



Figure 1. (a) Circular cross-section of a pipe with a hole partially filled with a material of different properties. (b) Circular cross-section of a pipe with a hole completely filled with a material of different properties.

where ρ is the mass density of the pipe material.

For a pipe with a hole partially filled with a material of different properties

the mass density of the pipe material is given by

$$\rho = \frac{m}{V} = \frac{m}{\pi(R^2 - r^2)L} \quad (1)$$

where m is the mass of the pipe, V is the volume of the pipe, R is the outer radius, r is the inner radius, and L is the length of the pipe.

For a pipe with a hole completely filled with a material of different properties

the mass density of the pipe material is given by

$$\rho = \frac{m}{V} = \frac{m}{\pi(R^2 - r^2)L} \quad (2)$$

where m is the mass of the pipe, V is the volume of the pipe, R is the outer radius, r is the inner radius, and L is the length of the pipe.

For a pipe with a hole partially filled with a material of different properties

the mass density of the pipe material is given by

$$\rho = \frac{m}{V} = \frac{m}{\pi(R^2 - r^2)L} \quad (3)$$

where m is the mass of the pipe, V is the volume of the pipe, R is the outer radius, r is the inner radius, and L is the length of the pipe.

For a pipe with a hole completely filled with a material of different properties

the mass density of the pipe material is given by

$$\rho = \frac{m}{V} = \frac{m}{\pi(R^2 - r^2)L} \quad (4)$$

where m is the mass of the pipe, V is the volume of the pipe, R is the outer radius, r is the inner radius, and L is the length of the pipe.

For a pipe with a hole partially filled with a material of different properties

the mass density of the pipe material is given by

$$\rho = \frac{m}{V} = \frac{m}{\pi(R^2 - r^2)L} \quad (5)$$

where m is the mass of the pipe, V is the volume of the pipe, R is the outer radius, r is the inner radius, and L is the length of the pipe.