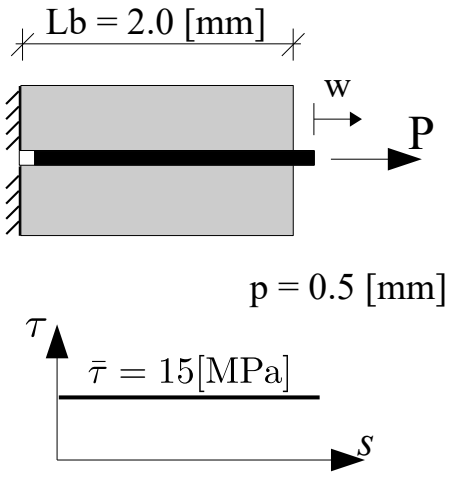
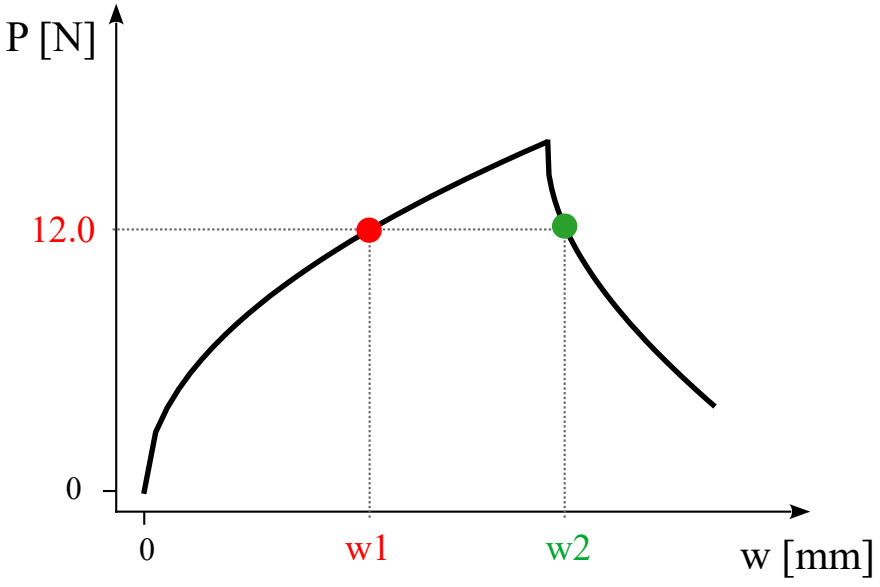
# X0203: Pull-out of short fiber with constant bond-slip law (ESF-RLM)

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 a rigid matrix is assumed.




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.

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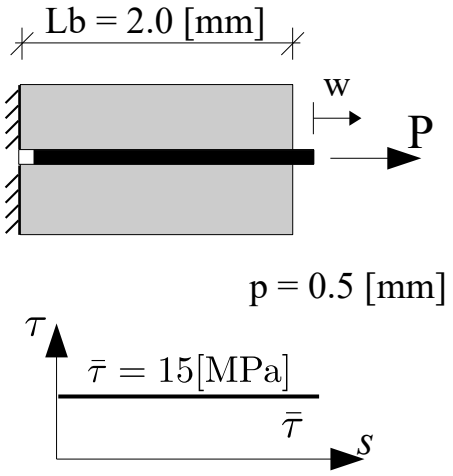
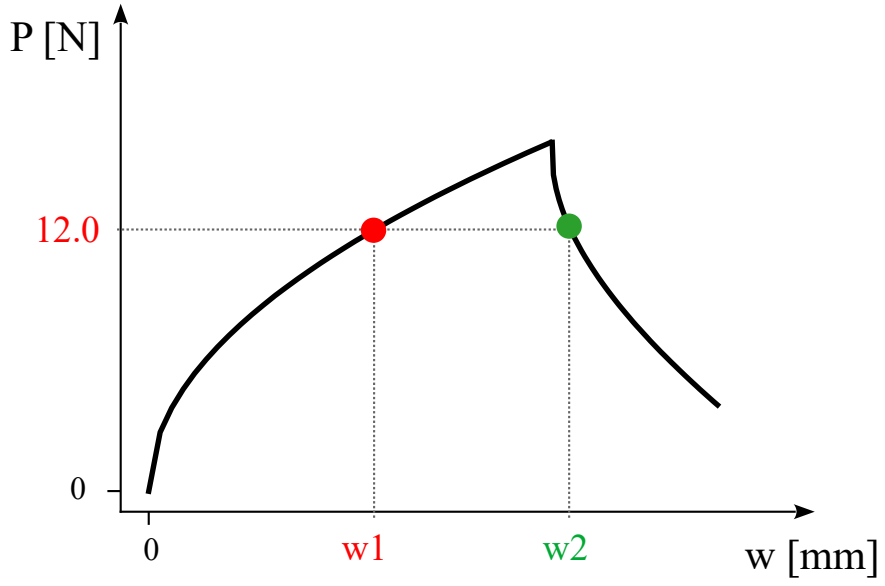



a) Calculate the debonded length (a) at the loading stage w1.

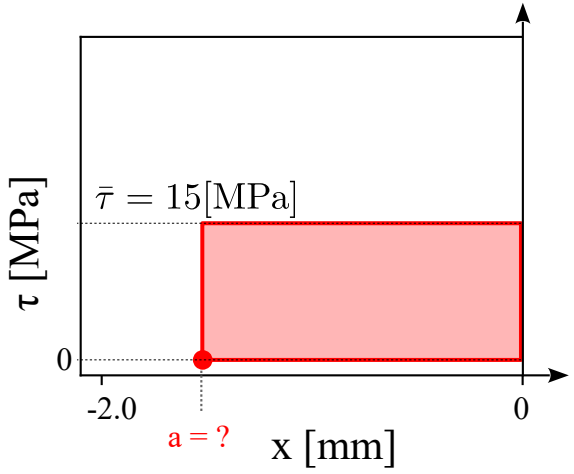
**Solution:**

$$P = \int_0^L p\,\tau(x)\mathrm{d}x$$

$$P(w) = p \times a(w) \times \bar{\tau}$$

at w1: P(w1) = 0.5 x a x 15 = 12.0 N

→ a = 12.0 / (0.5 x 15) = 1.6 mm



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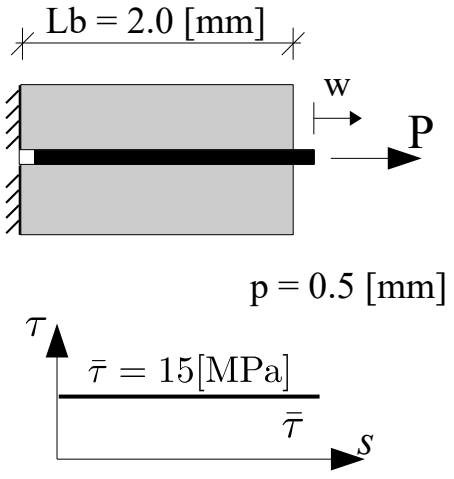
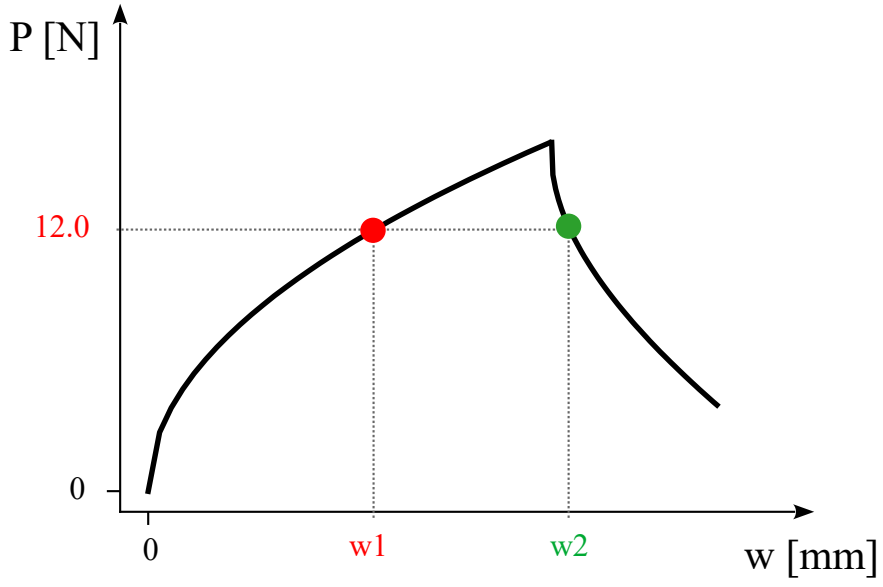


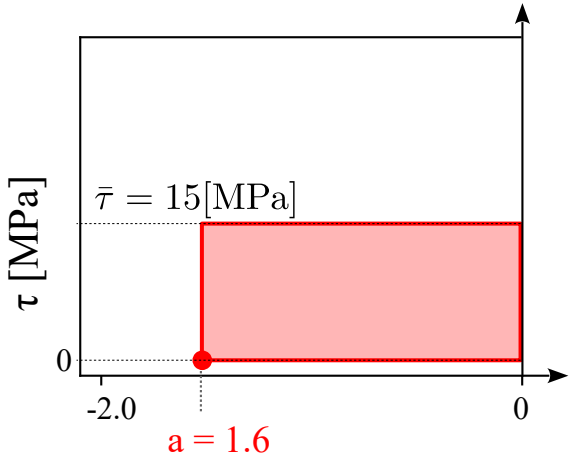



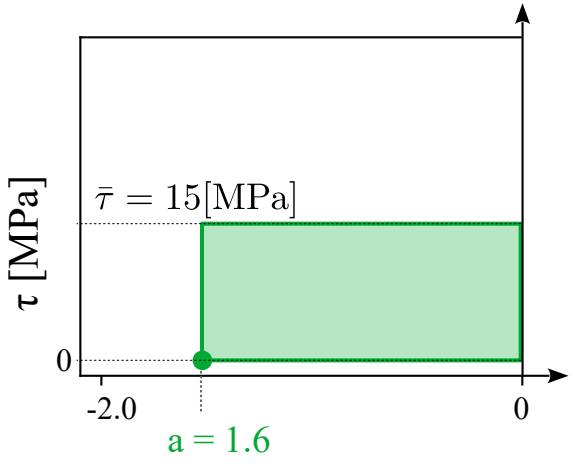

b) Plot the shear flow profiles at the loading stages w1, w2.

**Solution:**

Rigid matrix:

$u_f = s$



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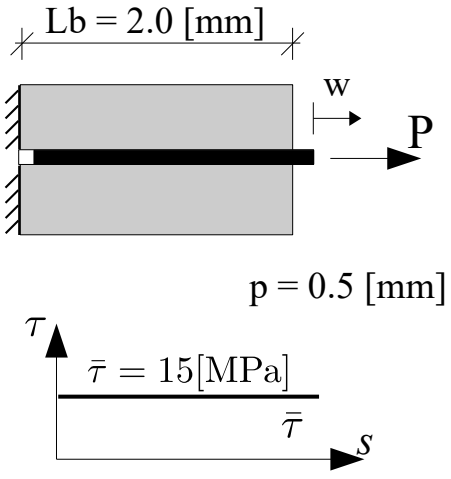
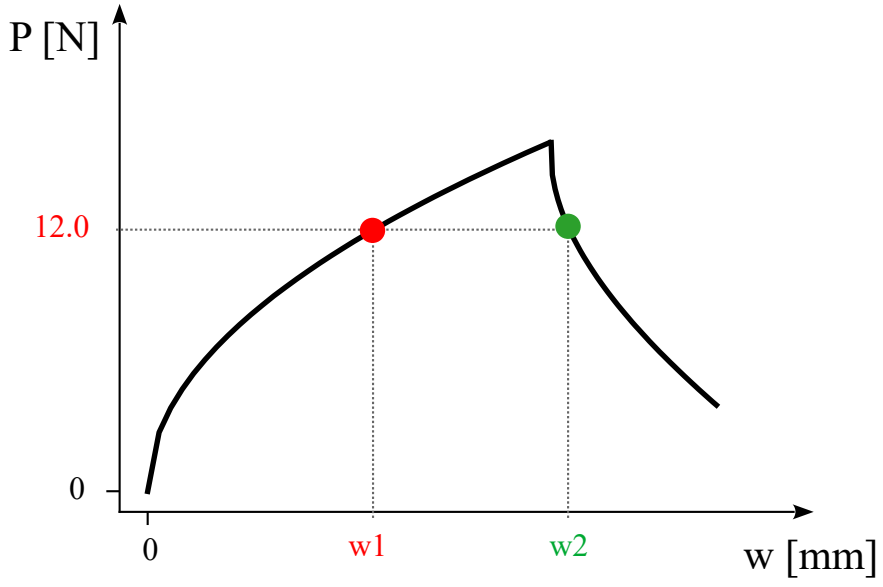
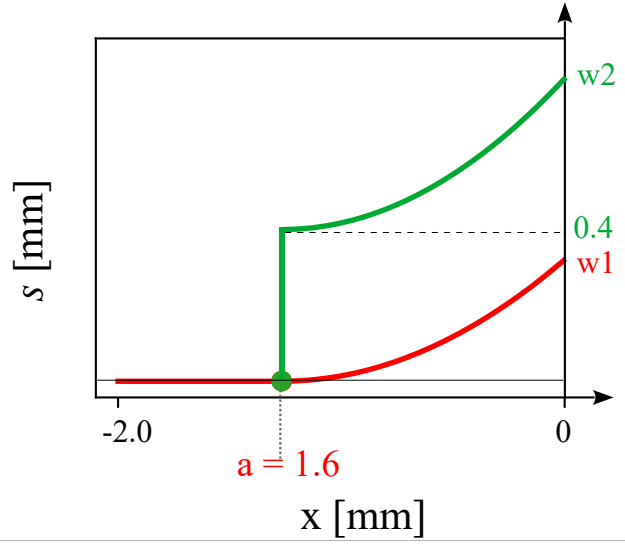



c) Qualitatively plot the slip profile at the loading stages w1 and w2.

**Solution:**



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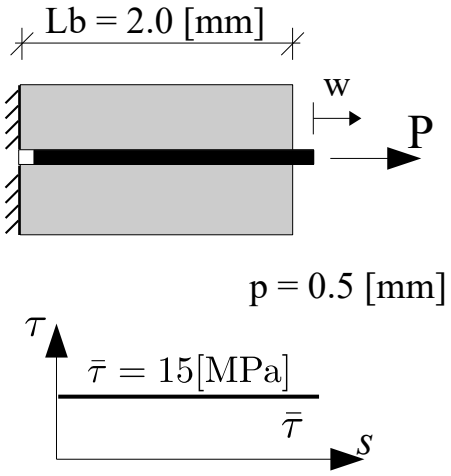
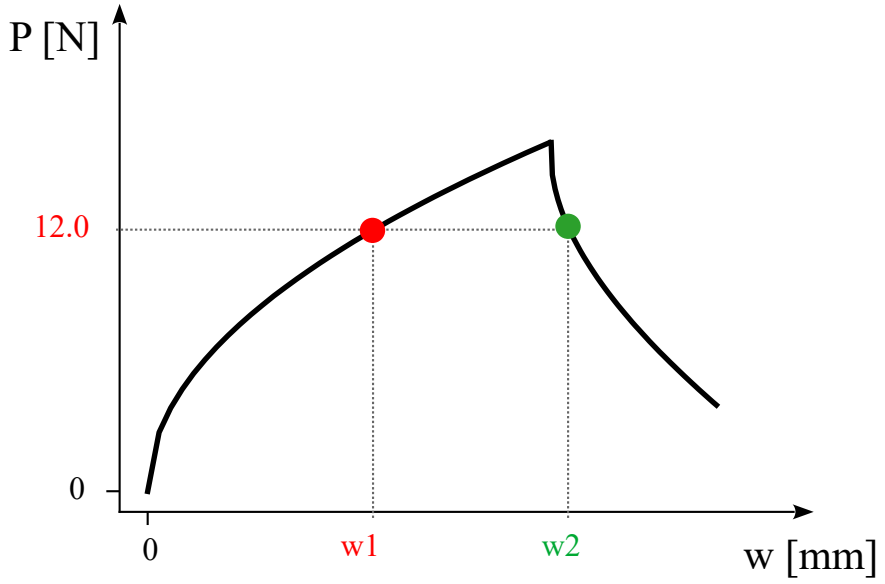
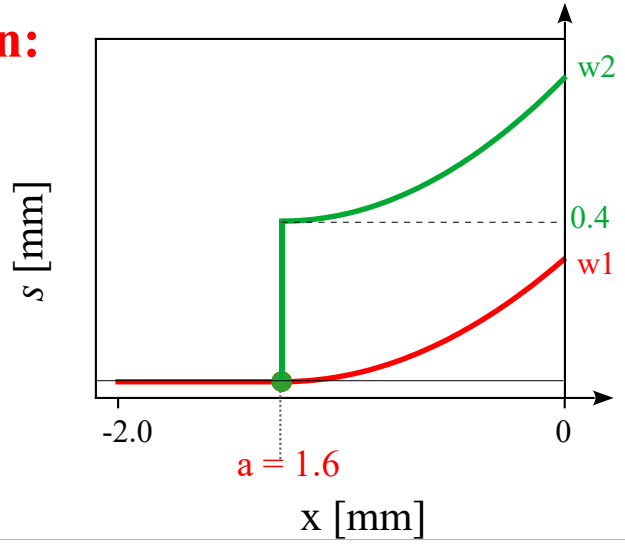



c) Qualitatively plot the strain profile at the loading stages w1 and w2.

**Solution:**




$$w = \frac{1}{2} \times \varepsilon_f(x=0) \times a(w)$$