Loadbearing capacity criteria in fire resistance testing

Investigation of an acceleration criterion

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Summary

- Purpose:
  - To compute the 2nd time-derivative of the deflection (=acceleration)
  - To inspect the acceleration curves in search for any behaviour predicting the failure of the loadbearing capacity, as an alternative to the existing deflection and rate of deflection criteria
- Computation phase:
  - The deflection measurements are always slightly noisy signals
  - The 2nd differentiation amplifies the noise quadratically, so that the noise literally explodes
  - A strong noise-filtering method is necessary to make the result usable
  - A simple and efficient method is to increase the extent of the scheme (extent = collection size of the samples which are encompassed in the scheme)
  - In practice:
    - an centered finite difference scheme combined with a centered moving average filter was used
    - an extent of 3 minutes was necessary
- Observation:

  The acceleration values don't show any specific behaviour that allows to predict the failure of the loadbearing capacity earlier than the two existing criteria

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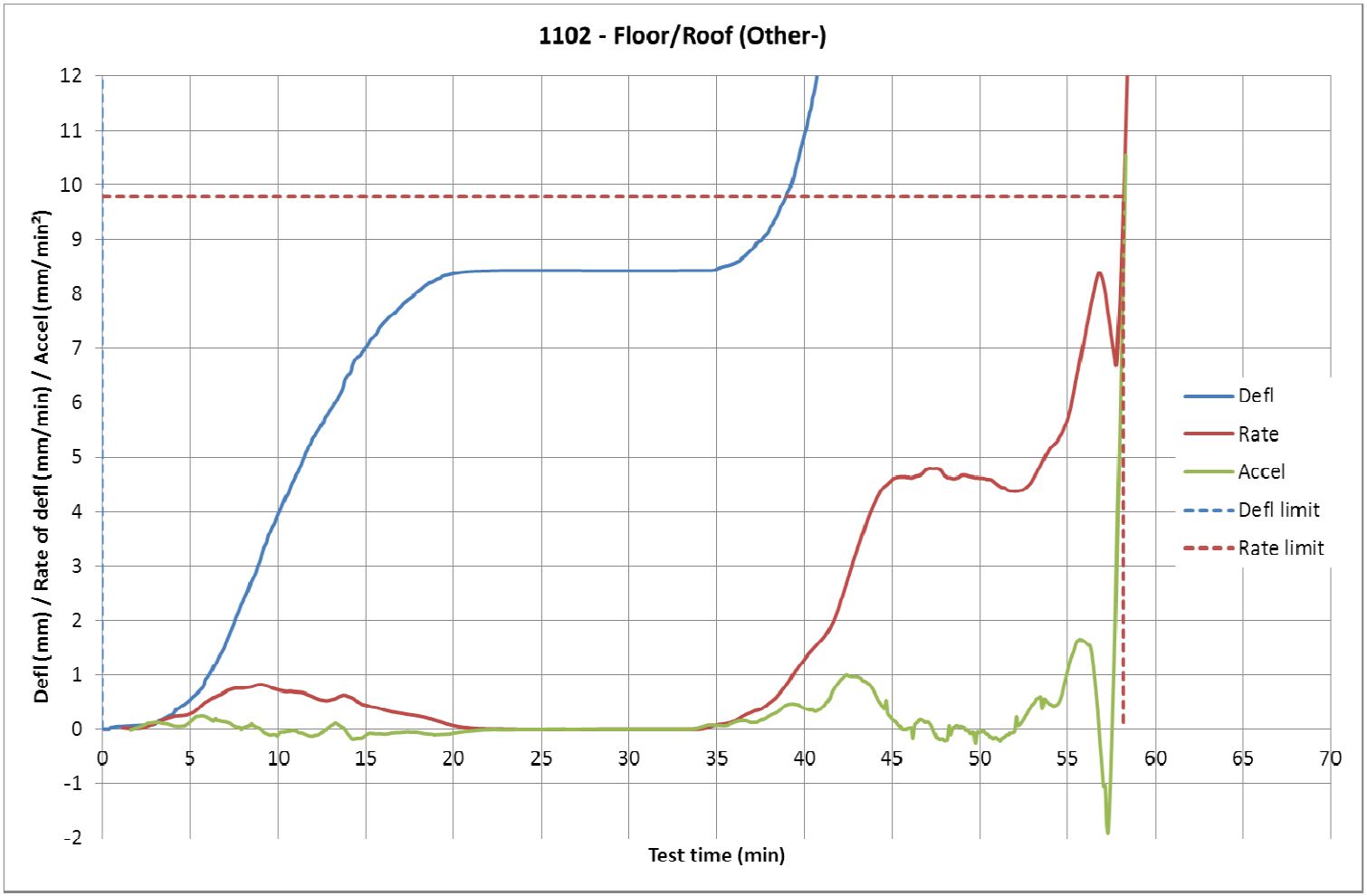

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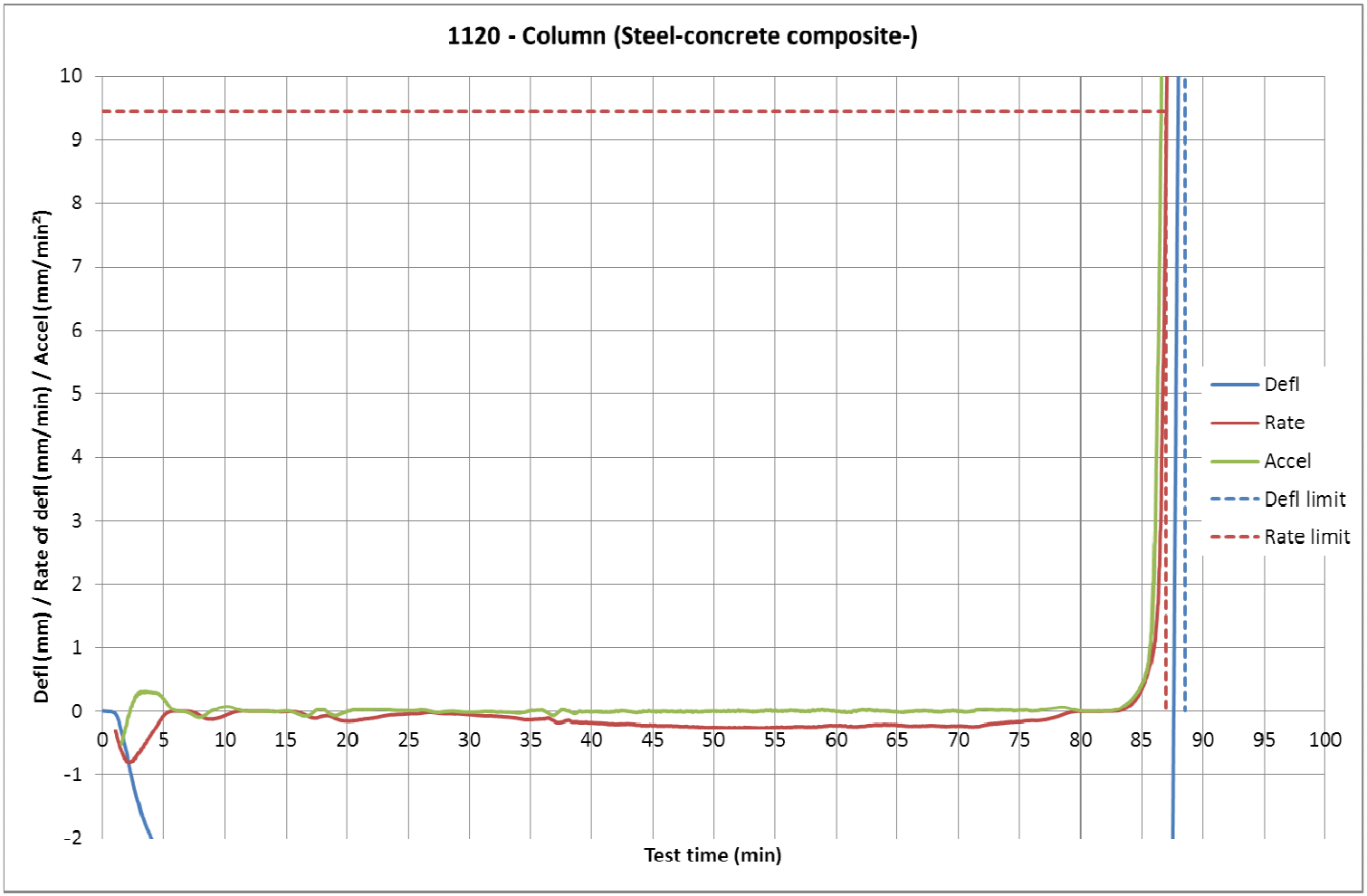

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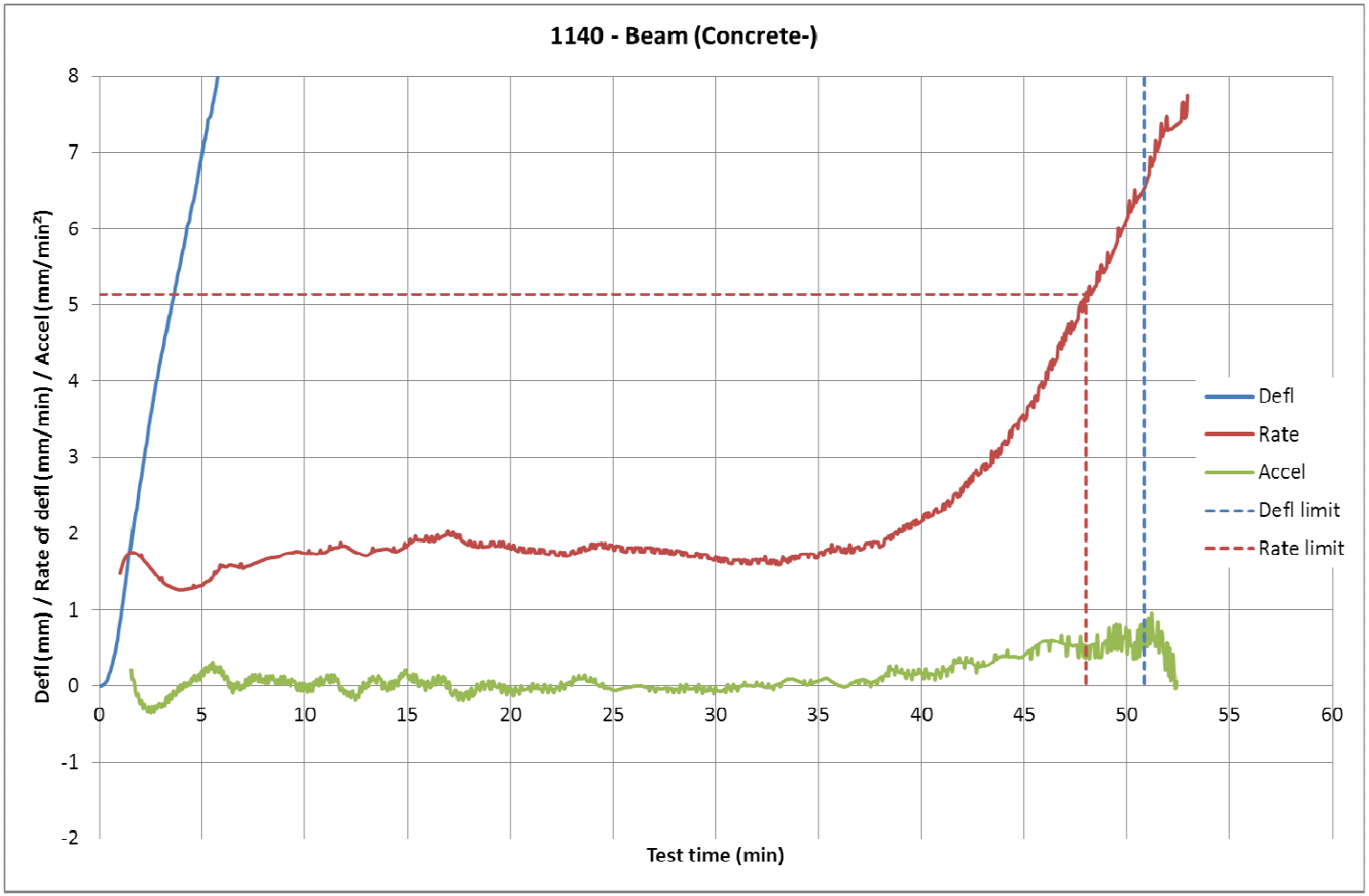

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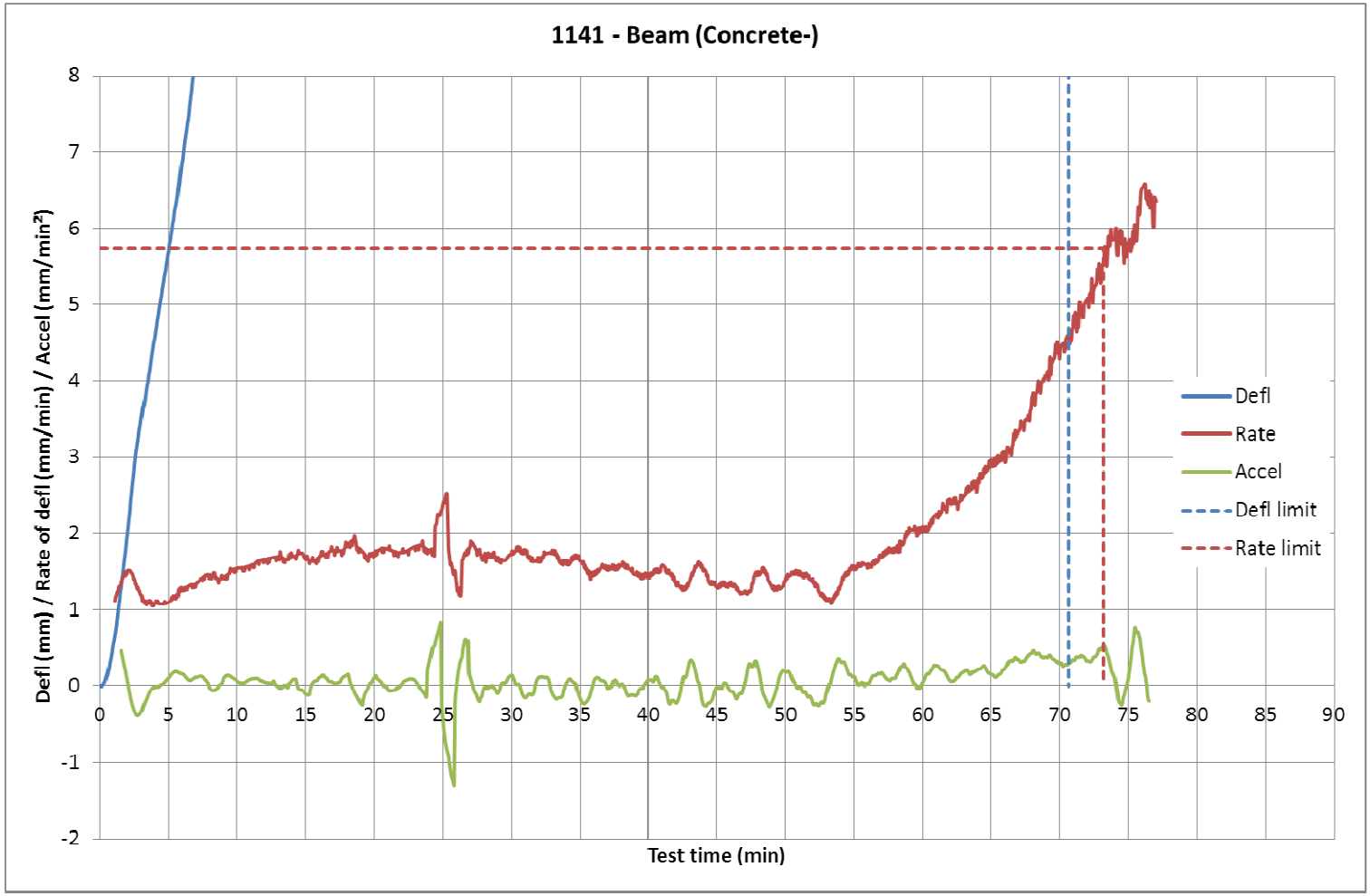

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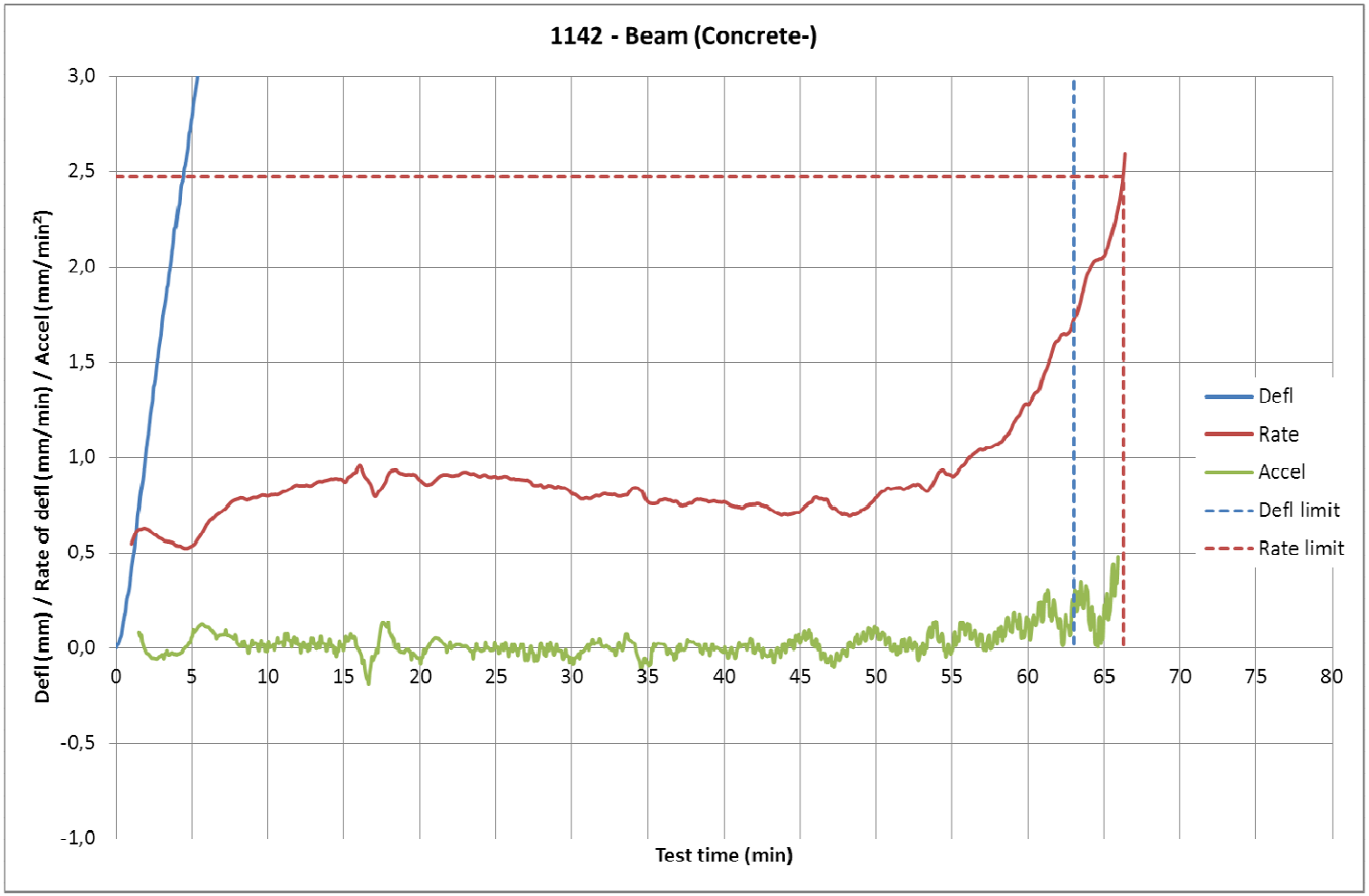

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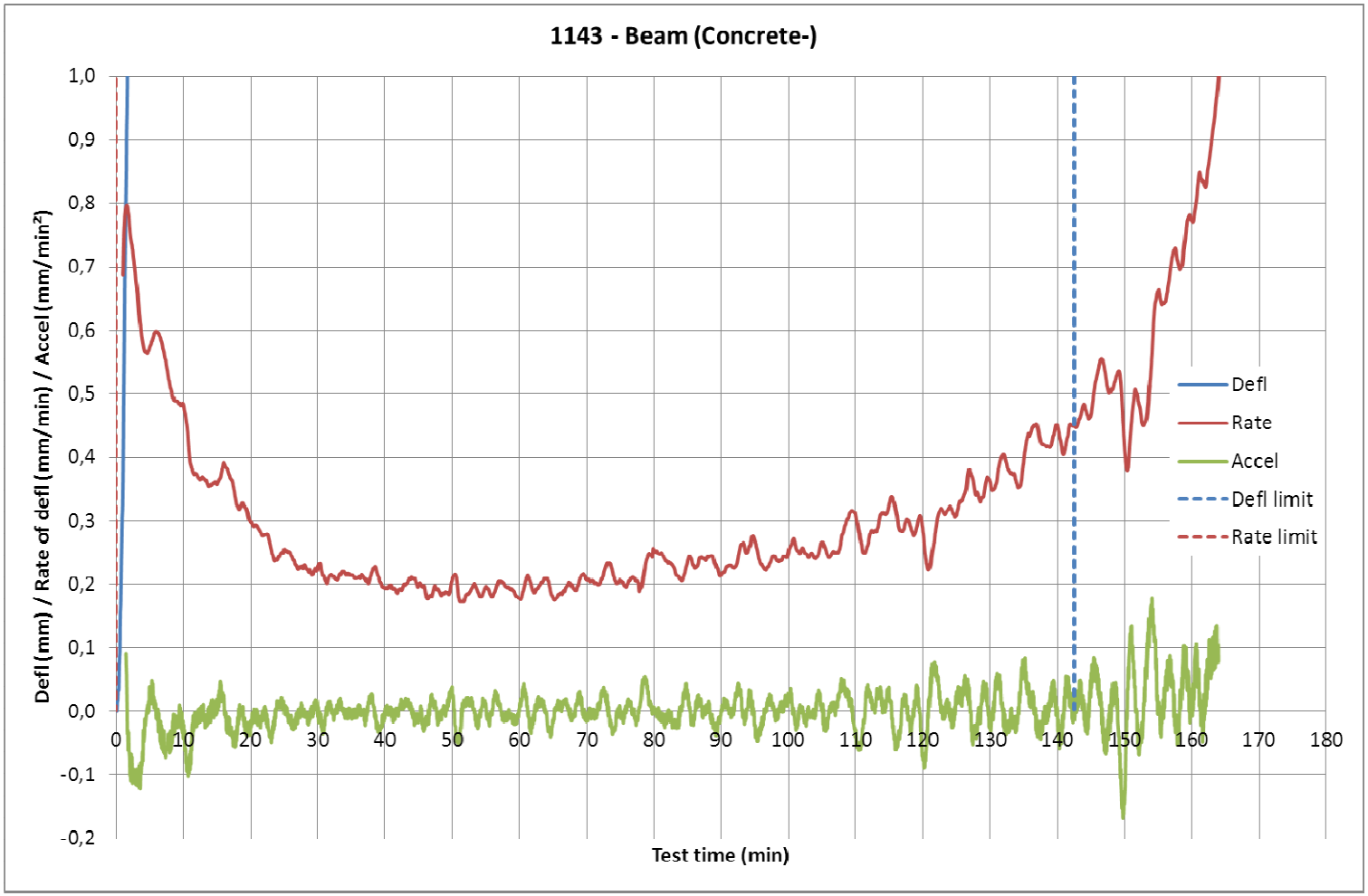

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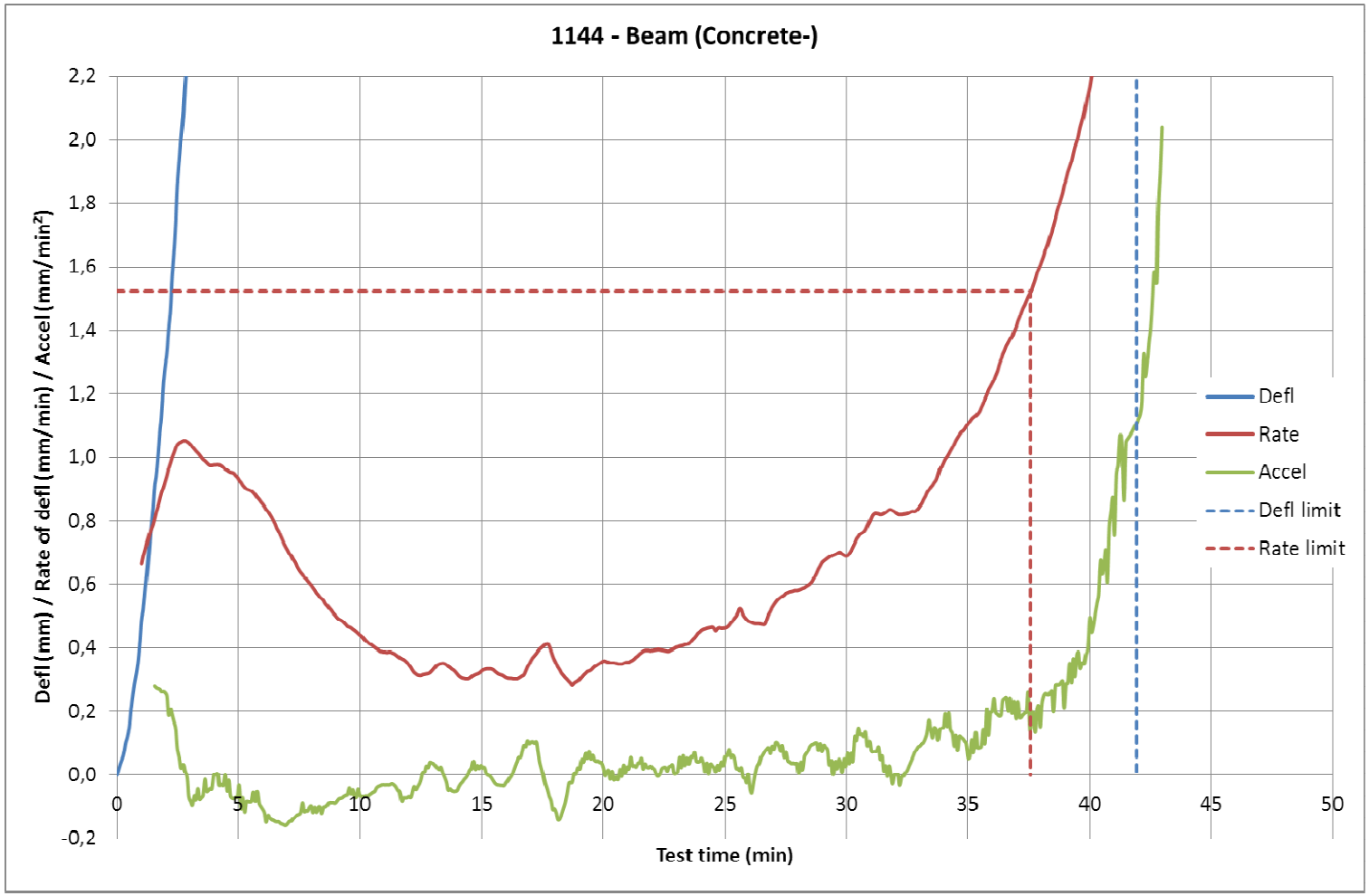

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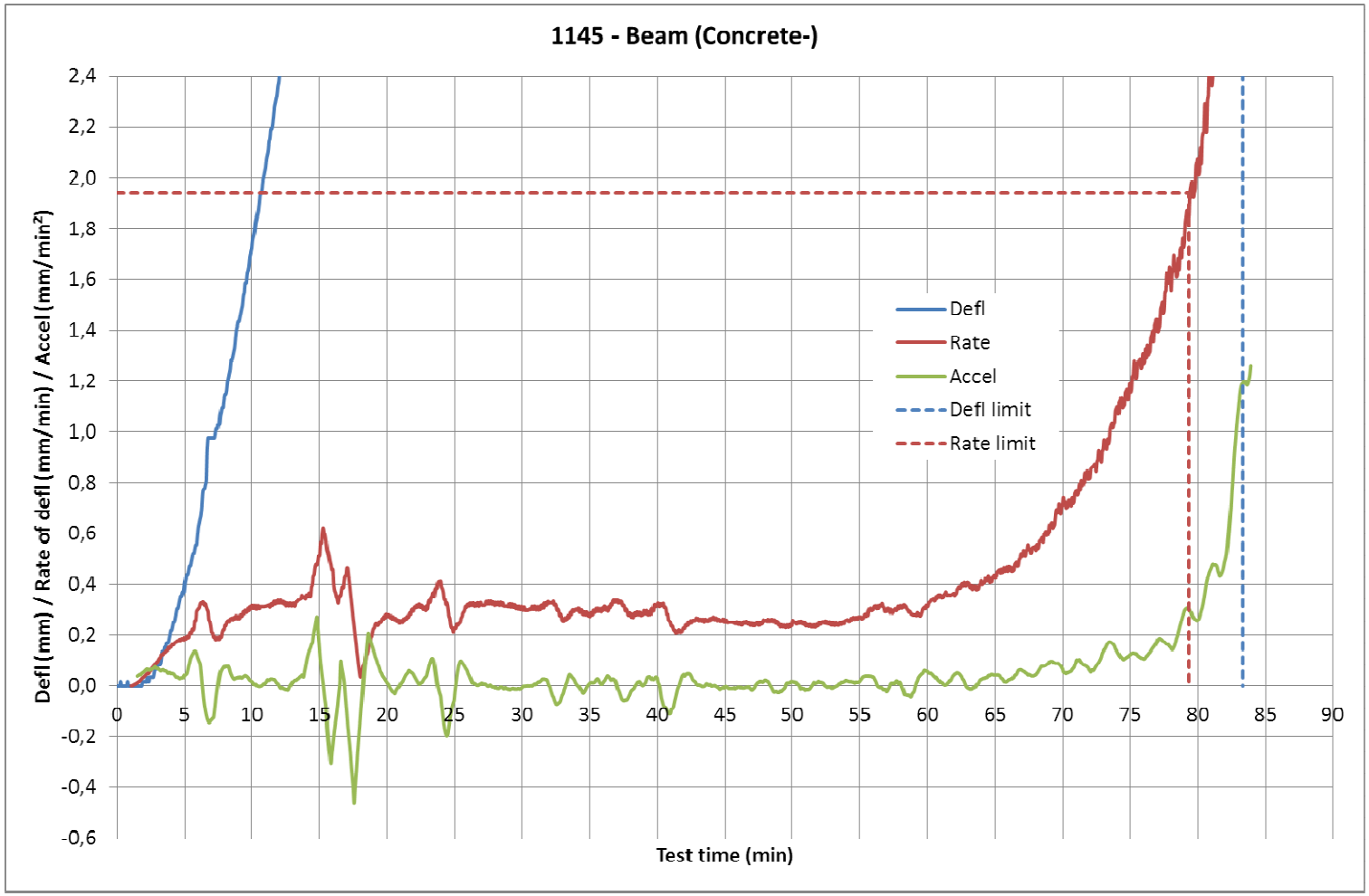

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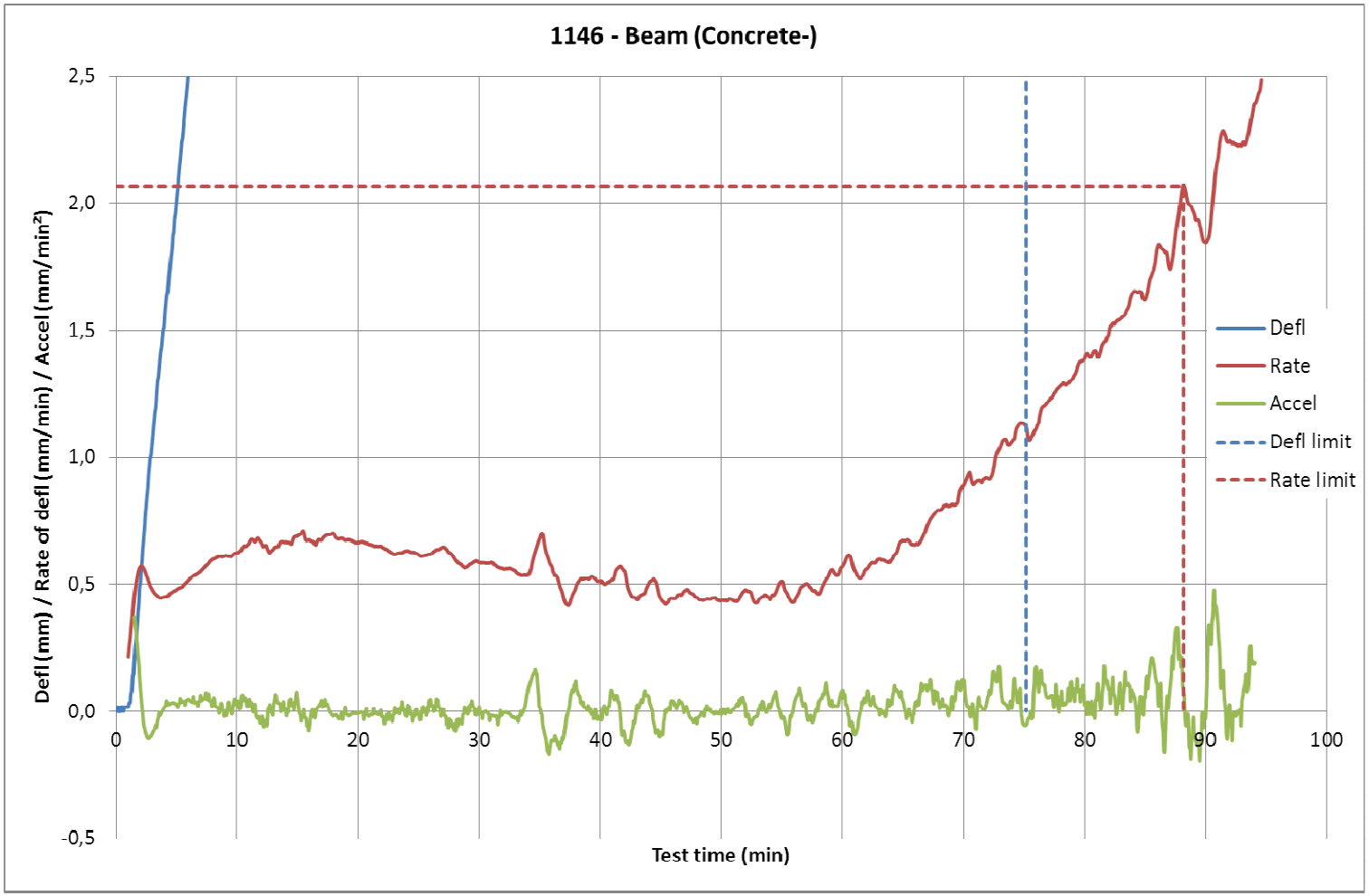

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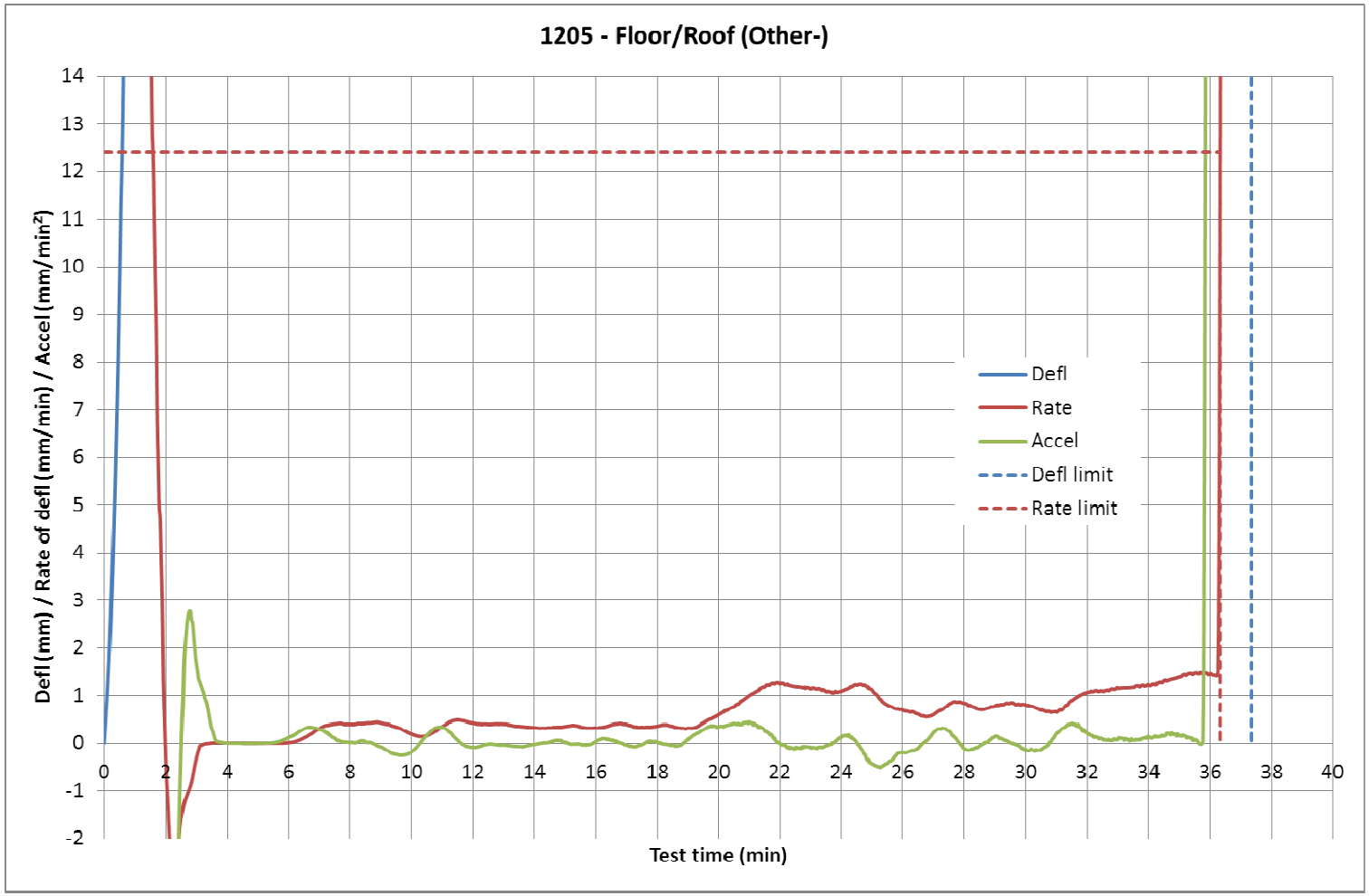

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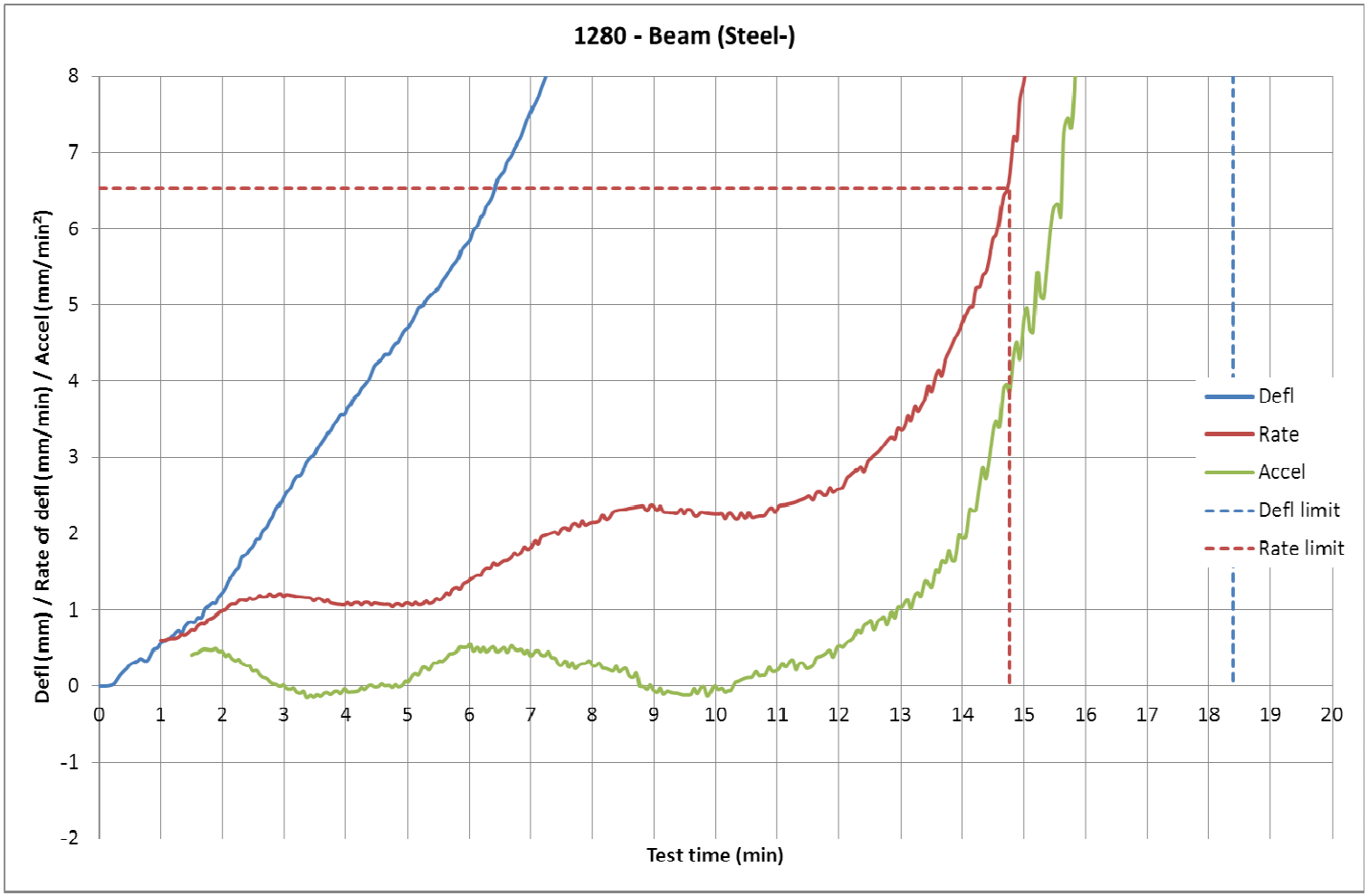

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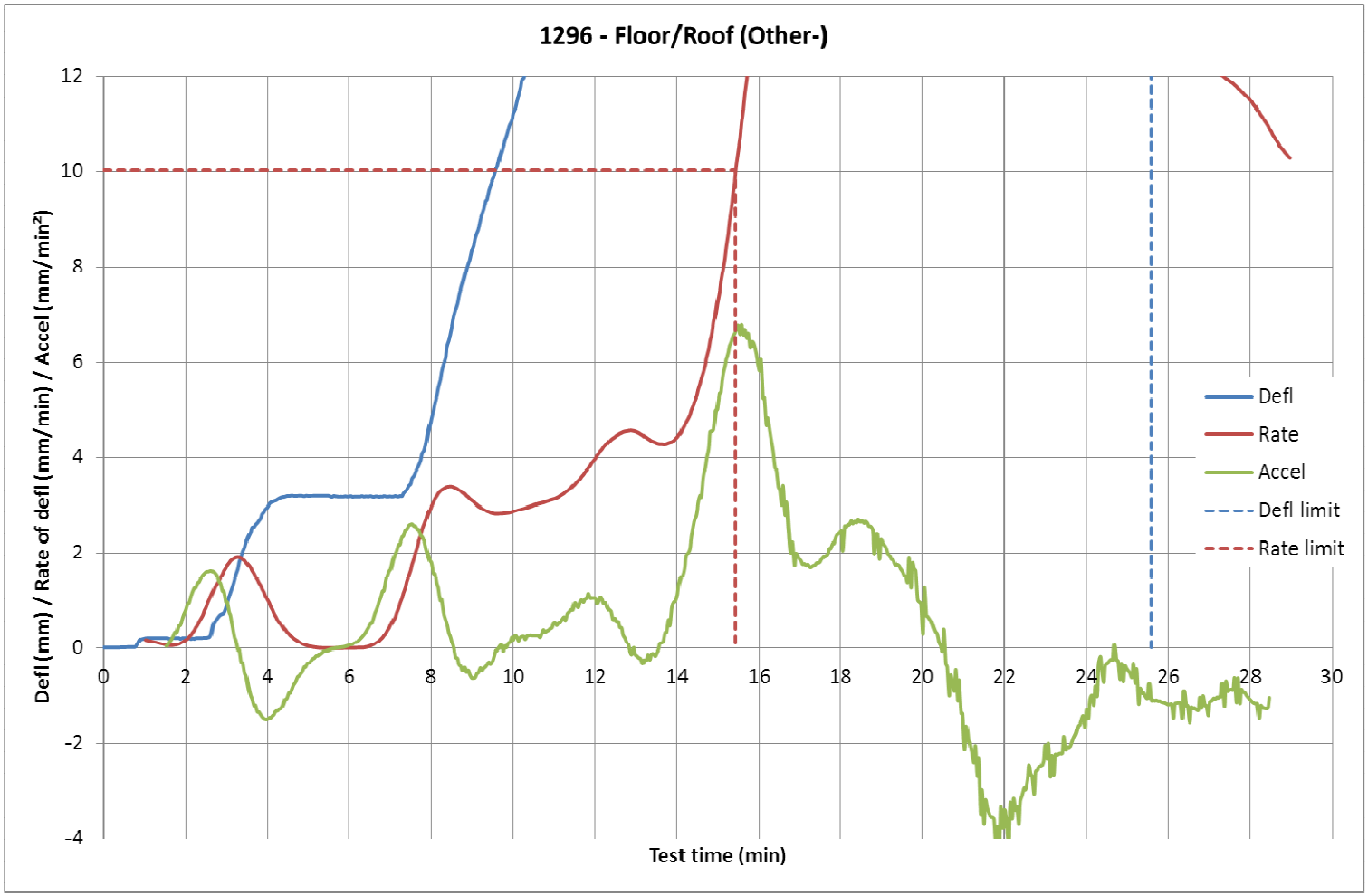

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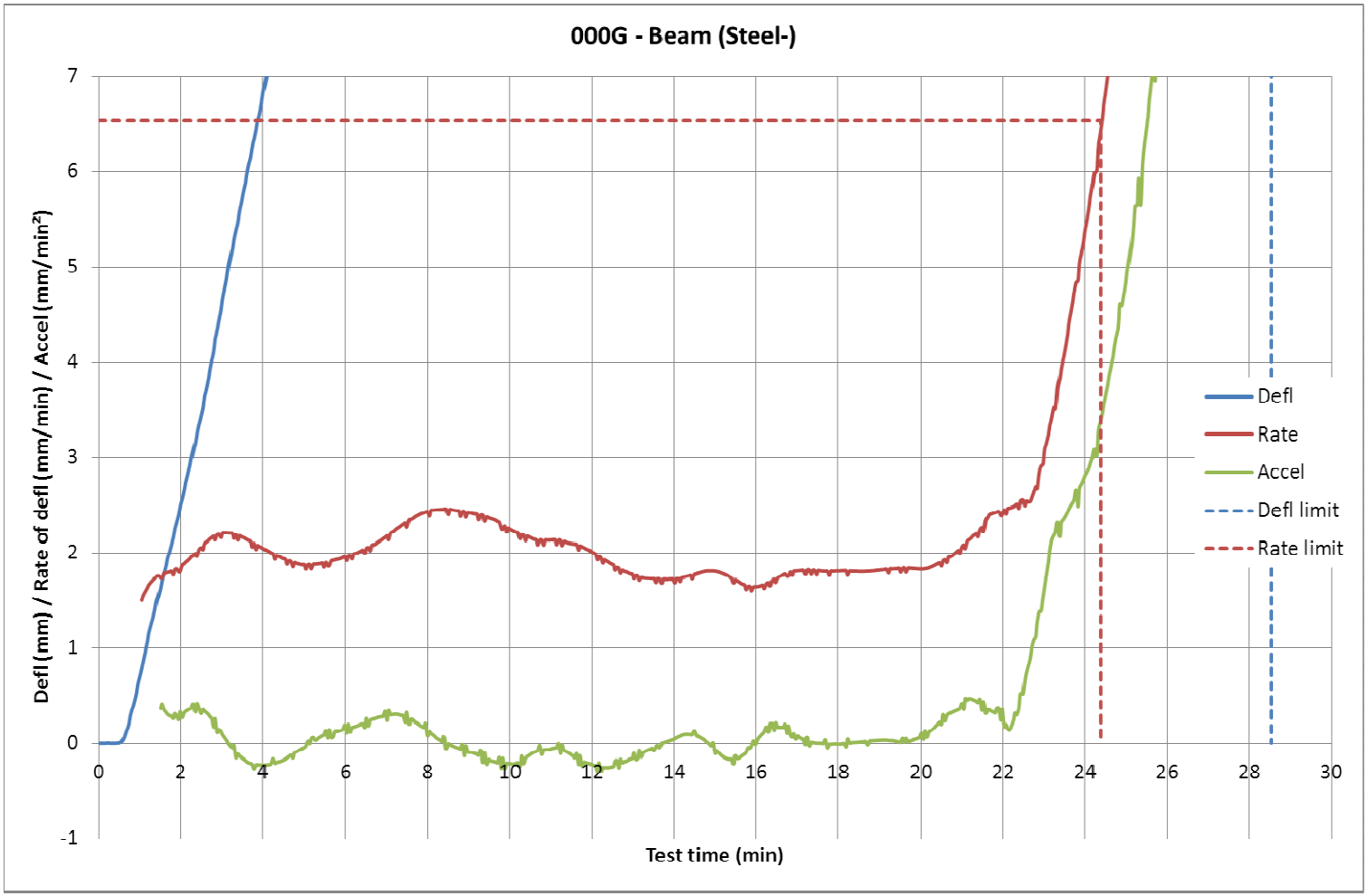

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