Appendix D

DOE-2 Materials Library

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1. Thermal Properties of Building Materials

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Acoustic Tile					
AC01	3/8 inch	0.0313	0.0330	18.0	0.32	0.95
AC02	1/2 inch	0.0417	0.0330	18.0	0.32	1.26
AC03	3/4 inch	0.0625	0.0330	18.0	0.32	1.89
AS01	**Aluminum or Steel Siding**	0.0050	26.000	480.0	0.10	
	Asbestos-Cement					
AB01	1/8 inch Board	0.0104	0.3450	120.0	0.2	0.03
AB02	1/4 inch Board	0.0208	0.3450	120.0	0.2	0.06
AB03	Shingle					0.21
AB04	1/4 inch Lapped Siding					0.21
AV01	**Asbestos-Vinyl Tile**				0.3	0.05
	Asphalt					
AR01	Roofing Roll			70.0	0.35	0.15
AR02	Shingle and Siding			70.0	0.35	0.44
AR03	Tile				0.30	0.05
	Brick					
BK01	4 inch Common	0.3333	0.4167	120.0	0.20	0.80
BK02	8 inch Common	0.6667	0.4167	120.0	0.20	1.60
BK03	12 inch Common	1.0000	0.4167	120.0	0.20	2.40
BK04	3 inch Face	0.2500	0.7576	130.0	0.22	0.33
BK05	4 inch Face	0.3333	0.7576	130.0	0.22	0.44
	Building Paper					
BP01	Permeable Felt					0.06
BP02	2-Layer Seal					0.12
BP03	Plastic Film Seal					0.01
BR01	**Built-up Roofing 3/8 inch**	0.0313	0.0939	70.0	0.35	0.33
	Carpet					
CP01	With Fibrous Pad				0.34	2.08
CP02	With Rubber Pad				0.34	1.23

1. Thermal Properties of Building Materials – Continued

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Cement					
CM01	1 inch Mortar	0.0833	0.4167	116.0	0.2	0.20
CM02	1.75 inch Mortar	0.1458	0.4167	116.0	0.2	0.35
CM03	1 inch Plaster with Sand Aggregate	0.0833	0.4167	116.0	0.2	0.20
	Clay Tile, Hollow					
CT01	3 inch 1 Cell	0.2500	0.3125	70.0	0.2	0.80
CT02	4 inch 1 Cell	0.3333	0.2999	70.0	0.2	1.11
CT03	6 inch 2 Cells	0.5000	0.3300	70.0	0.2	1.52
CT04	8 inch 2 Cells	0.6667	0.3600	70.0	0.2	1.85
CT05	10 inch 2 Cells	0.8333	0.3749	70.0	0.2	2.22
CT06	12 inch 3 Cells	1.0000	0.4000	70.0	0.2	2.50
	Clay Tile, Paver					
CT11	3/8 inch	0.0313	1.0416	120.0	0.2	0.03
	Concrete, Heavy Weight Dried Aggregate, 140 lbs.					
CC01	1.25 inch	0.1042	0.7576	140.0	0.2	0.14
CC02	2 inch	0.1667	0.7576	140.0	0.2	0.22
CC03	4 inch	0.3333	0.7576	140.0	0.2	0.44
CC04	6 inch	0.5000	0.7576	140.0	0.2	0.66
CC05	8 inch	0.6667	0.7576	140.0	0.2	0.88
CC06	10 inch	0.8333	0.7576	140.0	0.2	1.10
CC07	12 inch	1.0000	0.7576	140.0	0.2	1.32
	Concrete, Heavy Weight Undried Aggregate, 140 lbs.					
CC11	3/4 inch	0.0625	1.0417	140.0	0.2	0.06
CC12	1 3/8 inch	0.1146	1.0417	140.0	0.2	0.11
CC13	3 1/4 inch	0.2708	1.0417	140.0	0.2	0.26
CC14	4 inch	0.3333	1.0417	140.0	0.2	0.32
CC15	6 inch	0.5000	1.0417	140.0	0.2	0.48
CC16	8 inch	0.6667	1.0417	140.0	0.2	0.64
	Concrete, Light Weight, 80 lb.					
CC21	3/4 inch	0.0625	0.2083	80.0	0.2	0.30
CC22	1.25 inch	0.1042	0.2083	80.0	0.2	0.50
CC23	2 inch	0.1667	0.2083	80.0	0.2	0.80
CC24	4 inch	0.3333	0.2083	80.0	0.2	1.60
CC25	6 inch	0.5000	0.2083	80.0	0.2	2.40
CC26	8 inch	0.6667	0.2083	80.0	0.2	3.20

1. Thermal Properties of Building Materials -- Continued

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Concrete, Light Weight, 30 lb.					
CC31	3/4 inch	0.0625	0.0751	30.0	0.2	0.83
CC32	1.25 inch	0.1042	0.0751	30.0	0.2	1.39
CC33	2 inch	0.1667	0.0751	30.0	0.2	2.22
CC34	4 inch	0.3333	0.0751	30.0	0.2	4.44
CC35	6 inch	0.5000	0.0751	30.0	0.2	6.66
CC36	8 inch	0.6667	0.0751	30.0	0.2	8.88
	Concrete Block, 4 inch Heavy Weight					
CB01	Hollow	0.3333	0.4694	101.0	0.2	0.71
CB02	Concrete Filled	0.3333	0.7575	140.0	0.2	0.44
CB03	Perlite Filled	0.3333	0.3001	103.0	0.2	1.11
CB04	Partially Filled Concrete†	0.3333	0.5844	114.0	0.2	0.57
CB05	Concrete and Perlite††	0.3333	0.4772	115.0	0.2	0.70
	Concrete Block, 6 inch Heavy Weight					
CB06	Hollow	0.5000	0.5555	85.0	0.2	0.90
CB07	Concrete Filled	0.5000	0.7575	140.0	0.2	0.66
CB08	Perlite Filled	0.5000	0.2222	88.0	0.2	2.25
CB09	Partially Filled Concrete†	0.5000	0.6119	104.0	0.2	0.82
CB10	Concrete and Perlite††	0.5000	0.4238	104.0	0.2	1.18
	Concrete Block, 8 inch Heavy Weight					
CB11	Hollow	0.6667	0.6060	69.0	0.2	1.10
CB12	Concrete Filled	0.6667	0.7575	140.0	0.2	0.88
CB13	Perlite Filled	0.6667	0.2272	70.0	0.2	2.93
CB14	Partially Filled Concrete†	0.6667	0.6746	93.0	0.2	0.99
CB15	Concrete and Perlite††	0.6667	0.4160	93.0	0.2	1.60
	Concrete Block, 12 inch Heavy Weight					
CB16	Hollow	1.0000	0.7813	76.0	0.2	1.28
CB17	Concrete Filled	1.0000	0.7575	140.0	0.2	1.32
CB18	Partially Filled Concrete†	1.0000	0.7773	98.0	0.2	1.29
	Concrete Block, 4 inch Medium Weight					
CB21	Hollow	0.3333	0.3003	76.0	0.2	1.11
CB22	Concrete Filled	0.3333	0.4456	115.0	0.2	0.75
CB23	Perlite Filled	0.3333	0.1512	78.0	0.2	2.20
CB24	Partially Filled Concrete†	0.3333	0.3306	89.0	0.2	1.01
CB25	Concrete and Perlite††	0.3333	0.2493	90.0	0.2	1.34

† One filled and reinforced concrete core every 24 inches of wall length.

†† One filled and reinforced concrete core every 24 inches of wall length with the remaining cores filled with Perlite insulation.

1. Thermal Properties of Building Materials -- Continued

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Concrete Block, 6 inch Medium Weight					
CB26	Hollow	0.5000	0.3571	65.0	0.2	1.40
CB27	Concrete Filled	0.5000	0.4443	119.0	0.2	1.13
CB28	Perlite Filled	0.5000	0.1166	67.0	0.2	4.29
CB29	Partially Filled Concrete†	0.5000	0.3686	83.0	0.2	1.36
CB30	Concrete and Perlite††	0.5000	0.2259	84.0	0.2	2.21
	Concrete Block, 8 inch Medium Weight					
CB31	Hollow	0.6667	0.3876	53.0	0.2	1.72
CB32	Concrete Filled	0.6667	0.4957	123.0	0.2	1.34
CB33	Perlite Filled	0.6667	0.1141	56.0	0.2	5.84
CB34	Partially Filled Concrete†	0.6667	0.4348	76.0	0.2	1.53
CB35	Concrete and Perlite††	0.6667	0.2413	77.0	0.2	2.76
	Concrete Block, 12 inch Medium Weight					
CB36	Hollow	1.0000	0.4959	58.0	0.2	2.02
CB37	Concrete Filled	1.0000	0.4814	121.0	0.2	2.08
CB38	Partially Filled Concrete†	1.0000	0.4919	79.0	0.2	2.03
	Concrete Block, 4 inch Light Weight					
CB41	Hollow	0.3333	0.2222	65.0	0.2	1.50
CB42	Concrete Filled	0.3333	0.3695	104.0	0.2	0.90
CB43	Perlite Filled	0.3333	0.1271	67.0	0.2	2.62
CB44	Partially Filled Concrete†	0.3333	0.2808	78.0	0.2	1.19
CB45	Concrete and Perlite††	0.3333	0.2079	79.0	0.2	1.60
	Concrete Block, 6 inch Light Weight					
CB46	Hollow	0.5000	0.2777	55.0	0.2	1.80
CB47	Concrete Filled	0.5000	0.3819	110.0	0.2	1.31
CB48	Perlite Filled	0.5000	0.0985	57.0	0.2	5.08
CB49	Partially Filled Concrete†	0.5000	0.3189	73.0	0.2	1.57
CB50	Concrete and Perlite††	0.5000	0.1929	74.0	0.2	2.59
	Concrete Block, 8 inch Light Weight					
CB51	Hollow	0.6667	0.3333	45.0	0.2	2.00
CB52	Concrete Filled	0.6667	0.4359	115.0	0.2	1.53
CB53	Perlite Filled	0.6667	0.0963	48.0	0.2	6.92
CB54	Partially Filled Concrete†	0.6667	0.3846	68.0	0.2	1.73
CB55	Concrete and Perlite††	0.6667	0.2095	69.0	0.2	3.18

† One filled and reinforced concrete core every 24 inches of wall length.

†† One filled and reinforced concrete core every 24 inches of wall length with the remaining cores filled with Perlite insulation.

1. Thermal Properties of Building Materials -- Continued

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Concrete Block, 12 inch Light Weight					
CB56	Hollow	1.0000	0.4405	49.0	0.2	2.27
CB57	Concrete Filled	1.0000	0.4194	113.0	0.2	2.38
CB58	Partially Filled Concrete†	1.0000	0.4274	70.0	0.2	2.34
	Gypsum or Plaster Board					
GP01	1/2 inch	0.0417	0.0926	50.0	0.2	0.45
GP02	5/8 inch	0.0521	0.0926	50.0	0.2	0.56
GP03	3/4 inch	0.0625	0.0926	50.0	0.2	0.67
	Gypsum Plaster					
GP04	3/4 inch Light Weight Aggregate	0.0625	0.1330	45.0	0.2	0.47
GP05	1 inch Light Weight Aggregate	0.0833	0.1330	45.0	0.2	0.63
GP06	3/4 inch Sand Aggregate	0.0625	0.4736	105.0	0.2	0.13
GP07	1 inch Sand Aggregate	0.0833	0.4736	105.0	0.2	0.18
	Hard Board, 3/4 inch					
HB01	Medium Density Siding	0.0625	0.0544	40.0	0.28	1.15
HB02	Medium Density Others	0.0625	0.0608	50.0	0.31	1.03
HB03	High Density Standard Tempered	0.0625	0.0683	55.0	0.33	0.92
HB04	High Density Service Tempered	0.0625	0.0833	63.0	0.33	0.75
LT01	**Linoleum Tile**				0.30	0.05
	Particle Board					
PB01	Low Density 3/4 inch	0.0625	0.0450	75.0	0.31	1.39
PB02	Medium Density 3/4 inch	0.0625	0.7833	75.0	0.31	0.08
PB03	High Density 3/4 inch	0.0625	0.9833	75.0	0.31	0.06
PB04	Underlayment 5/8 inch	0.0521	0.1796	75.0	0.29	0.29

† One filled and reinforced concrete core every 24 inches of wall length.

1. Thermal Properties of Building Materials -- Continued

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Plywood					
PW01	1/4 inch	0.0209	0.0667	34.0	0.29	0.31
PW02	3/8 inch	0.0313	0.0667	34.0	0.29	0.47
PW03	1/2 inch	0.0417	0.0667	34.0	0.29	0.63
PW04	5/8 inch	0.0521	0.0667	34.0	0.29	0.78
PW05	3/4 inch	0.0625	0.0667	34.0	0.29	0.94
PW06	1 inch	0.0833	0.0667	34.0	0.29	1.25
	Roof Gravel or Slag					
RG01	1/2 inch	0.0417	0.8340	55.0	0.4	0.05
RG02	1 inch	0.0833	0.8340	55.0	0.4	0.10
RT01	**Rubber Tile**					0.05
SL01	**Slate**, 1/2 inch	0.0417	0.8340	100.0	0.35	0.05
ST01	**Stone**, 1 inch	0.0833	1.0416	140.0	0.2	0.08
SC01	**Stucco**, 1 inch	0.0833	0.4167	166.0	0.2	0.20
TZ01	**Terrazzo**, 1 inch	0.0833	1.0416	140.0	0.2	0.08
	Wood, Soft					
WD01	3/4 inch	0.0625	0.0667	32.0	0.33	0.94
WD02	1.5 inch	0.1250	0.0667	32.0	0.33	1.87
WD03	2.5 inch	0.2083	0.0667	32.0	0.33	3.12
WD04	3.5 inch	0.2917	0.0667	32.0	0.33	4.37
WD05	4 inch	0.3333	0.0667	32.0	0.33	5.00
	Wood, Hard					
WD11	3/4 inch	0.0625	0.0916	45.0	0.30	0.68
WD12	1 inch	0.0833	0.0916	45.0	0.30	0.91
	Wood, Shingle					
WS01	For Wall	0.0583	0.0667	32.0	0.30	0.87
WS02	For Roof	0.0583	0.0667	32.0	0.30	0.94

2. Thermal Properties of Insulating Materials

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Mineral Wool/Fiber					
IN01	Batt, R-7‡	0.1882	0.0250	0.60	0.2	7.53
IN02	Batt, R-11	0.2957	0.0250	0.60	0.2	11.83
IN03	Batt, R-19	0.5108	0.0250	0.60	0.2	20.43
IN04	Batt, R-24	0.6969	0.0250	0.60	0.2	27.88
IN05	Batt, R-30	0.8065	0.0250	0.60	0.2	32.26
IN11	Fill, 3.5 inch, R-11	0.2917	0.0270	0.60	0.2	10.80
IN12	Fill, 5.5 inch, R-19	0.4583	0.0270	0.63	0.2	16.97
	Cellulose					
IN13	Fill, 3.5 inch, R-13	0.2917	0.0225	3.0	0.33	12.96
IN14	Fill, 5.5 inch, R-20	0.4583	0.0225	3.0	0.33	20.37
	Preformed Mineral Board					
IN21	7/8 inch, R-3	0.0729	0.0240	15.0	0.17	3.04
IN22	1 inch, R-3.5	0.0833	0.0240	15.0	0.17	3.47
IN23	2 inch, R-6.9	0.1667	0.0240	15.0	0.17	6.95
IN24	3 inch, R-10.3	0.2500	0.0240	15.0	0.17	10.42
	Polystyrene, Expanded					
IN31	1/2 inch	0.0417	0.0200	1.8	0.29	2.08
IN32	3/4 inch	0.0625	0.0200	1.8	0.29	3.12
IN33	1 inch	0.0833	0.0200	1.8	0.29	4.16
IN34	1.25 inch	0.1042	0.0200	1.8	0.29	5.21
IN35	2 inch	0.1667	0.0200	1.8	0.29	8.33
IN36	3 inch	0.2500	0.0200	1.8	0.29	12.50
IN37	4 inch	0.3333	0.0200	1.8	0.29	16.66
	Polyurethane, Expanded					
IN41	1/2 inch	0.0417	0.0133	1.5	0.38	3.14
IN42	3/4 inch	0.0625	0.0133	1.5	0.38	4.67
IN43	1 inch	0.0833	0.0133	1.5	0.38	6.26
IN44	1.25 inch	0.1042	0.0133	1.5	0.38	7.83
IN45	2 inch	0.1667	0.0133	1.5	0.38	12.53
IN46	3 inch	0.2500	0.0133	1.5	0.38	18.80
IN47	4 inch	0.3333	0.0133	1.5	0.38	25.06

‡ Nominal thickness is 2 inches to 2 3/4 inches. Resistance value is based on a thickness of 2.26 inches.

2. Thermal Properties of Insulating Materials -- continued

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Urea Formaldehyde					
IN51	3.5 inch, R-19	0.2910	0.0200	0.7	0.3	14.55
IN52	5.5 inch, R-30	0.4580	0.0200	0.7	0.3	22.90
	Insulation Board					
IN61	Sheathing, 1/2 inch	0.0417	0.0316	18.0	0.31	1.32
IN62	Sheathing, 3/4 inch	0.0625	0.0316	18.0	0.31	1.98
IN63	Shingle Backer, 3/8 inch	0.0313	0.0331	18.0	0.31	0.95
IN64	Nail Base Sheathing, 1/2 inch	0.0417	0.0366	25.0	0.31	1.14
	Roof Insulation, Preformed					
IN71	1/2 inch	0.0417	0.0300	16.0	0.2	1.39
IN72	1 inch	0.0833	0.0300	16.0	0.2	2.78
IN73	1.5 inch	0.1250	0.0300	16.0	0.2	4.17
IN74	2 inch	0.1667	0.0300	16.0	0.2	5.56
IN75	2.5 inch	0.2083	0.0300	16.0	0.2	6.94
IN76	3 inch	0.2500	0.0300	16.0	0.2	8.33

3. Thermal Properties of Air Spaces

DOE-2 Code-word	Description	Thickness Feet	Thermal Properties: Conductivity Btu-Ft/ Hr-Ft^2-°F	Density Lb/ Ft^3	Specific Heat Btu/ Lb-°F	Resistance Hr-Ft^2-°F/ Btu
	Air Layer, 3/4 inch or less					
AL11	Vertical Walls					0.90
AL12	Slope 45°					0.84
AL13	Horizontal Roofs					0.82
	Air Layer, 3/4 inch to 4 inches					
AL21	Vertical Walls					0.89
AL22	Slope 45°					0.87
AL23	Horizontal Roofs					0.87
	Air Layer, 4 inches or more					
AL31	Vertical Walls					0.92
AL32	Slope 45°					0.89
AL33	Horizontal Roofs					0.92

Note: A more extensive list of data can be found in the ASHRAE Handbook of Fundamentals, Chap. 23, 1985.