

## INSULATION – BATT

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### Avoid Using Batt Insulation With Metal Framing

Batt insulation *should not* be used with metal framing systems. Although it is common to see fiberglass batt insulation installed between steel studs, there is significantly increased risk of moisture infiltration and thermal bridging. The best practice for insulating metal framing is to install rigid insulation inside the exterior wall; more detailed information can be found in the section Envelope, INSULATION – RIGID / SIPS.

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### Pressure or Friction Fit

Insulation should be cut to fit snugly against studs on all sides, and should completely fill the cavity with no air gaps. Cut lengths of insulation should be butted together with no gaps. Friction fit batts are slightly wider than the stud cavity and so held in place by friction, not stapling. Friction fit batts should not be used in walls over 8 feet tall.

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### Face & Inset Stapling

Push batt into stud cavity so that it makes contact with framing, especially at corners and sides. Then pull batt forward to full loft so that it fills the whole cavity.

**(1) Face Stapling:** Paper flanges are stapled to stud face. This method of installation is best practice and avoids loss of performance from air gap channels created with inset stapling.



**(2) Inset Stapling:** Insulation should be compressed only as far as is required to staple the flange to the inside of the stud. Extra compression will result in loss of performance therefore **this method is NOT RECOMMENDED.**

# Envelope

## INSULATION – BATT



### Obstructions

Junction boxes that back to outside walls should have insulation cut to fit snugly around them, and behind them, to fill the cavity. Similarly, insulation should be cut to fit around ceiling exhaust fans. All holes in junction boxes whether there are wires entering the boxes there or not should be air sealed.



### Split , Don't Stuff

Take the time to split insulation to fit snugly around electrical wires and plumbing. Do not stuff the batt in front of or behind the wire; this compresses the insulation and leaves an air gap.



### Proper Support

Wire struts or laced wire can be used to support fiberglass to keep it in touch with the floor above. Wire should not compress the insulation but also should not let it sag.

### Notes:

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## INSULATION – BLOWN

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### Avoid Using Blown Insulation With Metal Framing

Blown insulation *should not* be used with steel framing systems. The best practice for insulating metal framing is to install rigid insulation inside the exterior wall; more detailed information can be found in the section Envelope, INSULATION – RIGID / SIPS.

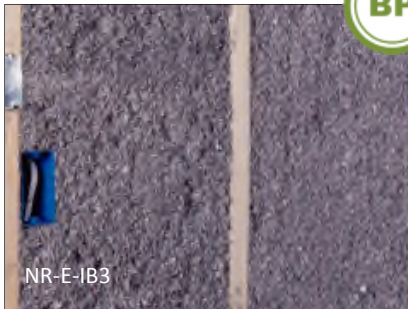
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### Dry Blown

Dry blown cellulose can be blown into walls through holes in netting fixed to the studs. The insulation should be packed firmly but not bulging. Rolling the packed insulation helps evenly distribute the cellulose in the stud cavity and leaves it flat ready for drywall installation.

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### Wet Blown

Wet blown cellulose is typically used in new construction or major renovations and sticks to the framing to fill the cavity. It is “shaved off” so that it aligns with the face of the studs.

The wall should not be covered until the insulation is totally dry (follow manufacturer instructions for approximate dry times).

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### Spray

Open-cell foam sprayed into walls fully fills the stud cavity with no voids. Properly installed foam will not shrink away from framing members. Pay attention to the rim joist area, where blocking and other obstructions, in addition to nozzles used to spray the foam, make it hard to cover the lower edge of that space. Closed cell foam has a higher R value per inch and adds shear strength to the building. Thickness of more than 1.5 inches of closed-cell foam can act as an air and moisture barrier.

NR-E-IB1: © PLACEHOLDER

NR-E-IB2: © Baechler, Gilbride, Hefty, Cole, Love

NR-E-IB3: © Architectural Energy Corporation

NR-E-IB4: © Baechler, Gilbride, Hefty, Cole, Love

# Envelope

## INSULATION – BLOWN



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### When Installed in an Unconditioned Space

Attic blown insulation should be installed uniformly and reach the outside edge of the exterior walls.

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## INSULATION – EXTERIOR AND RIGID/ SIPS

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### Urea Formaldehyde Foam

When using urea formaldehyde foam insulation it may only be installed in exterior side walls. A 4 mil thick plastic polyethylene vapor retarder must separate the foam from the interior space.

**Code Reference:** 2016 Title 24, Part 6 Standards §110.8(b)

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### Metal Framing

A wall assembly consisting of exterior veneer, a reflective air space, two inches of R-8 rigid foiled faced insulation, a vapor barrier, exterior gypsum board, topped with metal framing and interior drywall provides a calculated R-value around R-22. This approach prevents the risk moisture infiltration found with fiberglass batt, and allows the stud cavity to more easily be used for electrical and communications wiring.

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### SIPs

Structural Insulated Panels sandwich rigid foam insulation between layers of sheathing. Air seal electrical wiring channels in exterior walls. Seal connections between panels, sill and top plates when assembling to reduce water vapor and air transmission. Where appropriate, use SIPs with splines, allowing insulation to remain as continuous as possible. Some panels are produced with rough sawn plywood to speed up installation for board and batt siding.

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### Loading Dock Weather Sealing

Reduce air infiltration when loading and unloading at cargo dock doors by using weather seals meant to reduce air flow.

## INSULATION – EXTERIOR AND RIGID/ SIPS



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### Exterior Insulation

Insulation on the exterior of a building must be protected from wind, sun, and moisture as well as maintenance or landscape activities. Brick, stucco and metal siding are examples of cladding that protect exterior wall insulation.

**Notes:**

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## INSULATION – WALL SYSTEMS

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### Concrete Columns

Carefully follow the specifications for connection, air sealing and insulation details where concrete columns meet interior and exterior walls. These areas often leave gaps that are difficult to access.

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### Insulating Concrete Forms (ICF)

With careful installation and proper air sealing, ICFs can create continuous insulation and an air barrier. Avoid using metal ties to connect the layers of foam to minimize heat transfer through the ICF system.

**Notes:**

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## INSULATION – ATTIC/ROOF DECK

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### Direct Ceiling Contact

Install insulation so that it is in direct contact with roof or ceiling that is continuous and well-sealed to limit infiltration. The insulation may be placed above or below the roof deck, or above the ceiling drywall.

**Code Reference:** 2016 Title 24, Part 6 Standards §110.8(e)1

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### Roof Membrane

Unless the attic insulation has a maximum water absorption of 0.3% by volume, it must be installed below the roof membrane that seals the roof from water penetration.

**Code Reference:** 2016 Title 24, Part 6 Standards §110.8(e)4

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### Install Entirely Above the Roof Deck

Although not a code requirement, rigid insulation installed over a metal roof deck solves several issues associated with attic insulation. It alleviates thermal bridging, creates a very even R value across the entire roof, and covers the metal that otherwise acts as a conduit for heat gain or loss.



## INSULATION – ATTIC/ROOF DECK

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### Open Blown or Poured Loose Fill Insulation

Loose blown attic insulation should not be installed in attics with greater than a 3:12 sloped ceiling. Otherwise it will be hard to maintain an even full depth over the vaulted area.

### Vent Baffles

Attic baffles are required in every vented bay. The baffles protect insulation from being blown away from the exterior wall, help maintain the effectiveness of the insulation at its edge, and maintain venting space under the roof deck.

### Insulating Around Equipment

Maintain insulation thickness around equipment installed in the attic. Make sure full insulation depth is maintained above can lights and below ducts. Can lights must be air tight and insulation contact rated. Compressing insulation will reduced effective R value.

**Notes:**

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## INSULATION – WALLS/ FOUNDATION

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### More Insulation Less Frame

Install wall components to allow for as much insulation coverage as possible while meeting structural requirements. Use two or three stud corners that allow insulation to reach these cavities.

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### Metal Framing

Rigid insulation installed over metal studs alleviates thermal bridging of the studs. Cavity insulation between metal studs must be in direct contact with exterior sheathing or rigid insulation if present.

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### Slab Insulation

Insulation should extend all the way to the top of the slab.

## INSULATION – WALLS/ FOUNDATION

**Notes:**

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## INSULATION - FLOORS

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### Heated Slab Floors

A rigid shield is installed at the exposed top edge of insulation to prevent insects from penetrating the wall structure above. Any exposed insulation is protected from moisture, UV, and other damage with a solid covering.

**Code Reference:** 2016 Title 24, Part 6 Standards §110.8(g)2

### Heated Slab Insulation

Perimeter insulation installed on the exterior of the foundation extends 16" down from the level of the top of the slab; greater if the frost line is deeper. However it may stop at the footing if this is reached first. If the slab is below grade, insulation shall extend from the top of the foundation wall to the bottom of the foundation wall, footing or frost line; whichever is greater. When a heated slab is insulated between the slab and outside wall, the vertical insulation extends from the top of the slab down to the horizontal insulation. The horizontal insulation extends 4' inward from the outside edge of the vertical insulation.

**Code Reference:** 2016 Title 24, Part 6 Standards §110.8(g)2 Table 110.8-A

## INSULATION – FLOORS

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### Mass Floors

Install continuous rigid insulation under a mass floor so that none of the floor is visible through the insulation.

### Steel Joist Floor

When insulating a steel joist floor, insulation should be in direct, continuous contact with the floor above. This is most easily achieved with spray on foam insulation. If insulation is not installed for permanent contact, it will lose effectiveness.

### Wood Framed Floor

For full benefits of thermal insulation installed below wood framed floors, the insulation should be in direct contact with the under side of the floor deck. Cantilevers also require that the insulation be blocked in the joist bays above the exterior wall.

**Notes:**

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