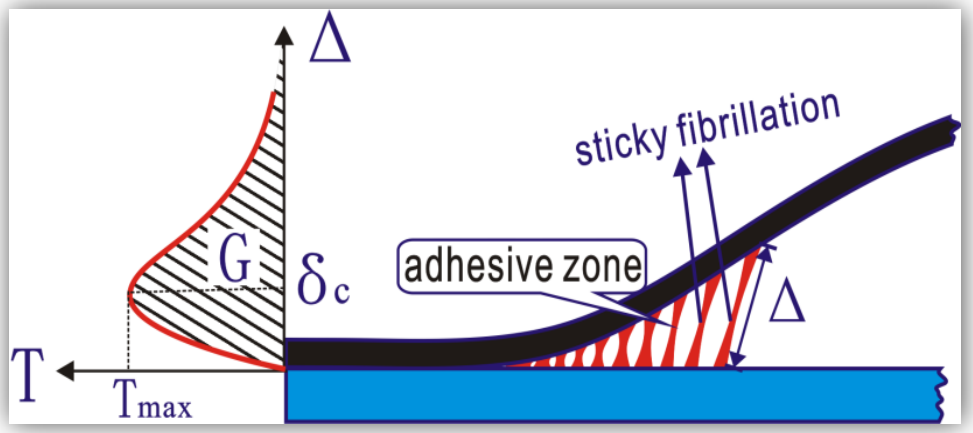
Interfacial fibrillation is a typical mechanism that frequently occurs during debonding of membranes from substrates.



A generic adhesive zone constitutive model is introduced to describe the process of membrane debonding on the basis of fibrillation.



Cohesive zone material model

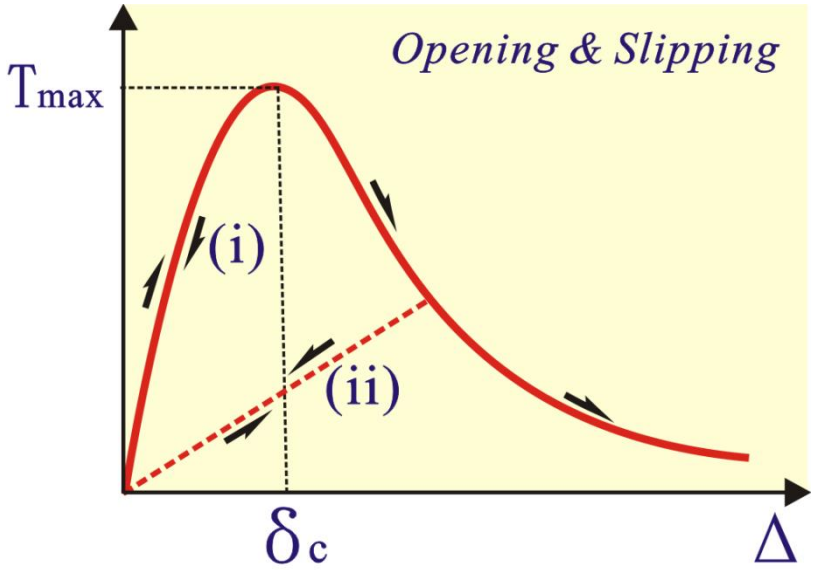


adhesive law

$$T = \frac{G}{\delta_C}\left(\frac{\Delta}{\delta_C}\right)\exp\left(-\frac{\Delta}{\delta_C}\right)$$

peak traction value

$$T_{max} = \frac{G}{\delta_C \exp(1)}$$

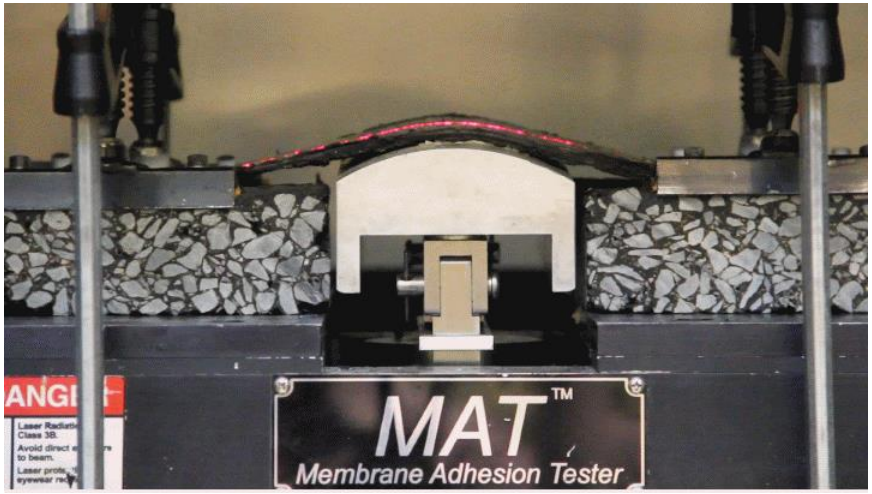


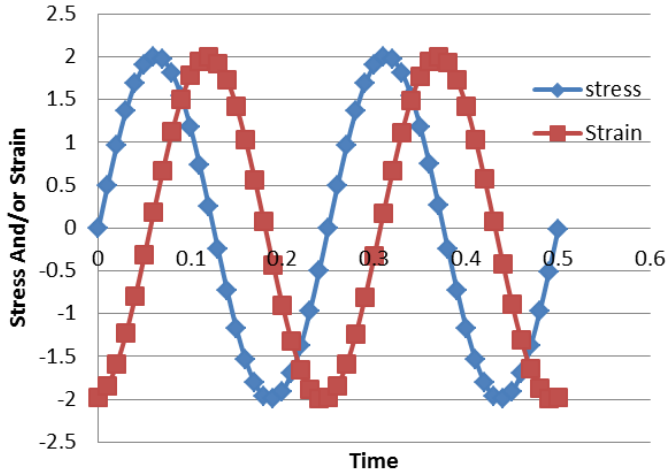
Two unloading stages:

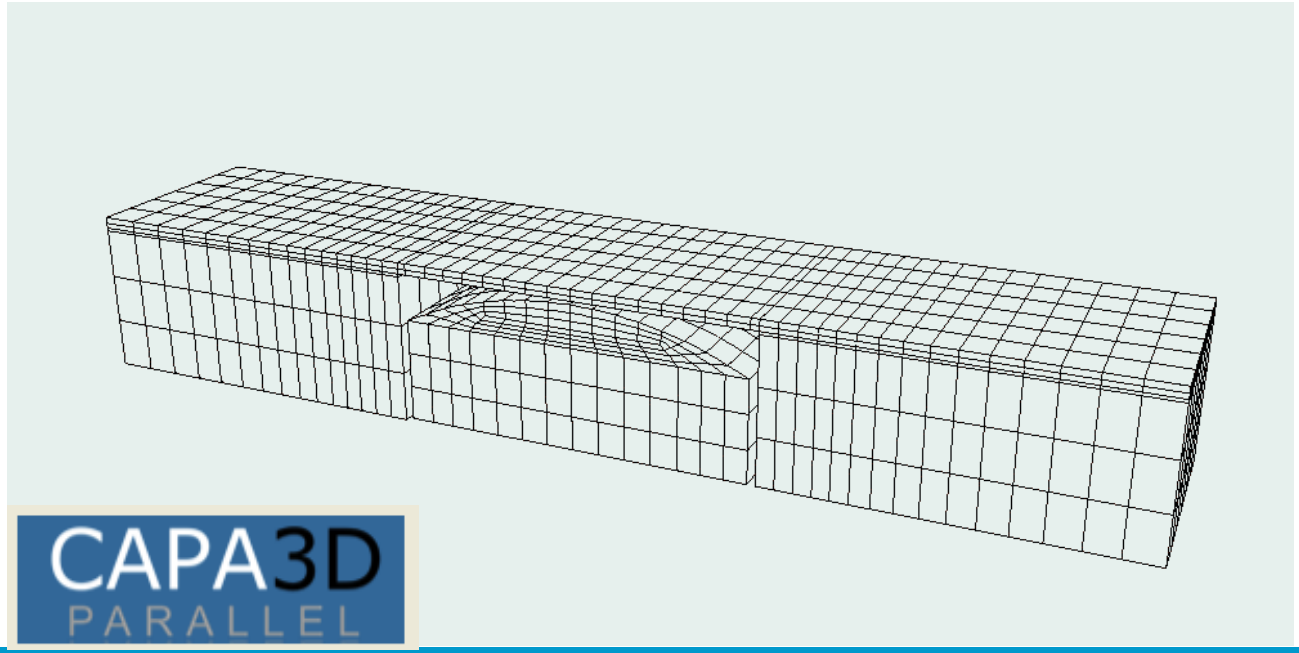
(i) Reversible response

(ii) Linear elastic unloading

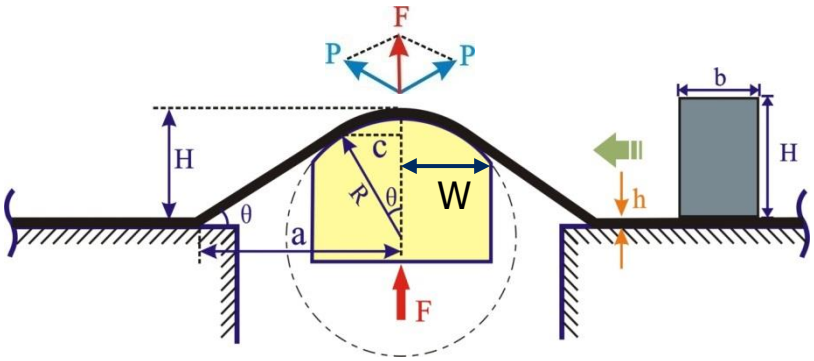
Membrane Adhesion Testing

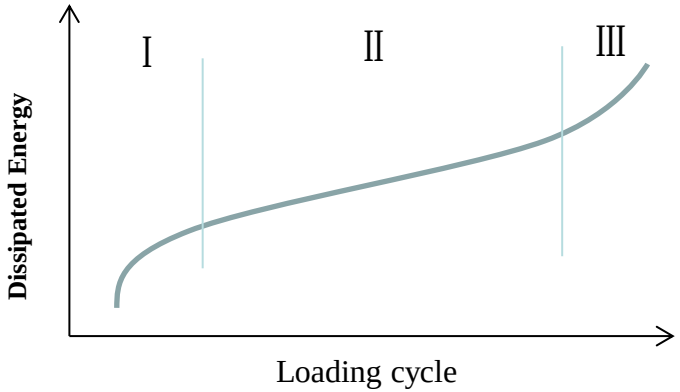






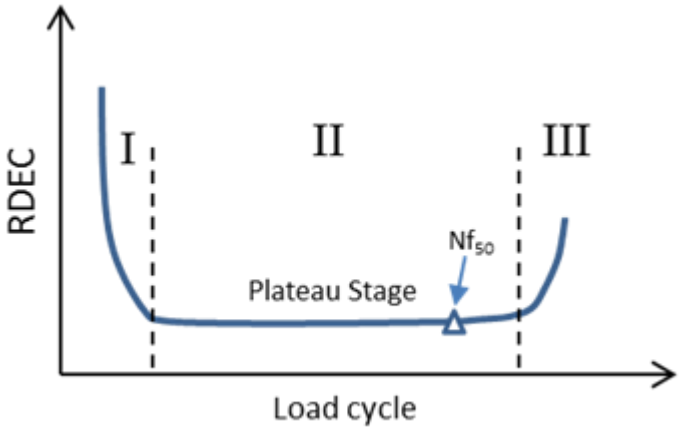
Membrane Fatigue Life Evaluation by Using Dissipated Energy Approach



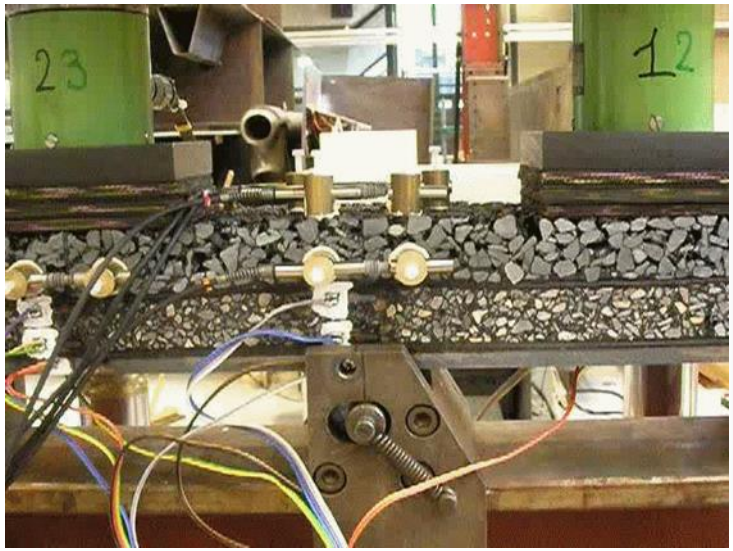


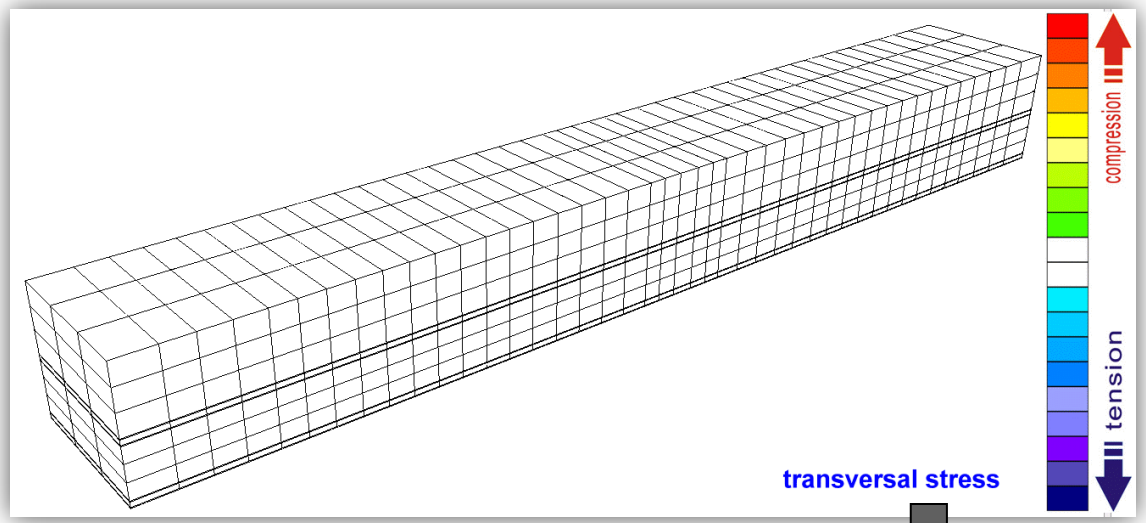
Dissipated Energy Ratio:

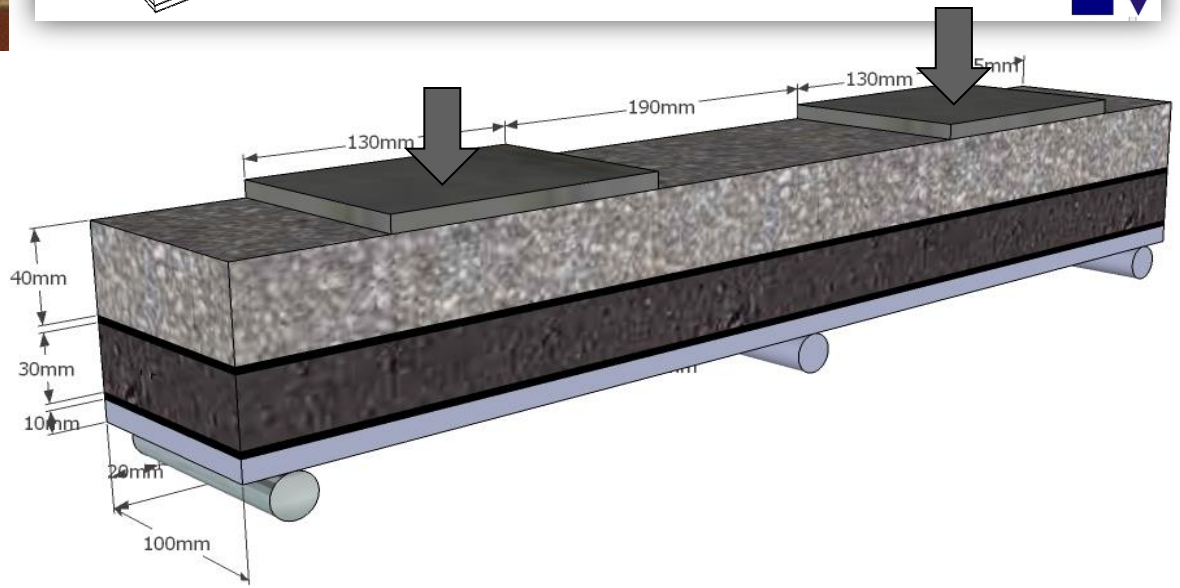
$$DER = \left(DE_b - DE_a\right)/\left(b-a\right)DE_a$$



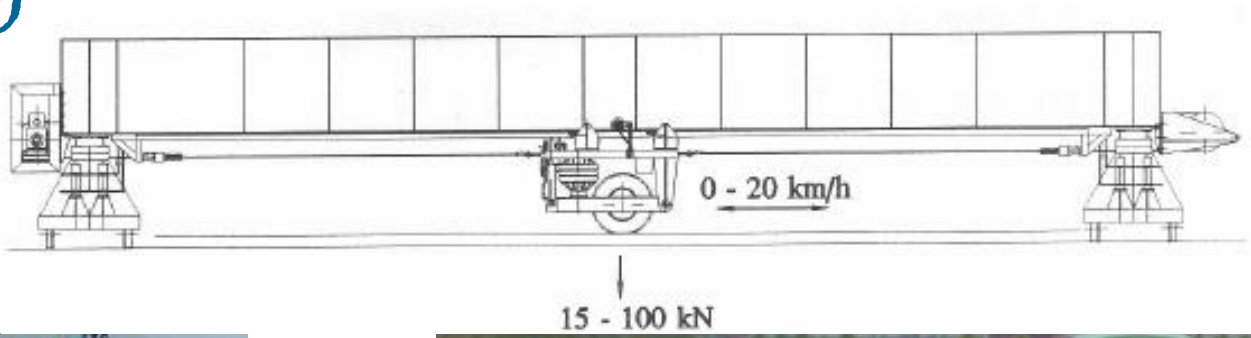
TU Delft five-points bending (5PB) beam test observation and FE modelling







Lintrack- Large Scale Testing Facility

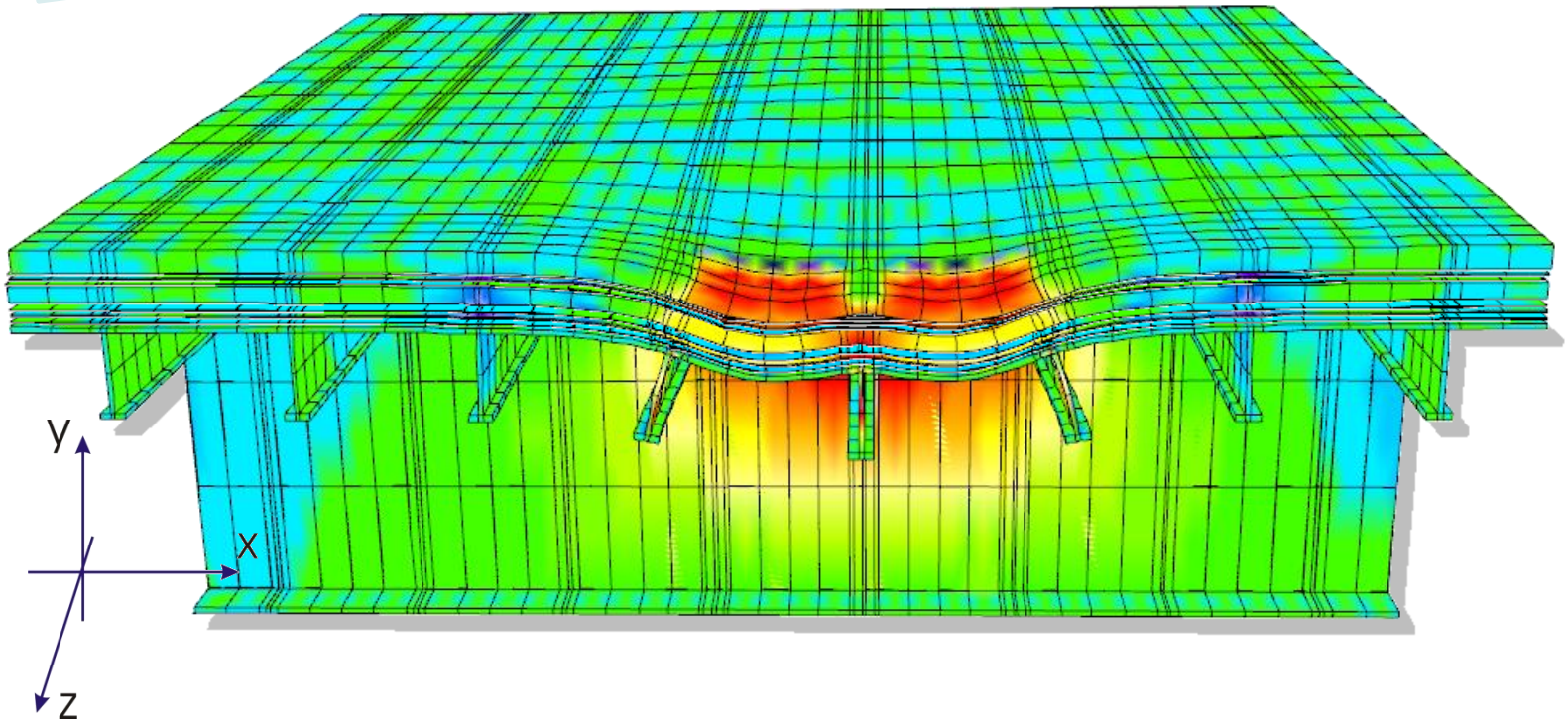


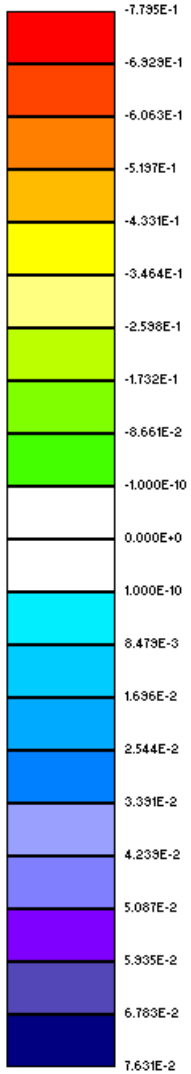
FE Simulations of bridge under traffic load

- **Load at middle span**

porous asphalt

Vertical stress

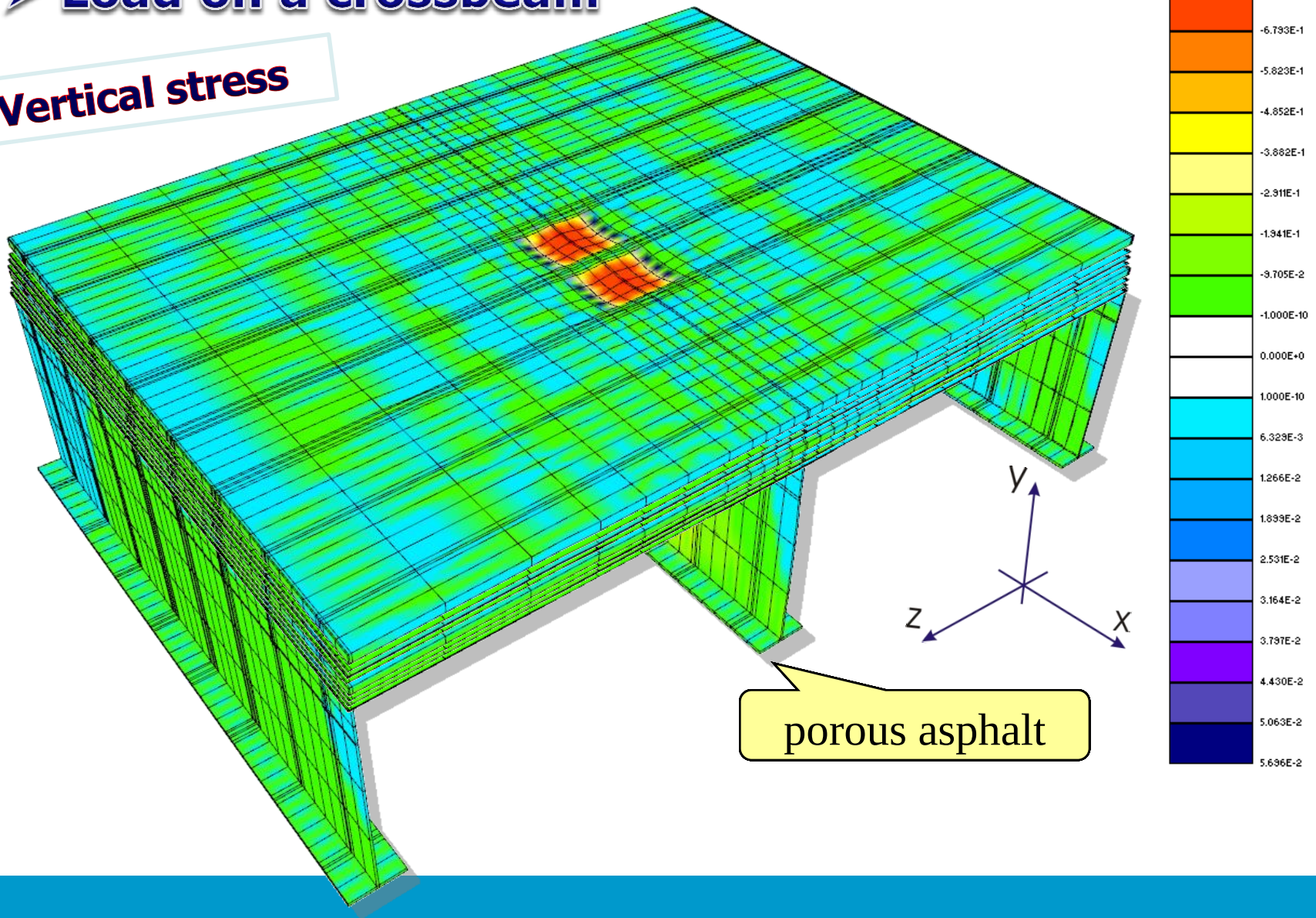




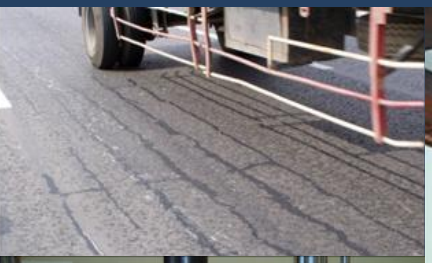
FE Simulations of bridge under traffic load

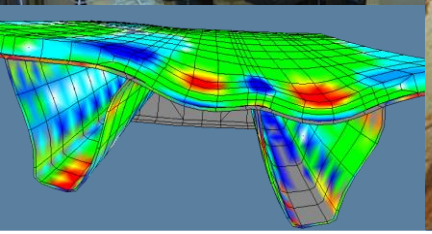
- **Load on a crossbeam**

Vertical stress



Advanced Testing and Characterization of Asphalt Surfacing on Steel Bridge Decks





22nd May 2012
Nanjing, China

TU Delft

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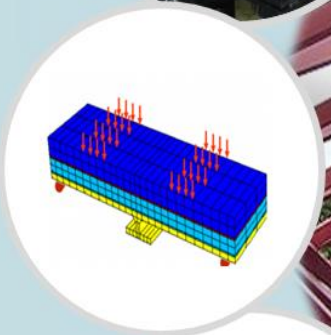
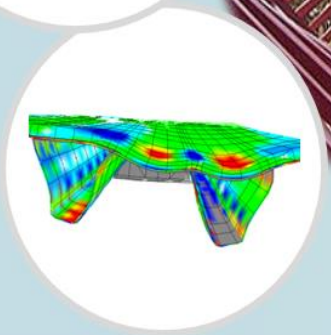
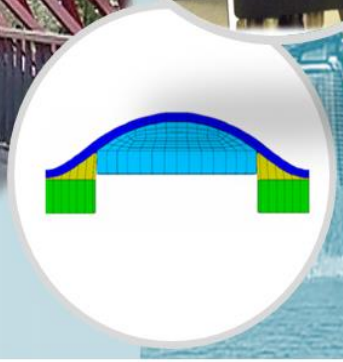
2nd Workshop on

Advanced Testing and Characterization of Asphalt Surfacings on Steel Bridge Decks

19th September 2013, Delft-The Netherlands







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Contact: Dr. Xueyan Liu (X.Liu@tudelft.nl)