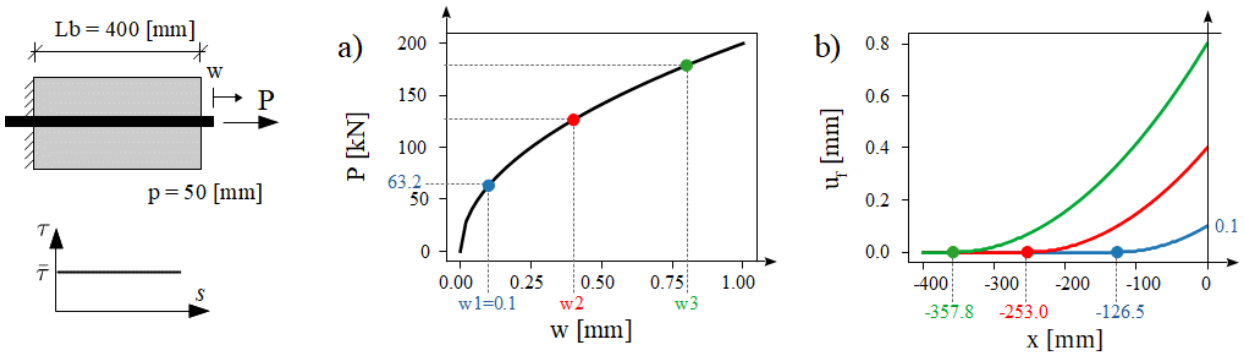
X0201: Pull-out with constant bond-slip law and rigid matrix (PO-ELF-RLM)

For the displayed pull-out test, the pull-out curve and the displacement profiles of the steel rebar at three loading stages are given.
The pull-out response is governed by a constant bod-slip law, and rigid long matrix with elastic long fiber is assumed.



The steel rebar area and stiffness given as: $A_f = 200[mm^2]$, $E_f = 200000[MPa]$.

a) Determine the bond stress (τ) governing the constant bond-slip law.

b) Plot the shear flow profiles at the loading stages w1, w2 and w3.

c) Calculate the pull-out force at the loading stages w2 and w3.

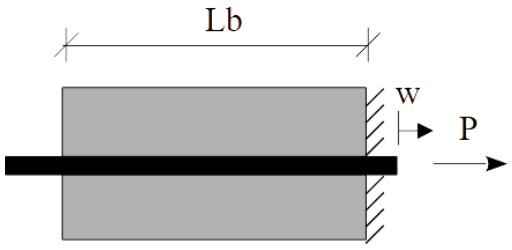
d) Calculate the displacements w2 and w3.

e) Plot strain profiles of the steel rebar at the loading stages w1, w2 and w3.

f) Plot the stress profiles of the steel rebar at the loading stages w1, w2 and w3.

X0202: Pull-out with constant bond-slip law and elastic matrix (PO-ELF-ELM)

For the displayed pull-out test assuming a constant bod-slip law, elastic long matrix and elastic long fiber with the given data:



Steel reinforcement bar:
ds = 16 [mm] ,
E_f = 210000[MPa].
Reinforcement strength fy = 500[MPa]

Concrete matrix:
A_m = 10000[mm^2],
E_m = 30000[MPa].

Bond:
Lb = 10 ds
τ = 8 [MPa]

a) Plot the pull-out response at both the loading and unloading ends.

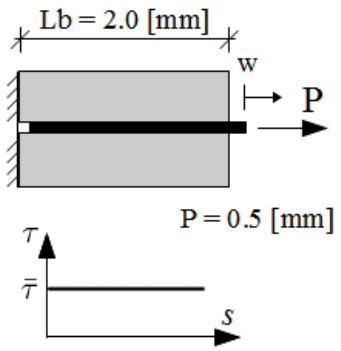
b) Determine the maximum pull-out force that can be achieved.

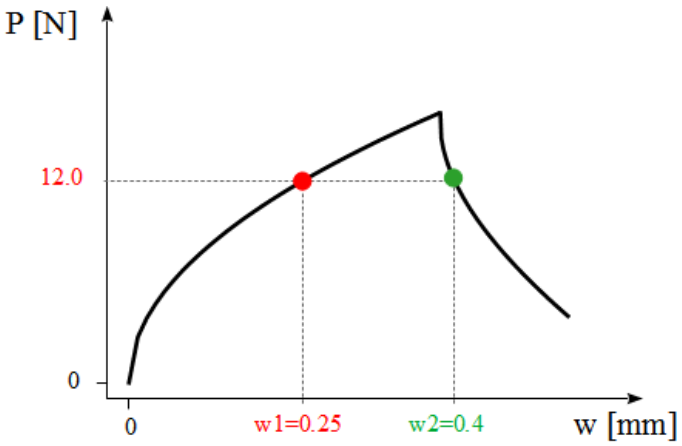
c) How will the specimen fail? is it pull-out or steel rapture failure?

d) If the bond length set to Lb = 20 ds, how will the specimen fail then?

X0203: Pull-out of short fiber with constant bond-slip law (PO-ESF-RLM)

For the displayed pull-out test of a short fiber the pull-out curve is shown.
The pull-out response is governed by a constant bod-slip law, and elastic short fiber with rigid long matrix is assumed.





The bond stress governing the constant bond-slip law: (τ = 15 [MPa]) .

a) Calculate the debonded length (a) at the loading stage w1.

b) Plot the shear flow profile at the loading stages w1 and w2.

c) Qualitatively plot the slip profile at the loading stages w1 and w2.

d) Qualitatively plot the strain profiles of the fiber at the loading stages w1 and w2.