The Dependency of Shear Zone Length on the Shear Strength Profiles in Paperboard

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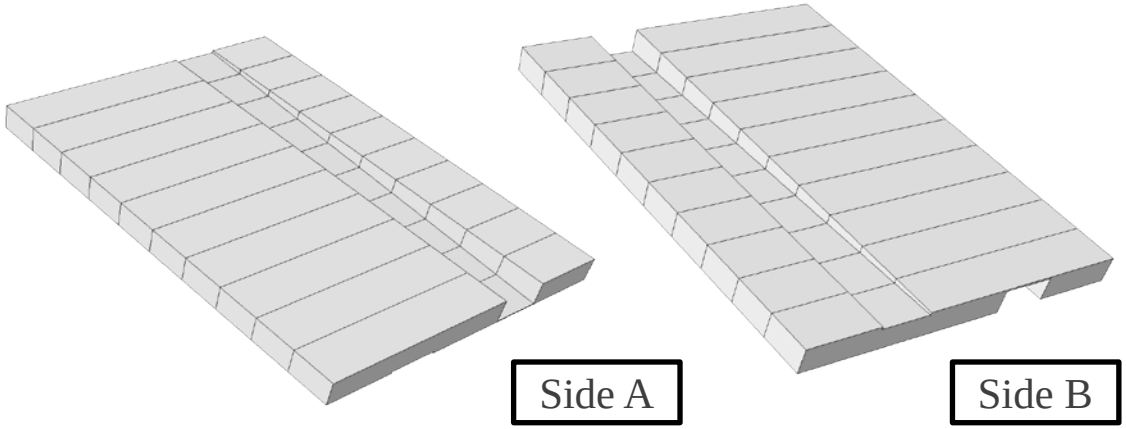
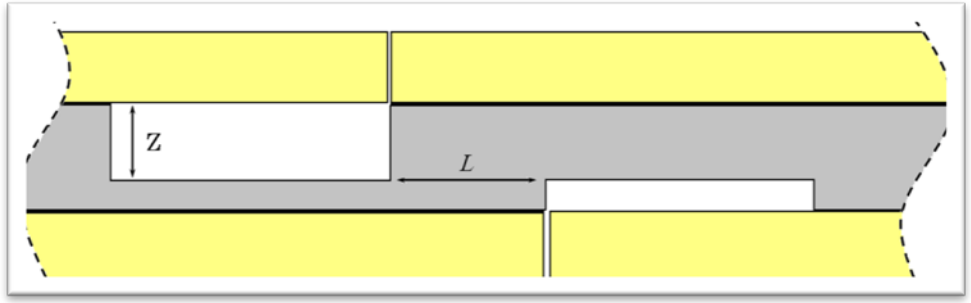
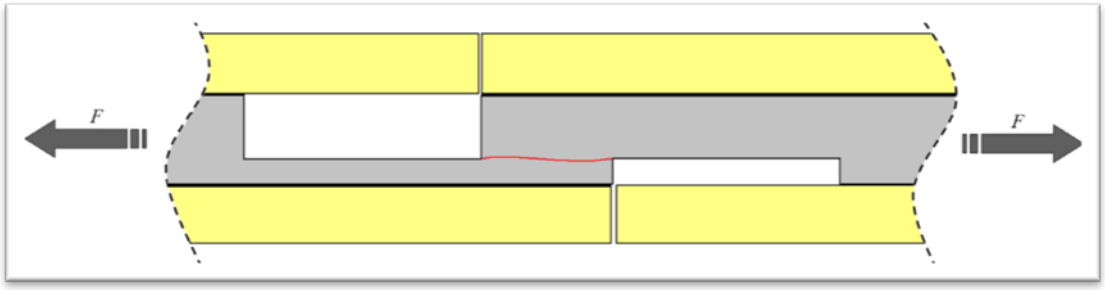
Tilted Double Notch Shear Test

Experiment Method

1. **Grinding**: Two grooves were grinded on each sheet, one on each side, but with declining depth. The two grooves were separated by a certain distance, the shear zone L.
2. **Lamination**
3. **Cutting:** strips with width 15 mm.
4. **Testing:** Tensile test to create shear failure.







Huang, H. and Nygårds, M. (2010): The dependency of shear zone length on the shear strength profiles in paperboard, Report 501, Solid Mechanics, KTH.

Tilted Double Notch Shear Test

- Tested paperboard sample:

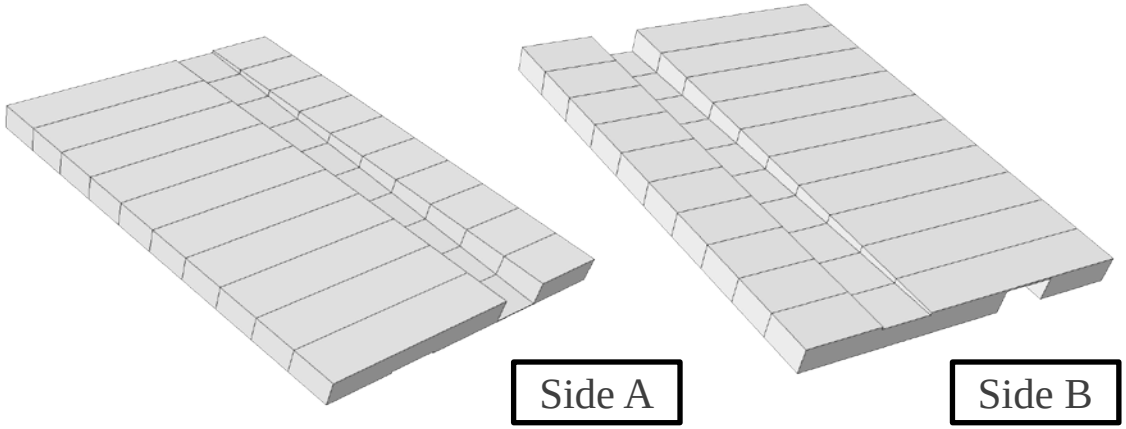
  * thickness: 0.65 mm

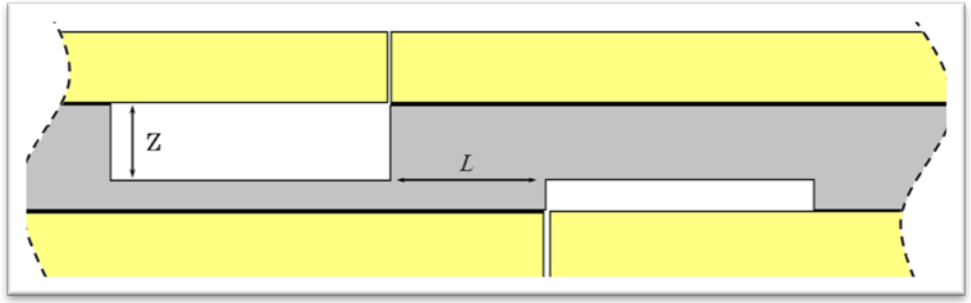
  * four-ply paperboard

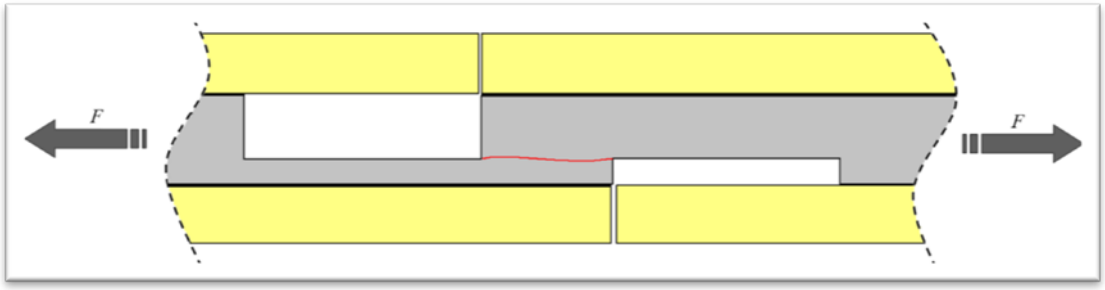
  * middle plies made from CTMP pulp

- Experiments were done for both MD and CD test.

- Tested shear zone length *L*: 1.5, 2.5, 5.0, 10.0, 15.0, 20.0 and 25 mm.







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Results and Discussion

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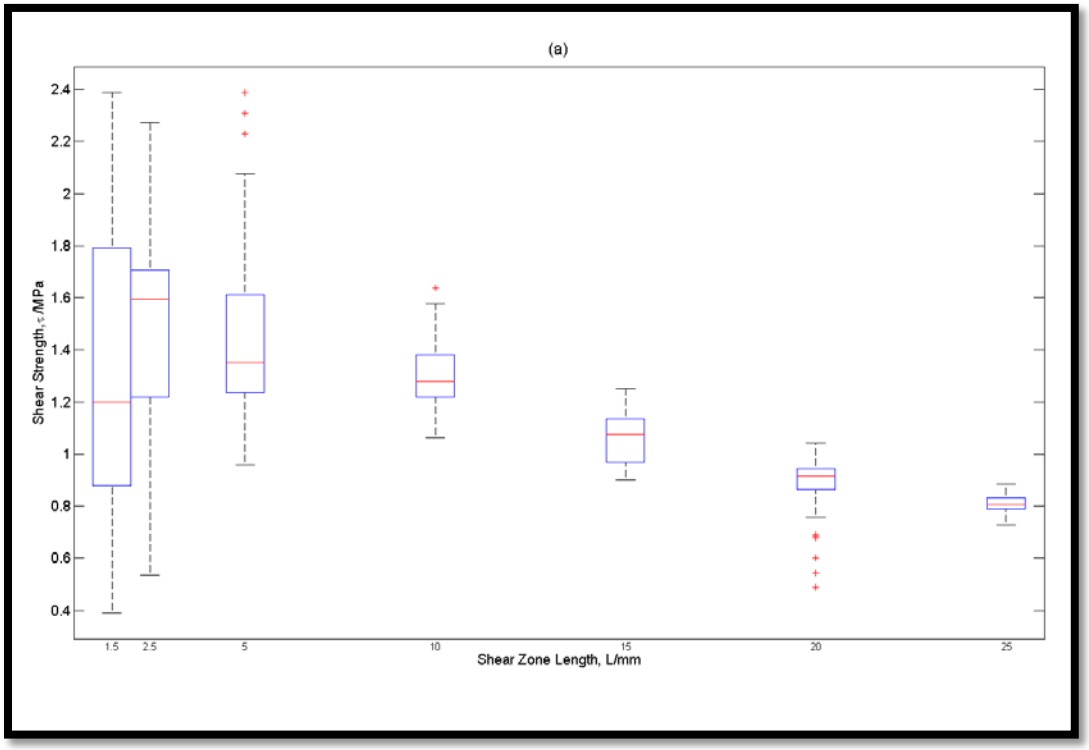

Box plots of shear stress with different shear zone length for (a) MD tests, and (b) CD tests.

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Conclusion

- With shorter shear zone, the shear test profile was more local, while the shear tests seemed to fail along the weakest position with long shear zone.
- For short shear zones (L ≤5.0 mm) the shear strength profiles can be used to define local material data for numerical simulation.
- Measurements using long shear zones (L≥15.0 mm) can be used for paper manufacture quality control, since it gave very uniform measurements in the thickness direction.

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Thank You!