



# Conduction Shape Factors for Different Configurations Formulas

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#### List of 21 Conduction Shape Factors for Different Configurations Formulas

## Conduction Shape Factors for Different Configurations

#### Finite Medium

1) Conduction through Edge of Two Adjoining Walls of Equal Thickness

 $m_{S} = 0.54 \cdot L_{w}$ 

 $28 \text{m} = 0.54 \cdot 51.85185 \text{m}$ 

2) Corner of Three Walls of Equal Thickness

 $m K S = 0.15 \cdot t_w$ 

 $28m = 0.15 \cdot 186.66666m$ 

3) Eccentric Isothermal Cylinder in Cylinder of Same Length

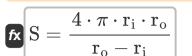
 $\left| \mathbf{S} = rac{2 \cdot \pi \cdot \mathbf{L_c}}{a} \mathrm{cosh} \left( rac{\mathbf{D_1^2} + \mathbf{D_2^2} - 4 \cdot \mathbf{z^2}}{2 \cdot \mathbf{D_1} \cdot \mathbf{D_2}} 
ight) 
ight|$ 

 $28 \text{m} = \frac{2 \cdot \pi \cdot 4 \text{m}}{a} \text{cosh} \left( \frac{\left(5.1 \text{m}\right)^2 + \left(13.739222 \text{m}\right)^2 - 4 \cdot \left(1.89 \text{m}\right)^2}{2 \cdot 5.1 \text{m} \cdot 13.739222 \text{m}} \right)^{2}$ 



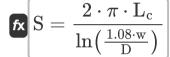


#### 4) Hollow Spherical Layer



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### 5) Isothermal Cylinder at Center of Square Solid Bar of Same Length

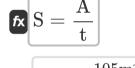


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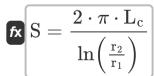
$$ext{ex} 28 ext{m} = rac{2 \cdot \pi \cdot 4 ext{m}}{\ln \left( rac{1.08 \cdot 102.23759 ext{m}}{45 ext{m}} 
ight)}$$

#### 6) Large Plane Wall



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## 7) Long Hollow Cylindrical Layer



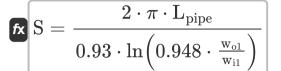
$$28 ext{m} = rac{2 \cdot \pi \cdot 4 ext{m}}{\ln \left(rac{13.994934 ext{m}}{5.7036 ext{m}}
ight)}$$







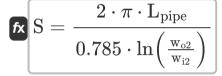
#### 8) Square Flow Passage with Width to b Ratio Greater than 1.4



Open Calculator

$$28 ext{m} = rac{2 \cdot \pi \cdot 0.10 ext{m}}{0.93 \cdot \ln \left(0.948 \cdot rac{3.241843149 ext{m}}{3 ext{m}}
ight)}$$

#### 9) Square Flow Passage with Width to b Ratio Less than 1.4

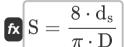


Open Calculator

$$\boxed{28 \text{m} = \frac{2 \cdot \pi \cdot 0.10 \text{m}}{0.785 \cdot \ln \left( \frac{6.173990514 \text{m}}{6 \text{m}} \right)}}$$

#### Infinite Medium 🗗

#### 10) Isothermal Cylinder in Midplane of Infinite wall





#### 11) Isothermal Ellipsoid Buried in Infinite Medium 🗗

 $extbf{S} = rac{4 \cdot \pi \cdot ext{a} \cdot \sqrt{1 - rac{ ext{b}}{ ext{a}^2}}}{a anh \left(\sqrt{1 - rac{ ext{b}}{ ext{a}^2}}
ight)}$ 

Open Calculator

 $28 \text{m} = \frac{4 \cdot \pi \cdot 5.745084 \text{m} \cdot \sqrt{1 - \frac{0.80 \text{m}}{(5.745084 \text{m})^2}}}{a \tanh \left(\sqrt{1 - \frac{0.80 \text{m}}{(5.745084 \text{m})^2}}\right)}$ 

#### 12) Isothermal Sphere Buried in Infinite Medium

fx  $S=4\cdot\pi\cdot R_{
m s}$ 

Open Calculator

 $\texttt{ex} \ 28 \texttt{m} = 4 \cdot \pi \cdot 2.228169 \texttt{m}$ 

#### 13) Two parallel Isothermal Cylinders placed in Infinite medium

 $ext{S} = rac{2 \cdot \pi \cdot ext{L}_{ ext{c}}}{a} ext{cosh} igg( rac{4 \cdot ext{d}^2 - ext{D}_1^2 - ext{D}_2^2}{2 \cdot ext{D}_1 \cdot ext{D}_2} igg)$ 

Open Calculator

ex

$$28 \text{m} = \frac{2 \cdot \pi \cdot 4 \text{m}}{a} \text{cosh} \left( \frac{4 \cdot (10.1890145 \text{m})^2 - (5.1 \text{m})^2 - (13.739222 \text{m})^2}{2 \cdot 5.1 \text{m} \cdot 13.739222 \text{m}} \right)$$





#### Semi Infinite Medium 🛂

#### 14) Disk Buried Parallel to Suface in Semi-Infinite Medium 🗗

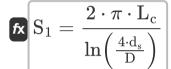


Open Calculator

$$oxed{ex}28 ext{m}=4\cdot7 ext{m}$$

fx  $S = 4 \cdot D_d$ 

#### 15) Isothermal Cylinder Buried in Semi-Infinite Medium 🗗



Open Calculator

$$oxed{ 6.642218 m = rac{2 \cdot \pi \cdot 4 m}{\ln \left( rac{4 \cdot 494.8008429 m}{45 m} 
ight) } }$$

#### 16) Isothermal Rectangular Parallelepiped Buried in Semi-Infinite Medium 🗗

fx

$$\mathrm{S} = 1.685 \cdot \mathrm{L_{pr}} \cdot \left( \log 10 \bigg( 1 + rac{\mathrm{D_{ss}}}{\mathrm{W_{pr}}} \bigg) 
ight)^{-0.59} \cdot \left( rac{\mathrm{D_{ss}}}{\mathrm{H}} 
ight)^{-0.078}$$

$$28 \text{m} = 1.685 \cdot 7.0479 \text{m} \cdot \left(\log 10 \left(1 + \frac{8 \text{m}}{11 \text{m}}\right)\right)^{-0.59} \cdot \left(\frac{8 \text{m}}{9 \text{m}}\right)^{-0.078}$$



#### 17) Isothermal Sphere Buried in Semi-Infinite Medium

 $ext{S} = rac{2 \cdot \pi \cdot ext{D}_{ ext{S}}}{1 - \left(rac{0.25 \cdot ext{D}_{ ext{S}}}{ ext{d}_{ ext{s}}}
ight)}$ 

Open Calculator

$$28 \mathrm{m} = \frac{2 \cdot \pi \cdot 4.446327 \mathrm{m}}{1 - \left(\frac{0.25 \cdot 4.446327 \mathrm{m}}{494.8008429 \mathrm{m}}\right)}$$

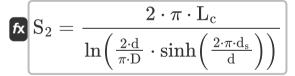
## 18) Isothermal Sphere Buried in Semi-Infinite Medium whose Surface is Insulated

 $extbf{S} = rac{2 \cdot \pi \cdot D_{si}}{1 + rac{0.25 \cdot D_{si}}{d_s}}$ 

Open Calculator

$$28 \text{m} = \frac{2 \cdot \pi \cdot 4.466395 \text{m}}{1 + \frac{0.25 \cdot 4.466395 \text{m}}{494.8008429 \text{m}}}$$

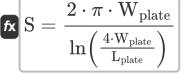
#### 19) Row of Equally Spaced Parallel Isothermal Cylinders Buried in Semiinfinite Medium





#### 20) Thin Rectangular Plate Buried in Semi-Infinite Medium 🗗

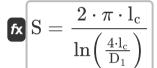




Open Calculator

$$\mathbf{ex} = \frac{2 \cdot \pi \cdot 35.42548 \mathrm{m}}{\ln\left(rac{4 \cdot 35.42548 \mathrm{m}}{0.05 \mathrm{m}}
ight)}$$

#### 21) Vertical Isothermal Cylinder Buried in Semi-Infinite Medium



$$28 ext{m} = rac{2 \cdot \pi \cdot 8.40313 ext{m}}{\ln \left( rac{4 \cdot 8.40313 ext{m}}{5.1 ext{m}} 
ight)}$$



#### Variables Used

- a Semi Major Axis of Ellipse (Meter)
- A Cross-Sectional Area (Square Meter)
- **b** Semi Minor Axis of Ellipse (Meter)
- d Distance Between Centers (Meter)
- D Diameter of Cylinder (Meter)
- **D**<sub>1</sub> Diameter of Cylinder 1 (Meter)
- D<sub>2</sub> Diameter of Cylinder 2 (Meter)
- **D**<sub>d</sub> Diameter of Disk (Meter)
- d<sub>s</sub> Distance from Surface to Centre of Object (Meter)
- D<sub>S</sub> Diameter of Sphere (Meter)
- D<sub>si</sub> Diameter of Sphere Insulated (Meter)
- D<sub>SS</sub> Distance from Surface to Surface of Object (Meter)
- **H** Height of Parallelepiped (Meter)
- I<sub>C</sub> Length of Cylinder 1 (Meter)
- L<sub>c</sub> Length of Cylinder (Meter)
- Lpipe Length of Pipe (Meter)
- Lplate Length of Plate (Meter)
- Lpr Length of Parallelepiped (Meter)
- L<sub>w</sub> Length of Wall (Meter)
- r<sub>1</sub> Inner Radius of Cylinder (Meter)
- r<sub>2</sub> Outer Radius of Cylinder (Meter)
- ri Inner Radius (Meter)





- ro Outer Radius (Meter)
- R<sub>s</sub> Radius of Sphere (Meter)
- S Conduction Shape Factor (Meter)
- S<sub>1</sub> Conduction Shape Factor 1 (Meter)
- S<sub>2</sub> Conduction Shape Factor 2 (Meter)
- t Thickness (Meter)
- tw Thickness of Wall (Meter)
- w Width of Square Bar (Meter)
- Wi1 Inner Width 1 (Meter)
- Wi2 Inner Width 2 (Meter)
- Wo1 Outer Width 1 (Meter)
- W<sub>02</sub> Outer Width 2 (Meter)
- W<sub>plate</sub> Width of Plate (Meter)
- W<sub>pr</sub> Width of Parallelepiped (Meter)
- Z Eccentric Distance Between Objects (Meter)





#### Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
   Archimedes' constant
- Function: acosh, acosh(Number)

  Hyperbolic cosine function, is a function that takes a real number as an input and returns the angle whose hyperbolic cosine is that number.
- Function: atanh, atanh(Number)
   The inverse hyperbolic tangent function returns the value whose hyperbolic tangent is a number.
- Function: cosh, cosh(Number)

  The hyperbolic cosine function is a mathematical function that is defined as the ratio of the sum of the exponential functions of x and negative x to 2.
- Function: In, In(Number)

  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Function: log10, log10(Number)
   The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Function: sinh, sinh(Number)
   The hyperbolic sine function, also known as the sinh function, is a
  mathematical function that is defined as the hyperbolic analogue of the sine
  function.
- Function: sqrt, sqrt(Number)
   A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Function: tanh, tanh(Number)

  The hyperbolic tangent function (tanh) is a function that is defined as the ratio of the hyperbolic sine function (sinh) to the hyperbolic cosine function (cosh).





- Measurement: Length in Meter (m)
  Length Unit Conversion
- Measurement: Area in Square Meter (m²)

  Area Unit Conversion





#### **Check other formula lists**

- Conduction in Cylinder Formulas
- Conduction in Plane Wall Formulas
- Conduction in Sphere Formulas Transient Heat Conduction
- Conduction Shape Factors for Different Configurations

- Formulas 🛂
- Other shapes Formulas
- Steady State Heat Conduction with Heat Generation Formulas
- Transient Heat Conduction
   Formulas

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