Ensuring the Quality of Insulation: RESNET Insulation Inspections

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Conservation Services Group

Insulation Inspection Procedures

RESNET standards
Practical Applications
Sample Inspection Checklist

Insulation Inspection Procedures

Assess insulation quality
- – Three installation Grades: I, II, and III
- – "Grade I" based on industry published standards

Provide specific modeling guidance
- – Based on results of field assessment
- – Primarily for software developers, not raters

Other details
- – Installation practices, framing, compression

Inspection *Requirement* ?

Yes—to take full credit for thermal performance of properly installed product

No—not required for a rating
- – Accept defaults if you don't inspect
  - • Equivalent to Grade III
- – Parallel to other HERS requirements
  - • Envelope, duct testing

Applies to all types of insulation

Assessment: Grade I

Installed according to manufacturers instructions
- – Fills each cavity side-to-side and top-to-bottom
- – No substantial gaps or voids around obstructions (i.e. blocking or bridging)
- – Split and/or fitted tightly around wiring and other services

No exterior sheathing is visible through gaps in the material, minimal compression

Incomplete fill or compression of up to 30% of intended thickness, to up to 2% of the area

Boundary condition for "Grade I"

Gaps clear through insulation– minimal

Compression or incomplete fill: <2% of area, compressed by <30% of intended thickness

NOTE

"Grade I" is REQUIRED to use the EPA 2006 National Builder Option Package

Assessment: Grade II

Moderate to frequent defects:
- Gaps around wiring, electrical outlets, plumbing, other intrusions
- Rounded edges or "shoulders"

Gaps/spaces clear through the insulation amounting to up to 2% of total surface area covered by the insulation; or

Incomplete fill or compression of up to 30% of intended thickness, to up to 10% of the area

Boundary condition for "Grade II"

Gaps clear through insulation: <2%

Compression or incomplete fill: <10% of area, compressed by <30% of intended thickness

Assessment: Grade III

Gaps and voids amounting to greater than 2% percent of the surface area it is intended to occupy
- But less than 5%

Boundary condition for "Grade III"

Gaps – no more than 5% missing

- In cases that are worse than "Grade III", the requirement is to measure missing areas.
- If the entire surface is compressed, insulation R-value according to manufacturer (or defaults) for whole assembly

Conditions for *Wall* Insulation

To attain a rating of "Grade I" or "Grade II":

Must be enclosed on all six sides
- Sheathing wrap is accepted

Must be in substantial contact with the sheathing material on at least one side of the cavity
- Interior or exterior

W*all* insulation that is:

Not in substantial contact with the sheathing on at least one side of the cavity

OR, wall that is open (unsheathed) on one side and exposed to the exterior conditions or a vented attic or crawlspace;

Shall be rated "Grade III"

Additional for Ceilings

For "Grade I" rating

- Must be in complete contact with the surface it is intended to insulate
- Must have eave baffles
- Need *not* be enclosed on the top

Inspectors need to note whether the framing is covered, and by how much

- Model cavity insulation separately from continuous insulation

Additional for Floors:

Must be in complete contact with the surface it is intended to insulate, for "Grade I" rating

Need not be enclosed on 6 sides, **IF** in enclosed, unconditioned basement

- **Vented, or outdoors does need enclosure**

Missing insulation

Treat as SEPARATE areas

- Insulation R-values may ***not*** be averaged over areas
- Example: If 50 square feet of wall has no insulation, must be counted as separate wall area with no insulation
- Example: if 100 s.f. of an attic has ½ the R-value of loose fill that exists everywhere else, must be input as 100 s.f. with ½ the R-value

Practical Issues

Inspections of Modular/Manufactured

- Can use in-plant inspection (IPIA) provided they follow the RESNET inspection guidelines
- Use judgment (!) about what you'll accept

Building techniques or materials with inherent insulation qualities

- SIP's, ICF's, log construction, etc.
- Be careful about manufacturers' claims of "equivalent" R-values (!)

Steel framing: use specified method in standards

- NOT parallel path UxA calculations! (Software)

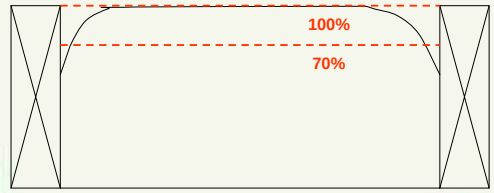

CertainTeed


CW

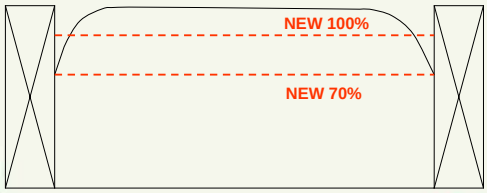

CW15


Incomplete Fill / Compression
Two choices
– Select thickness of insulation that meets grade level across assembly
– Select lower grade
CSG

Select thickness of insulation that meets grade level across assembly



Select thickness of insulation that meets grade level across assembly



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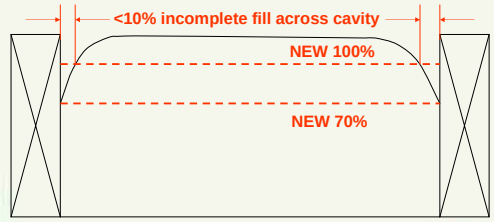


"Grade II" at the new thickness

Individual Cavities

For example, exterior wall cavities containing duct risers

Measure area separately

- Give credit as due for any rigid foam, fiberglass, or whatever is in bays
- According to guidelines, but at that R-value

Or, the walls ALL have to be Grade III

Comments

Grade I

- Essentially "practically" perfect installation
- Does *not* exclude kraft-faced batt installation—provided it meets criteria
- Can be assessed for less than "full" thickness

Grade II

- Can NOT be met using batts, if batts are stuffed in over wiring
- Splitting batts around wiring necessary (but not sufficient)

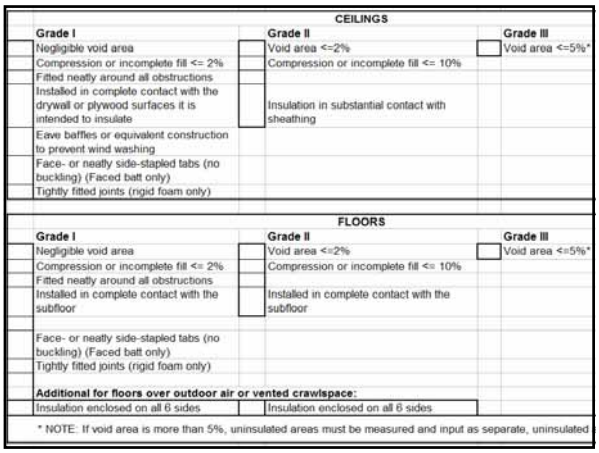
Checklist Example

Insulation Inspection Grading Checklist

ALL items in a category must be checked to assign that category for an insulation rating

WALLS

Grade I	Grade II	Grade III
☐ Negligible void area	☐ Void area <=2%	☐ Void area <=5%*
☐ Compression or incomplete fill <= 2%	☐ Compression or incomplete fill <= 10%	
☐ Fitted neatly around all obstructions		
☐ Insulation in substantial contact with sheathing	☐ Insulation in substantial contact with sheathing	
☐ Insulation enclosed on all 6 sides	☐ Insulation enclosed on all 6 sides	
☐ Face- or neatly side-stapled tabs (no buckling) (Faced batt only)		
☐ Tightly fitted joints (rigid foam only)		
☐ Insulation springs back when compressed (blown- or sprayed-in materials only)		



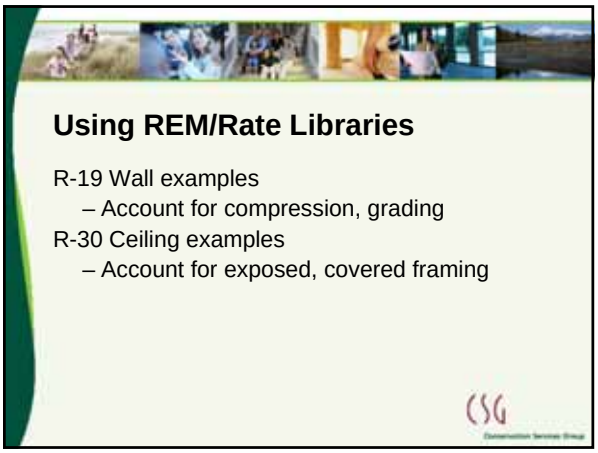
CEILINGS

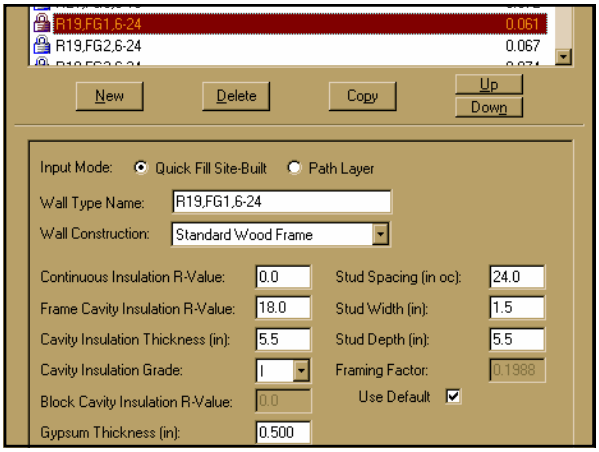
Grade I	Grade II	Grade III
Negligible void area	Void area <=2%	Void area <=5%*
Compression or incomplete fill <= 2%	Compression or incomplete fill <= 10%	
Fitted neatly around all obstructions		
Installed in complete contact with the drywall or plywood surfaces it is intended to insulate	Insulation in substantial contact with sheathing	
Eave baffles or equivalent construction to prevent wind washing		
Face- or neatly side-stapled tabs (no buckling) (Faced batt only)		
Tightly fitted joints (rigid foam only)		

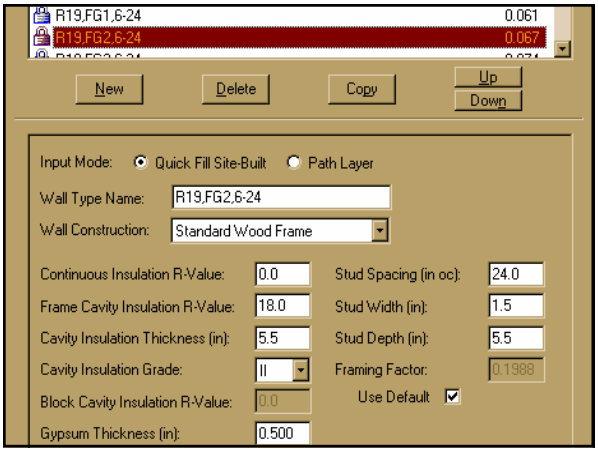
FLOORS

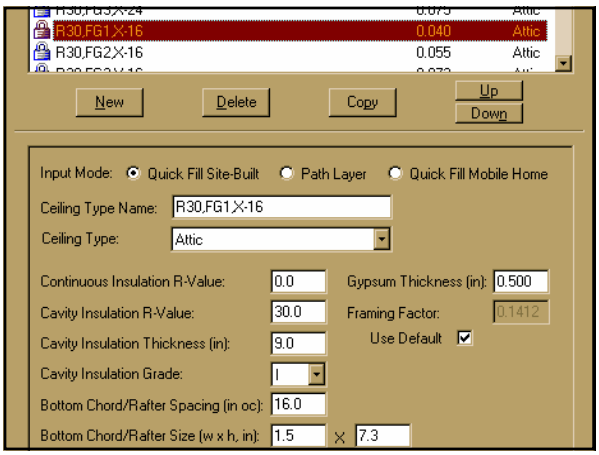
Grade I	Grade II	Grade III
Negligible void area	Void area <=2%	Void area <=5%*
Compression or incomplete fill <= 2%	Compression or incomplete fill <= 10%	
Fitted neatly around all obstructions		
Installed in complete contact with the subfloor	Installed in complete contact with the subfloor	
Face- or neatly side-stapled tabs (no buckling) (Faced batt only)		
Tightly fitted joints (rigid foam only)		
Additional for floors over outdoor air or vented crawlspace:		
Insulation enclosed on all 6 sides	Insulation enclosed on all 6 sides	

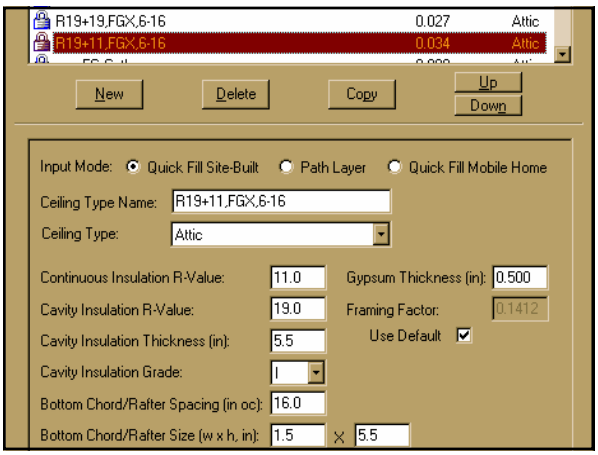
* NOTE: If void area is more than 5%, uninsulated areas must be measured and input as separate, uninsulated

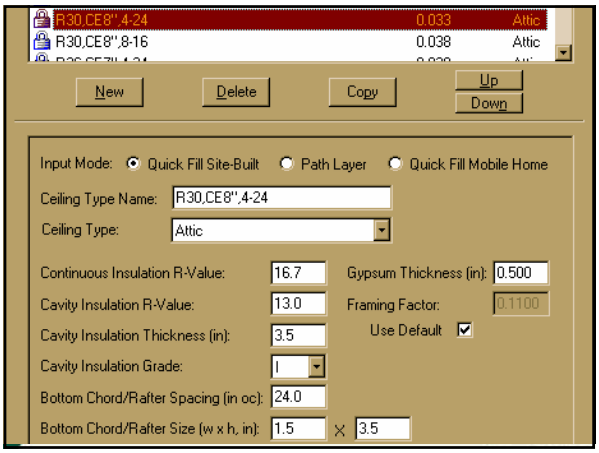








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R30,CE8",8-16 0.038 Attic
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Input Mode: Quick Fill Site-Built Path Layer Quick Fill Mobile Home
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Ceiling Type: Attic
Continuous Insulation R-Value: 16.7
Gypsum Thickness (in): 0.500
Cavity Insulation R-Value: 13.0
Framing Factor: 0.1100
Cavity Insulation Thickness (in): 3.5
Use Default
Cavity Insulation Grade: I
Bottom Chord/Rafter Spacing (in oc): 24.0
Bottom Chord/Rafter Size (w x h, in): 1.5 x 3.5


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