

Influence of Specimen Size/Geometry on the Elastic/Plastic Fracture Properties

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PROJECT OBJECTIVES:

- To evaluate the suitability of fracture toughness parameters developed for macro-specimens for characterizing micro-specimens.

Motivation:

- Results from macro-specimens will be used to assess the influence of specimen geometry (including notch acuity).
- Correlation between macro- and micro-specimen needs to be determined to assess influence of specimen size.
- Assessing the usefulness of micro-specimens is the goal since they are ideal for providing localised measurements of fracture toughness.

EXPECTED OUTCOMES:

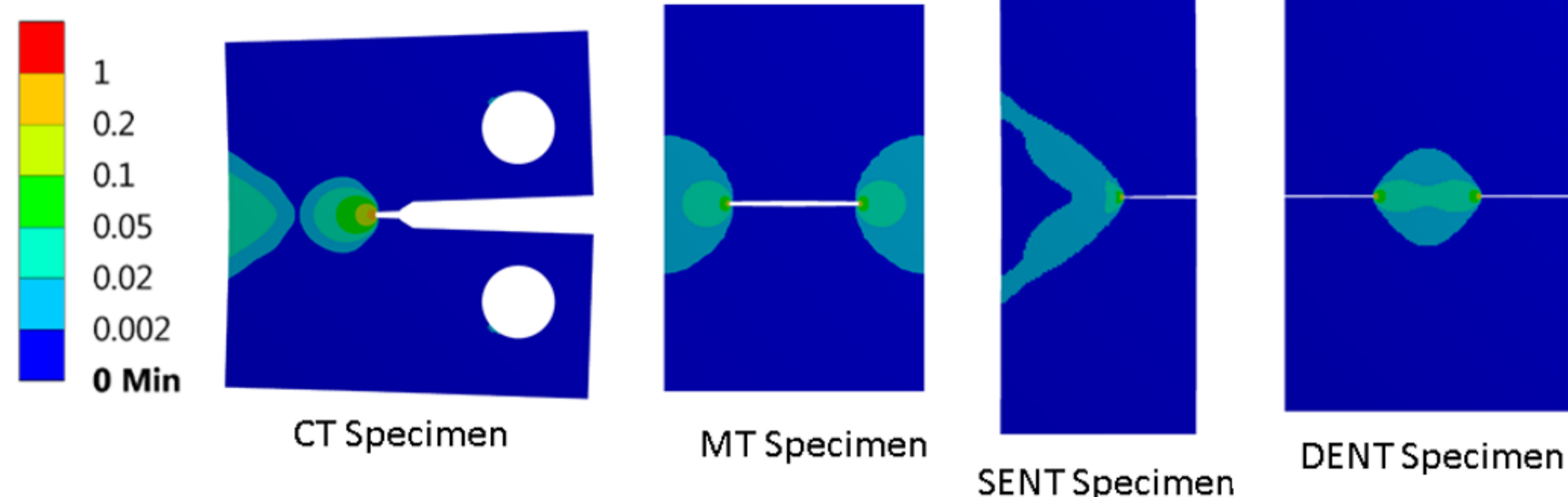
- An assessment of elastic-plastic fracture parameters for characterizing the fracture toughness of micro-sized specimens.

FEDERAL STAKEHOLDERS: CNSC

WORK COMPLETED:

- Finite element modeling to evaluate the effect of specimen geometry/size on plastic zone size and fracture parameters

Equivalent Plastic Strain



Predicted plastic zone of compact tension (CT), middle-cracked tension (MT), single- and double-edge notched tension (SENT & DENT) specimens.

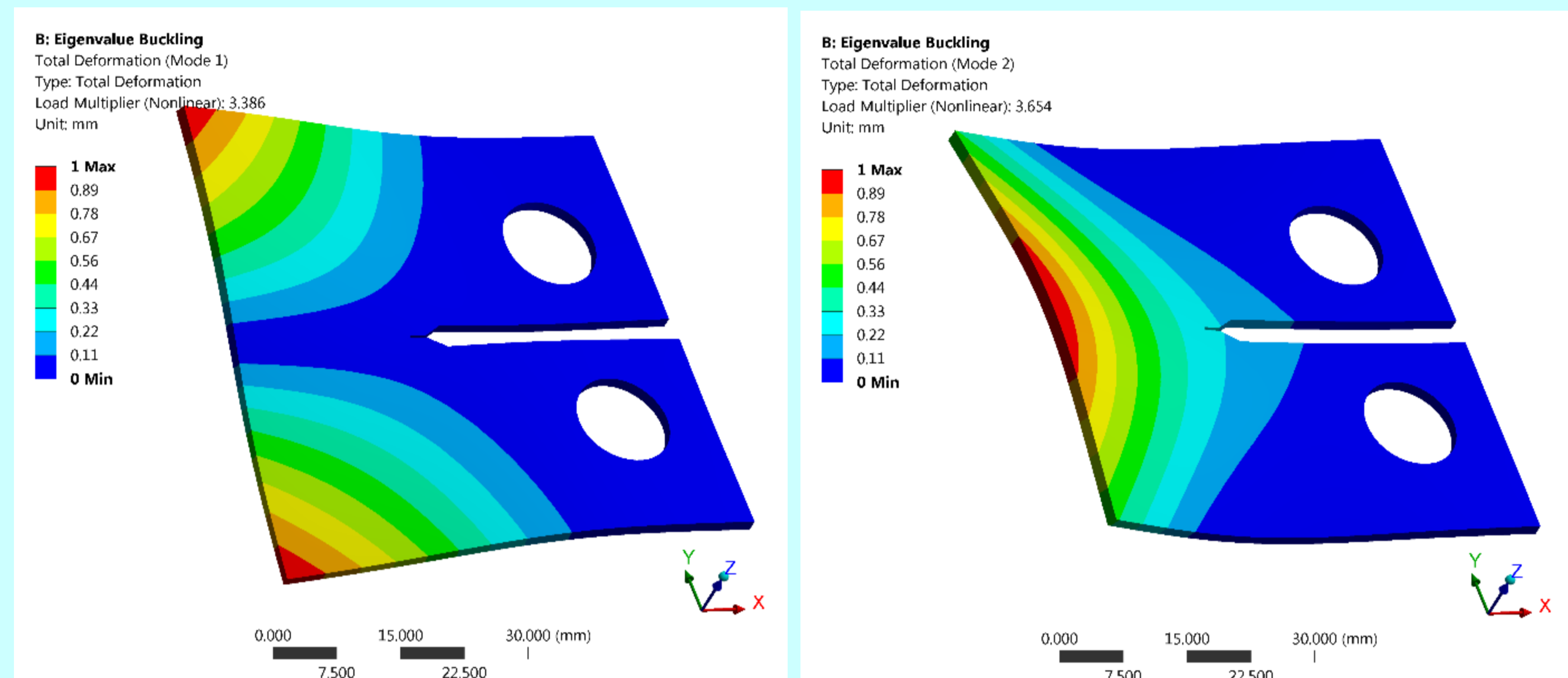
Macro CT and micro MT specimens are to be tested.

- Developed macro-scale CT specimens based on sensitivity analysis results and ASTM standards

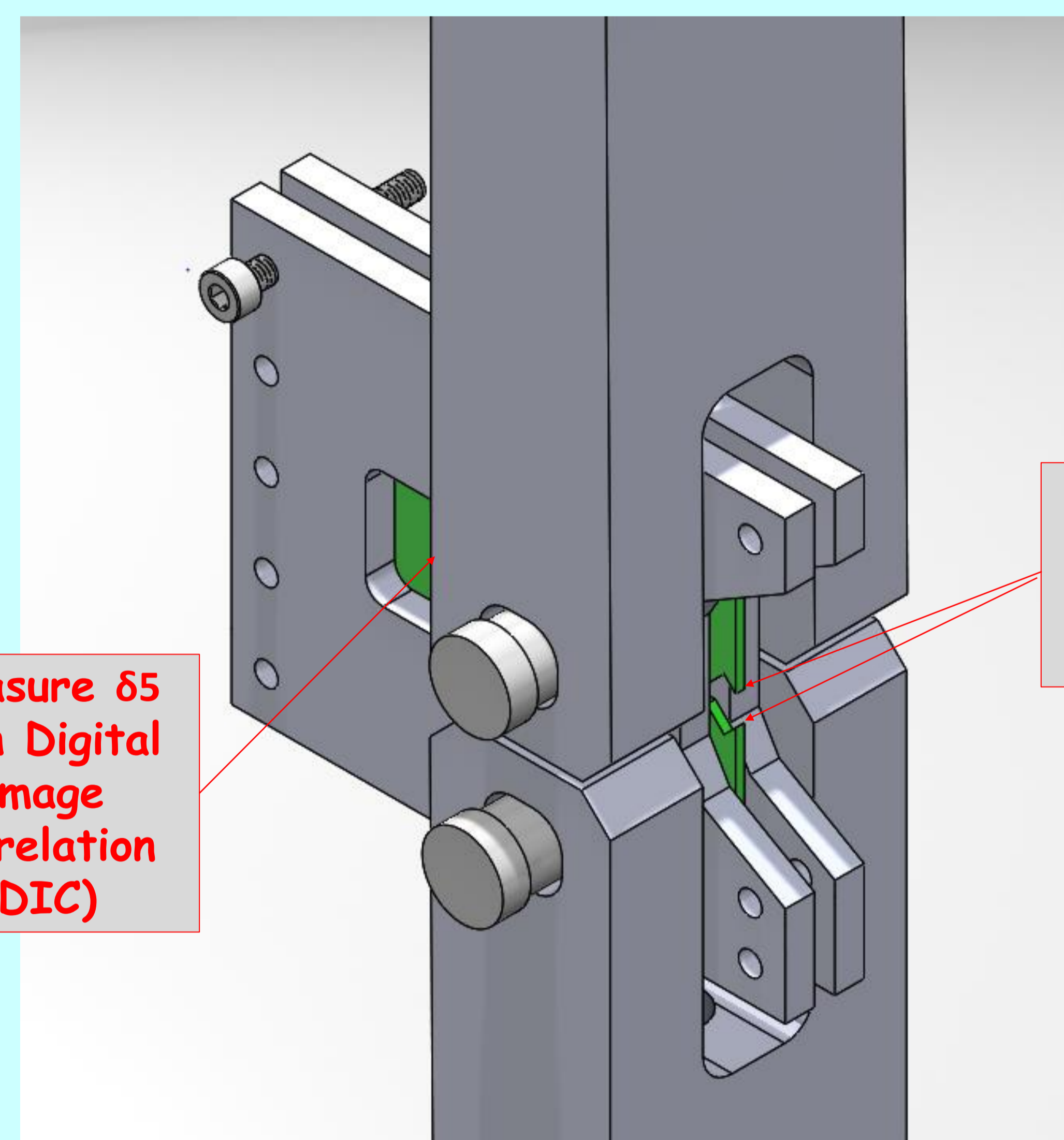
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WORK COMPLETED:

- Development of macro-scale CT specimens and fixtures



Predicted buckling mode shapes for thin CT specimens with pin loading. **Boundary conditions significantly affect buckling modes.**



Anti-Buckling Guides and locations of interest.

δ5: measured at the crack tip location over a gauge length of 5 mm
CMOD: Crack Mouth Opening Displacement

- Machining of specimens and fixtures is ongoing

CONTINUING WORK:

- Conduct fracture toughness tests on macro-scale specimen
- Develop, machine and test micro-scale specimens

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