Simple radial water turbine with inlet and outlet velocity triangles for BP1 (operating Point 1) $d\frac{BP_1}{\wedge D} = 0.1m$, $d = 0.05m$ $b = 0.01m$

a.) Calculate rotational speeds for BP1 & BP2.

use formula $u_1 = \frac{\pi D n_{BP1}}{2}$, $u_2 = \frac{\pi D n_{BP_2}}{2}$

Hint: measure values of u_1 and u_2 in diagramm:
Take 1cm = 1m/s.

b.) Δh_{BP1}: Shovel work for operating point 1 = ?

$\dot{m}_{BP1}$: mass flow rate for BP1 = ?

Now think what idle speed the turbine can reach.

c.) Draw new outlet triangle at idle conditions

d.) Calculate rotational speed n_{idle} = ?

e.) Draw inlet triangle new ?

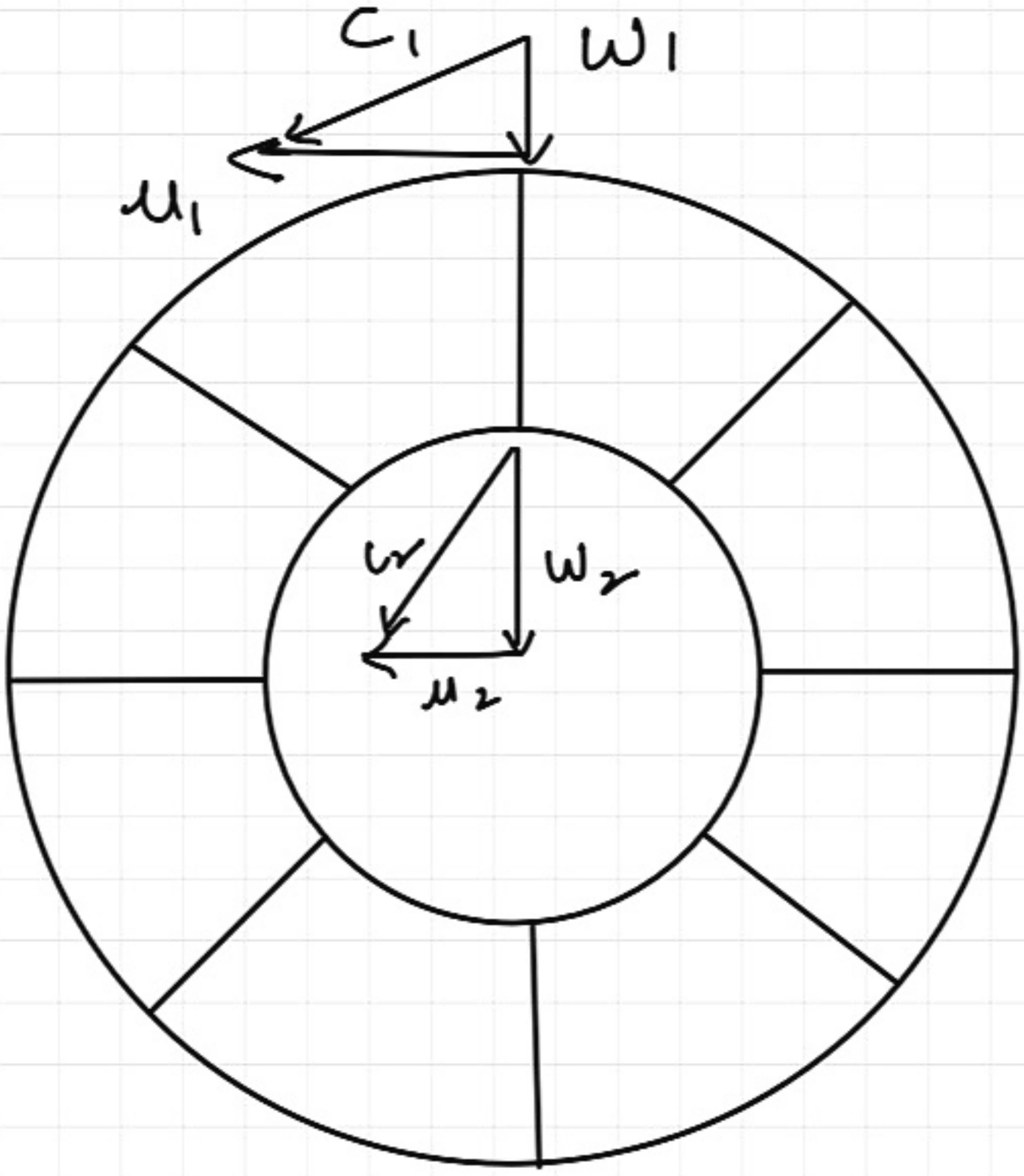
You are now considering how to change the blades of the impeller at the outlet so that you can achieve swirl-free outflow at Operating Point BP1

f.) Draw new outlet triangle

g.) Calculate new angle $\beta_2 = ?$

h.) draw new shovel geometry for $\beta_2 = ?$

[new design of blade according to new relative velocity]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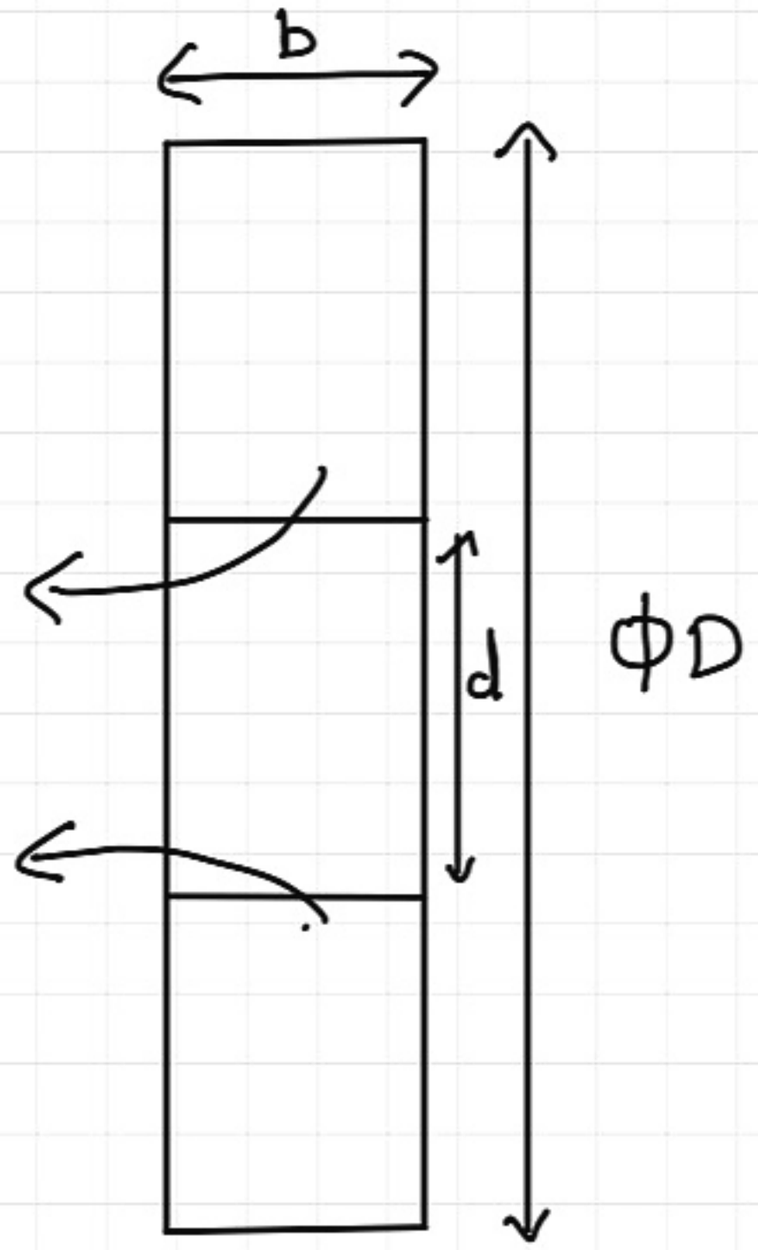
b
d
ϕD