Second Generation of Eurocode 8

CEN/TS 1998-1-101: Characterisation & qualification of structural components for seismic applications by means of cyclic tests

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Scope

Contains rules for qualification by cyclic testing of structural elements:

- to be used in design of structures for earthquake resistance (EN1998)
- potentially new elements for use in seismic applications
- provides general indications for the definition of cyclic tests
- does not preclude the development of specific European standards

Table of contents

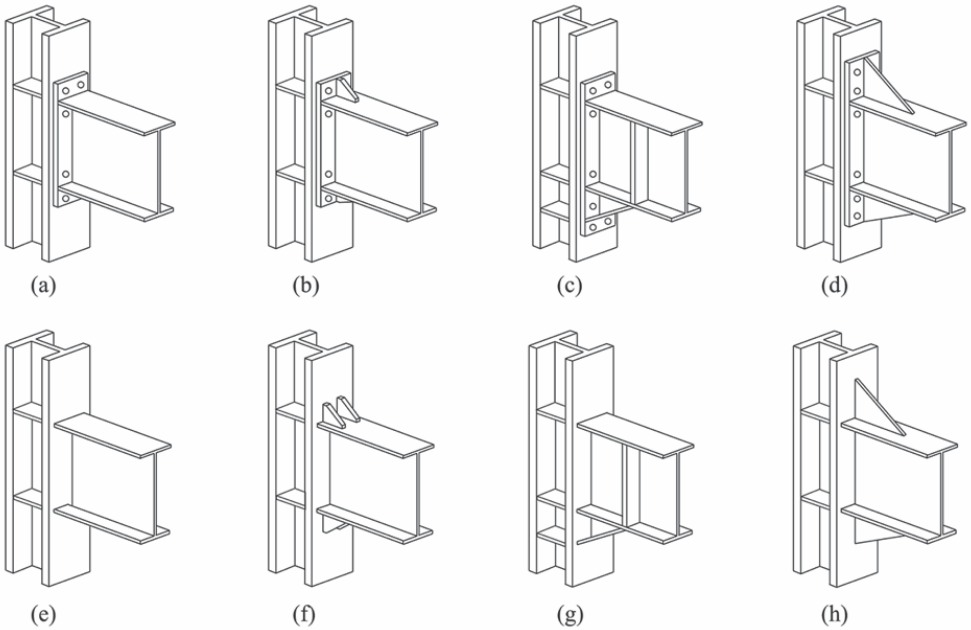
- Section 4: Conditions for pre-qualification
- Section 5: Testing provisions
- Section 6: Loading history (depending on type of element or device)
- Section 7: Test reporting requirements
- Section 8: Verification of limit states
- Section 9: Instrumentation
- Section 10: Testing provisions for material specimens

Section 4: Conditions for pre-qualification

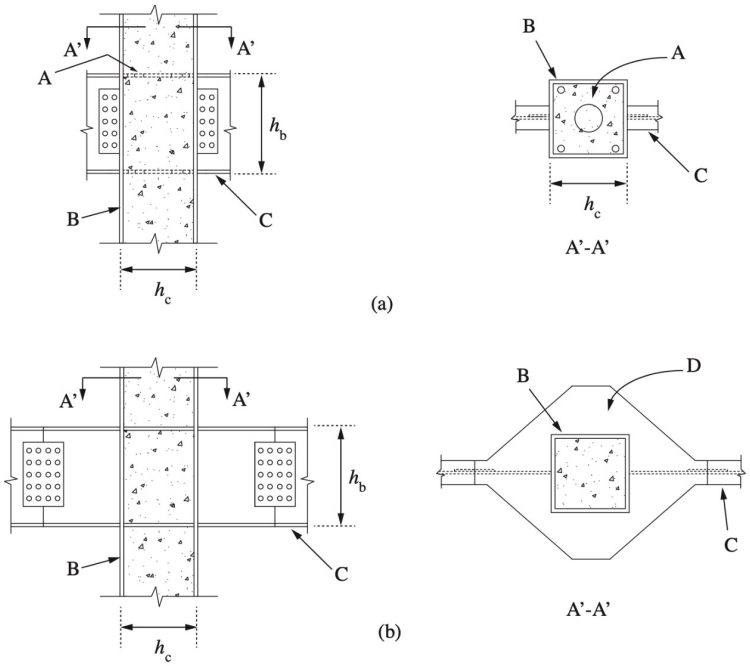
- Loading histories for deformation-controlled quasi-static cyclic loading
- Generally in planar loading conditions
- Enough tests on enough test specimens should be performed (reliability)
  - Number of tests should be established by relevant authority or National Annex
- Test specimens should have representative geometric and material properties
- Test data, numerical studies and design models:
  - sufficient to provide the required deformation demands of structural systems according to EN1998-1-1:2022 and EN1998-1-2:2022

Section 4: Conditions for pre-qualification (cont.)

Annexes E (EN1998-1-2:2022) Prequalified joints



Annexes G (EN1998-1-2:2022) Composite joints



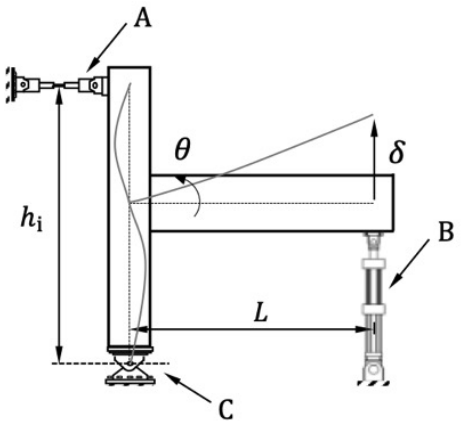
- No further testing is required if within the pre-qualification limits

Section 5: Testing provisions

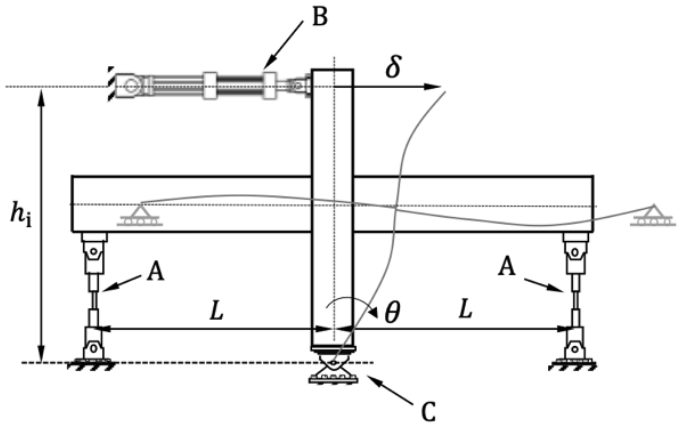
Provisions for test subassembly

- Shall replicate closely the demand & boundary conditions that occur in the prototype during seismic action

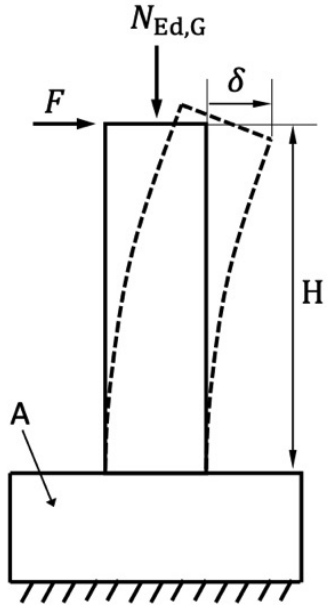
Exterior joint subassembly



Interior joint subassembly



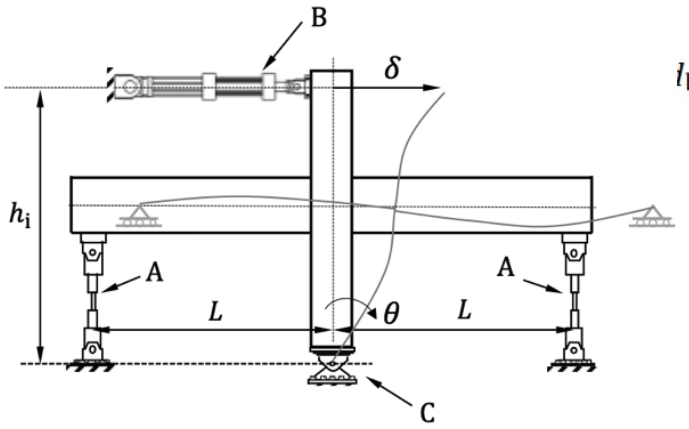
Cantilever wall or column

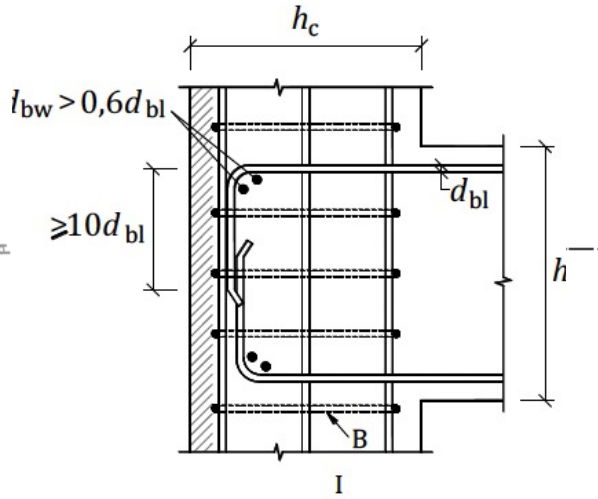


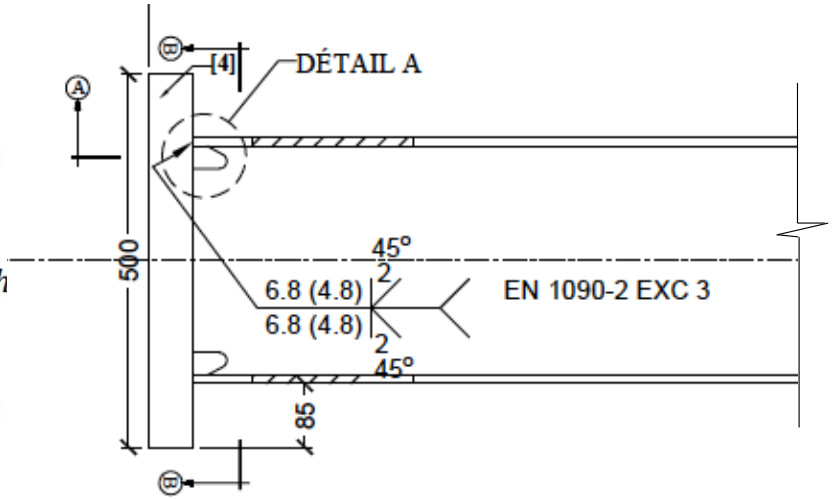
Section 5: Testing provisions (cont.)

Qualification record

Drawings



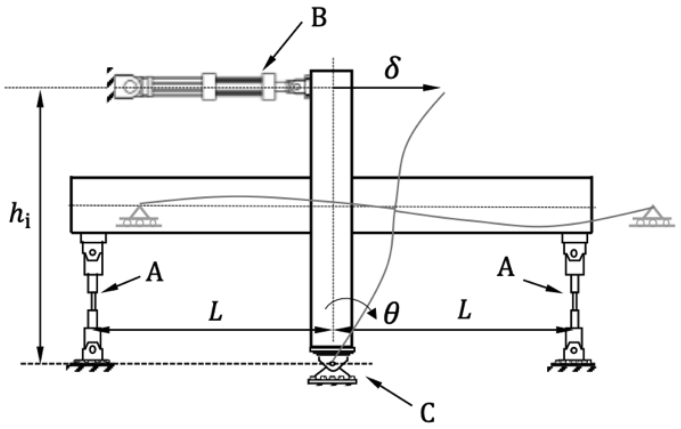




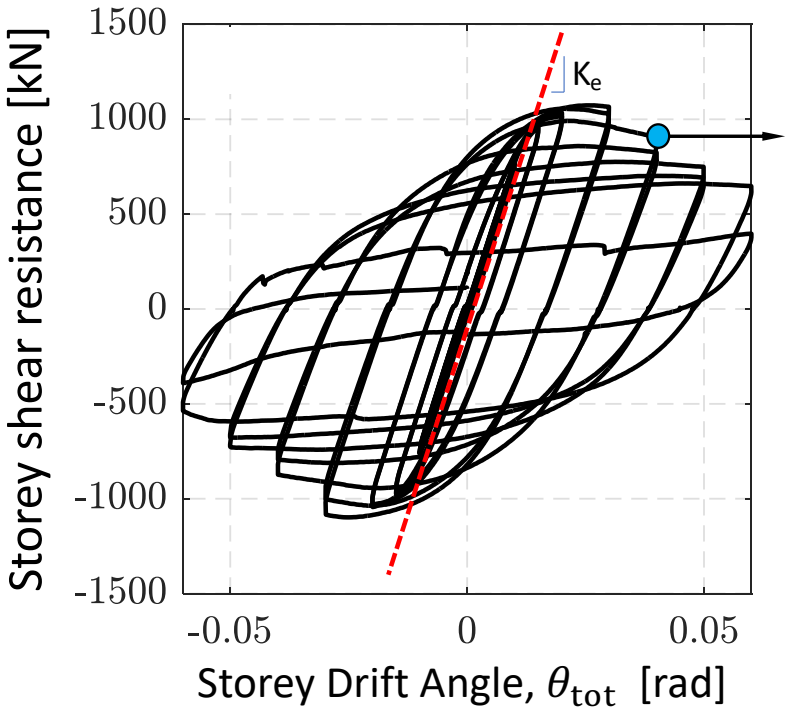
- A summary of quality control and quality assurance procedures should be provided

Section 5: Testing provisions (cont.)

Qualification record



Storey Drift Angle: $\theta_{tot} = \delta / h_i$



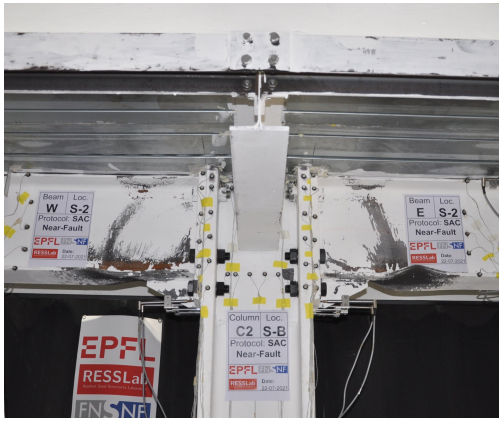


Image source: El Jisr and Lignos (2022)

- Should include a description of the expected behaviour of structural elements and dissipative zones

Section 6: Loading history

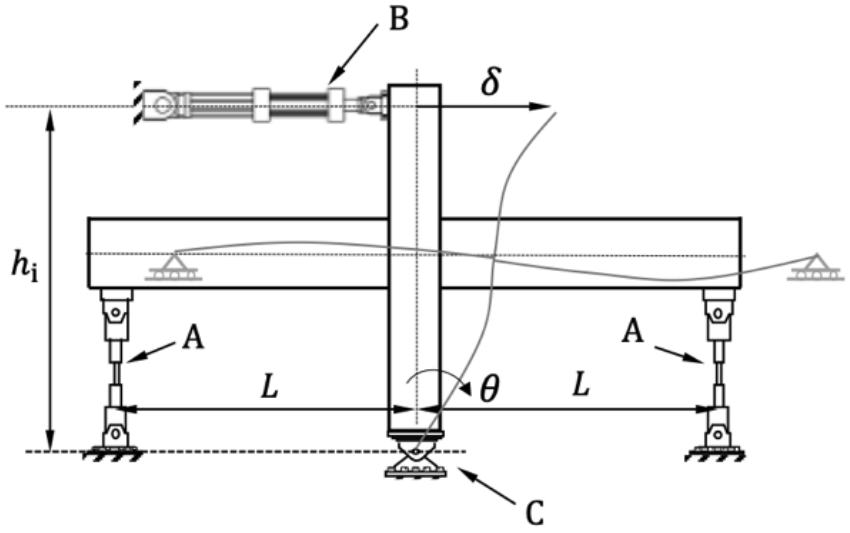
Loading sequences per material and element type

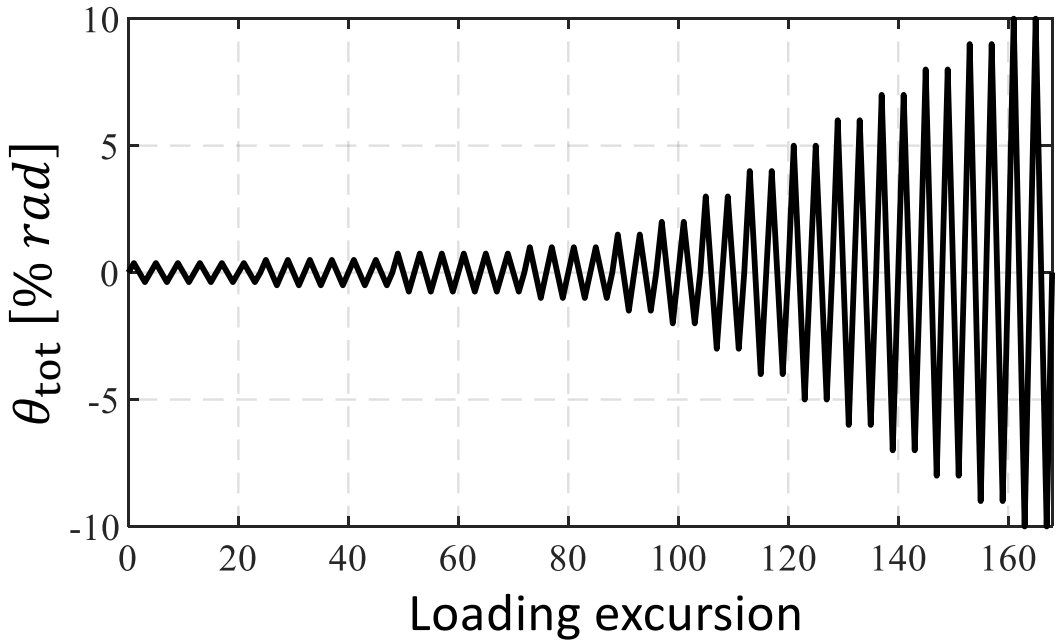
- Antiseismic devices
- Structural elements in concrete buildings
- Structural elements in steel buildings
- Lightweight steel systems
- Structural elements in composite steel-concrete buildings
- Structural elements in timber buildings
- Structrural elements in masonry buildings

Generally, follows the outline of EN1998-1-2:2022

Section 6: Loading history

Loading sequences (cont.)



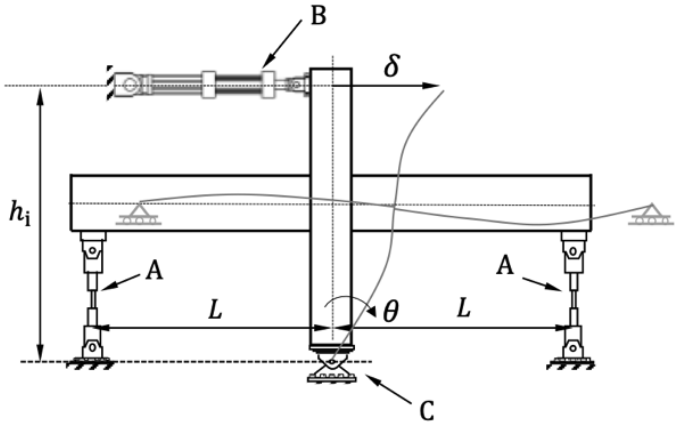


Storey Drift Angle: $\theta_{tot} = \delta / h_i$

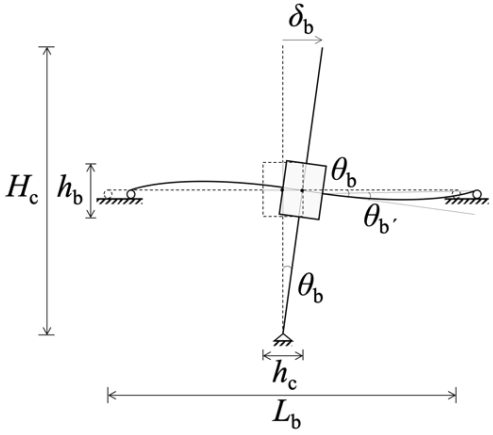
Section 7: Test reporting requirements

For each test specimen, a written report should be provided

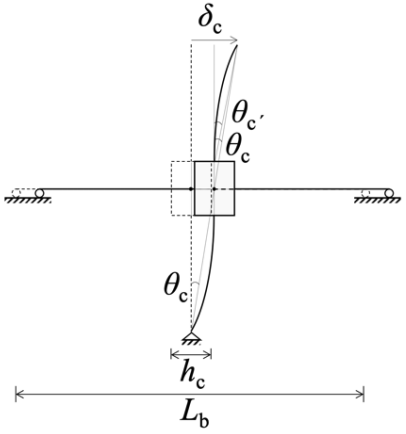
- Loading history
- Pertinent deformation quantities



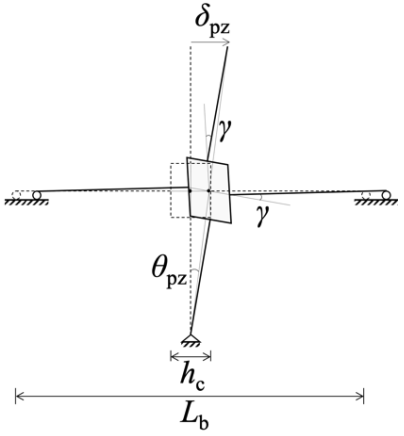
Beam contribution



Column contribution



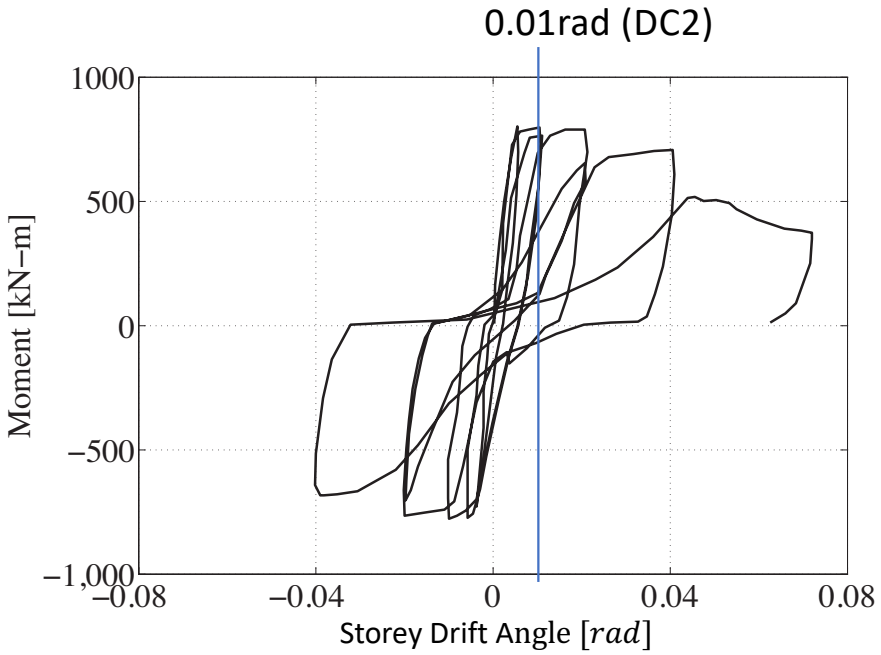
joint contribution



Section 8: Verification of limit states

Verification criteria apply according to DC2, DC3 in EN1998-1-2:2022

- Example: Reinforced concrete shear walls

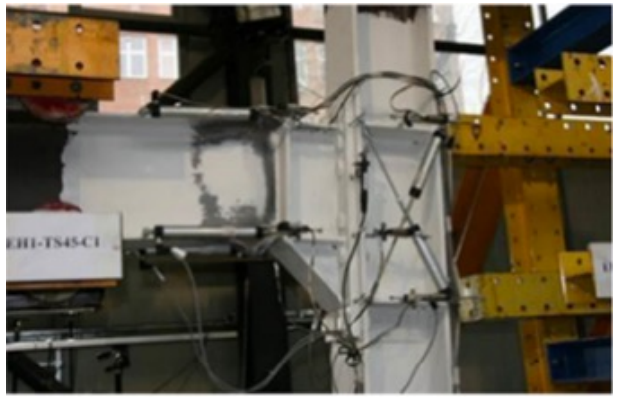


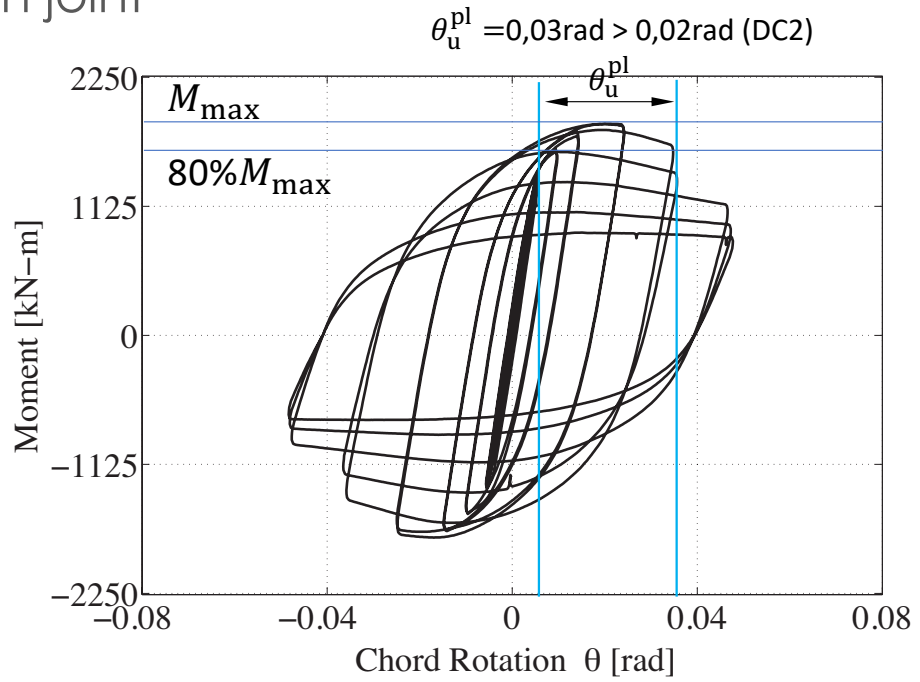
Source: Choun and Park (2015)

Section 8: Verification of limit states

Verification criteria apply according to DC2, DC3 in EN1998-1-2:2022

- Example: Full strength beam-to-column joint





Source: Landolfo (2022)

Section 9: Instrumentation

- Should permit the measurement and the calculation of all pertinent quantities
- A drawing should be developed that identifies the location of each instrument
- Sensor calibration (as per ISO/IEC 17025:2017) range should be identified
- Should permit measurements of the elastic deformations of the test rig
  - These should be removed from the reported results

Section 10: Testing provisions for material specimens

Testing provisions for concrete

- Geometric properties of concrete mixture aggregates should be reported
- At least three cylinders of concrete should be tested at 28 days and at the day of testing

Testing provisions for structural and reinforcing steel materials

- Tensile tests should be conducted according to EN10002-1
- The measured strengths at yield, $f_{y,m}$ and at ultimate, $f_{u,m}$ should be reported

Section 10: Testing provisions for material specimens (cont.)

Testing provisions for masonry

- Tensile & compressive strength should be determined from mortar prisms
- The masonry mortar compressive strength should be determined according to EN1015-11:2009
- The shear strength of masonry and the shear modulus of masonry should be determined from simple diagonal compressive tests on masonry walletes

Thank you for your kind attention!

Questions?

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