

Appendix A

Envelope Thermal Performance Factors

The Recommendation Tables in Chapter 3 present the opaque envelope recommendations in a standard format. This is a simple approach, but it limits the construction options. In order to allow for alternative constructions, the recommendations can also be represented by thermal performance factors such as U-factors for above-grade components, C-factors for below-grade walls, or F-factors for slabs-on-grade; see Table A-1. Any alternative construction that is less than or equal to these thermal performance factors will be acceptable alternatives to the recommendations.

Table A-1. Envelope Thermal Performance Factors

| Item | Description | Unit | #1 | #2 | #3 | #4 | #5 | #6 |
|-----------------------|--------------------------------|-------|--------|--------|--------|---------|---------|---------|
| Roof | Insulation entirely above deck | R | 15 | 20 | 25 | 30 | | |
| | | U | 0.063 | 0.048 | 0.039 | 0.032 | | |
| | Metal building | R | 19 | 13+13 | 13+19 | 16 + 19 | | |
| | | U | 0.065 | 0.055 | 0.049 | 0.047 | | |
| | Attic and other | R | 30 | 38 | 49 | 60 | | |
| | | U | 0.034 | 0.027 | 0.021 | 0.017 | | |
| Single rafter | R | 30 | 38 | 38+5 | 38+10 | | | |
| | U | 0.036 | 0.028 | 0.024 | 0.022 | | | |
| Walls, Above Grade | Mass | R | 5.7 | 7.6 | 9.5 | 11.4 | 13.3 | 15.2 |
| | | U | 0.151 | 0.123 | 0.104 | 0.090 | 0.080 | 0.071 |
| | Metal building | R | 13 | 13+13 | 13+16 | | | |
| | | U | 0.113 | 0.057 | 0.055 | | | |
| | Steel-framed | R | 13 | 13+3.8 | 13+7.5 | 13+10 | | |
| | | U | 0.124 | 0.084 | 0.064 | 0.055 | | |
| Wood-framed and other | R | 13 | 13+3.8 | 13+7.5 | 13+10 | | | |
| | U | 0.089 | 0.064 | 0.051 | 0.045 | | | |
| Walls, Below Grade | Below-grade | R | 7.5 | 12.5 | 15 | | | |
| | | C | 0.119 | 0.075 | 0.063 | | | |
| Floors | Mass | R | 4.2 | 6.3 | 10.4 | 12.5 | 14.6 | 16.7 |
| | | U | 0.137 | 0.107 | 0.074 | 0.064 | 0.056 | 0.051 |
| | Steel joist | R | 19 | 30 | 38 | | | |
| | | U | 0.052 | 0.038 | 0.032 | | | |
| Wood-framed and other | R | 19 | 30 | | | | | |
| | U | 0.051 | 0.033 | | | | | |
| Slabs | Unheated | R-in. | 10-24 | 15-24 | 20-24 | | | |
| | | F | 0.54 | 0.52 | 0.51 | | | |
| | Heated | R-in. | 7.5-12 | 7.5-24 | 10-36 | 10 Full | 15 Full | 20 Full |
| | | F | 1.02 | 0.95 | 0.84 | 0.55 | 0.44 | 0.373 |