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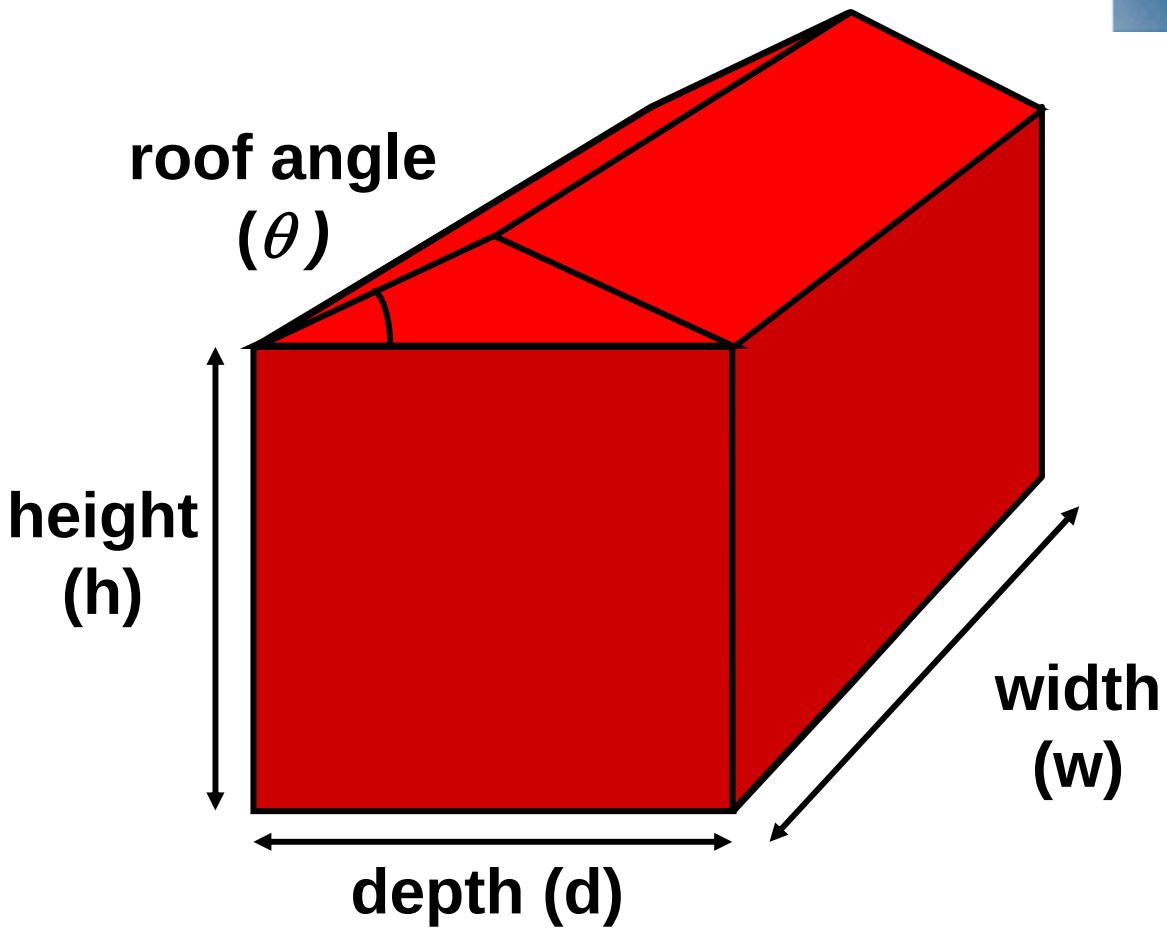

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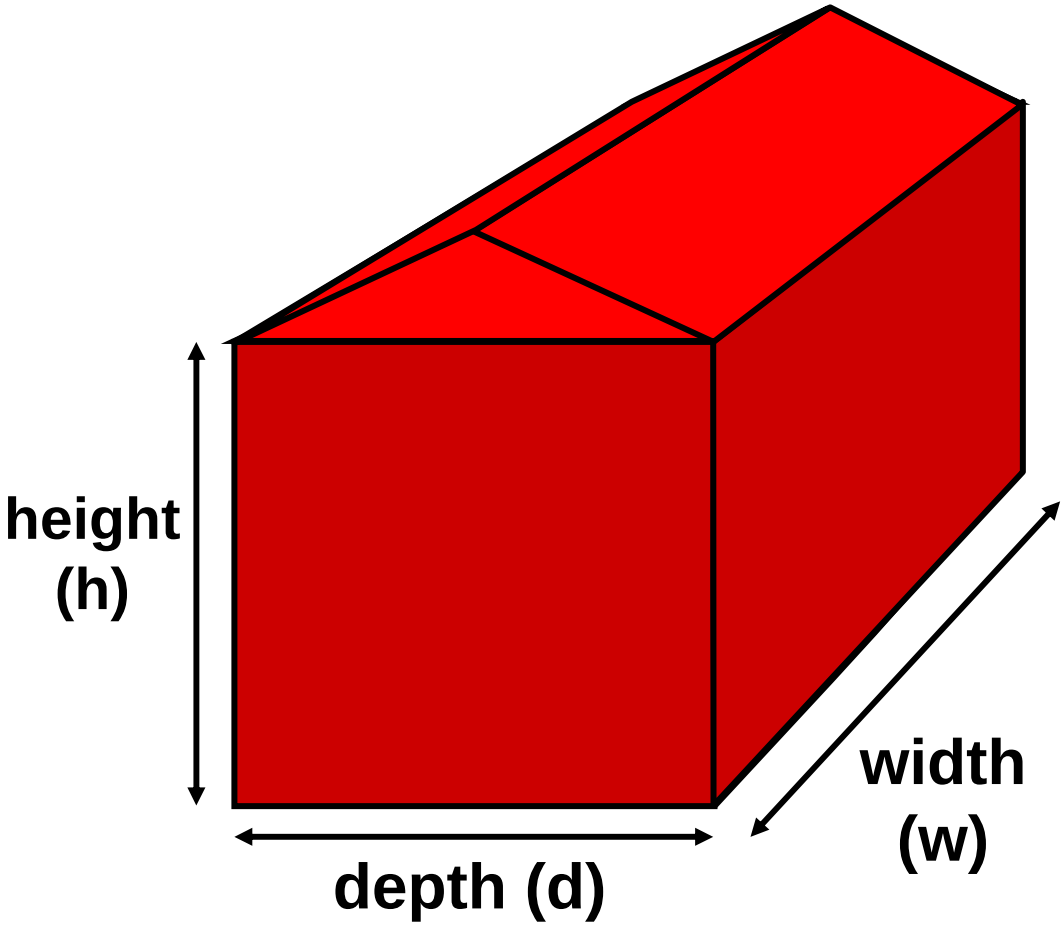

Cold roof, i.e. insulation above ceiling of upper storey

Floor area: width by depth = *wd* m^2

Roof area - same as floor area: width by depth = *wd* m^2

Wall area: perimeter by height = *2(w+d)h* m^2

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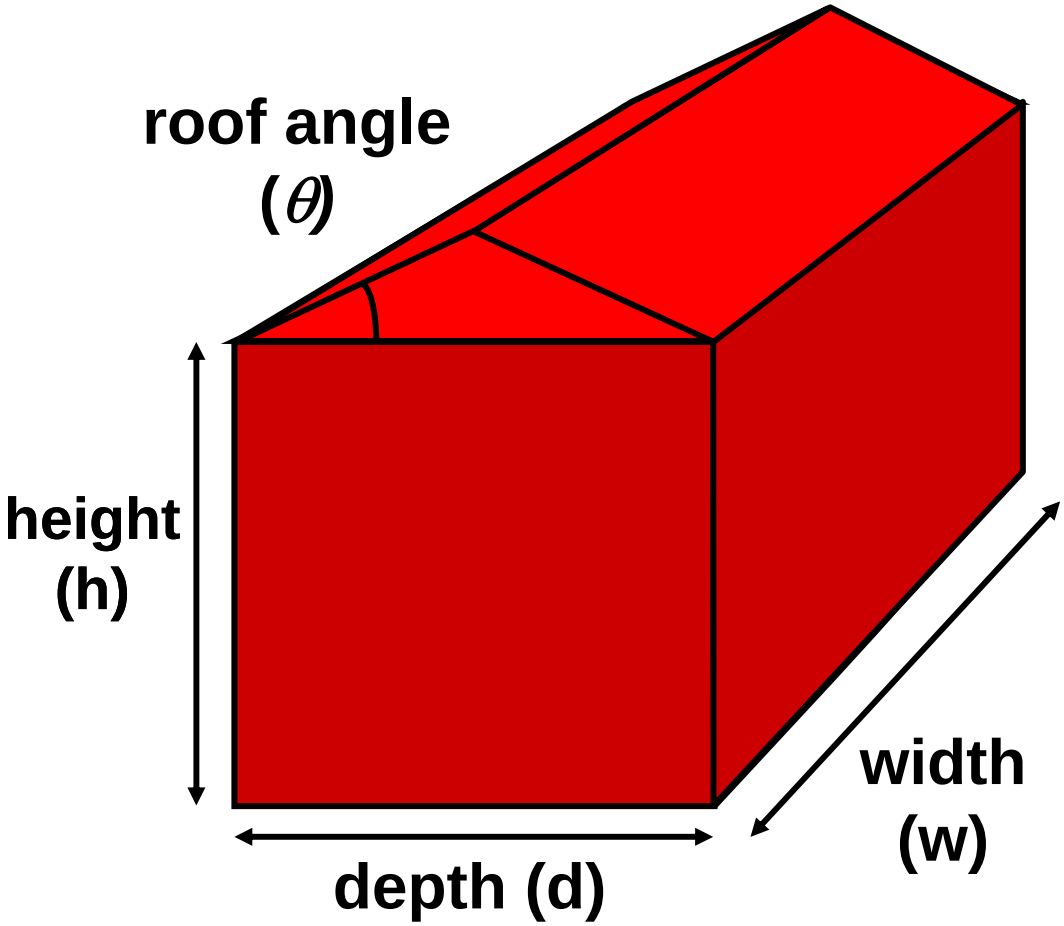

Warm roof, i.e. insulation along underside of pitched roof

Floor area: width by depth = *wd* m^2

Roof area: width by depth over cosθ = *wd/cosθ* m^2

Wall area: perimeter by height, plus gable ends = *2(w+d)h + ½dd tanθ* m^2

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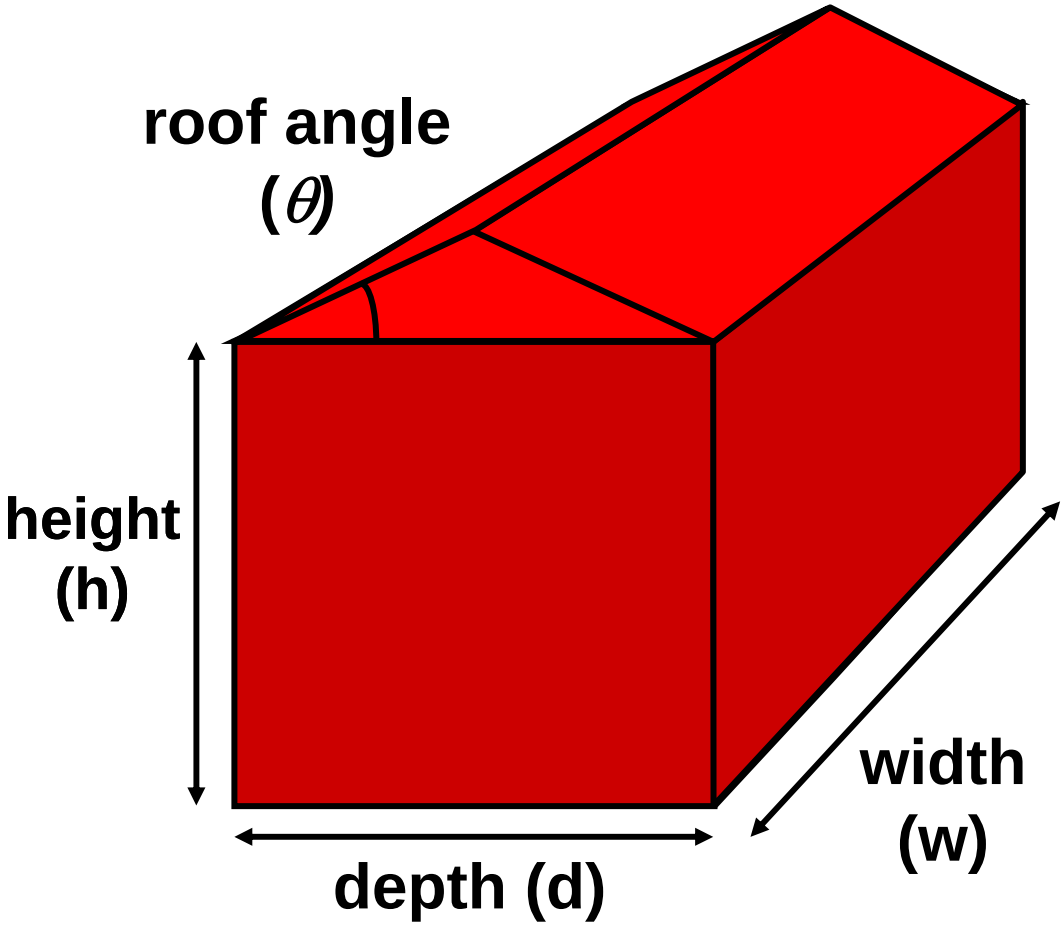

Total surface area (cold roof):

$= 2wd + 2(w+d)h\ m^2$

Total surface area (warm roof):

$= wd + 2(w+d)h + wd/\cos\theta + \frac{1}{2}dd\tan\theta\ m^2$

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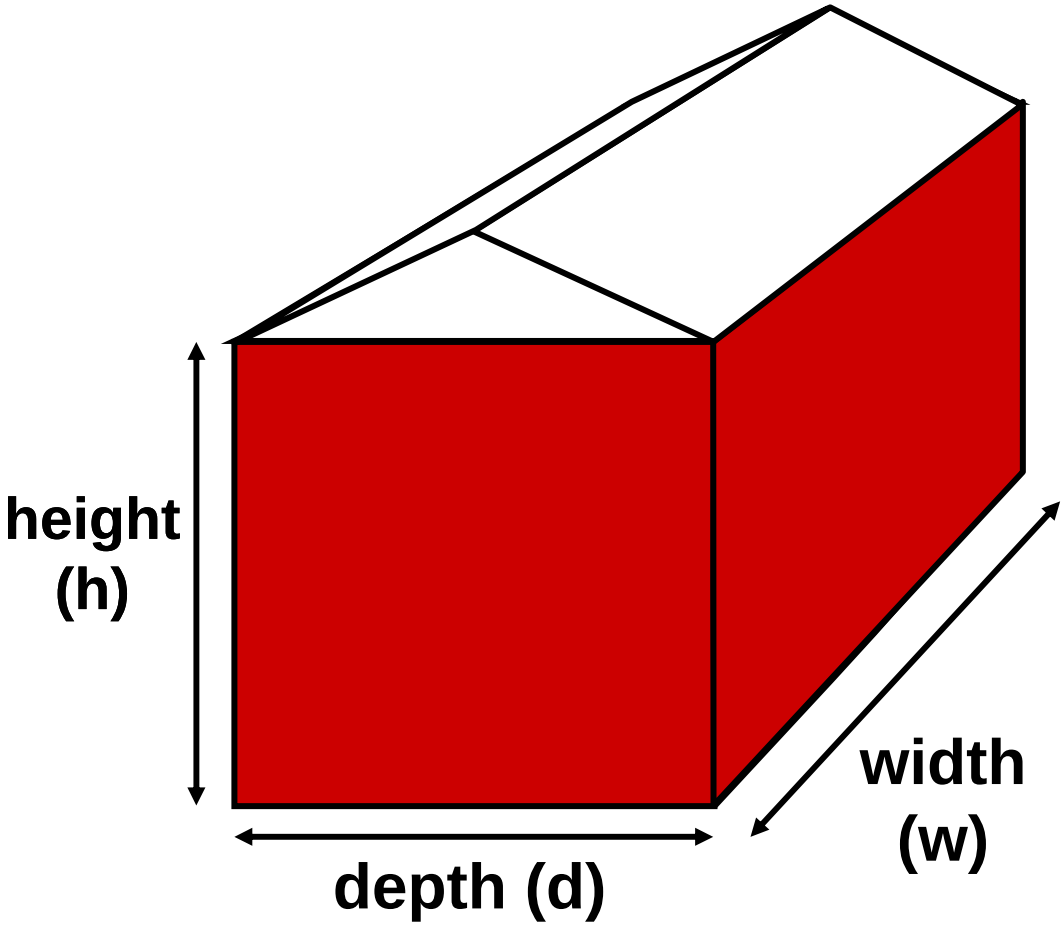

Example (cold roof):

width (w) = 50 m

depth (d) = 30 m

height (h) = 15 m

Total surface area:

$= 2wd + 2(w+d)h\ m^2$

$= 2 \times 50 \times 30 + 2 \times (50 + 30) \times 15$

$= 3000 + 2400 = 5400\ m^2$

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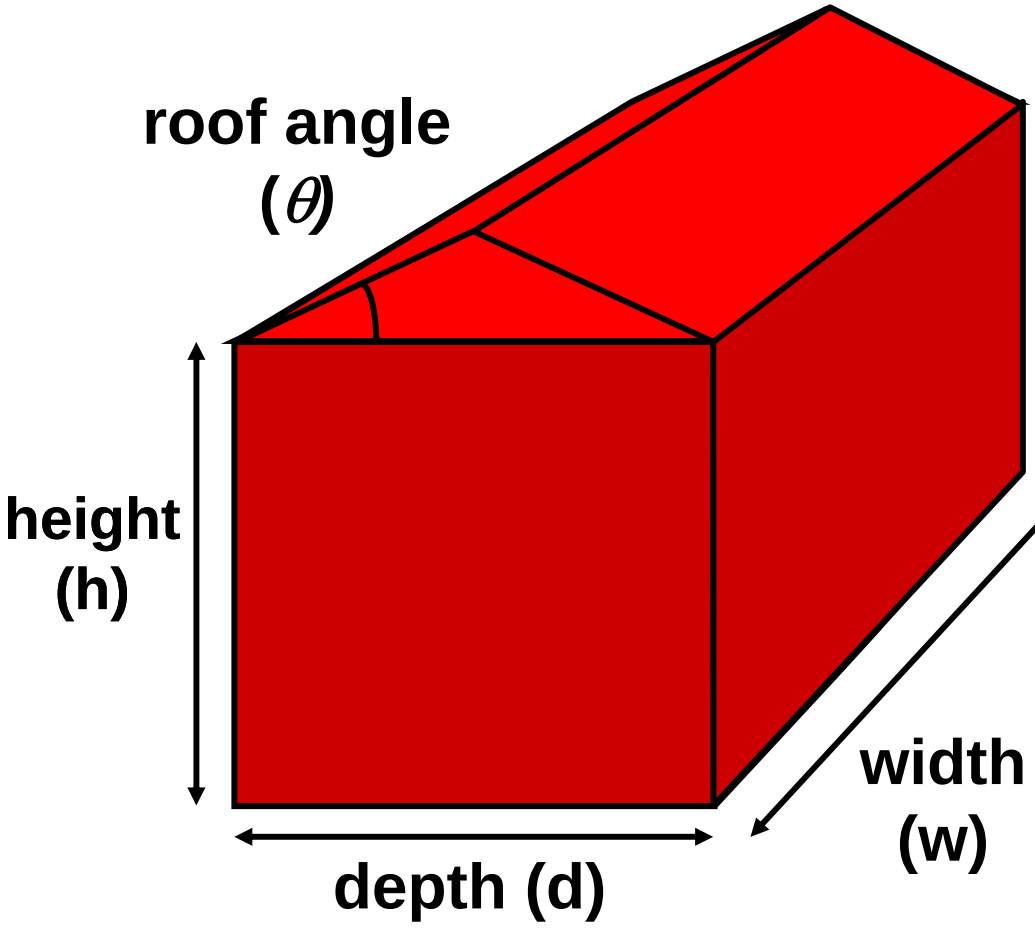

Example (warm roof):

Width (w) = 50 m; depth (d) = 30 m

height (h) = 15 m; roof angle (θ)=20°

Total surface area (warm roof):

$= wd + 2(w+d)h + wd/\cos\theta + \frac{1}{2} dd \tan\theta \ m^2$

$= 50 \times 30 + 2 \times(50 + 30) \times 15 + 50 \times 30/\cos 20^{o} + 15 \times 30 \times \tan 20^{o}$

$= 1500 + 2400 + 1500/0.940 + 450 \times 0.364 = 5660 \ m^2$

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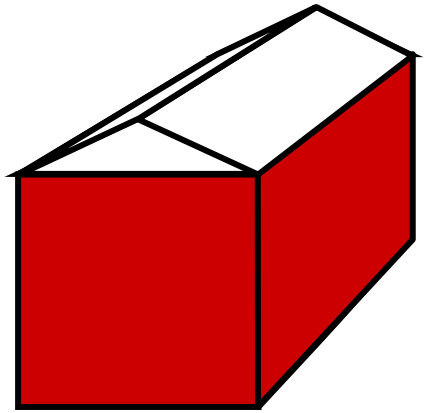

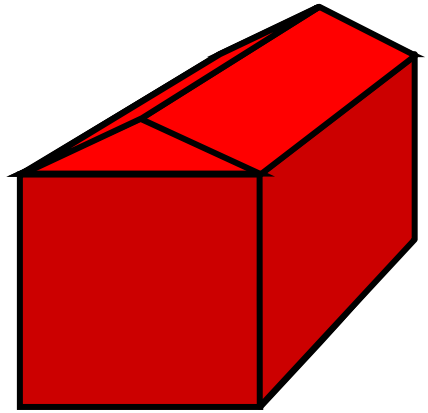

Cold roof example:

Volume = 22500 m^3

Total surface area = 5400 m^2

Warm roof example:

Volume = 26595 m^3

Total surface area = 5660 m^2

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