



Residential Energy Conservation Submittal, Inspection and Compliance

2009 International Energy Conservation Code®

The City and County of Broomfield Building Division has adopted the 2009 *International Energy Conservation Code®*, effective March 7, 2011. We have amended out Chapter 11 from the IRC and refer instead to IECC Chapters 3 and 4. This handout will summarize the submittal requirements for energy code compliance. This applies to building permits for all new residential projects, including detached one and two family homes, townhomes, and multifamily projects.

There are three design paths that the designer can take to show compliance with these codes. Option #1 is the Prescriptive Path per IECC Section 402; Option #2 is the Total UA Alternative Path per IECC 402.1.4; and Option #3 is the Simulated Performance Alternative Path per IECC Section 405.

OPTION #1 - PRESCRIPTIVE PATH

IECC Section 402 has the requirements for the prescriptive path. The **plans** need to show the following information. All information shall be per tables in Section 402 using zone 5 Dry.

1. **Insulation.** Provide all insulation "R" values, materials, and locations to be installed (walls, ceilings, cantilever floors, floors over garage, crawl space, basement walls, etc.) per Sections 402.1 and 402.2 and Table 402.1.1. The exact location of the building thermal envelope that corresponds with this information shall be delineated on the plans, details, and section views.

Please note that the cavity insulation shall be completely in direct contact with the floor sheathing at cantilevers or in floors located above garages.

2. **Fenestration.** Provide all fenestration U factors per Section 402.3 and Table 402.1.1. This will apply for all glazing in windows and doors. If the U-values differ from window to window, please be clear which unit is intended for each location.
3. **Air Leakage.** Provide details on how all areas listed in Section 402.4 will be protected against air leakage. Please pay attention to the areas behind fire places and knee walls in attics. Verify that all windows, skylights, swinging doors, and sliding glass doors will meet the maximum air infiltration rate per Section 402.4.4. Verify that all recessed lighting will comply with Section 402.4.5.
4. **Duct Insulation.** Indicate duct insulation per Section 403.2.1. Provide details to show R-8 for supply and return ducts in attics or R-6 for ducts in floor trusses – please note the exception for ducts located completely inside the building thermal envelope.
5. **Duct Sealing.** Indicate duct sealing methods per Section 403.2.2. Provide details for method of duct sealing to be used. Note that the Code requires that "duct joints shall be made substantially air tight." The definition for substantially air tight is maximum duct leakage of 10% for ducts within the building envelope and 5% for ducts outside the building envelope.
6. **HVAC Equipment Sizing.** ACCA Manual J 8th edition calculation package shall be based on the orientation of the home on the building lot for custom homes. We will allow the builder to do calculations based on worst case scenario for master plans. These calculations need to be done

for all of the options if these options add or change room layout scenarios or fenestration details. Calculations shall show the size of the appliances: furnace and air conditioner condenser – make and model for both. Include the performance data for the equipment used. ACCA Manual J requires that ACCA Manual S be used for the equipment selection. These calculations shall be based on the design parameters shown on the last page of this handout, using the Bin data for Fort Collins or Stapleton/Denver. These design parameters will not be allowed to be changed for any reason. Currently there are only these 2 approved software choices: Wrightsoft, and Elite.

7. **Duct Sizing.** ACCA Manual D calculations are required for each house and will be allowed to be a deferred submittal. They will need to be submitted to the plan checker after ductwork has been installed to be checked against the approved Manual J calculations. These will then be stamped by plan checker and sent back to the field. These calculations and layout sheets will need to be on site at time of mechanical rough inspection. The layout sheets will need to show all take-off locations and sizes, register sizes, return air opening sizes, duct run length, and duct size. Limited changes to this plan will be allowed in the field but approval of these field changes will be solely at the discretion of the field inspector. **See comments at end of handout for duct leakage testing at time of rough inspections.** Note that ACCA Manual D recommends that ductwork NOT be located within any exterior walls of the building envelope.

OPTION #2 - TOTAL UA ALTERNATIVE PATH

IECC Section 402.1.4 has the requirements for the total UA alternative path. This allows the builder to show compliance by providing a copy of the REScheck calculations. The applicant shall show compliance with the 2009 IECC when using this option.

The submitted REScheck printout shall show all of the following specific information:

- orientation of each individual wall;
- insulation types, R-values, and whether continuous or cavity;
- accurate square footage; and
- accurate window and door sizes and the specific wall in which they are located, along with the U factor and SHGC factor (solar heat gain) for this glazing.

Builders who have master plans shall provide the “best case” and the “worst case” orientation for the REScheck (based on the orientation of the exterior walls). The plans examiner will check the differences and verify if the builder can just submit the “worst case” orientation when submitting future master plan permits. With this total UA option, the performance piece of the 2009 REScheck software cannot be used because: the 2009 REScheck provides a performance simulation, not how the house actually performs; the simulation does not include HVAC duct leakage or design; . If a performance option is desired, the builder may use 2009 IECC Section 405 (see option #3).

In addition to the REScheck the builder shall also supply the following information:

1. Air leakage details per Section 402.4. See required details listed in Option #1 above.
2. Duct sealing methods per Section 403.2.2. See required details listed in Option #1 above.
3. Manual J and Manual D calculations as listed in Option #1 above.

OPTION #3 - SIMULATED PERFORMANCE ALTERNATIVE PATH

This option allows design complying with IECC Section 405. Please be aware that IECC Section 401.2 requires compliance with the mandatory requirements of Sections 401 (General), 402.4 (Air leakage), 402.5 (Maximum Fenestration U-factor and SHGC), and section 403 (Systems).

We will accept software tools which have RESNET (Residential Energy Services Network) accreditation to perform the simulated energy performance requirement of R405.3. A building plans rating completed by an accredited RESNET rater that includes the Building File, the Building Reference File, and the Code Compliance sheets shall be submitted at time of permit application or master plan review. This document

shall be site specific for custom homes; for subdivision master plans we will allow builders to submit one for each model (with all various options at worst case orientation) for initial review. The builder shall submit a copy of this approved building plans rating with each new model permit application. Every house will be required to furnish a final report and compliance certificate which will be compared to the initially approved master Plan Rating. **This option requires the builder to provide on-site third party inspections by an accredited RESNET rater.**

SUBMITTAL REQUIREMENTS FOR ALL OPTIONS

The building plans rating document shall include the following:

1. Inspection checklist documenting the building component characteristics of the proposed design.
2. Accurate square footage.
3. Mechanical system features.
4. Name of individual completing report.
5. Name and version of the compliance software tool.
6. Name of individual who will do the field inspections and issue the final rating.

Additional information shall be submitted to verify compliance with:

1. Duct sealing methods – see details in Option #1.
2. Air leakage details – see details in Option #1.
3. Manual J and D calculations as shown in Option #1.

At time of final inspection, the 2009 IECC Certificate shall show that the house complies with section 405.3 and meets the minimum requirements of the 2009 IECC. The proposed design needs to have an annual energy cost that is less than or equal to the annual energy cost of the standard reference design.

The builder shall provide a Balance Report at time of final inspection that verifies that the air flow meets the calculations submitted at time of permit issuance. This report shall show the following: static pressure at final (total static should not be more than the manufacturers' listing and add supply, return, AC coil and filter for total static pressure; total flow and room to room flows. Room to room pressures are not to exceed 3 pa (Pascal) which is the industry standard. If outside air is introduced into the system or if the structural floor is provided with exhaust fans, these flows shall be measured to determine if they are performing as designed. When a builder is working from approved master plans we will require this only to be done on the first time the model is built

Please note that the City and County of Broomfield Building Division is still required to do on-site insulation and air barrier inspections with this option, see item 6 below.

INSPECTION AND COMPLIANCE REQUIREMENTS FOR OPTIONS #1 AND #2:

1. The builder shall call for an insulation inspection and we will also check all air leakage as called out on approved plans.
2. The builder shall perform a "duct blaster" test which will verify that the maximum duct leakage is 10% for ducts within building thermal envelope and 5% for ducts outside building thermal envelope. This test is to be performed and observed by a city inspector at the time the mechanical rough is called for inspection, and is required on all new homes and multifamily projects. Please note that verifying the duct leakage at time of rough inspection will require all returns to be ducted and not use wall stud bays or floor joist spaces since we do not allow drywall to be installed at time of rough inspections. The builder will have to show the static pressures at rough inspection (total static should not be more than the manufacturers listing; add supply, return, AC coil, and filter for total static pressure). The builder will also have to show the total system flow on cooling speed at rough inspection. At first it would be advisable to do room to room flows at rough inspection.

3. The builder shall provide a Balance Report at time of final inspection that verifies that the air flow meets the calculations submitted at time of permit issuance. This report shall show the following: static pressure at final (total static should not be more than the manufacturers' listing and add supply, return, AC coil and filter for total static pressure; total flow and room to room flows. Room to room pressures are not to exceed 3 pa (Pascal) which is the industry standard. If outside air is introduced into the system or if the structural floor is provided with exhaust fans, these flows shall be measured to determine if they are performing as designed.
4. The builder shall post a permanent certificate in an approved location in the house. The approved location is on a wall nearest the furnace. This 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), ducts outside conditioned spaces and U factors and solar heat gain coefficients (SHGC) for 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.
5. The builder shall provide a copy of the REScheck if using Option #2 or fenestration list if using Option #1 on site for inspector doing rough inspection and insulation inspections. The builder shall leave the National Fenestration Rating Council (NFRC) labels on all windows and doors with glazing at time of rough inspections so inspectors can verify the glazing requirements.
6. Please note that Broomfield Building Division is also required to do an insulation and air barrier inspection if using Option #3 (Performance path). The builder shall have a copy of the insulation requirements from the RESNET master plan rating calculations on site for this inspection.

CITY AND COUNTY OF BROOMFIELD DESIGN PARAMETERS	
Outdoor Design Conditions per Table 1A ACCA Manual J Eighth Edition	
Elevation:	5344 feet
Latitude:	40° North
Winter heating 99% Dry Bulb:	1° F
Summer Cooling 1% Dry Bulb:	91° F
Coincident Wet Bulb:	59°F
Design Grains Difference at 50% RH:	-41
Daily Range:	High (H)
Relative Humidity:	50% winter and summer
Indoor Design Temperature for Heating:	70° F
Indoor Design Temperature for Cooling:	75° F
Heating Temperature Difference (HTD):	69° F
Cooling Temperature Difference (CTD):	16° F
Cooling Load Temperature Difference (CLTD):	21.0° F
SHGC:	SHGC taken directly from sticker on glass.
<i>While not required per IECC Table 402.1.1, the SHGC is still required data for Manual J.</i>	<i>If not known, either use default per 2009 IECC Table 102.2(3) or equation SHGC= .87 x SC (shading coefficient) under A4-5 of Manual J.</i>
Altitude Correction Factor (ACF):	0.84
Moisture Content:	68.2
Air Density:	0.063
Wind Velocity Value:	15 mph for heating
Wind Velocity Value:	7.5 mph for cooling