ENSC 2113
Engineering Mechanics: Statics

Lecture 15
Section 4.9

College of Engineering, Architecture & Technology

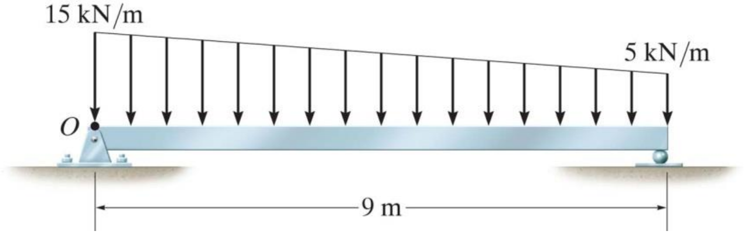
4.9: Reduction of a Simple Distributed Loading

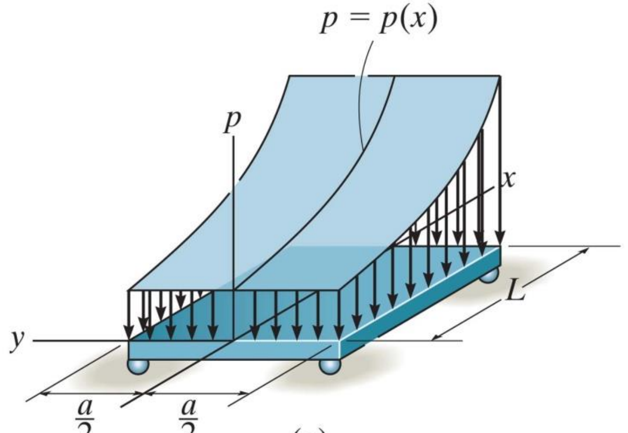
Distributed loads are commonly caused by:

Wind

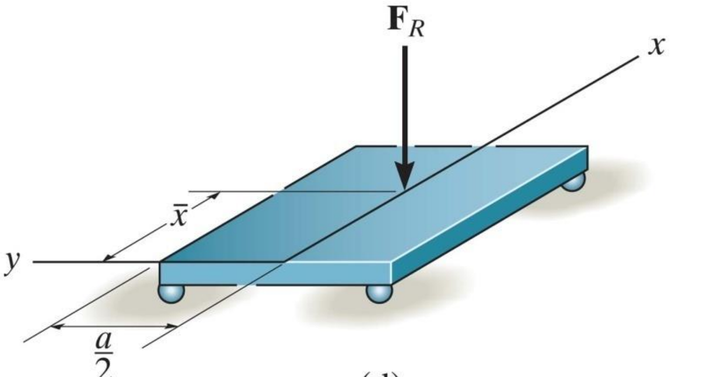
Fluid

Weight of construction materials





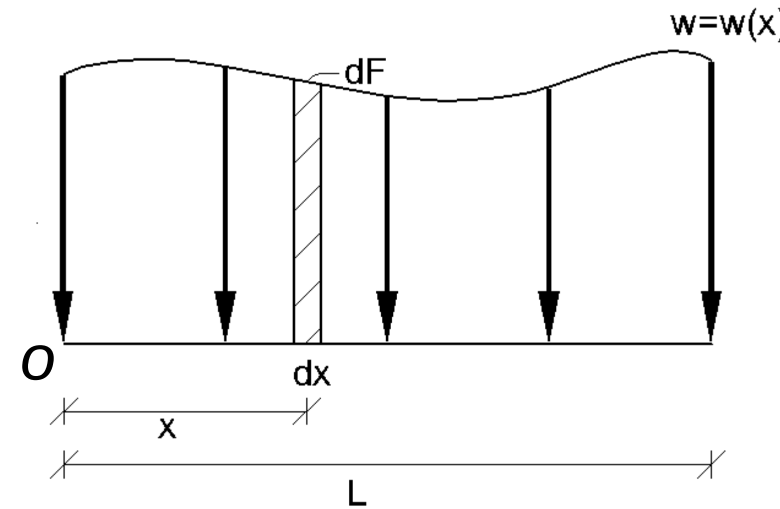
(a)



(d)

Simplify distributed load to a Resultant Force

For a given distributed load, find the equivalent force and its location:



Resultant force, ***R***:

$$R = \int_L w(x)\,dx = \int_A dA$$

Moment about point ***O***:

$$\sum M_O = \int_L x\,w(x)\,dx = \int_A x\,dA$$

Once found, we can locate the resultant force using eqn:

$$\bar{x}R = \sum M_O$$

$$\bar{x} = \frac{\sum M_O}{R} = \frac{\int_A x\,dA}{\int_A dA}$$

<u>Note</u>: Distributed loads on structures typically consist of common geometric shapes

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