

A.3.1

**Heat transmission of jacketed vessels : overall coefficients**

Jacketed Fluid	Heated Fluid	Wall Material	Overall U* W/m <sup>2</sup>
Steam	Water	Stainless steel	850-1700
Steam	Aqueous solution	Stainless steel	450-1140
Steam	Organics	Stainless steel	285-850
Steam	Light Oil	Stainless steel	340-910
Steam	Heavy Oil	Stainless steel	57-285
Brine	Water	Stainless steel	230-1625
Brine	Aqueous solution	Stainless steel	200-850
Brine	Organics	Stainless steel	170-680
Brine	Light Oil	Stainless steel	200-740
Brine	Heavy Oil	Stainless steel	57-170
Heat transfer oil	Water	Stainless steel	285-1140
Heat transfer oil	Aqueous solution	Stainless steel	230-965
Heat transfer oil	Organics	Stainless steel	170-680
Heat transfer oil	Light Oil	Stainless steel	200-740
Heat transfer oil	Heavy Oil	Stainless steel	57-230
Steam	Water	Glass lined CS	400-570
Steam	Aqueous solution	Glass lined CS	285-480
Steam	Organics	Glass lined CS	170-400
Steam	Light Oil	Glass lined CS	230-425
Steam	Heavy Oil	Glass lined CS	57-230
Brine	Water	Glass lined CS	170-450
Brine	Aqueous solution	Glass lined CS	140-400
Brine	Organics	Glass lined CS	115-340
Brine	Light Oil	Glass lined CS	140-370
Brine	Heavy Oil	Glass lined CS	57-170
Heat transfer oil	Water	Glass lined CS	170-450
Heat transfer oil	Aqueous solution	Glass lined CS	140-400
Heat transfer oil	Organics	Glass lined CS	140-370
Heat transfer oil	Light Oil	Glass lined CS	115-400
Heat transfer oil	Heavy Oil	Glass lined CS	57-200

\* Values listed are for moderate nonproximity agitation. CS = carbon steel

Temperature difference	222	194	167	139	111	83	56	28
Heat loss approximate W/m <sup>2</sup> diff.	21.8	19.7	17.7	16	14.4	13	11.7	10.6
Temperature difference	400	350	300	250	200	150	100	50
Heat Loss approximate Btu/ft <sup>2</sup> h diff.	3.84	3.47	3.12	2.82	2.54	2.29	2.07	1.87

The above apply to plain vertical surfaces.

For plain horizontal surfaces losing heat upwards, multiply by 1.3. For plain horizontal surfaces losing heat downwards, multiply by 0.65.

Actual heat loss from plain vertical surfaces in still air W/m <sup>2</sup>							
Surrounding air temp	Hot face temperature						
	204	177	149	121	93	66	38
38	2952	2221	1603	1082	653	296	-
21	3740	2650	1956	1382	905	502	170
10	3833	2952	2221	1603	1082	653	296
-2	4215	3281	2502	1845	1281	817	429
-18	4230	3833	2952	2221	1603	1082	653

For surfaces losing heat upwards, multiply by 1.3. For surfaces losing heat downwards, multiply by 0.65. To allow for conditions other than still air multiply by the factors given in Table 7.

in Btu per sq. ft per hr. per			
Water	Cast Iron	Air or Gas	1.4
Water	Mild Steel	Air or Gas	2.0
Water	Copper	Air or Gas	2.25
Water	Cast Iron	Water	40 to 50
Water	Mild Steel	Water	60 to 70
Water	Copper	Water	62 to 80
Air	Cast Iron	Air	1.0
Air	Mild Steel	Air	1.4
Steam	Cast Iron	Air	2.0
Steam	Mild Steel	Air	2.5
Steam	Copper	Air	3.0
Steam	Cast Iron	Water	160
Steam	Mild Steel	Water	185
Steam	Copper	Water	205
Steam	Stainless Steel	Water	120

The above values are average coefficients for practically still fluids. The coefficients are dependent on velocities of heating and heated media on type of heating surface, temperature difference and other circumstances. For special cases, see literature, and manufacturer's data.