

# APPENDIX

## COMPARATIVE R-VALUES OF FLOORING AND SUBFLOORS

MATERIAL	R VALUE / INCH	THICKNESS	R VALUE
Plywood	1.1	3/4"	0.825
OSB	1.4	3/4"	1.05
Softwood	1.1	3/4"	0.825
Sheet Vinyl	1.6	1/8"	0.2
Vinyl Composition Tile (VCT)	1.6	1/8"	0.2
Linoleum	1.6	1/4"	0.4
Linoleum	1.6	1/8"	0.2
Dense Rubber Flooring	1.3	21/64"	0.25
Recycled Rubber Flooring	2.2	1/2"	1.1
Cork	3	3/8"	1.125
Cork / MDF / Laminate	2.35	1/2"	1.175
Brick	2.25	1 1/2"	3.375
Marble	0.8	1/2"	0.4
Ceramic Tile	1	1/4"	0.25
Thinset Mortar	0.4	1/8"	0.05
MDF / Plastic Laminate	1	1/2"	0.5
Laminate Floor Pad	1.92	5/32"	0.3
Engineered Wood	1	1/4"	0.25
Engineered Wood	1	3/8"	0.375
Engineered Wood	1	5/8"	0.625
Engineered Wood	1	3/4"	0.75
Engineered Wood Flooring Pad	1.6	1/8"	0.2
Engineered Bamboo	0.96	3/4"	0.72
Oak	0.85	3/4"	0.638
Ash	1	3/4"	0.75
Maple	1	3/4"	0.75
Pine	1.3	3/4"	0.975
Fir	1.2	3/4"	0.9
Carpet Pad / Slab Rubber 33 lb.	1.28	1/4"	0.320
Carpet Pad / Slab Rubber 33 lb.	1.28	3/8"	0.480
Carpet Pad / Slab Rubber 33 lb.	1.28	1/2"	0.640
Carpet Pad / Waffle Rubber 25 lb.	2.48	1/4"	0.620
Carpet Pad / Waffle Rubber 25 lb.	2.48	1/2"	1.240
Carpet Pad / Frothed Polyurethane 16 lb.	3.53	1/8"	0.530
Carpet Pad / Frothed Polyurethane 12 lb.	3.48	1/4"	0.870
Carpet Pad / Frothed Polyurethane 10 lb.	3.22	3/8"	1.200
Carpet Pad / Frothed Polyurethane 10 lb.	3.22	1/2"	1.610
Hair Jute	3.88	1/2"	1.940
Hair Jute	3.88	21/64"	1.250
Synthetic Fiber Pad 20 oz.	1.80	15/64"	0.421
Synthetic Fiber Pad 27 oz.	1.98	18/64"	0.545
Synthetic Fiber Pad 32 oz.	2.10	19/64"	0.630
Synthetic Fiber Pad 40 oz.	2.20	11/32"	0.770
Prime Urethane	4.30	21/64"	1.400
Prime Urethane	4.30	1/2"	2.150

MATERIAL	R VALUE / INCH	THICKNESS	R VALUE
Bonded Urethane	4.20	21/64"	1.350
Bonded Urethane	4.20	1/2"	2.100
Carpet	2.80	1/4"	0.700
Carpet	2.80	3/8"	1.050
Carpet	2.80	1/2"	1.400
Carpet	2.80	5/8"	1.750
Carpet	2.80	3/4"	2.100
Wool Carpet	4.20	3/8"	1.575
Wool Carpet	4.20	1/2"	2.100

## HEAT OUTPUT FORMULA

$$\text{BTU} / \text{H} = 501 \times \text{GPM} \times \Delta T$$

(GPM is the flow, and  $\Delta T$  (delta-T) is the temperature drop over the loop, 501 is the weight of 1 gallon of water x 60 minutes in 1 hour)

## GPM FLOW FORMULA

$$\text{GPM} = \text{BTU}/\text{H} / \Delta T / 501$$

(GPM is the flow, and  $\Delta T$  (delta-T) is the temperature drop over the loop, 501 is the weight of 1 gallon of water x 60 minutes in 1 hour)

## TO FIND AMOUNT OF TUBING REQUIRED TO COVER SQ.FT.

### MULTIPLY SQUARE FEET WITH MULTIPLIER

TUBE SPACING	MULTIPLIER
6"	2
8"	1.5
9"	1.33
12"	1
18"	0.67
24"	0.5

## TO FIND AREA COVERED BY LOOP AT SPACING

### MULTIPLY LOOP LENGTH WITH MULTIPLIER

TUBE SPACING	MULTIPLIER
6"	0.5
8"	0.67
9"	0.75
12"	1
18"	1.5
24"	2

## FLOOR SURFACE TEMPERATURE APPROXIMATION

$$T_{\text{ROOM}} + \text{HEAT INTENSITY} \div 2 \text{ [HEAT INTENSITY EXPRESSED AS BTU} / (\text{H} \times \text{SQ.FT.)}]$$

- › ☒ For snowmelt applications use 2.2 (Instead of 2) in above formula—at no wind.
- › ☒ For snowmelt applications use 3.7 (Instead of 2) in above formula—at 10 mph official wind speed.
- › ☒ For radiant ceiling, use 1.3 (Instead of 2) in above formula.

## DATA FOR TUBING / PIPES

SIZE & TYPE	VOLUME	WEIGHT
3/8" PEX	0.497 gallons/100 ft.	4.1 lbs/100 ft.
1/2" PEX	0.917 gallons/100 ft.	5.3 lbs/100 ft.
5/8" PEX	1.392 gallons/100 ft.	7.1 lbs/100 ft.
3/4" PEX	1.832 gallons/100 ft.	10.2 lbs/100 ft.
1" PEX	3.067 gallons/100 ft.	16.5 lbs/100 ft.
1/2" Copper (Class M)	1.32 gallons/100 ft.	20.4 lbs/100 ft.
3/4" Copper (Class M)	2.690 gallons/100 ft.	32.8 lbs/100 ft.
1" Copper (Class M):	4.540 gallons/100 ft.	46.5 lbs/100 ft.
1.25" Copper (Class M):	6.810 gallons/100 ft.	66.2 lbs/100 ft.
1.5" Copper (Class M):	9.510 gallons/100 ft.	94.0 lbs/100 ft.

## ASTM F876 PEX TUBING DIMENSION CHART

	OD	WALL	ID
3/8	0.500	0.070	0.360
1/2	0.625	0.070	0.485
5/8	0.750	0.083	0.584
3/4	0.875	0.097	0.681
1	1.125	0.125	0.875
1 1/4	1.375	0.153	1.069
1 1/2	1.625	0.181	1.263

## ASTM F1281 PEX-AL-PEX TUBING DIMENSION CHART

	OD	WALL	ID
1/2	0.630	0.065	0.500
5/8	0.787	0.075	0.637
3/4	0.984	0.089	0.806
1	1.260	0.118	1.024

### GENERAL GUIDELINES

GPM	MAIN SIZE
0-4	3/4"
4-8	1"
8-14	1.25"
14-25	1.5"
25-45	2"