Hydraulic Diameter of Ducts and Channels

Hydraulic diameter of a rectangular duct, an annulus, or a partly full circular pipe from the flow area and wetted perimeter, for Reynolds number and friction.

Method: D_h = 4A/P (Textbook fluid mechanics (White, Fluid Mechanics))

Input parameters

Unit system: SI

Parameter	Value	Unit
Cross-section	Rectangle a × b, full	
Width a, outer diameter D	400.00	mm
Height b, inner diameter d, or depth h	200.00	mm

Calculated results

Parameter	Value	Unit
Flow area	0.080000	m²
Wetted perimeter	1.2000	m
Hydraulic diameter 4A/P	266.67	mm

Notes for this case

- For the partly full pipe only the wetted arc counts (open channel); the free surface is not part of the perimeter.

Formula and method

$$D_h = \frac{4A}{P_w}$$

Variables

shape	Cross-section	-
a	Width a, outer diameter D	m
b	Height b, inner diameter d, or depth h	m
A	Flow area	m²
P_w	Wetted perimeter	m
D_h	Hydraulic diameter 4A/P	m

Method and standards

Definition.

Assumptions and limits

- Uniform cross-section.

References

- D_h = 4A/P (Textbook fluid mechanics (White, Fluid Mechanics))

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/fluid-mechanics/hydraulic-diameter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.