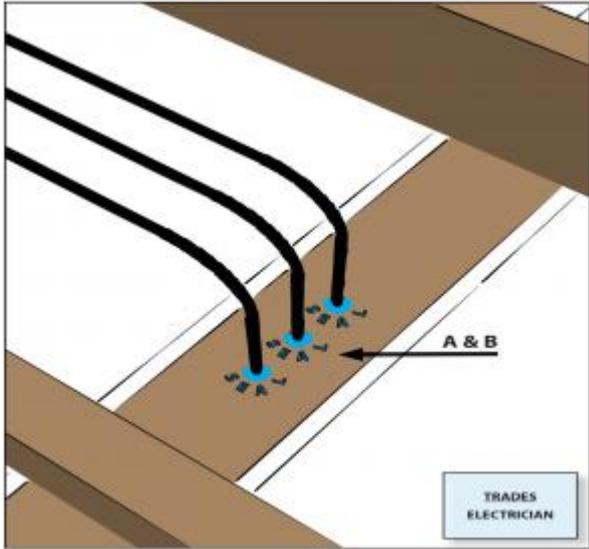


Air Sealing Electrical Wiring

Last Updated: 03/14/2016

Scope



Air seal around all wiring installed through walls, ceilings, and flooring to keep conditioned air from leaking into unconditioned space.

Air seal around all electrical wiring and electrical boxes installed through walls, ceilings, and flooring to keep conditioned air from leaking into unconditioned space.

- Using a drill, cleanly cut holes no more than 1 inch larger in diameter than the wiring diameter.
- Seal around installed wiring using caulk or canned spray foam.
- For ceiling-mounted electrical boxes, install the electrical box in the ceiling drywall, then caulk around the base and caulk all holes in the box with fire-retardant caulk.
- For wall-mounted electrical boxes, install gasketed, airtight electrical boxes or install standard electrical boxes, then caulk all openings and seal the box to the drywall with caulk.

See the [Compliance Tab](#) for related codes and standards requirements, and criteria to meet national programs such as DOE's Zero Energy Ready Home program, ENERGY STAR Certified Homes, and Indoor airPLUS.

Description

Air can pass through tiny gaps around electrical wiring and holes in electrical boxes, carrying conditioned air into wall cavities and up into unconditioned attics or allowing air from unconditioned garages and crawlspaces into living spaces. Pressure and temperature differences between conditioned and unconditioned spaces encourage this air flow. These air leaks represent energy losses, and they could also potentially allow warm, moisture-laden air into unconditioned spaces where it can condense on cold surfaces creating moisture problems. Conversely, air leaking into the house from the garage or crawlspace can affect indoor air quality and cause drafts. Air barriers need to be continuous to be effective; this means sealing all penetrations in exterior walls and in walls, ceilings, or floors adjoining unconditioned spaces. Holes drilled through studs and top and bottom plates should be caulked or foam sealed to prevent air from following the wiring through wall cavities.

Be sure to schedule caulking of electrical penetrations after the wiring has been installed and before the drywall is completed. Responsibility for sealing air leaks around electrical wiring and electrical boxes should be included in the contract for the appropriate trade, depending on the workflow at specific job sites.

How to Air Seal Electrical Boxes and Wiring

- For ceiling-mounted electrical boxes, install the electrical box in the ceiling drywall, then caulk around the base and caulk all holes in the box with fire-retardant caulk.

Figure 1 - Air seal electrical box with fire-retardant material. 

- For wall-mounted electrical boxes, specify that the electrician install prefabricated, airtight electric boxes that have flexible boot seals at wire penetrations and a gasketed flange at the face.

Figure 2 - Air sealing an electrical box. 

- Or, as another option, install standard electrical boxes and caulk all of the openings in the box (including around wire penetrations), then seal the face of the box to the drywall with caulk.

Figure 3 - Air sealing a plastic electrical box. 

- Seal all wiring holes through the exterior walls of the house, such as holes for electrical wiring, security system wiring, television and telephone cables, porch light fixtures, and exterior electrical outlets. Use caulk, gaskets, or spray foam (note that spray foam degrades in sunlight).

Figure 4 - Air sealing wiring holes. 

- Use caulk or canned spray foam to seal wiring holes through all top plates and bottom plates.

Figure 5 - Air sealing wiring holes with foam. 

Ensuring Success

Holes around wiring should be visually checked to see if caulk and canned spray foam have been applied before insulation and drywall are installed. Blower door testing, which is conducted as part of the whole-house energy performance test-out, may help indicate whether holes for electrical wiring in exterior walls have been successfully sealed. An experienced technician can also check for air leaks with a smoke pencil or by feeling with the back of the hand.

Climate

No climate specific information applies.

Training

Right and Wrong Images



Display Image: [ES_TESRC_5.1.3_PG132_247b_102811_0.jpg](#)

Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

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Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



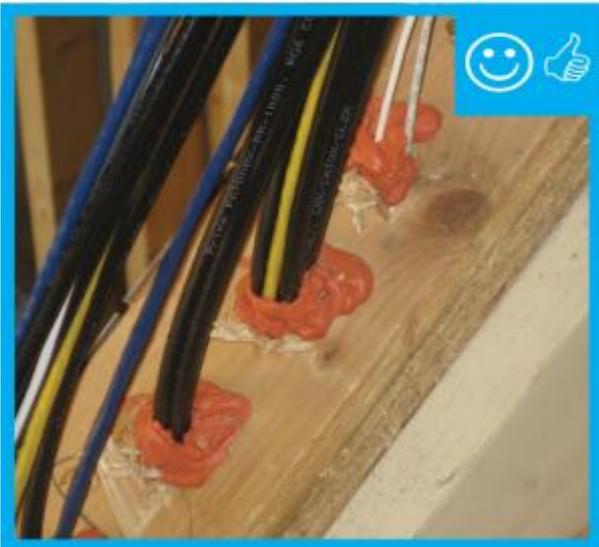
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Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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Author(s): EPA

Organization(s): EPA

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Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



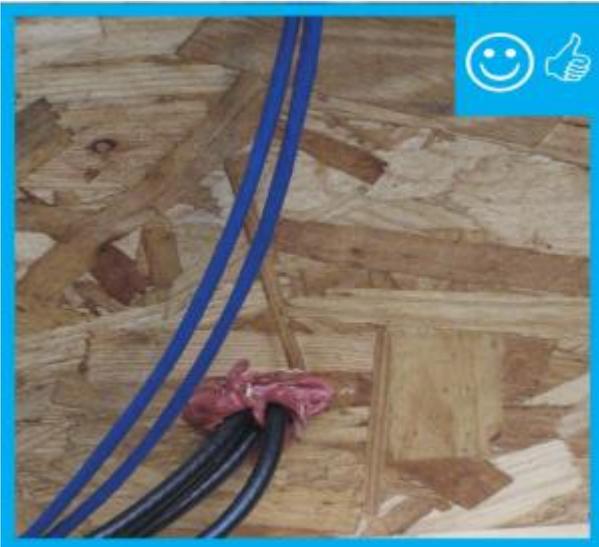
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Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

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Organization(s): EPA

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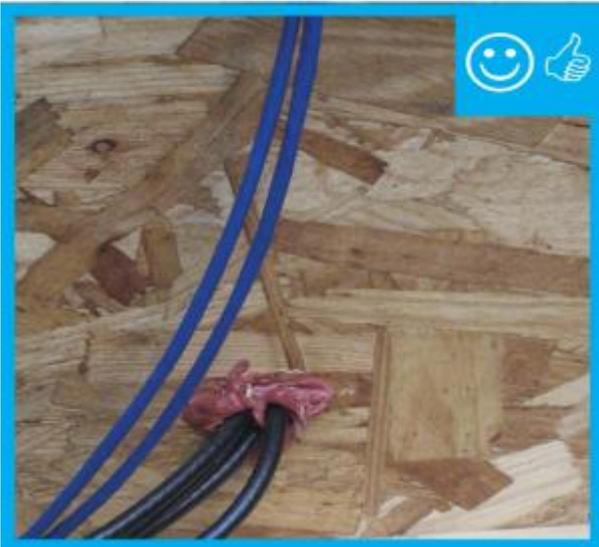
Display Image: [ES_TESRC_5.1.3_PG132_250e_102811_0.jpg](#)

Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

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Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



Display Image: [ES_TESRC_5.1.3_PG132_251f_102811_0.jpg](#)

Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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Organization(s): EPA

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Courtesy Of: Jim Mackovyak



Display Image: [JM_electrical-by-pass_wrong_TE.jpg](#)
Courtesy Of: Jim Mackovyak

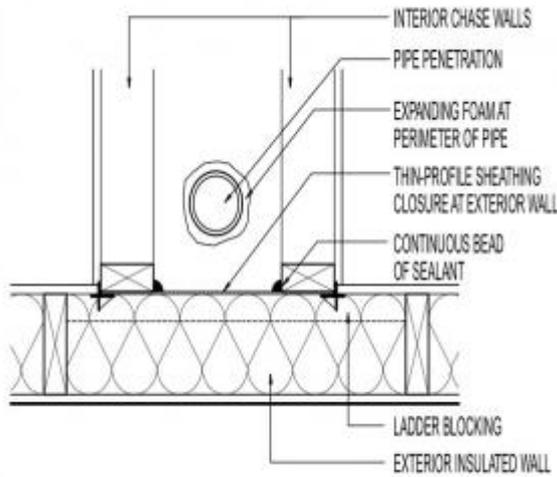


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CAD



CAD FILE: [511_CAD_4-3_flue_shaft_at_chase_wall_plan_view_5-01031_GBA_1-31-12.dwg](#)

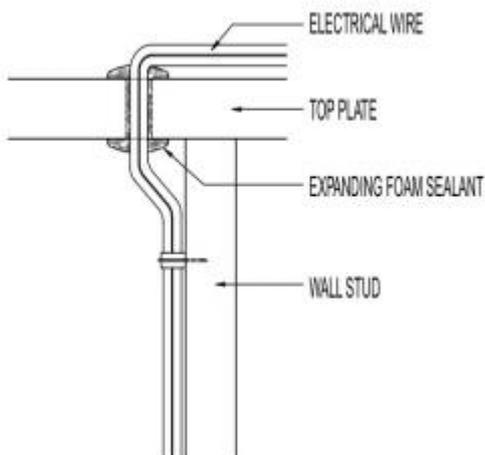
PDF: [511_CAD_4-3_flue_shaft_at_chase_wall_plan_view_5-01031_GBA-1-31-12.pdf](#)

Reference: [Building Plans for Advanced Framing](#)

Author(s): Green Building Advisor

Organization(s): Green Building Advisor

Website providing CAD files and drawings of advanced framing details.



CAD FILE: [513_CAD_4-2_wire_thr_top_plate_5-01024_GBA_1-31-12.dwg](#)

PDF: [513_CAD_4-2_wire_thr_top_plate_5-01024_GBA_1-31-12.pdf](#)

Reference: [Building Plans for Advanced Framing](#)

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Website providing CAD files and drawings of advanced framing details.

Compliance

The Compliance tab contains both program and code information. Exact code language is copyrighted and may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

[ENERGY STAR Certified Homes](#)

ENERGY STAR Certified Homes (Version 3/3.1, Revision 08), Rater Field Checklist

Thermal Enclosure System:

4. Air Sealing (Unless otherwise noted below, "sealed" indicates the use of caulk, foam, or equivalent material):

4.1 Ducts, flues, shafts, plumbing, piping, wiring, exhaust fans, & other penetrations to unconditioned space sealed, with blocking / flashing as needed

ENERGY STAR Revision 08 requirements are required for homes permitted starting 07/01/2016.

[DOE Zero Energy Ready Home](#)

Exhibit 1: Mandatory Requirements. Certified under ENERGY STAR Qualified Homes Version 3.

[2009 IECC](#)

Table R402.4.1.1 Air Barrier and Insulation Installation, Shafts/penetrations: Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space are air sealed. Table R402.4.1.1 Air Barrier and Insulation Installation, Plumbing and wiring: Insulation is placed between the exterior of the wall assembly and pipes. Batt insulation is cut and fitted around wiring and plumbing, or for insulation that on installation readily conforms to available space such insulation shall fill all space between wall and piping/wiring.*

[2009 IRC](#)

Table N11402.4.2 Air Barrier and Insulation Installation, Shafts/penetrations: Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space are air sealed. Table N11402.4.2 Air Barrier and Insulation Installation, Plumbing and wiring: Insulation is placed between the exterior of the wall assembly and pipes. Batt insulation is cut and fitted around wiring and plumbing, or for insulation that on installation readily conforms to available space such insulation shall fill all space between wall and piping/wiring.*

[2012 IECC](#)

Table R402.4.1.1 Air Barrier and Insulation Installation, Shafts/penetrations: Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space are air sealed. Table R402.4.1.1 Air Barrier and Insulation Installation, Plumbing and wiring: Insulation is placed between the exterior of the wall assembly and pipes. Batt insulation is cut and fitted around wiring and plumbing, or for insulation that on installation readily conforms to available space such insulation shall fill all space between wall and piping/wiring.*

[2012 IRC](#)

Table N11402.4.1.1 Air Barrier and Insulation Installation, Shafts/penetrations: Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space are air sealed. Table N1102.4.1.1 Air Barrier and Insulation Installation, Plumbing and wiring: Insulation is placed between the exterior of the wall assembly and pipes. Batt insulation is cut and fitted around wiring and plumbing, or for insulation that on installation readily conforms to available space such insulation shall fill all space between wall and piping/wiring.*

*Due to copyright restrictions, exact code text is not provided. For specific code text, refer to the applicable code.

[2015 IECC](#)

[2015 IRC](#)

More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

Case Studies

1. [New Whole-House Solutions Case Study: Attention to Detail in High-Performance Homes 2012, Heritage Buildings, Leland NC](#)
(3 MB)
Author(s): PNNL
Organization(s): PNNL
Publication Date: October, 2012
Case study about one builder's conversion to high-performance building in the hot-humid regions of the Atlantic seaboard.
2. [Technology Solutions Case Study: Preventing Thermal Bypass](#)
(2 MB)
Author(s): PNNL
Organization(s): PNNL
Publication Date: October, 2012
Case study detailing techniques used to prevent thermal bypass in new homes.

References and Resources*

1. [Air Barriers - Airtight Drywall Approach](#)
Author(s): Lstiburek
Organization(s): BSC
Publication Date: May, 2009
Brochure about creating an air barrier by sealing drywall assemblies.
2. [Building America Best Practices Series Volume 12: 40% Whole-House Energy Savings in the Cold and Very Cold Climates](#)
Author(s): Baechler, Gilbride, Hefty, Cole, Love
Organization(s): PNNL, ORNL
Publication Date: February, 2011
Guide describing measures that builders in the cold and very cold climates can take to build homes that have whole-house energy savings of 40% over the Building America benchmark with no added overall costs for consumers.
3. [DOE Zero Energy Ready Home National Program Requirements](#)
Author(s): DOE
Organization(s): DOE
Publication Date: August, 2015
Standard requirements for DOE's Zero Energy Ready Home national program certification.
4. [ENERGY STAR Certified Homes, Version 3 \(Rev. 08\) National Program Requirements](#)
Author(s): EPA
Organization(s): EPA
Publication Date: September, 2015
Document outlining the program requirements for ENERGY STAR Certified Homes, Version 3 (Rev. 08).
5. [Guide to Attic Air Sealing](#)
Author(s): Lstiburek
Organization(s): BSC
Publication Date: January, 2010
Fact sheet providing detailed information about air sealing attics.
- 6.

[Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Publication Date: October, 2011

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

Contributors to this Guide

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