

COST E55, Trondheim, 2009

Session: Moisture induced stresses

# Some statements on cracks in grain direction

Details from the research project:  
“Failure analysis on timber structures in Germany”

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# Background

- The research project “Failure analysis on timber structures in Germany” was continued in 2008
- The database currently contains 548 primary damages recorded
- + 404 cases in comparison with the way things stood in 2007 (contribution in Graz)
- A total of 969 single causes of the fault were assigned to the 548 damages



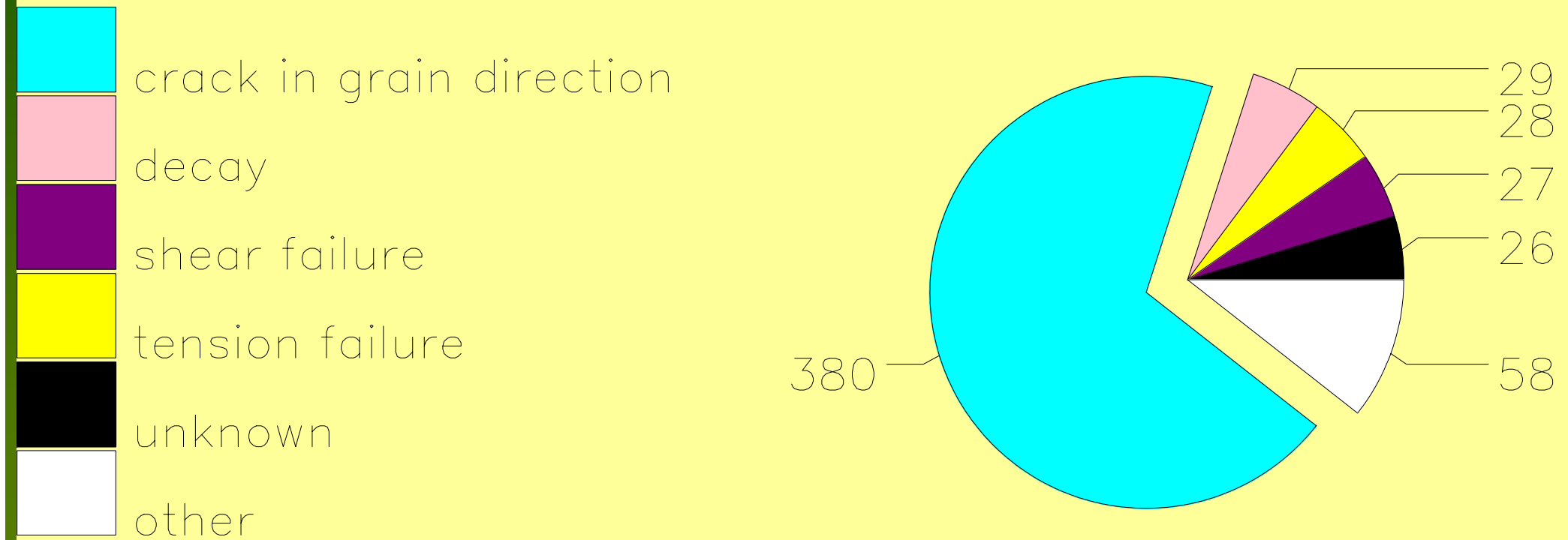


## Typical crack in grain direction



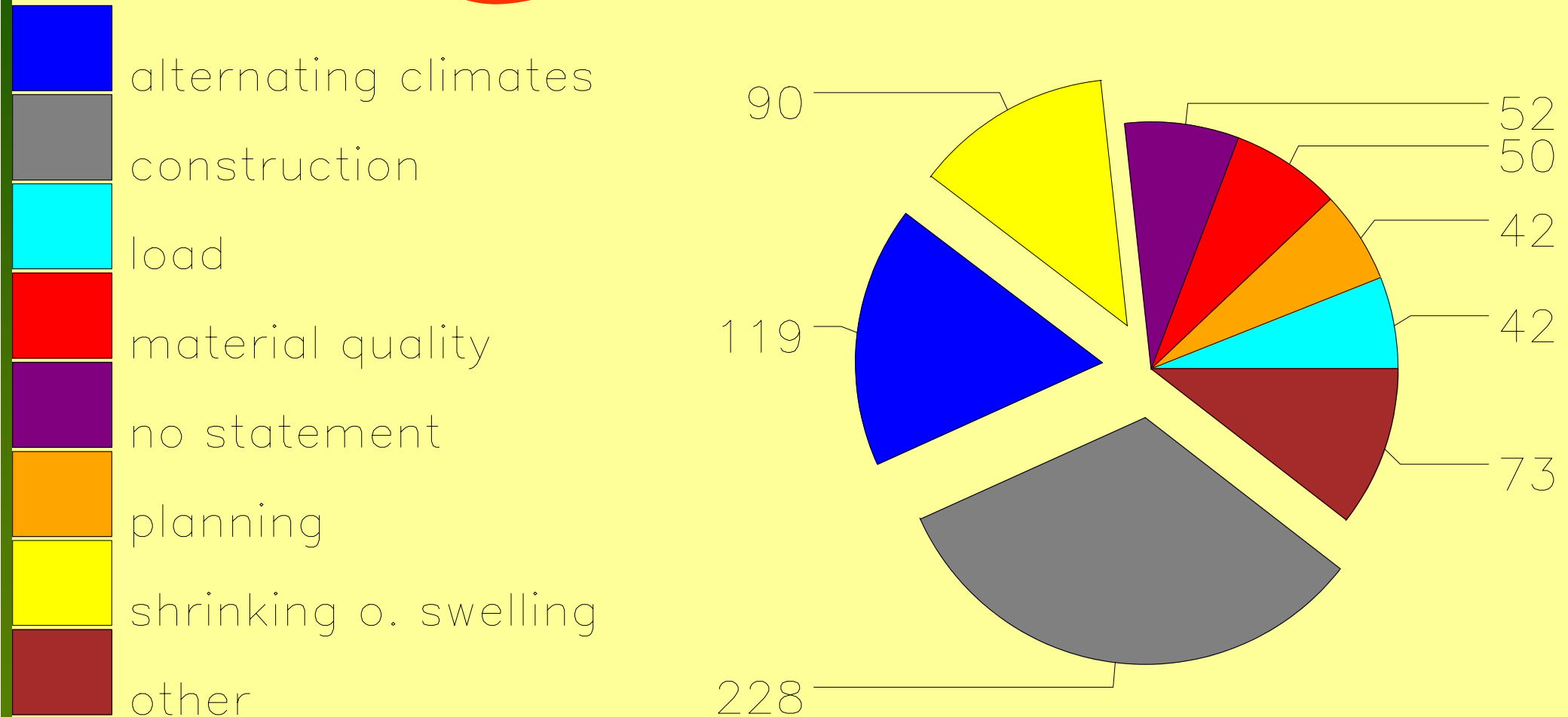
# Distribution of primary damages

Total: 548



# Distribution of causes of the fault

696 relations distributed on 380 cases of cracks in grain direction



# Main problems

## 1) Construction

- Double-tapered or curved beams
- End-notched beams
- Hindrance of shrinking

## 2) Alternating climates

## 3) Shrinking o. swelling

Items associated with moisture induced stresses

...moisture content



Measurement of  
crack depth

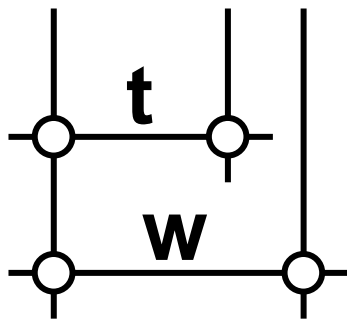
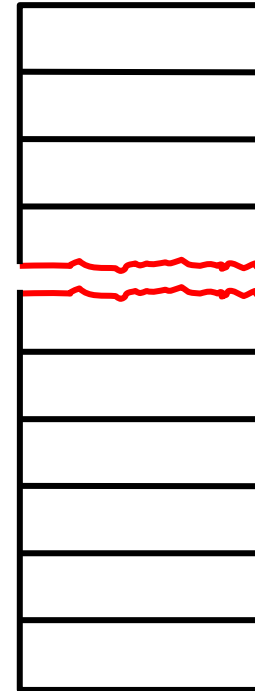


**Def.: Relative crack depth  
= crack depth over width of structural member**

$t/w < 1$

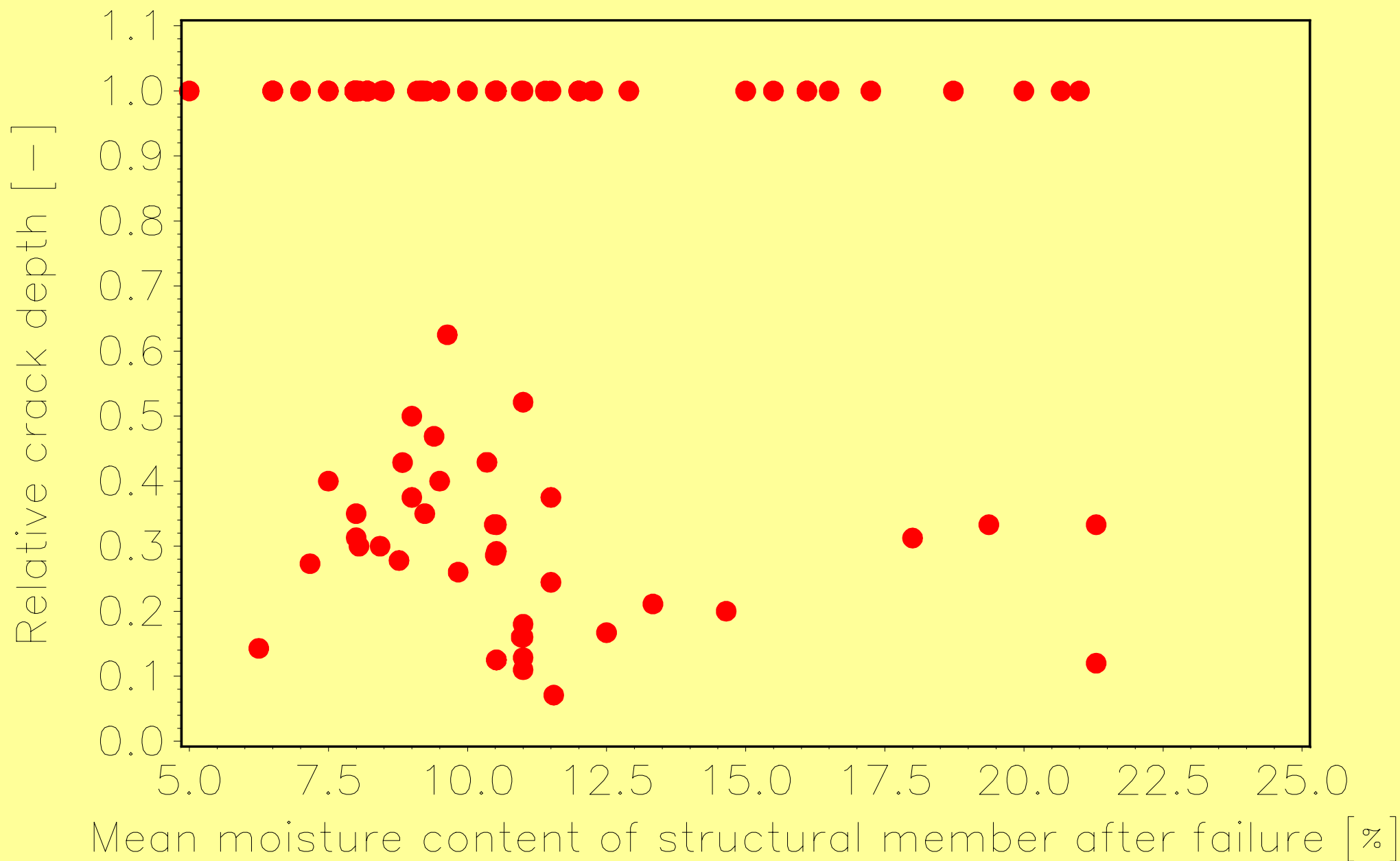


$t/w = 1$

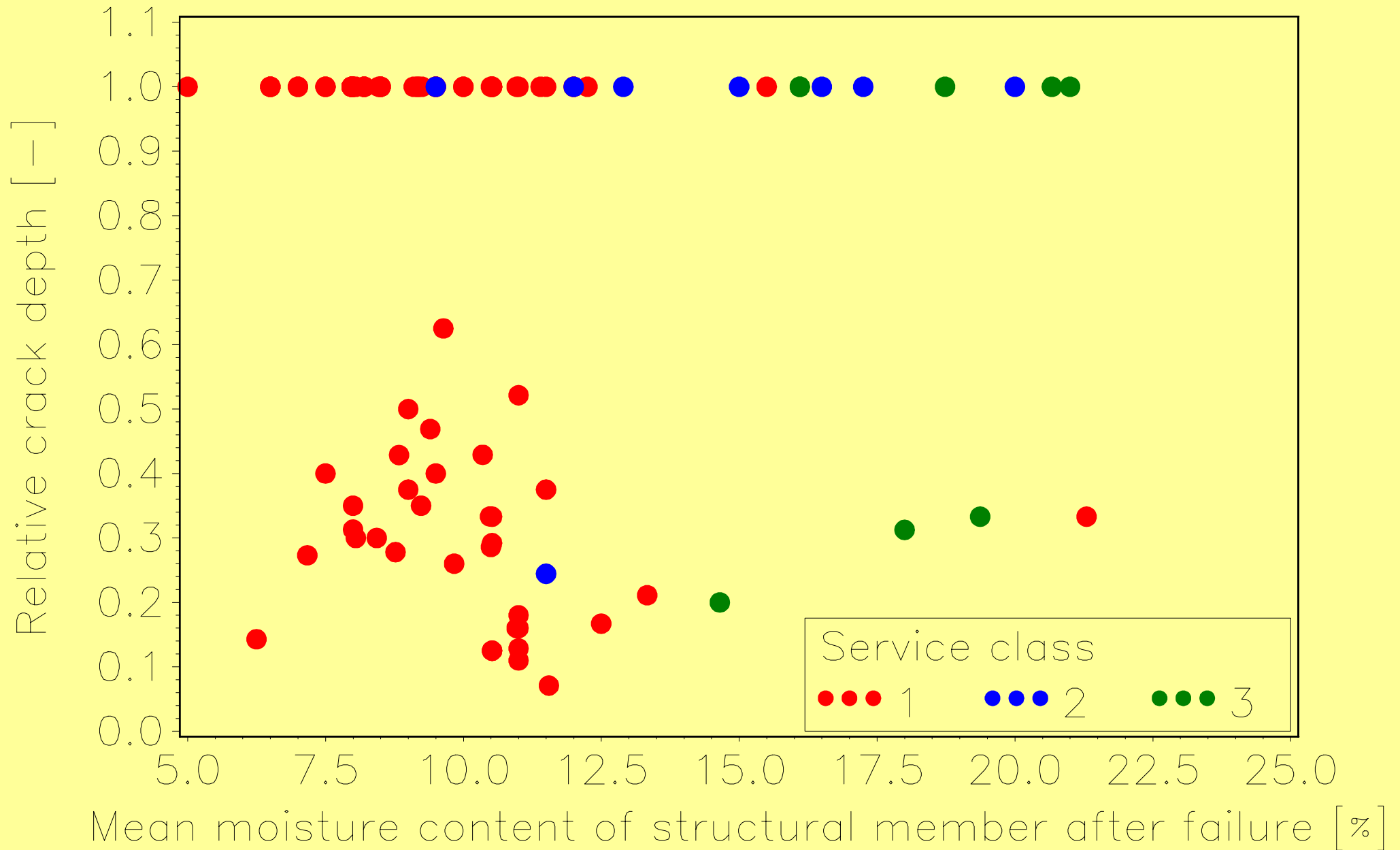




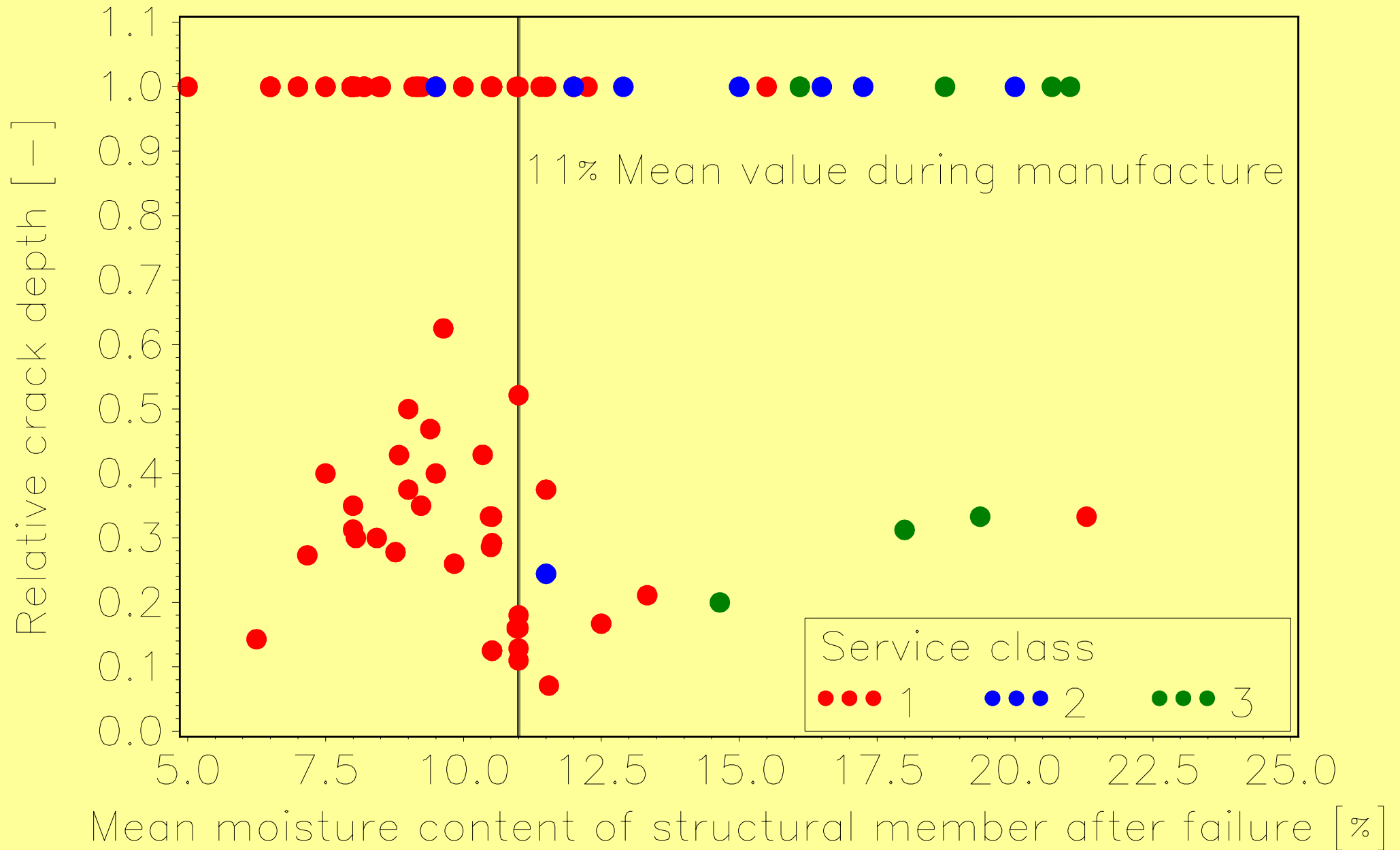
# Crack depth – moisture content – relation



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# Crack depth – moisture content – relation



# Observations

- In particular, structural members in service class 1 tend to crack when their moisture content started to decrease
- Structural members in service class 2 or 3 are seldom involved in crack problems
- No relative crack depth greater than  $\approx 0.6$  and less than 1.0 can be observed  
Assumption: If the relative crack depth becomes  $\approx 0.6$  the crack goes straight through



Thank you for your kind attention

