INVESTIGATION OF COMPOSITE SLIM-FLOOR SYSTEM – ANALYSIS OF A PUSH OUT TEST

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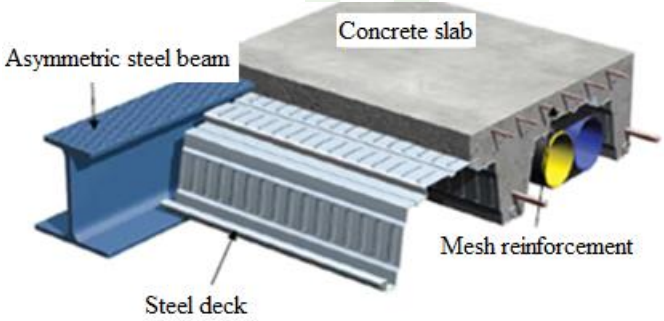
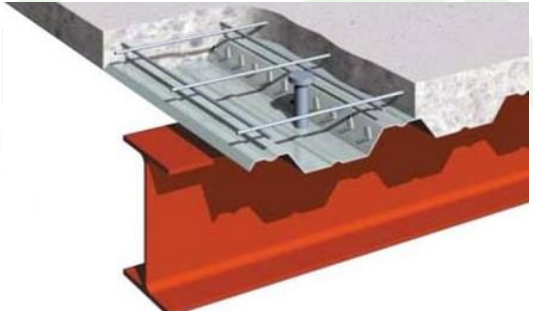
– The main supporting element is the steel beam, which has been integrated into the concrete slab.

- Reduction of floor thickness.
- Constructing floors of variable thickness.
- Longer spans.
- Built-in fire resistance.

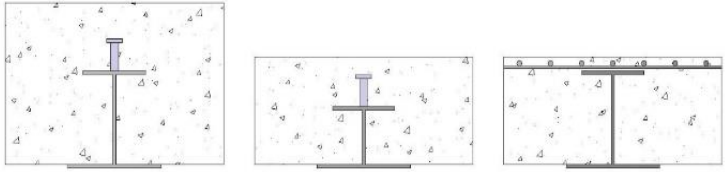


Composite Slim-Floor Beam



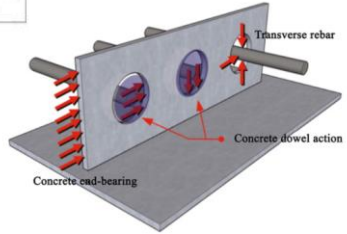
Ordinary Composite beam

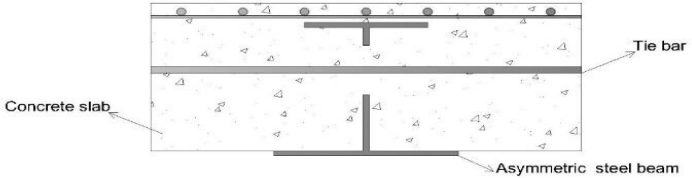
Perfobond shear connections



– Using headed studs requires a reduction in beam height or an increasing in slab thickness.

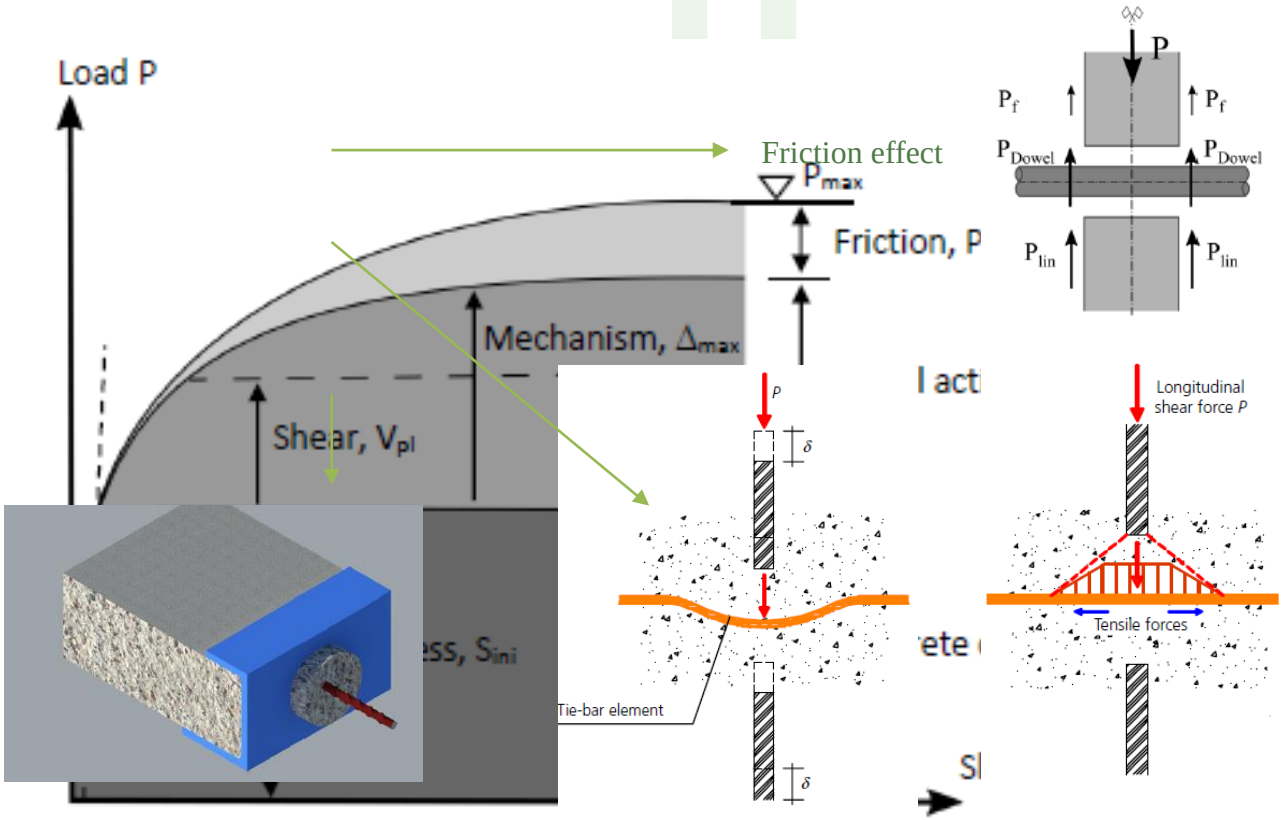
– CoSFBs has been developed with an innovative shear connections, by using concrete dowels with transversal bars.





– Concrete dowels are defined as drilled openings through the web of a steel section and standard reinforcement bars (tie / transverse - bars) placed perpendicularly to the beam span through the web openings, while they are filled with concrete

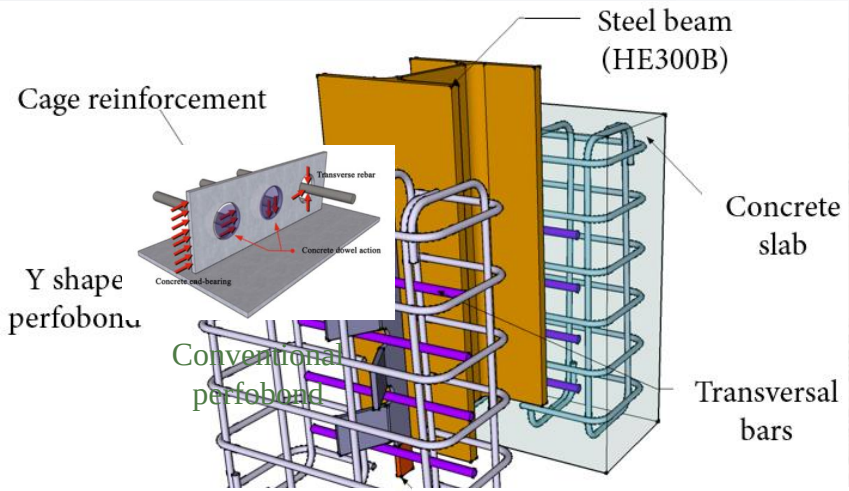
Force transferring mechanism



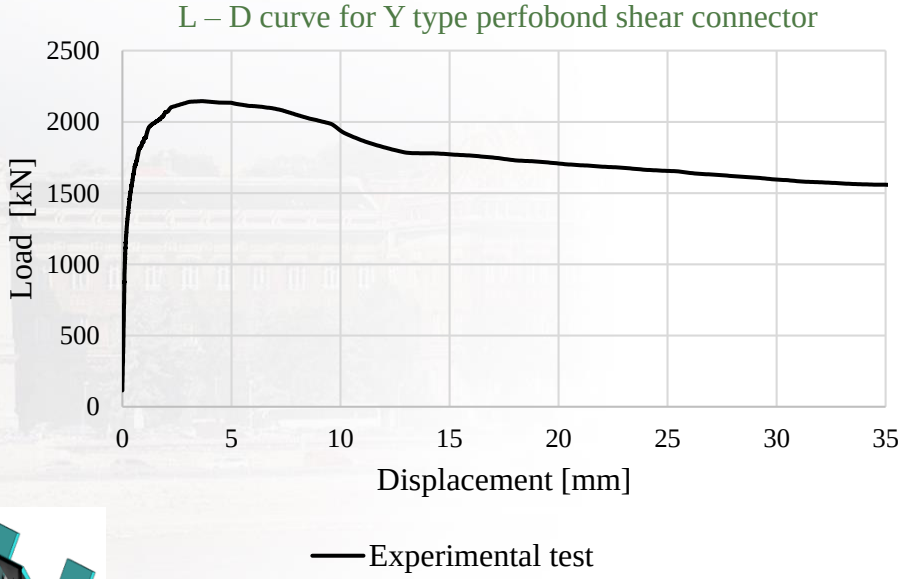
Concrete component

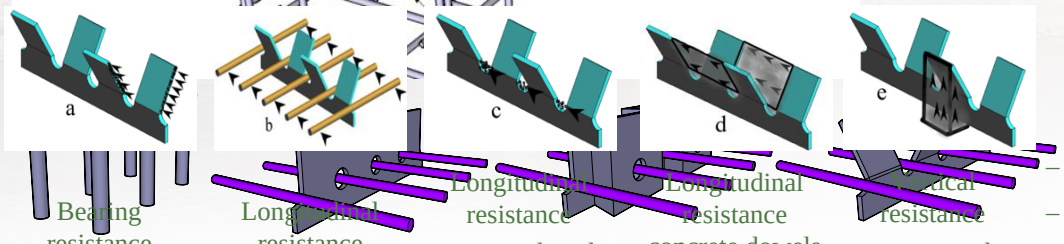
Dowel action

Push-out test



Conventional perfobond





Bearing resistance
Headed studs

Longitudinal resistance
transverse rebars
Conventional perfobond

Longitudinal resistance
concrete dowels
inside circular
holes
Trapezoid perfobond

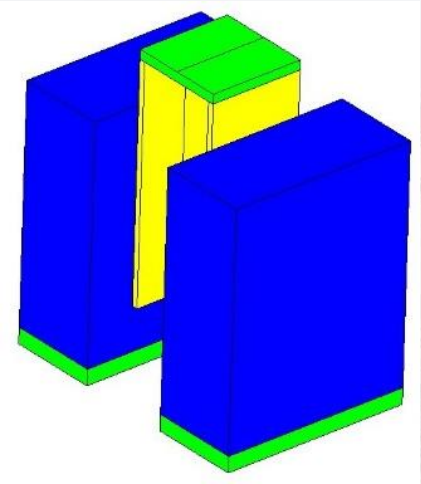
Longitudinal resistance
concrete dowels
between
inclined parts

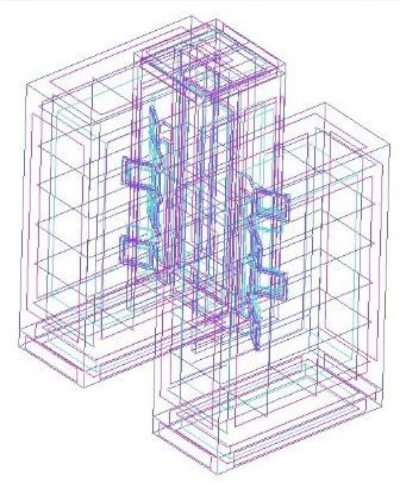
Vertical resistance
concrete under
inclined parts
Y-type perfobond

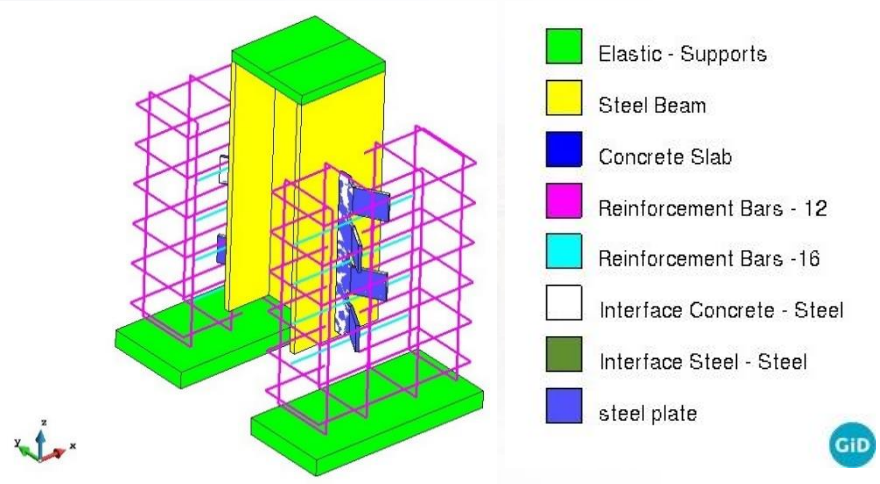
- Concrete: C35/45.
- Steel beam: H300 / S275.
- Reinforcement: S500B
- Steel plate: S355.

  - The load was achieved with a hydraulic press 600 tons, it was measured with a built-in sensor.
  - The ultimate strength was approximately 2145 kN.

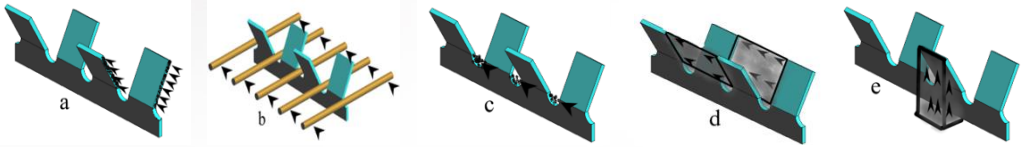
Finite element model







- Finite element model was developed using Atena-GID software.
- The analysis was a displacement control analysis.
- The geometrical and materials parameters are equal to the test specimen.
- Y shape perfobond shear connections has a very complicated gematrical and contact surface characteristics.



Bearing resistance

Longitudinal resistance transvers bars

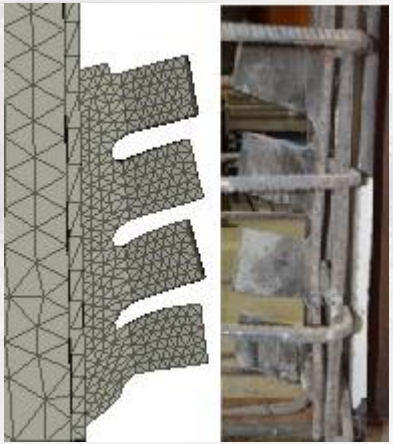
Longitudinal resistance concrete dowels inside circular holes

Longitudinal resistance concrete dowels between inclined parts

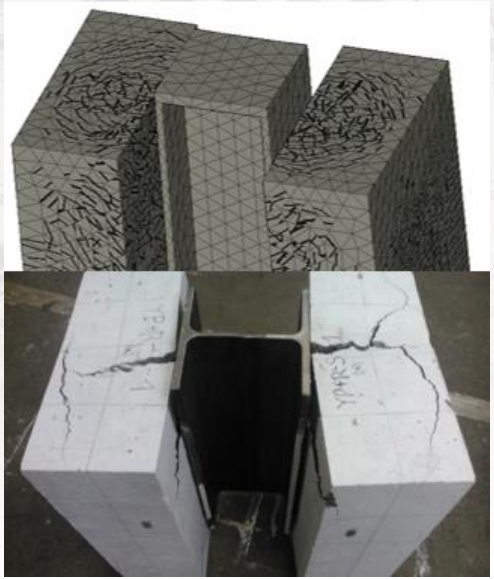
Vertical resistance concrete under inclined parts

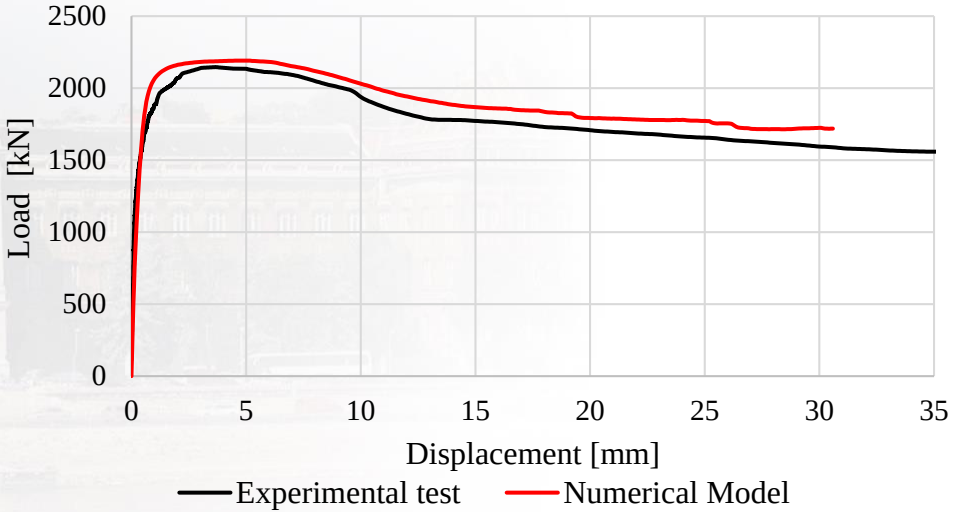
Finite element model - validation

Perfobond deformation ✓



Failure mode ✓





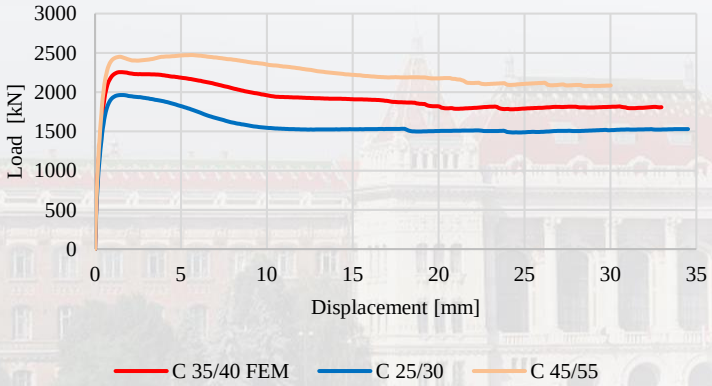
– The initial stiffness. ✓

– Maximum resistance. (3% higher). ✓

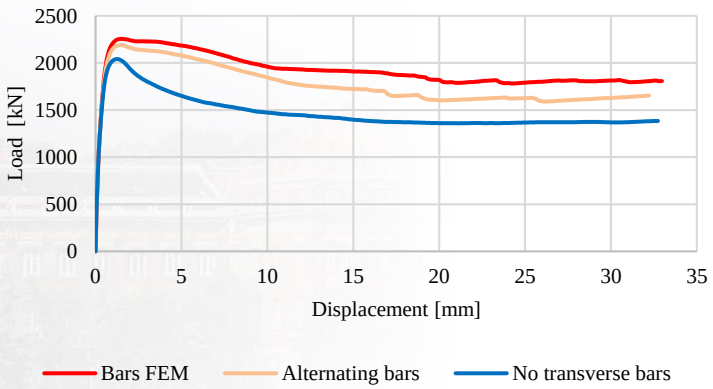
– Failure behavior. ✓

– Resistance degradation. ✓

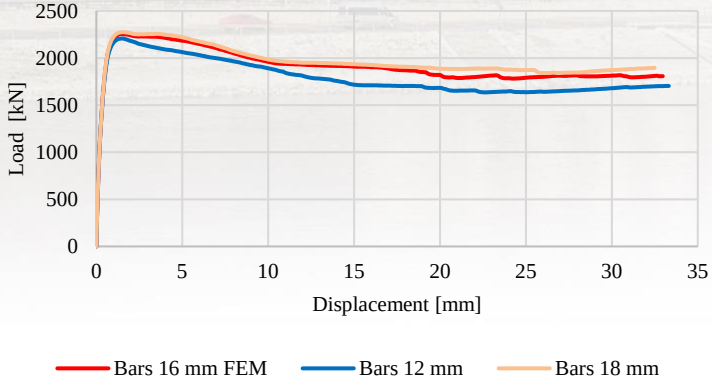
Parametric study



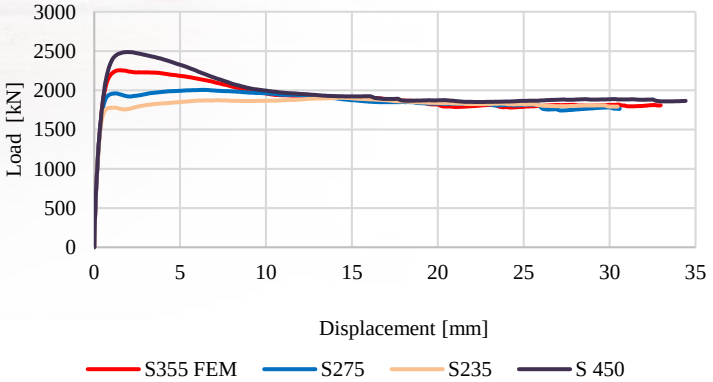
Concrete Class



Transverse bars position

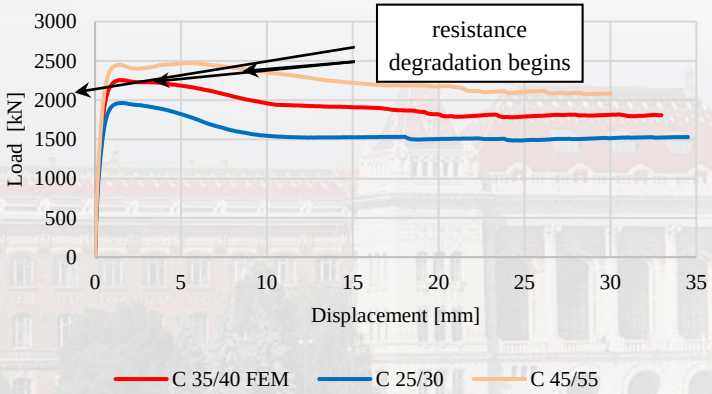


Transvers bars diameter



Y type perfobond yield strength

Parametric study



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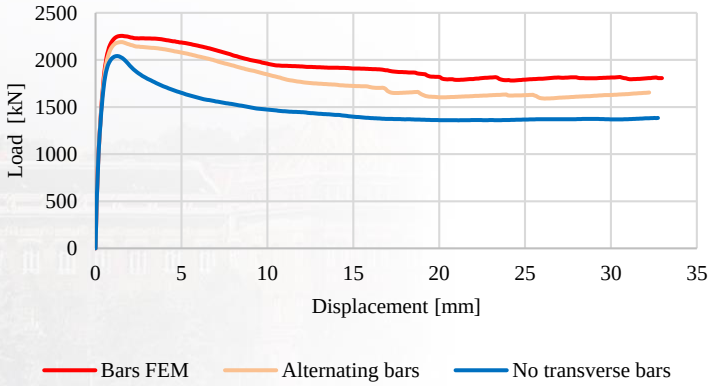

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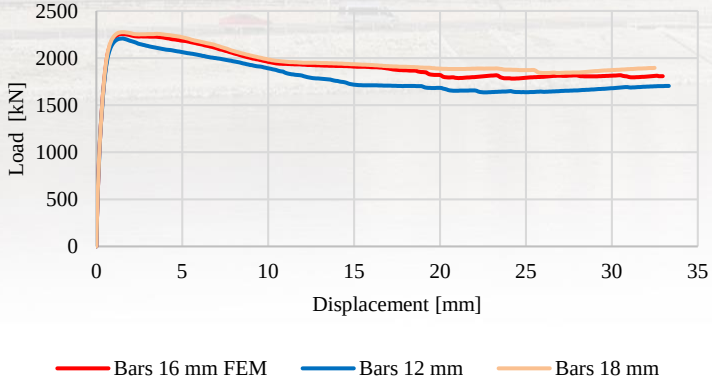

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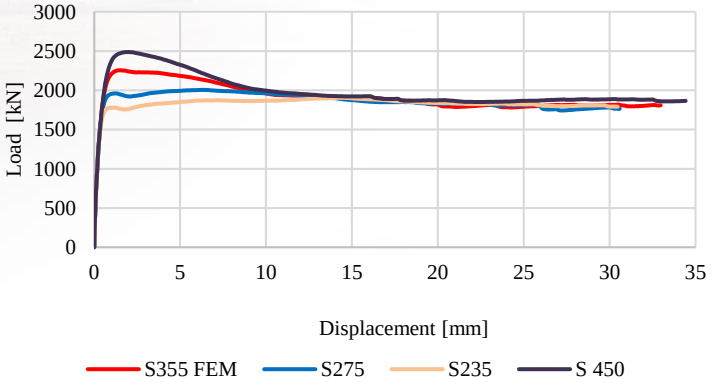

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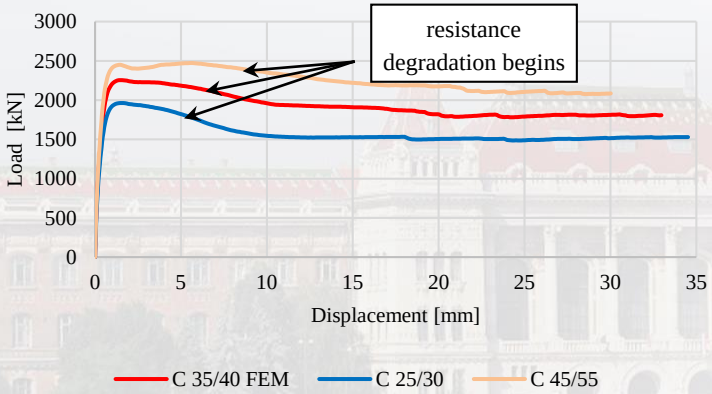

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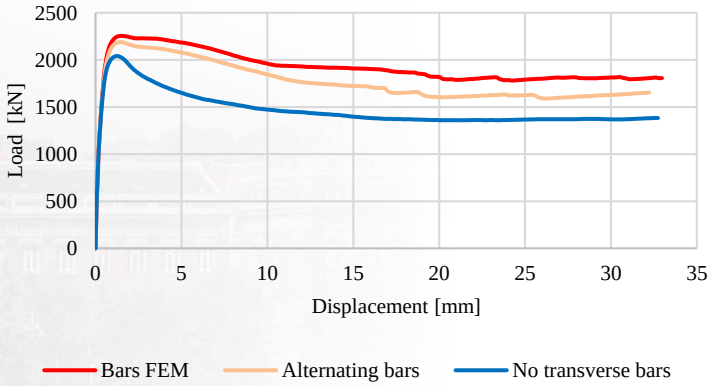

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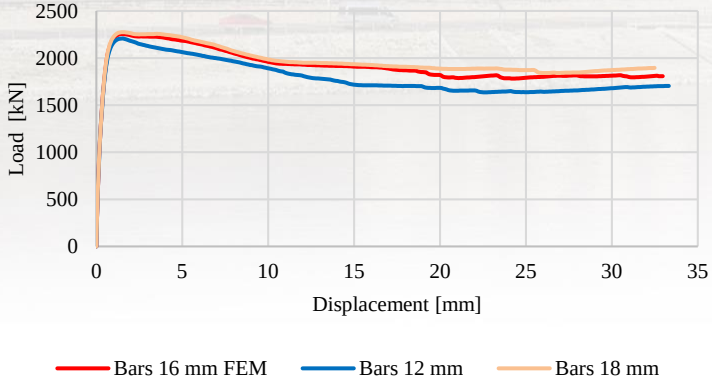

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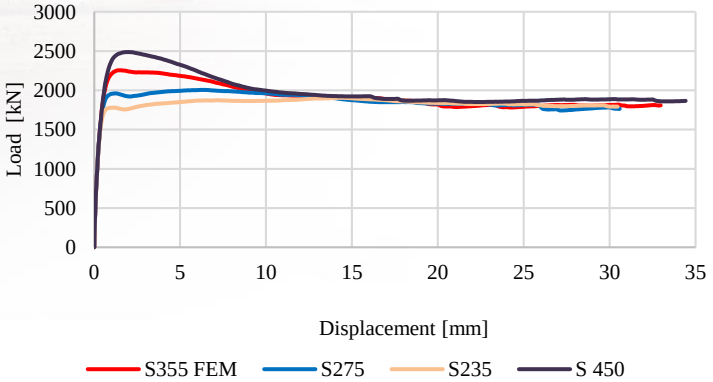

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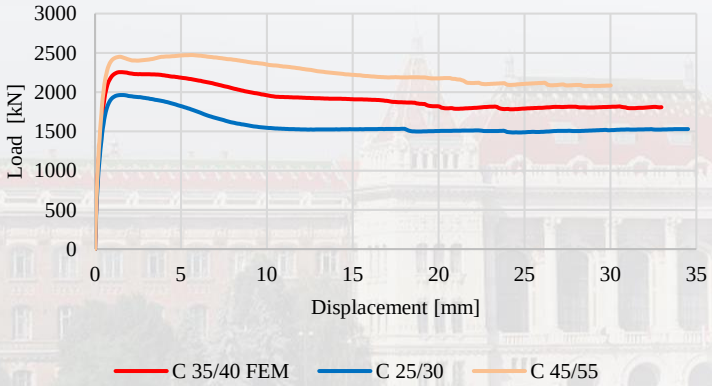

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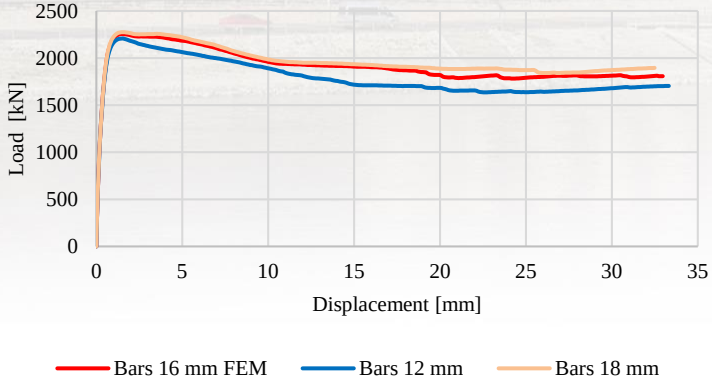

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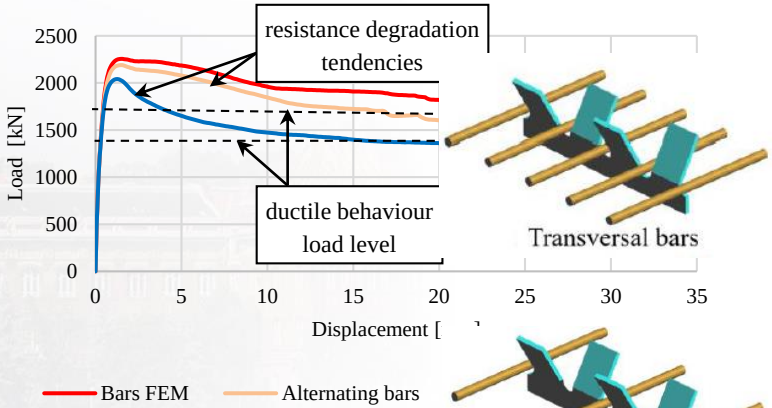
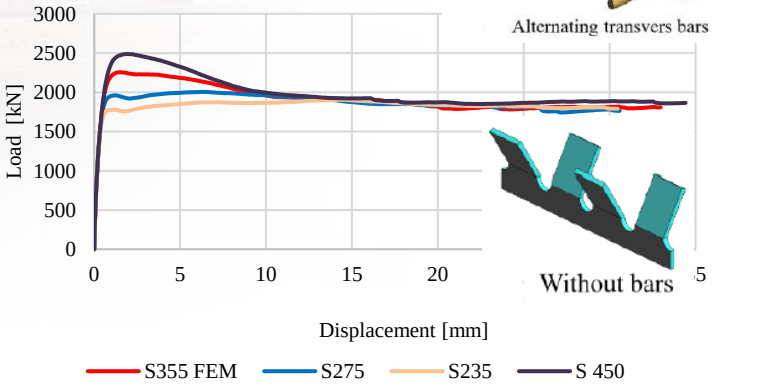


Transverse bars p



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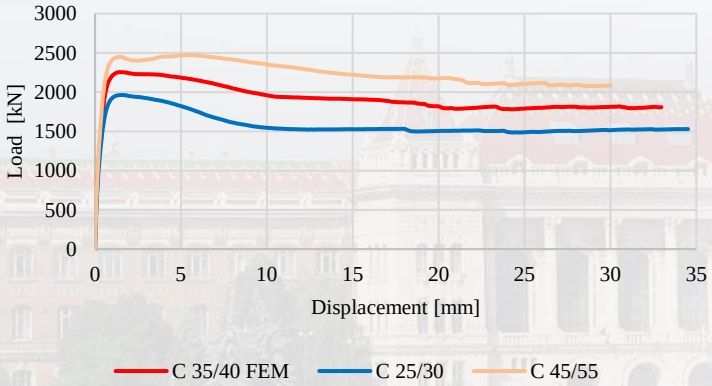
Parametric study



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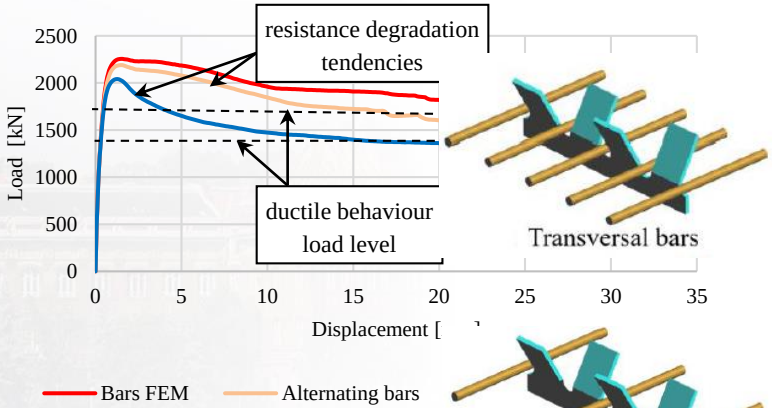

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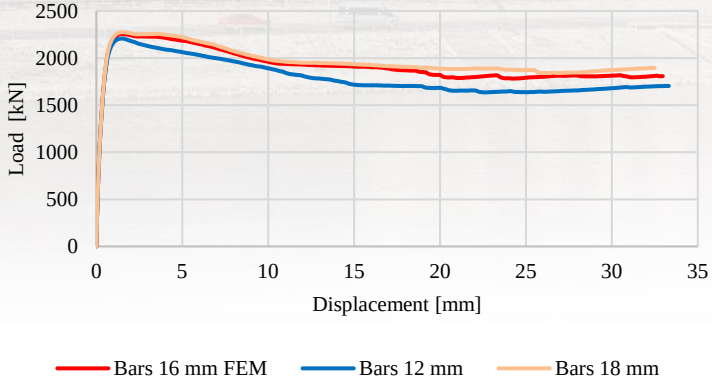

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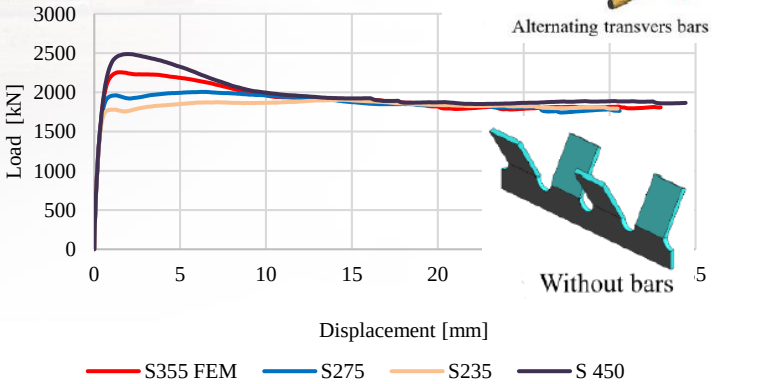

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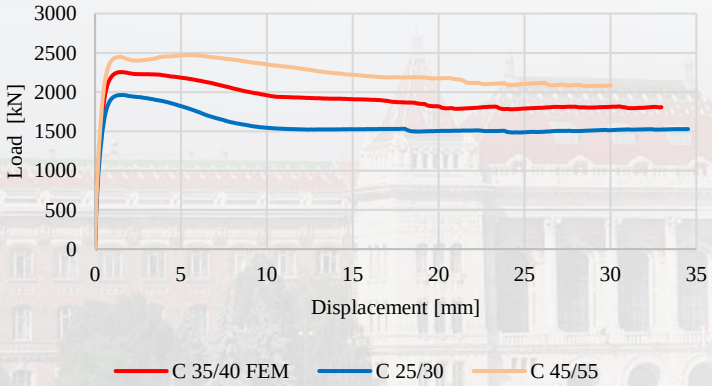

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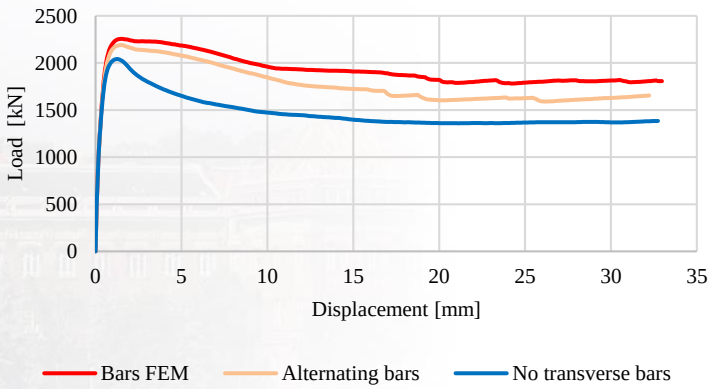
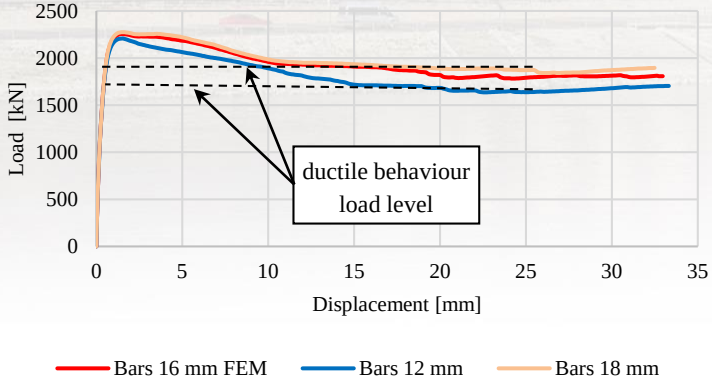


Transverse bars position



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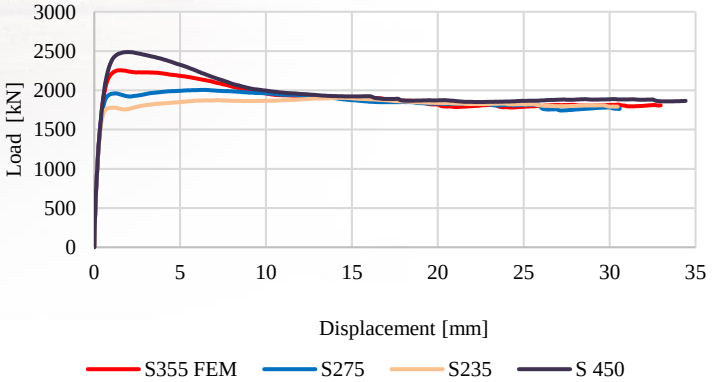
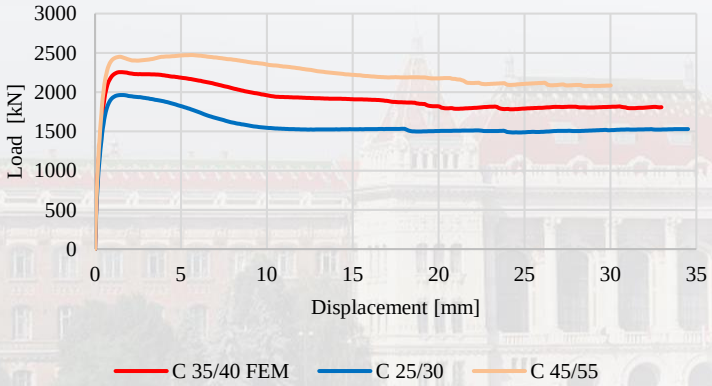


Y type perfobond yield strength

Parametric study



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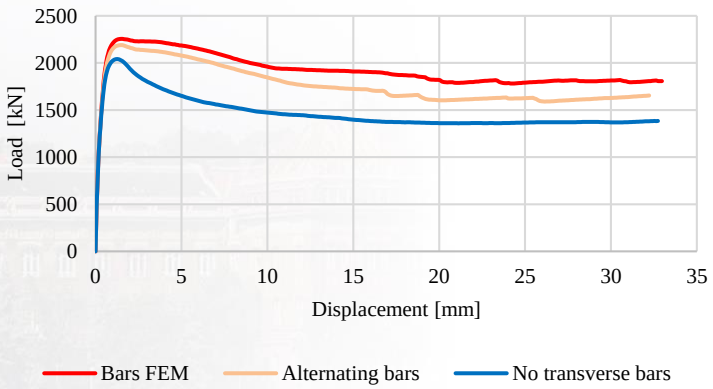

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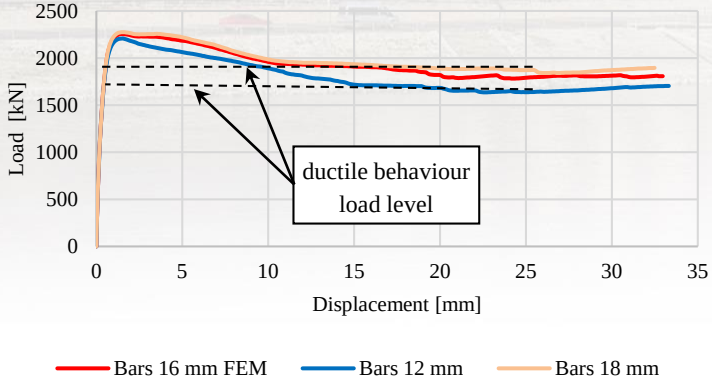

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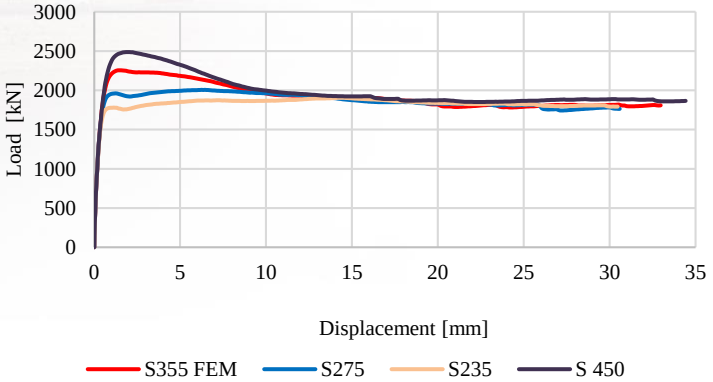

Y type perfobond yield strength

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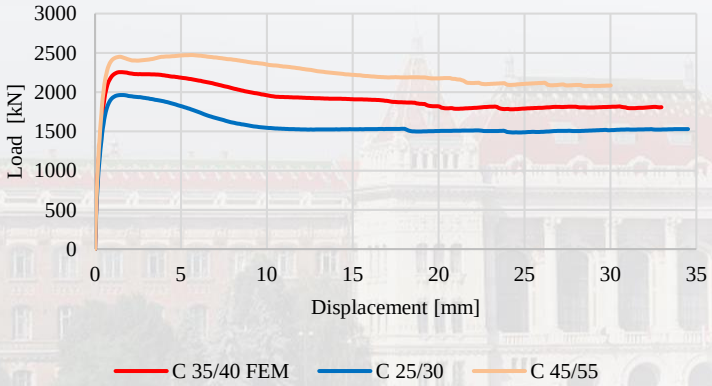

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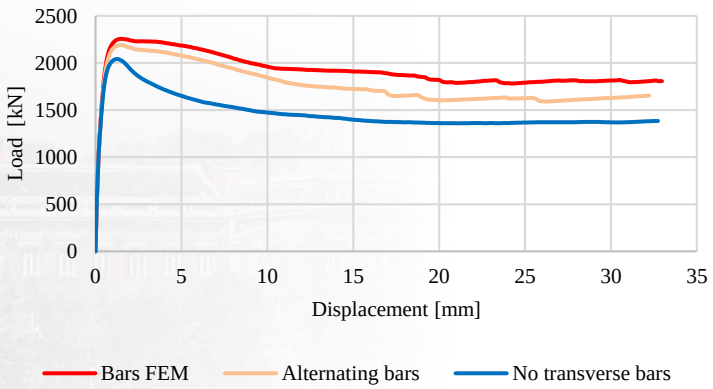

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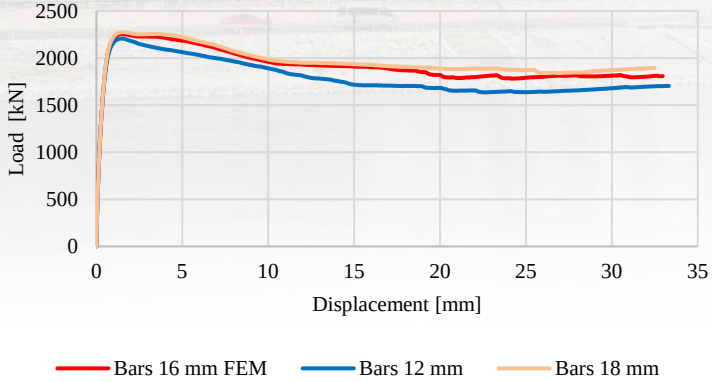

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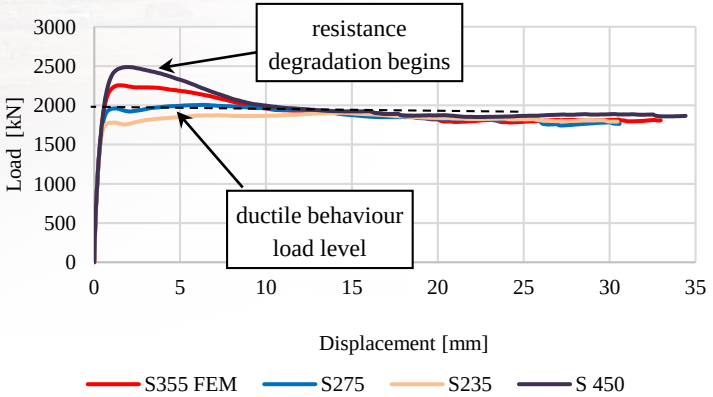
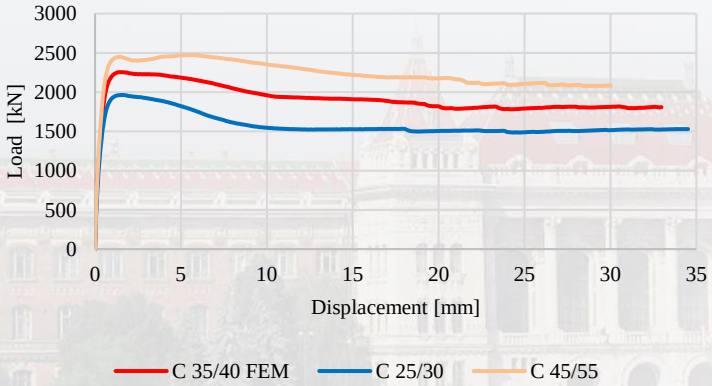


Y type perfobond yield strength

Parametric study



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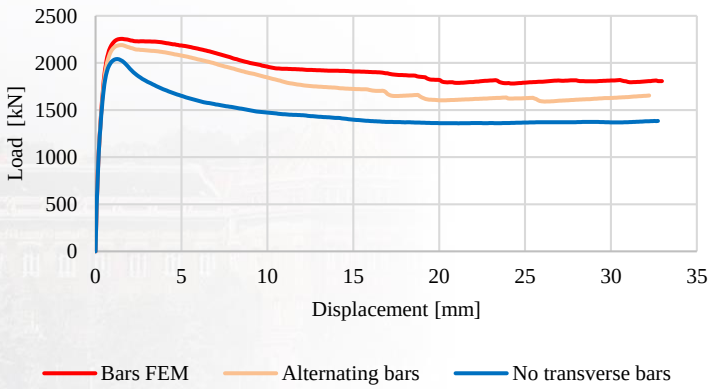

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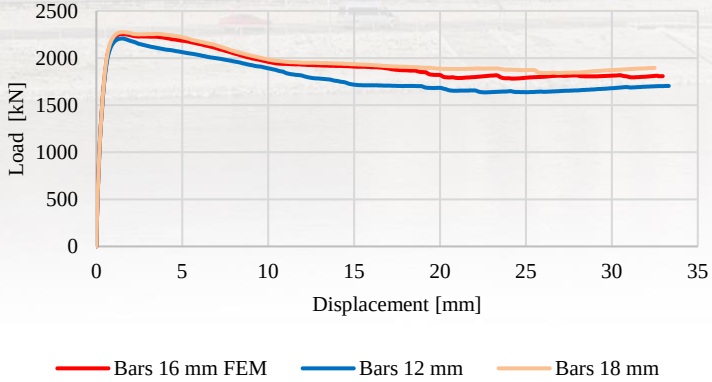

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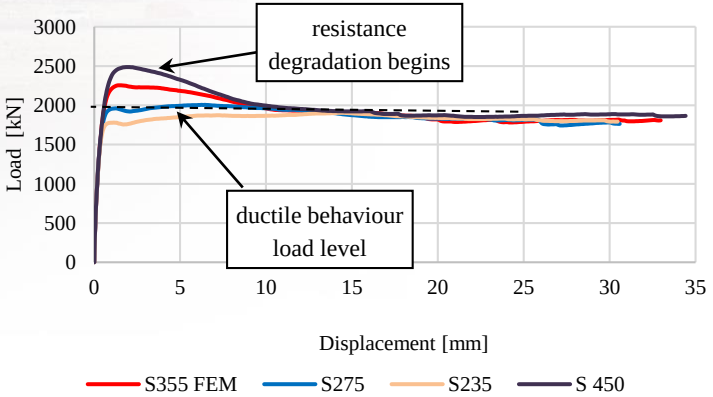
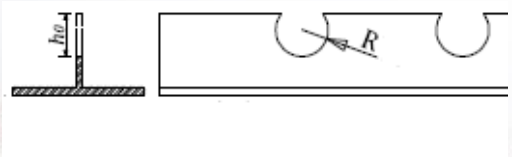
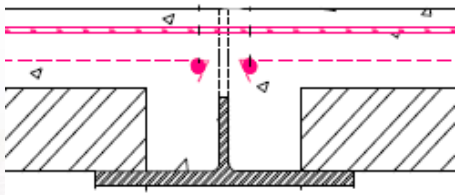


Y type perfobond yield strength

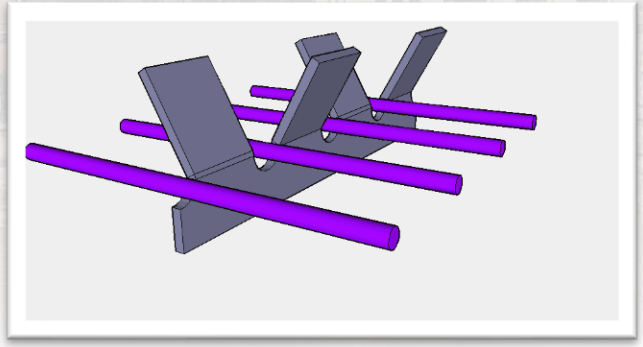
Further studies

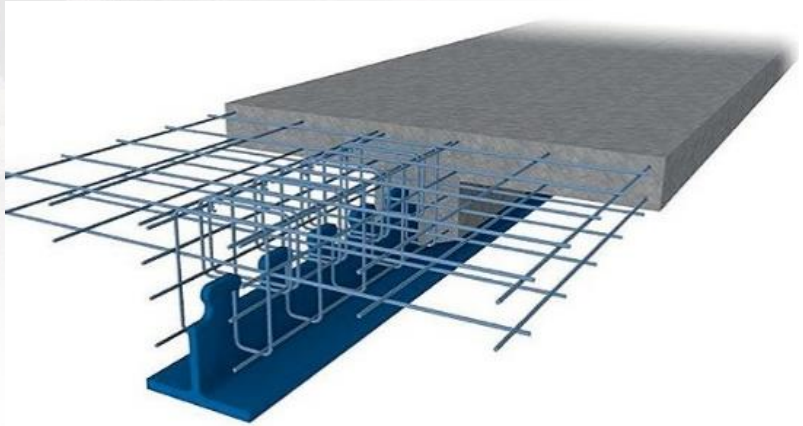
– A parametric study will be also done to check the effect of geometrical and combined parameters, to have a better understanding for the behavior.





– A FE model for a composite slim-floor beam will be developed and validated with an experimental test.





Thank you for you listening