



NFRC Errata and Addendum Log

E3A20 (November 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ϵ^1 |
|---|-----------------------------|------------------|------------------|-------------------------------|----------------------------|
| | ρ kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | |
| BASF Corp-EPS Foam w/ Graphite | 19.7 | 0.029 | 0.017 | 0.200 | - |
| BASF Neopor EPS Foam w/ Graphite | 19.7 | 0.029 | 0.017 | 0.200 | - |
| Saint-Gobain-Norseal V730 Foam | 85.86 | 0.025 | 0.015 | 0.177 | - |

E3A19 (July 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ϵ^1 |
|---|-----------------------------|------------------------|-------------|-------------------------------|----------------------------|
| | ρ kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | |
| Interlayer Solutions-Evasafe Interlayer | 935 | 1.435 0.207 | 0.120 | 0.207 1.435 | - |

E2A19 (August 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | Emissivity ϵ^1 | |
|--|-------------------|--------------|-------------|-------------------------------|---|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| BASF Corp-EPS Foam w/ Graphite | 19.7 | 0.029 | 0.017 | 0.200 | - |
| Jeld-Wen Sunpro Lambdapor Premium Expanded Polystyrene | 21.5 | 0.029 | 0.017 | 0.199 | - |

E2A18 (July 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | Emissivity ϵ^1 | |
|---|-------------------|--------------|-------------|-------------------------------|---|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Interlayer Solutions-Evasafe Interlayer | 935 | 1.435 | 0.120 | 0.207 | - |

E2A17 (July 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ϵ^1 |
|---------------------------------------|-------------------|--------------|-------------|-------------------------------|----------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | - |
| Jeld-Wen Fiberlast Door Skin Material | 878 | 0.107 | 0.062 | 0.742 | - |

E2A16 (June 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ϵ^1 |
|---|-------------------|--------------|-------------|-------------------------------|----------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | - |
| Boshert Dokana – Tecniplast CV51 | 519 | 0.060 | 0.035 | 0.418 | - |
| Major Industries-15 Light Transmitting Insulation | 5.89 | 0.061 | 0.035 | 0.422 | - |

E2A15 (May 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ϵ^1 |
|---|-------------------|--------------|-------------|-------------------------------|----------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | - |
| Boshert Dokana – Insulating foam one | 78.7 | 0.034 | 0.020 | 0.236 | - |
| Boshert Dokana – Insulating foam two | 244 | 0.047 | 0.027 | 0.326 | - |
| Midwest Manufacturing-Elastopor® P15860R RESIN/ELASTOPOR® P1001U ISOCYANATE RIGID POLYURETHANE FOAM SYSTEM | 25.63 | 0.022 | 0.013 | 0.154 | - |
| Midwest Manufacturing-Elastocool® P18731/P1001U Iso Rigid Urethane Foam System | 19.22 | 0.017 | 0.010 | 0.120 | - |

E2A14 (April 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ϵ^1 |
|----------------------------|-------------------|--------------|-------------|-------------------------------|----------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Veka-cellular PVC material | 775 | 0.065 | 0.037 | 0.449 | - |

E2A13 (January 11)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ϵ^1 |
|---------------------------------------|-------------------|--------------|-------------|-------------------------------|----------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Chelsea Building Products-PVC Adapter | 702 | 0.092 | 0.053 | 0.639 | - |
| Milgard Polystyrene foam | 25.9 | 0.032 | 0.018 | 0.220 | - |

E2A12 (November 10)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density ρ | Conductivity k | | | Emissivity ϵ^1 |
|----------------------------------|-------------------|---------------------|-------|-------------|----------------------------|
| | | kg/m ³ | W/m·K | Btu/hr·ft·F | |
| Saint-Gobain-SAN 35% Glass Fiber | 1216 | 0.142 | 0.082 | 0.986 | - |

E2A11 (November 10)

Table A.2: Thermophysical Properties of Gases

| Gas | Conductivity $k = a + bT + cT^2$ [W/m·K] | | | Dynamic Viscosity $\mu = a + bT + cT^2$ [kg/m·s] | | |
|-------------------|--|---|---|--|--------------------------------|--|
| | Coefficient a [W/m·K] | Coefficient b [W/m·K ²] | Coefficient c [W/m·K ³] | Coefficient a [kg/m·s] | Coefficient b [kg/m·s·K] | Coefficient c [kg/m·s·K ²] |
| Octofluoropropane | -1.576×10^{-3} | 1.804×10^{-5} | 9.830×10^{-8} | -2.009×10^{-6} | 5.475×10^{-8} | -2.054×10^{-11} |

*Note: Nitrogen shall be treated as air.

| Gas | Specific Heat $C_p = a + bT + cT^2$ [J/kg·K] - | | | Molecular Masses |
|-------------------|--|---|---|-----------------------------|
| | Coefficient a [J/kg·K] | Coefficient b [J/kg·K ²] | Coefficient c [J/kg·K ³] | |
| Octofluoropropane | 6.332×10^2 | -3.805×10^{-1} | 3.119×10^{-3} | Mass [kg/kmol] 188.02 |

*Note: Nitrogen shall be treated as air.

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density ρ | Conductivity k | | | Emissivity ϵ^1 |
|------------------------------------|-------------------|---------------------|-------|-------------|----------------------------|
| | | kg/m ³ | W/m·K | Btu/hr·ft·F | |
| Leading Edge – TS tin plated steel | 7,147 | 51.6 | 29.8 | 358 | - |

E2A10 (September 10)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity |
|--|--------------------|-------------------------|-------------------------|-------------------------------|--------------|
| | ρ | k | | | ϵ^1 |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | - |
| Futura Coatings-ITW Foamseal E-Z Fill Plus Foam | 41.7 | 0.030 | 0.018 | 0.212 | - |
| J-M Manufacturing- Plastpro-Cellular PVC Material | 597 | 0.067 | 0.039 | 0.462 | - |
| J-M Manufacturing- Plastpro PF Wood Plastic Composite Material | 698 | 0.084 | 0.049 | 0.583 | - |
| Unilux-Compressed PU-Foam | 451 | 0.064 | 0.037 | 0.443 | - |
| Edgetech-Triseal Premium S2 Edgetech-Triseal Premium/Slimline | 767 702 | 0.1300 0.108 | 0.0750 0.063 | 0.8990 0.752 | -- |
| Edgetech- Triseal Premium Plus S2 | 776 | 0.117 | 0.067 | 0.809 | - |
| Efco-Acetal copolymer | 360 | 0.189 | 0.109 | 1.313 | - |

E2A9 (August 10)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity |
|---------------------------------|----------------------|--------------|-------------|-------------------------------|--------------|
| | ρ | k | | | ϵ^1 |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | - |
| Milgard Polyurethane w/ fly ash | 7,720 753 | 0.124 | 0.072 | 0.862 | - |
| Novatech-Foamed PVC | 303 | 0.047 | 0.027 | 0.324 | - |

E2A8 (August 10)

APPENDIX A BASIC SET OF GENERIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table A.1: Thermophysical Properties of Solid Materials¹

| Name | Density | Conductivity | | | Source ² | Emissivity |
|---------------------------|-------------------|--------------|-------------|-------------------------------|---------------------|------------|
| | ρ | k | | | | |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | - | - |
| Metals | | | | | | |
| Aluminum alloys (painted) | | 160.000 | 92.446 | 1109.357 | 1,6,11 | 0.9 |
| | | | | | | |

E2A7 (July 10)

APPENDIX A BASIC SET OF GENERIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table A.1: Thermophysical Properties of Solid Materials¹

| Name | Density | Conductivity | | | Source ² | Emissivity |
|---------------------------|-------------------|--------------|-------------|-------------------------------|---------------------|------------|
| | ρ | k | | | | |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | - | - |
| Metals | | | | | | |
| Aluminum alloys (painted) | | 160.000 | 92.446 | 1109.357 | 1,6,11 | 0.8 |
| | | | | | | |

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity |
|--|-------------------|--------------|-------------|-------------------------------|--------------|
| | ρ | k | | | |
| | kg/m ³ | W/m•K | Btu/hr•ft•F | Btu•in/hr•ft ² •°F | ϵ^1 |
| | | | | | - |
| Aurora Plastics-AP 3344 Foam Board | 673 | 0.061 | 0.035 | 0.424 | - |
| Aurora Plastics-AP 3345 Foam Board | 602 | 0.061 | 0.035 | 0.425 | - |
| Deceuninck-DNA Thermal Reinforcement | 1,649 | 0.341 | 0.198 | 2.370 | - |
| Nan Ya Plastics-Neuma Door-phenolic foam | 740 | 0.029 | 0.017 | 0.201 | - |

E2A6 (June 10)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ¹ |
|---|-------------------|--------------|-------------|-------------------------------|-------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Bayer Material Science-Glass-Reinforced Polyurethane Pultrusion | 2,127 | 0.219 | 0.127 | 1.522 | - |
| Glasscraft-Celuka Foamed PVC | 628 | 0.066 | 0.038 | 0.455 | - |
| Glasscraft-Extira Brand Composite Panel | 730.42 | 0.106 | 0.061 | 0.732 | - |
| Glasscraft-Houston Polyurethane from Houston Foam | 35.24 | 0.024 | 0.014 | 0.166 | - |
| Glasslam- Air-Tight EPDM foam spacer | 826 | 0.143 | 0.083 | 0.995 | - |
| Glasslam- Air-Tight silicone foam spacer | 1,009 | 0.125 | 0.072 | 0.867 | - |
| Leading Edge SST coil | 7,720 | 13.467 | 7.781 | 93.370 | - |
| Milgard Polyurethane w/ fly ash | 7,720 | 0.124 | 0.072 | 0.862 | - |

E2A5 (May 10)

APPENDIX C MANUFACTURER SPECIFIC THERMOPHYSICAL PROPERTY VALUES OF MATERIALS

Table C.1: Thermophysical Properties of Solid Materials

| Name | Density | Conductivity | | | Emissivity ² |
|----------------------|-------------------|--------------|-------------|-------------------------------|-------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Lakeside Radiant SST | 7,461 | 14.1 | 8.16 | 97.9 | - |

E2A4 (April 10)

¹ Emissivity for non-metallic materials is defaulted to 0.90 without actual measurements

² Emissivity for non-metallic materials is defaulted to 0.90 without actual measurements

| Name | Density | Conductivity | | | Emissivity ³ |
|--------------------------------------|-------------------|--------------|-------------|-------------------------------|-------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Mikron-XTD composite-(updated, 2009) | 493 | 0.0520 | 0.030 | 0.362 | - |

E2A4 (March 10)

| Name | Density | Conductivity | | | Emissivity ⁴ |
|--|-------------------|--------------|-------------|-------------------------------|-------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Milgard Polyethylene | 38.9 | 0.053 | 0.031 | 0.366 | - |
| Nan Ya Plastics-Neuma Door-foam PVC material | 999 | 0.082 | 0.048 | 0.570 | - |

E1A3 (March 10)

Editorial changes only were added.

E0A3 (March 10)

| Name | Density | Conductivity | | | Emissivity ⁵ |
|---|-------------------|--------------|-------------|-------------------------------|-------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Ply Gem Windows-Ply Gem G-Force | 916 | 0.093 | 0.054 | 0.646 | - |
| Mikron-XTD composite-(updated) | 666 | 0.070 | 0.041 | 0.489 | - |
| Eagle Window and Doors-Eagle Composite | 1,349 | 0.190 | 0.110 | 1.317 | - |
| Plast Pro-cellular PVC framing material | 999 | 0.096 | 0.055 | 0.665 | - |

E0A2 (February 10)

³ Emissivity for non-metallic materials is defaulted to 0.90 without actual measurements

⁴ Emissivity for non-metallic materials is defaulted to 0.90 without actual measurements

⁵ Emissivity for non-metallic materials is defaulted to 0.90 without actual measurements

| Name | Density | Conductivity | | | Emissivity ⁶ |
|--|-------------------|--------------|-------------|-------------------------------|-------------------------|
| | ρ | k | | | |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - |
| Futura Coatings-ITW Foamseal E-Z Fill Foam | 51.9 | 0.03 | 0.018 | 0.211 | - |

E0A1 (January 10)

| Name | Density | Conductivity | | | Emissivity ⁷ | Absorptivity ¹ |
|---|-------------------|--------------|-------------|-------------------------------|-------------------------|---------------------------|
| | ρ | k | | | | α |
| | kg/m ³ | W/m·K | Btu/hr·ft·F | Btu·in/hr·ft ² ·°F | - | - |
| Edgetech- Silicone foam spacer, S1 | 968 | 0.159 | 0.092 | 1.104 | - | - |
| Edgetech- Silicone foam spacer, S2 | 690 | 0.102 | 0.059 | 0.704 | - | - |
| ADCO PIB-8 HSNB Gray | 1,060 | 0.155 | 0.089 | 1.073 | - | - |
| Mikron-Energy Core Fusion Insulation System | 134 | 0.032 | 0.019 | 0.225 | - | - |

⁶ Emissivity for non-metallic materials is defaulted to 0.90 without actual measurements

⁷ Emissivity for non-metallic materials is defaulted to 0.90 without actual measurements