Richard Greene Company, Inc.
INDUSTRIAL CONTROLS FOR FACTORY AUTOMATION
Since 1958
RGreene.com

St. Louis
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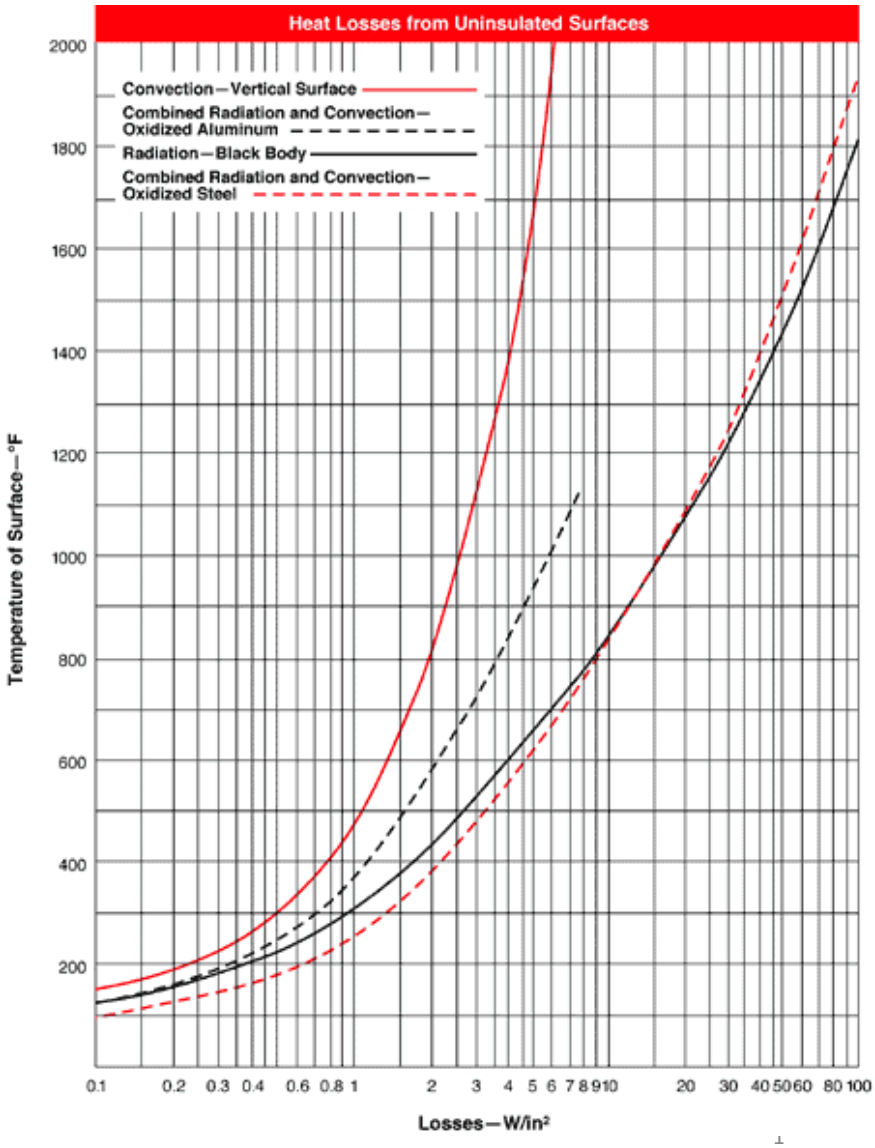
WATLOW® Powered by Possibility

Heat Loss Factors & Graphs

Heat Losses at 70°F Ambient
How to use the graph for more accurate calculations
Convection curve correction factors:
For losses from top surfaces or from horizontal pipes
•Multiply convection curve value by 1.29
For side surfaces and vertical pipes
•Use convection curve directly

For bottom surfaces
•Mulitply convection curve value by 0.63
Radiation Curve Correction Factors
The radiation curve shows losses from a perfect blackbody and are not dependent upon position. Commonly used block materials lose less heat by radiation than a blackbody, so correction factors are applied. These corrections are the emissivity (e) values.
Total Heat Losses =
•Radiation losses (curve value times e)
•+ Convection losses (top)
•+ Convection losses (sides)
•+ Convection losses (bottom)
•= Conduction losses (where applicable)



Helpful Hint:

The graphs for losses from uninsulated and insulated surfaces are hard to read at low temperatures close to ambient. Here are two easy-to-use calculations that are only rule-of-thumb approximations, but they are reasonably accurate when used within the limits noted.

Rule #1:

$$\frac{\Delta T\ (^{\circ}F) \text{ rise above ambient}}{200}$$

Losses from an uninsulated surface (with an emissivity close to 1.0): (This applies only to temperatures between ambient and about 250ºF)

Rule #2:

$$\frac{\Delta T\ (^{\circ}F) \text{ rise above ambient}}{950}$$

Losses from an insulated surface: (This insulation is assumed to be 1 inch thick and have a K-value of about 0.5 Btu-in/hr-ft2-°F. Use only for surfaces less than 800°F.)

Some Material Emissivities/Metals

Material	Specific Heat Btu/lb.-°F	Emissivity Polished Surface	Medium Oxide	Heavy Oxide
Blackbody			0.75	1.00
Aluminum	0.24	0.09	0.11	0.22
Brass	0.10	0.04	0.35	0.60
Copper	0.10	0.04	0.03	0.65
Inocoloy®800	0.12	0.20	0.60	0.92
Inconel®600	0.11	0.20	0.60	0.92
Iron, Cast	0.12	-	0.80	0.85
Lead, Solid	0.03	-	0.28	-
Magnesium	0.23	-	-	-
Nickel 200	0.11	-	-	-
Nichrome,-80-20	0.11	-	-	-
Solder, 50-50	0.04	-	-	-
Steel				
mild	0.12	0.10	0.75	0.85
stainless 304	0.11	0.17	0.57	0.85
stainless 430	0.11	0.17	0.57	0.85
Tin	0.056	-	-	-
Zinc	0.10	-	0.25	-

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Some Material Emissivities/Non-Metals

Material	Specific Heat Btu/lb.-°F	Emissivity
Asbestos Asphalt Brickwork Carbon Glass	0.25 0.40 0.22 0.20 0.20	Most Non-Metals: 90
Paper Plastic Rubber Silicon Carbide Textiles Wood, Oak	0.45 0.2-0.5 0.40 0.20-0.23 - 0.57	

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Heat Losses from Insulated, Water & Metal Surfaces

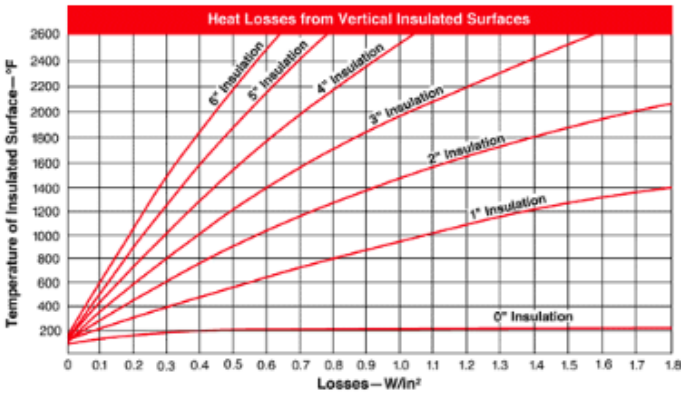
•Based upon combined natural convection and radiation losses into 70ºF environment.

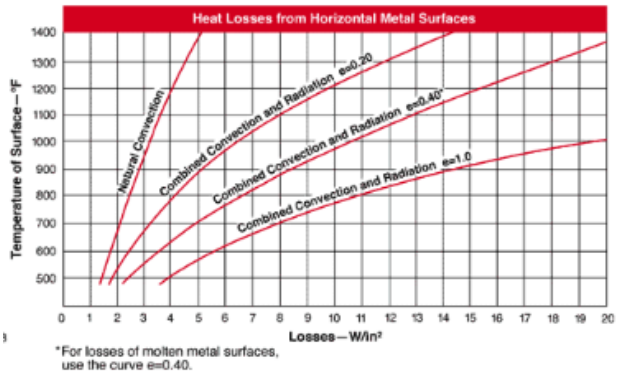
•Insulation characteristics

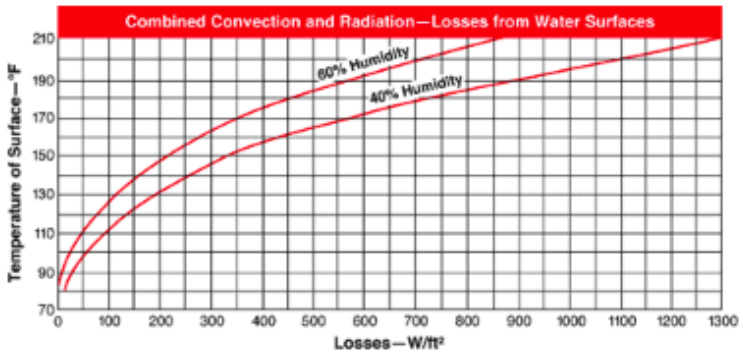
- k = 0.67 @ 200ºF
- k = 0.83 @ 1000ºF.

•For molded ceramic fiber products and packed or tightly packed insulation, losses will be lower than values shown.

- For 2 or 3 inches Insulation: multiply by 0.84
- For 4 or 5 inches Insulation: multiply by 0.81
- For 6 inches Insulation: multiply by 0.79







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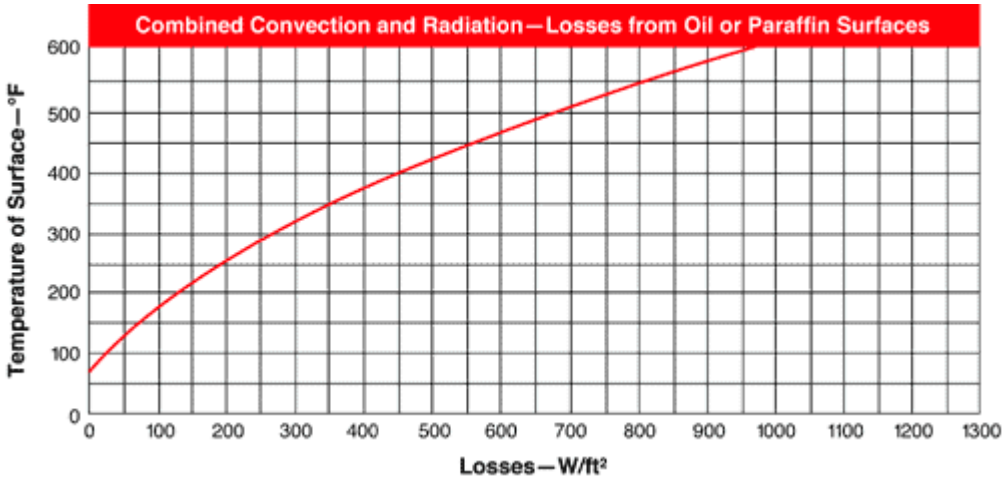
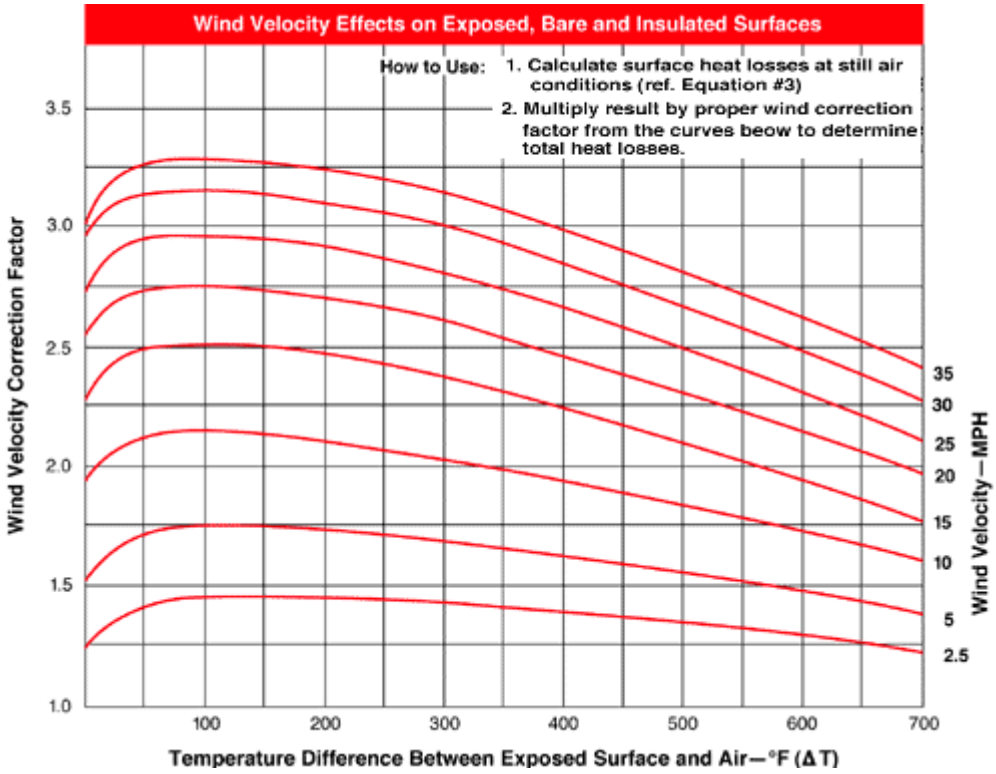
Heat Losses from Oil or Paraffin Surfaces



Wind Velocity Effects on Surfaces



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