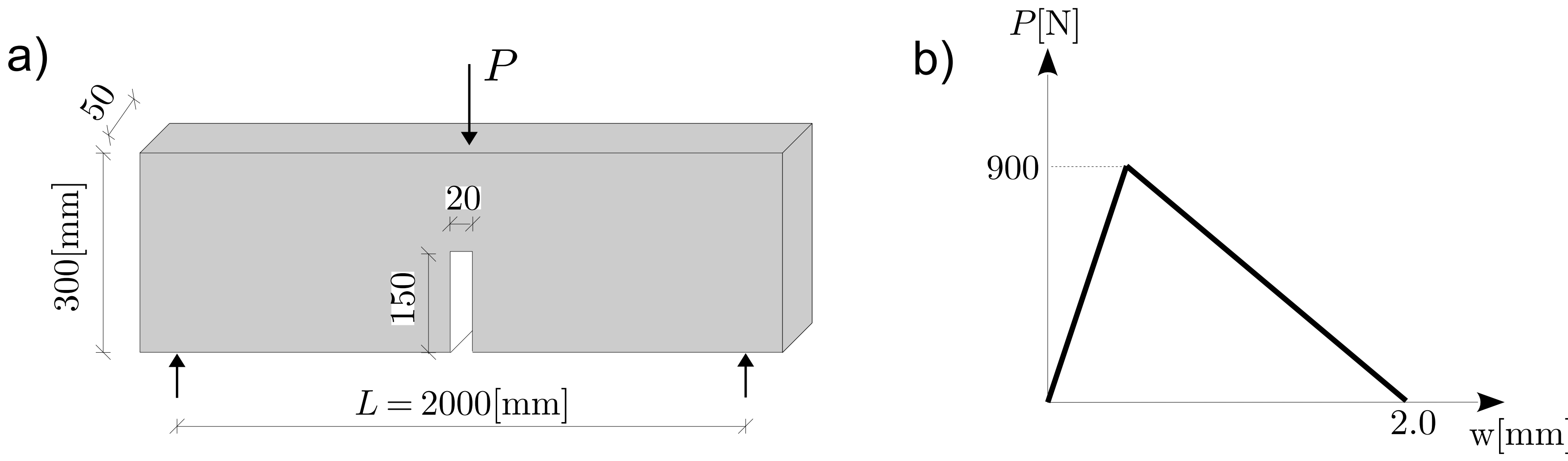
# Identification of fracture energy

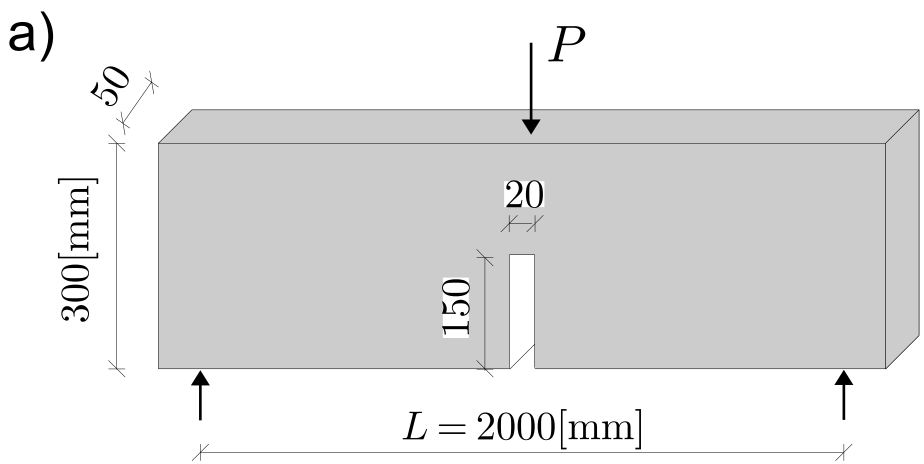
Using the 3-point bending test shown in Fig. a) the load-deflection curve displayed in Fig. b) has been measured.

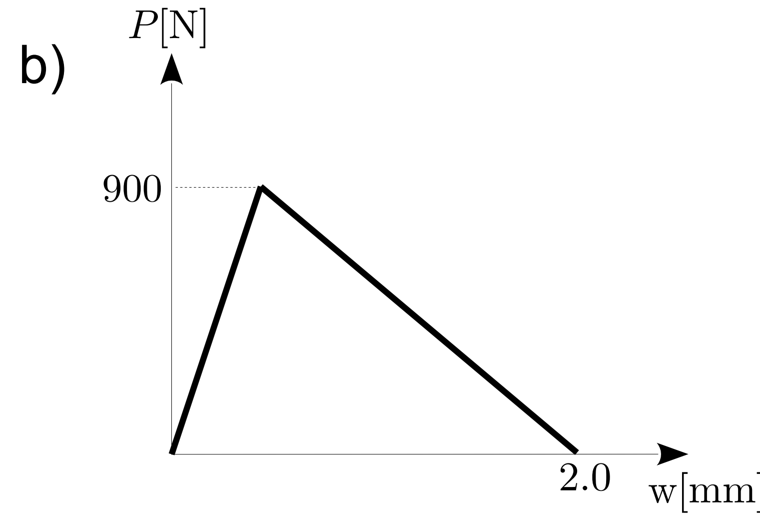



a) Determine the fracture energy $G$f without considering the self-weight.

b) What would be the test response if the fracture energy was twice as large? Plot the response in terms of load deflection curve. Assume that $P_{max}$ does not change.

c) Consider the case that the self-weight of the beam is large so that the specimen experiences load and deflection even before starting the test. Briefly explain the possible remedy to account for self-weight in the evaluation of fracture energy.



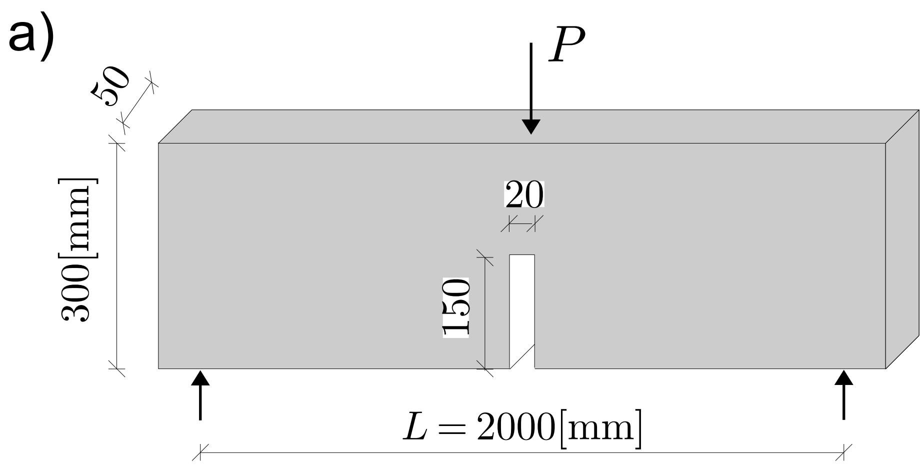



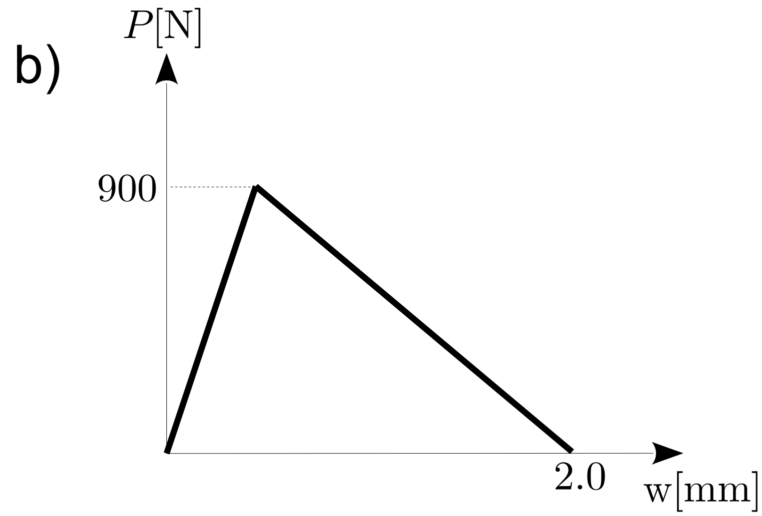

a) Determine the fracture energy $Gf$ without considering the self-weight.

**Solution:**

The fracture energy can be determined as follows:

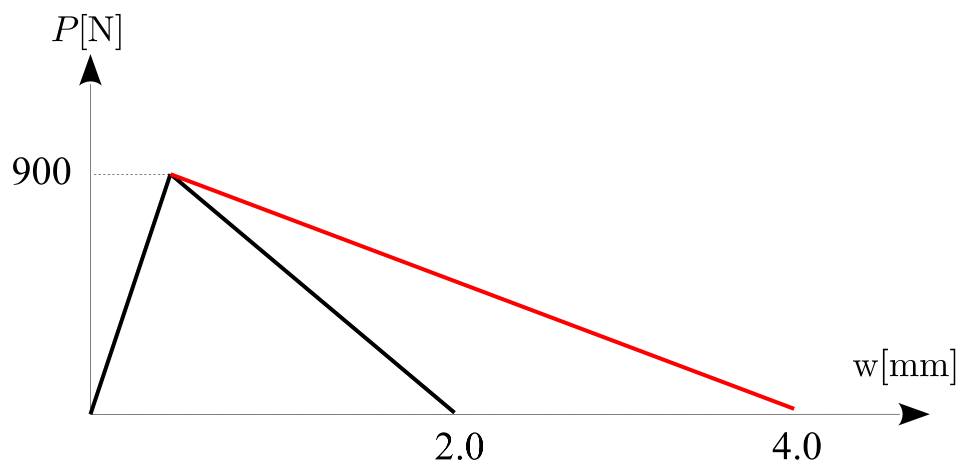
$$\mathrm{G_F} = \frac{W}{b(h-a)} = \frac{\frac{1}{2}.2.900}{50(300-150)} = 0.12\,\mathrm{N/mm}$$




b) What would be the test response if the fracture energy was twice as large? Plot the response in terms of load deflection curve. Assume that $P_{max}$ does not change.

**Solution:**



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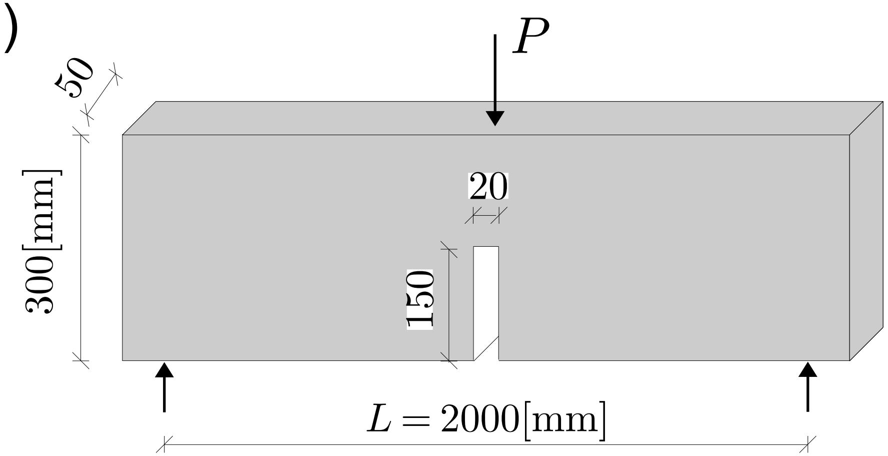
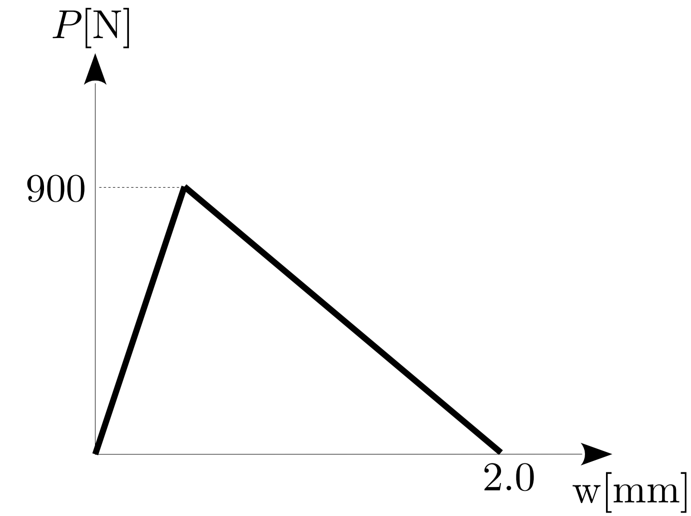
a)

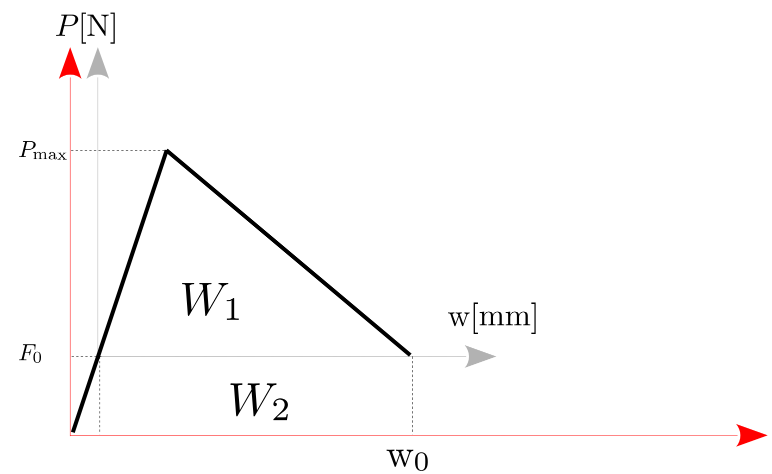



b)




c) Consider the case that the self-weight of the beam is large so that the specimen experiences load and deflection even before starting the test. Briefly explain the possible remedy to account for self-weight in the evaluation of fracture energy.

**Solution:**




A simple remedy has been suggested by Petersson in the form:

$$G_{\mathrm{F}} = \frac{W_1 + mg\ \mathrm{w}_0}{b(h-a)}$$

$mg$ : is the self weight of the beam between the supports.