



# Commercial Energy Code

Montgomery County has adopted and is currently enforcing the 2006 Edition of International Energy Conservation Code (IECC). IECC is a performance-based national code, which regulates the design of new commercial and multi-family residential buildings for thermal resistance, air leakage, and mechanical, electrical, water-heating, and lighting systems efficiency. There are several methods of achieving compliance with the IECC. For the purpose of this manual, only one method is offered. If this method does not satisfy the particular building design, the building must then comply with the requirements of ASHRAE/IESNA 90.1 or the requirements contained in Chapter 4 and 5 of IECC 2006, Sections 401, 402, 403, and 502,503,504,505,506 are each satisfied as applicable.

Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of the 2006 IECC as they relate to new construction without requiring the unaltered portion of the existing building to or system to comply.

Buildings undergoing a change in occupancy that would result in an increased energy demand shall comply with the 2006 IECC. Where a building includes both residential and commercial occupancies, each occupancy will be separately considered in order to meet the applicable provisions of chapter 4 for residential and chapter 5 for commercial occupancies. Residential buildings shall meet the provisions of chapter 4 and commercial buildings shall meet the provisions of chapter 5.

## Chapter 4 RESIDENTIAL ENERGY EFFICIENCY

**401.1 Scope:** This chapter applies to residential buildings.

**401.2 Compliance:** Project shall comply with sections 401,402, and 403.

**401.3 Certificate.** A permanent certificate shall be posted on or in the electrical distribution panel. The certificate shall be completed by the builder or registered design professional. The certificate shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall and/or floor) and ducts outside conditioned spaces; U-factors for fenestration; and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the type and efficiency of heating, cooling and service water heating equipment.

### BUILDING THERMAL ENVELOPE

#### 402.1 General (Prescriptive).

The Building thermal envelope shall meet the requirements of Tables 402.1.1, 402.1.3 and 402.2.4 for residential based on the climate zone specified in the Chapter 3.

**402.1.1 Insulation and fenestration criteria.** The building thermal envelope shall meet the requirements of Table 402.1.1 based on the climate zone specified in Chapter 3.

**TABLE 402.1.1  
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT <sup>a</sup>**

| CLIMATE ZONE    | FENESTRATION U-FACTOR | SKY LIGHT <sup>b</sup> U-FACTOR | GLAZED FENESTRATION SHGC | CEILING R-VALUE | WOOD FRAME WALL R-VALUE | MASS WALL R-VALUE | FLOOR R-VALUE   | BSMT <sup>c</sup> WALL R-VALUE | SLAB <sup>d</sup> R-VALUE & DEPTH | CRAWL SPACE <sup>e</sup> WALL R-VALUE |
|-----------------|-----------------------|---------------------------------|--------------------------|-----------------|-------------------------|-------------------|-----------------|--------------------------------|-----------------------------------|---------------------------------------|
| 1               | 1.20                  | 0.75                            | 0.40                     | 30              | 13                      | 3                 | 13              | 0                              | 0                                 | 0                                     |
| 2               | 0.75                  | 0.75                            | 0.40                     | 30              | 13                      | 4                 | 13              | 0                              | 0                                 | 0                                     |
| 3               | 0.65                  | 0.65                            | 0.40 <sup>e</sup>        | 30              | 13                      | 5                 | 19              | 0                              | 0                                 | 5 / 13                                |
| 4 except Marine | 0.40                  | 0.60                            | NR                       | 38              | 13                      | 5                 | 19              | 10/13                          | 10, 2ft                           | 10/13                                 |
| 5 and Marine    | 0.35                  | 0.60                            | NR                       | 38              | 19 or 13+5              | 13                | 30 <sup>f</sup> | 10/13                          | 10, 2ft                           | 10/13                                 |
| 6               | 0.35                  | 0.60                            | NR                       | 49              | 19 or 13+5              | 15                | 30 <sup>f</sup> | 10/13                          | 10,4ft                            | 10/13                                 |
| 7 and 8         | 0.35                  | 0.60                            | NR                       | 49              | 21                      | 19                | 30 <sup>f</sup> | 10/13                          | 10,4ft                            | 10/13                                 |

For SI: 1 foot = 304.8 mm.

- a. R-values are minimums. U-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2 × 6 cavity.
- b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- c. The first R-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.
- d. R-5 shall be added to the required slab edge R-values for heated slabs.
- e. There are no SHGC requirements in the Marine zone.
- f. Or insulation sufficient to fill the framing cavity, R-19 minimum.
- g. “13+5” means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.

**402.1.2 R- value computation.** Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component R-value. The manufacturer’s settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films.

**402.1.3 U-factor alternative.** An assembly with a U-factor equal to or less than that specified in Table 402.1.3 shall be permitted as an alternative to the R-value in Table 402.1.1.

**Exception:** For mass walls not meeting the criterion for insulation location in Section 402.2.3, the U-factor shall be permitted to be:

- 1. U-factor of 0.17 in Climate Zone 1.
- 2. U-factor of 0.14 in Climate Zone 2.
- 3. U-factor of 0.12 in Climate Zone 3.

**TABLE 402.1.3  
EQUIVALENT U-FACTORS <sup>a</sup>**

| CLIMATE ZONE    | FENESTRATION U-FACTOR | SKYLIGHT U-FACTOR | CEILING U-FACTOR | FRAME WALL U-FACTOR | MASS WALL U-FACTOR | FLOOR U-FACTOR | BSMT. WALL U-FACTOR | CRAWL SPACE WALL U-FACTOR |
|-----------------|-----------------------|-------------------|------------------|---------------------|--------------------|----------------|---------------------|---------------------------|
| 1               | 1.2                   | 0.75              | 0.035            | 0.082               | 0.197              | 0.064          | 0.360               | 0.477                     |
| 2               | 0.75                  | 0.75              | 0.035            | 0.082               | 0.165              | 0.064          | 0.360               | 0.477                     |
| 3               | 0.65                  | 0.65              | 0.035            | 0.082               | 0.141              | 0.047          | 0.360               | 0.136                     |
| 4 except Marine | 0.40                  | 0.60              | 0.030            | 0.082               | 0.141              | 0.047          | 0.059               | 0.065                     |
| 5 and Marine 4  | 0.35                  | 0.60              | 0.030            | 0.060               | 0.082              | 0.033          | 0.059               | 0.065                     |
| 6               | 0.35                  | 0.60              | 0.026            | 0.060               | 0.06               | 0.033          | 0.059               | 0.065                     |
| 7 and 8         | 0.35                  | 0.60              | 0.026            | 0.057               | 0.057              | 0.033          | 0.059               | 0.065                     |

a. Nonfenestration *U* -factors shall be obtained from measurement, calculation or an approved source.

**402.1.4 Total UA alternative.** If the total building thermal envelope UA (sum of *U* -factor times assembly area) is less than or equal to the total UA resulting from using the *U* -factors in Table 402.1.3 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table 402.1.1. The UA calculation shall be done using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. The SHGC requirements shall be met in addition to UA compliance.

**402.2 Specific insulation requirements. (Prescriptive).**

**402.2.1 Ceilings with attic spaces.** When Section 402.1.1 would require R-38 in the ceiling, R-30 shall be deemed to satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Similarly R-38 shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.

**402.2.2 Ceilings without attic spaces.** Where Section 402.1.1 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. This reduction of insulation from the requirements of Section 402.1.1 shall be limited to 500 square feet (46 m<sup>2</sup>) of ceiling area.

**402.2.3 Mass walls.** Mass walls for the purposes of this Chapter shall be considered walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth) and solid timber/logs. The provisions of Section 402.1.1 for mass walls shall be applicable when at least 50 percent of the required insulation *R* -value is on the exterior of, or integral to, the wall. Walls that do not meet this criterion for insulation placement shall meet the wood frame wall insulation requirements of Section 402.1.1.

**Exception:** For walls that do not meet the criterion for insulation placement, the minimum added insulation *R* -value shall be permitted to be:

1. *R* -value of 4 in Climate Zone 1.
2. *R* -value of 6 in Climate Zone 2.
3. *R* -value of 8 in Climate Zone 3.

**402.2.4 Steel-frame ceilings, walls and floors.** Steel-frame ceilings, walls and floors shall meet the insulation requirements of Table 402.2.4 or shall meet the *U*-factor requirements in Table 402.1.3. The calculation of the *U*-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

**TABLE 402.2.4  
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION  
(R-VALUE)**

| WOOD FRAME<br>R-VALUE REQUIREMENT | COLD-FORMED STEEL<br>EQUIVALENT R-VALUE <sup>a</sup>     |
|-----------------------------------|--|
| Steel Truss Ceilings <sup>b</sup> |  |
| R-30                              | R-38 or R-30 + 3 or R-26 + 5                             |
| R-38                              | R-49 or R-38 + 3   |
| R-49                              | R-38 + 5   |
| Steel Joist Ceilings <sup>b</sup> |  |
| R-30                              | R-38 in 2 X 4 or 2 X 6 or 2 X 8<br>R - 49 in any framing |
| R-38                              | R-49 in 2 X 4 or 2 X 6 or 2 X 8 or 2 X 10                |
| Steel Framed Wall                 |  |
| R-13                              | R-13 + 5 or R-15 + 4 or R-21 + 3                         |
| R-19                              | R-13 + 9 or R-19 + 8 or R-25 + 7                         |
| R-21                              | R-13 + 10 or R-19 + 9 or R-25 + 8                        |
| Steel Joist Floor                 |  |
| R-13                              | R-19 in 2 X 6<br>R-19 + 6 in 2 X 8 or 2 X 10             |
| R- 19                             | R-19 + 6 in 2 X 6<br>R-19 + 12 in 2 X 8 or 2 X 10        |

a. Cavity insulation *R*- value is listed first, followed by continuous insulation *R*- value.

b. Insulation exceeding the height of the framing shall cover the framing. **402.2.5 Floors.** Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

**402.2.6 Basement walls.** Walls associated with conditioned basements shall be insulated from the top of the basement wall down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections 402.1.1 and 402.2.5.

**402.2.7 Slab-on-grade floors.** Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table 402.1.1. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table 402.1.1 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation.

**402.2.8 Crawl space walls.** As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the floor to the finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous vapor retarder. All joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (153 mm) up the stem wall and shall be attached to the stem wall.

**402.2.9 Masonry veneer.** Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

**402.2.10 Thermally isolated sunroom insulation.** The minimum ceiling insulation R-values shall be R-19 in zones 1 through 4 and R-24 in zones 5 through 8. The minimum wall R-value shall be R-13 in all zones. New wall(s) separating a sunroom from conditioned space shall meet the building thermal envelope requirements.

### **402.3 Fenestration. (Prescriptive).**

**402.3.1 U-factor.** An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements.

**402.3.2 Glazed fenestration SHGC.** An area-weighted average of fenestration products more than 50 percent glazed shall be permitted to satisfy the SHGC requirements.

**402.3.3 Glazed fenestration exemption.** Up to 15 square feet (1.4 m<sup>2</sup>) of glazed fenestration per dwelling unit shall be permitted to be exempt from U-factor and SHGC requirements in Section [402.1.1](#).

**402.3.4 Opaque door exemption.** One opaque door assembly is exempted from the U-factor requirement in Section [402.1.1](#).

**402.3.5 Thermally isolated sunroom U-factor.** For Zones 4 through 8, the maximum fenestration U-factor shall be 0.50 and the maximum skylight U-factor shall be 0.75. New windows and doors separating the sunroom from conditioned space shall meet the building thermal envelope requirements.

**402.3.6 Replacement fenestration.** Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for U-factor and SHGC in Table [402.1.1](#).

### **402.4 Air leakage. (Mandatory).**

**402.4.1 Building thermal envelope.** The building thermal envelope shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:

1. All joints, seams and penetrations.
2. Site-built windows, doors and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
4. Utility penetrations.
5. Dropped ceilings or chases adjacent to the thermal envelope.
6. Knee walls.
7. Walls and ceilings separating a garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.

9. Common walls between dwelling units.

10. Other sources of infiltration.

**402.4.2 Fenestration air leakage.** Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot ( $1.5 \text{ L/s/m}^2$ ), and swinging doors no more than 0.5 cfm per square foot ( $2.6 \text{ L/s/m}^2$ ), when tested according to NFRC 400 or AAMA/WDMA/ CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer.

**Exceptions:** Site-built windows, skylights and doors.

**402.4.3 Recessed lighting.** Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces by being:

1. IC-rated and labeled with enclosures that are sealed or gasketed to prevent air leakage to the ceiling cavity or unconditioned space; or  
2. IC-rated and labeled as meeting ASTM E 283 when tested at 1.57 psi (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the conditioned space to the ceiling cavity; or

3. Located inside an airtight sealed box with clearances of at least 0.5 inch (12.7 mm) from combustible material and 3 inches (76 mm) from insulation.

**402.5 Moisture control. (Mandatory).** The building design shall not create conditions of accelerated deterioration from moisture condensation. Above-grade frame walls, floors and ceilings not ventilated to allow moisture to escape shall be provided with an approved vapor retarder. The vapor retarder shall be installed on the warm-in-winter side of the thermal insulation.

Exceptions:

1. In construction where moisture or its freezing will not damage the materials.

2. Frame walls, floors and ceilings in jurisdictions in Zones 1 through 4. (Crawl space floor vapor retarders are not exempted.)

3. Where other approved means to avoid condensation are provided.

**402.6 Maximum fenestration  $U$ -factor and SHGC. (Mandatory).** The area weighted average maximum fenestration  $U$ -factor permitted using trade offs from Section 402.1.4 or Section 404 shall be 0.48 in zones 4 and 5 and 0.40 in zones 6 through 8 for vertical fenestration, and 0.75 in zones 4 through 8 for skylights. The area weighted average maximum fenestration SHGC permitted using trade-offs from Section 404 in Zones 1 through 3 shall be 0.50.

**Chapter 5  
COMMERCIAL ENERGY EFFICIENCY**

**BUILDING ENVELOPE REQUIREMENTS**

. The Building thermal envelope shall meet the requirements of Tables 502.2(1), 502.3 for commercial occupancies based on the climate zone specified in the Chapter 3. Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table 502.3 shall comply with the building envelope provisions of the ASHRAE/IESNA 90.1

In utilizing the Tables as design guides, the following must be recognized:

1 The building envelope components shall meet each of the applicable requirements in the Tables below based on the percentage of wall that is glazed. The percentage of wall that is glazed shall be determined by dividing the aggregate area of rough openings for glazing (windows and glazed doors) in all the above-grade walls associated with the building envelope by the total gross area of all above-grade exterior walls that are a part of the building envelope. In buildings with multiple types of building envelope construction, each building envelope construction type shall be evaluated separately. Where the Tables below do not list a particular construction type, the applicable provisions of ASHRAE/IESNA 90.1 shall be used in lieu of this section.

2 The minimum thermal resistance (R-value) of the openings and penetrations in the building envelope shall be sealed with the caulking materials or closed with gasketing system compatible with the construction materials and location. Joints and seams shall be sealed in the manner or taped or covered with a moisture vapor-permeable wrapping materials. Sealing materials spanning joints between construction materials shall allow for expansion and contraction of the construction materials, insulating material (s) installed in the wall cavity between the framing members and continuously on the walls shall be as specified in the Table 502.2 (1), based on framing type and construction materials used in the wall assembly. The R-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table 502.2(1). "Mass Walls" shall include walls weighing at least (1) 35 pounds per square foot (170 kg/m<sup>2</sup>) of wall surface area or (2) 25 pounds per square foot ( 120kg/m<sup>2</sup> ) of the wall surface area if the material weight is not more than 120 pounds per cubic foot (1,900k/m<sup>3</sup>).

3 The window projection factor shall be determined in accordance with following equation:  
 $PF = A/B$  Where PF = Projection factor (decimal).

A = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.

B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.

Where different windows or glass doors have different PF values, they shall each be evaluated separately, or an area-weighted PF value shall be calculated and used for all windows and glass doors.

4 Slab-on-grade insulation shall be placed on the outside of the foundation or on the inside of a foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table.

5 The below -grade wall insulation shall extend to a depth of 10 feet below the outside finish ground level, or the level of the floor, whichever is less.

6 Openings and penetrations in the building envelope shall be sealed with the caulking materials or closed with gasketing system compatible with the construction materials and location. Joints and seams shall be sealed in the manner or taped or covered with a moisture vapor-permeable wrapping materials. Sealing materials spanning joints between construction materials shall allow for expansion and contraction of the construction materials.

The following foot notes apply to the tables listed below:

For SI: 1 inch = 25.4mm

ci – Continuous Insulation

NR – No Requirement

a. Thermal blocks are a minimum R-5 of rigid insulation, which extends 1-inch beyond the width of the purlin on each side, perpendicular to the purlin.

b. Assembly descriptions can be found in the above Table.

c. R-5.7 ci maybe substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 in. or less on center vertically and 48 in. or less on center horizontally, with ungrouted cores filled with material having a maximum thermal conductivity of 0.44 Btu-in./h-f<sup>2</sup> F.

d. When heated slabs are placed below grade, below grade walls must meet the exterior insulation requirements for perimeter insulation according to the heated slab-on-grade construction.

e. Insulation is not required for mass walls in Climate Zone 3A located below the “Warm-Humid” line, and in Zone 3B.

TABLE 502.2(1)

BUILDING ENVELOPE REQUIREMENTS – OPAQUE ASSEMBLIES

| CLIMATE ZONE   | 1                            | 2                            | 3                            | 4<br>except<br>Marine        | 5 and<br>Marine4             | 6                           | 7                           | 8                           |
|--|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|
| <b>Roofs</b>   |                              |                              |                              |                              |                              |                             |                             |                             |
| Insulation entirely above deck                                       | R-15 ci                      | R-15 ci                      | R-15 ci                      | R-15 ci                      | R-20 ci                      | R-20 ci                     | R-25 ci                     | R-25 ci                     |
| Metal buildings (with R-5 thermal blocks <sup>a</sup> ) <sup>b</sup> | R-19 + R-10                  | R-19                         | R-19                         | R-19                         | R-19                         | R-19                        | R-19 + R-10                 | R-19 + R-10                 |
| Attic and other  | R-30                         | R-30                         | R-30                         | R-30                         | R-30                         | R-30                        | R-38                        | R-38                        |
| <b>Walls, Above Grade</b>  |                              |                              |                              |                              |                              |                             |                             |                             |
| Mass   | NR                           | NR                           | R-5.7ci, <sup>e</sup>        | R-5.7ci <sup>c</sup>         | R-7.6 ci                     | R-9.5 ci                    | R-11.4 ci                   | R-13.3 ci                   |
| Metal building <sup>b</sup>  | R-13                         | R-13                         | R-13                         | R-13                         | R-13 + R-13                  | R-13 + R-13                 | R-13 + R-13                 | R-13 + R-13                 |
| Metal framed   | R-13                         | R-13                         | R-13                         | R-13                         | R-13 + R-3.8 ci              | R-13 + R-3.8 ci             | R-13 + R-7.5 ci             | R-13 + R-7.5 ci             |
| Wood framed and other  | R-13                         | R-13                         | R-13                         | R-13                         | R-13                         | R-13                        | R-13                        | R-13 + R-7.5 ci             |
| <b>Walls, Below Grade</b>  |                              |                              |                              |                              |                              |                             |                             |                             |
| Below grade wall <sup>d</sup>  | NR                           | NR                           | NR                           | NR                           | NR                           | NR                          | R-7.5 ci                    | R-7.5 ci                    |
| <b>Floors</b>  |                              |                              |                              |                              |                              |                             |                             |                             |
| Mass   | NR                           | R-5 ci                       | R-5 ci                       | R-10 ci                      | R-10 ci                      | R-10 ci                     | R-15 ci                     | R-15 ci                     |
| Joist/Framing  | NR                           | R-19                         | R-19                         | R-19                         | R-19                         | R-30                        | R-30                        | R-30                        |
| <b>Slab-on-Grade Floors</b>  |                              |                              |                              |                              |                              |                             |                             |                             |
| Unheated slabs   | NR                           | NR                           | NR                           | NR                           | NR                           | NR                          | NR                          | R-10<br>for 24 in.<br>below |
| Heated slabs   | R-7.5<br>for 12 in.<br>below | R-7.5<br>for 12 in.<br>below | R-7.5<br>for 12 in.<br>below | R-7.5<br>for 12 in.<br>below | R-7.5<br>for 24 in.<br>below | R-10<br>for 36 in.<br>below | R-10<br>for 36 in.<br>below | R-10<br>for 48 in.<br>below |
| <b>Opaque Doors</b>  |                              |                              |                              |                              |                              |                             |                             |                             |
| Swinging   | U – 0.70                     | U – 0.70                     | U – 0.70                     | U – 0.70                     | U – 0.70                     | U – 0.70                    | U – 0.70                    | U – 0.50                    |
| Roll-up or sliding   | U – 1.45                     | U – 1.45                     | U – 1.45                     | U – 1.45                     | U – 1.45                     | U – 0.50                    | U – 0.50                    | U – 0.50                    |

**TABLE 502.2 (2)**

**METAL BUILDING ASSEMBLY DESCRIPTIONS**

| ROOFS        | DESCRIPTION   | REFERENCE                    |
|--------------|---|------------------------------|
| R-19 + R-10  | <p>Filled cavity roof.</p> <p>Thermal blocks are a minimum, R-5 of rigid insulation, which extends 1 in. beyond the width of the purlin on each side, perpendicular to the purlin.</p> <p>This construction is R-10 insulation batts draped perpendicularly over the purlins, with enough looseness to allow R-19 batt to be laid above it, parallel to the purlins. Thermal blocks are then placed above the purlin/batt, and the roof deck is secured to the purlins. In the metal building industry, this is known as the “sag and bag” insulation system.</p> | ASHRAE/IESNA 90.1 Table A2.3 |
| R-19         | <p>Standing seam with single insulation layer.</p> <p>Thermal blocks are a minimum R-5 of rigid insulation, which extends 1 in. beyond the width of the purlin on each side, perpendicular to the purlin.</p> <p>This construction R-19 insulation batts draped perpendicularly over the purlins. Thermal blocks are then placed above the purlin/batt, and the roof deck is secured to the purlins.</p>  | ASHRAE/IESNA 90.1 Table A2.3 |
| <b>Walls</b> |   |                              |
| R-13         | <p>Single insulation layer</p> <p>The first layer of R-13 insulation batts is installed continuously perpendicular to the girts and is compressed as the metal skin is attached to the girts.</p>   | ASHRAE/IESNA 90.1 Table A3.2 |
| R-13 + R-13  | <p>Double insulation layer</p> <p>The first layer of R-13 insulation batts is installed continuously perpendicular to the girts, and is compressed as the metal skin is attached to the girts. The second layer of R-13 insulation batts is installed within the framing cavity.</p>  | ASHRAE/IESNA 90.1 Table A3.2 |

**502.3 Fenestration (Prescriptive).** Fenestration shall comply with Table 502.3.

**TABLE 502.3  
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION**

| CLIMATE ZONE   | 1    | 2    | 3    | 4<br>except<br>Marine | 5<br>and<br>Marine 4 | 6    | 7    | 8    |
|--|------|------|------|-----------------------|----------------------|------|------|------|
| Vertical Fenestration (40% maximum of above-grade wall)                            |      |      |      |                       |                      |      |      |      |
| <i>U</i> -Factor   |      |      |      |                       |                      |      |      |      |
| Framing materials other than metal with or without metal reinforcement or cladding |      |      |      |                       |                      |      |      |      |
| <i>U</i> -Factor   | 1.20 | 0.75 | 0.65 | 0.40                  | 0.35                 | 0.35 | 0.35 | 0.35 |
| Metal framing with or without thermal break  |      |      |      |                       |                      |      |      |      |
| Curtain Wall/Storefront <i>U</i> -Factor   | 1.20 | 0.70 | 0.60 | 0.50                  | 0.45                 | 0.45 | 0.45 | 0.45 |
| Entrance Door <i>U</i> -Factor   | 1.20 | 1.10 | 0.90 | 0.85                  | 0.80                 | 0.80 | 0.80 | 0.80 |
| All Other <i>U</i> -Factor <sup>a</sup>  | 1.20 | 0.75 | 0.65 | 0.55                  | 0.55                 | 0.55 | 0.50 | 0.50 |
| SHGC-All Frame Types   |      |      |      |                       |                      |      |      |      |
| SHGC: PF < 0.25  | 0.25 | 0.25 | 0.25 | 0.40                  | 0.40                 | 0.40 | NR   | NR   |
| SHGC: 0.25 ≤ PF < 0.5  | 0.33 | 0.33 | 0.33 | NR                    | NR                   | NR   | NR   | NR   |
| SHGC: PF ≥ 0.5   | 0.40 | 0.40 | 0.40 | NR                    | NR                   | NR   | NR   | NR   |
| Skylights (3% maximum)   |      |      |      |                       |                      |      |      |      |
| Glass  |      |      |      |                       |                      |      |      |      |
| <i>U</i> -Factor   | 1.60 | 1.05 | 0.90 | 0.60                  | 0.60                 | 0.60 | 0.60 | 0.60 |
| SHGC   | 0.40 | 0.40 | 0.40 | 0.40                  | 0.40                 | 0.40 | NR   | NR   |
| Plastic  |      |      |      |                       |                      |      |      |      |
| <i>U</i> -Factor   | 1.90 | 1.90 | 1.30 | 1.30                  | 1.30                 | 0.90 | 0.90 | 0.60 |
| SHGC   | 0.35 | 0.35 | 0.35 | 0.62                  | 0.62                 | 0.62 | NR   | NR   |

## **BUILDING MECHANICAL SYSTEM**

Building mechanical system shall comply with section 503 of the IECC. Compliance with Section 503 shall be achieved by meeting either Section 503.3 or 503.4. Section provision applicable to all mechanical systems.

Section 503.3 applies to buildings served by unitary or packed HVAC equipment listed in Tables 503.2.3(1) through 503.2.2(5), each serving one zone and controlled by a single thermostat in the zone served. It also applies to two-pipe heating systems serving one or more zones, where no cooling system is installed.

This section does not apply to fan systems serving multiple zones, non unitary or non packaged HVAC equipment and systems or hydronic or steam heating and hydronic cooling equipment and distribution systems that provide cooling or cooling and heating which are covered by Section 503.4.

Supply air economizers shall be provided on each cooling system as shown in table 503.3.1(1).

## **LIGHTING SYSTEMS**

Building lighting system, including lighting controls, tandem wiring requirements, interior lighting power requirements and exterior lighting shall comply with Section 505 of the 2006 IECC.

**COMMERCIAL ENERGY CODE COMPLIANCE FORM**

Building Address: \_\_\_\_\_ Permit (A/P) # \_\_\_\_\_

Design Professional's Name: \_\_\_\_\_

Address: \_\_\_\_\_ Phone# \_\_\_\_\_

$$\text{Glazing Area} = 100 \times \frac{\text{Glazing Area}}{\text{Gross Wall Area}} = \text{Percent Glazing Area}$$

In the Table below, indicate the U-factor, SHGC, and R-value of the building elements as appropriate:

| ELEMENT  | CONDITION/VALUE                   |                      |                              |
|--|-----------------------------------|----------------------|------------------------------|
| <b>SKYLIGHT (U-factor)</b>   |                                   |                      |                              |
| <b>Slab or below-grade wall (R-value)</b>  |                                   |                      |                              |
| <b>Windows and glass doors</b>   | <b>SHGC</b>                       |                      | <b>U- factor</b>             |
| PF < 0.25  |                                   |                      |                              |
| 0.25 ≤ PF < 0.50   |                                   |                      |                              |
| PF ≥ 0.50  |                                   |                      |                              |
| <b>Roof assemblies (R-value)</b>   | <b>Insulation between framing</b> |                      | <b>Continuous insulation</b> |
| All-wood joist/truss   |                                   |                      |                              |
| Metal joist/truss Concrete slab or deck  |                                   |                      |                              |
| Metal purlin with thermal block Metal purlin without thermal block   |                                   |                      |                              |
|  |                                   |                      |                              |
| <b>Floors over outdoor air or unconditioned space (R-value)</b>  | <b>Insulation between framing</b> |                      | <b>Continuous insulation</b> |
| All-wood joist/truss   |                                   |                      |                              |
| Metal joist/truss  |                                   |                      |                              |
| Concrete slab or deck  |                                   |                      |                              |
|  |                                   |                      |                              |
| <b>Above-Grade Walls (R-value)</b>   | <b>No framing</b>                 | <b>Metal framing</b> | <b>Wood framing</b>          |
| Framed   |                                   |                      |                              |
| R-value cavity   |                                   |                      |                              |
| R-value continuous CMU, ≥ 8 in, with integral insulation R-value cavity R-value continuous Other Masonry Walls R-value cavity R-value continuous |                                   |                      |                              |
|  |                                   |                      |                              |
|  |                                   |                      |                              |
|  |                                   |                      |                              |
|  |                                   |                      |                              |
|  |                                   |                      |                              |
|  |                                   |                      |                              |

**Building Mechanical System Complies with** (check all that applies):

- Section 503.3 of the 2006 IECC
- Section 503.4 of the 2006

**Building Lighting Systems comply with**

- Section 505 of the 2006 IECC

**I hereby certify that the proposed building design represented in these construction documents has been designed to meet the requirements of the Montgomery County Energy Code.**

\_\_\_\_\_  
Design Professional's Name

\_\_\_\_\_  
Original Seal & Signature

\_\_\_\_\_  
Date