ComfortReady HOME

Manufactured Homes

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Energy Specialist

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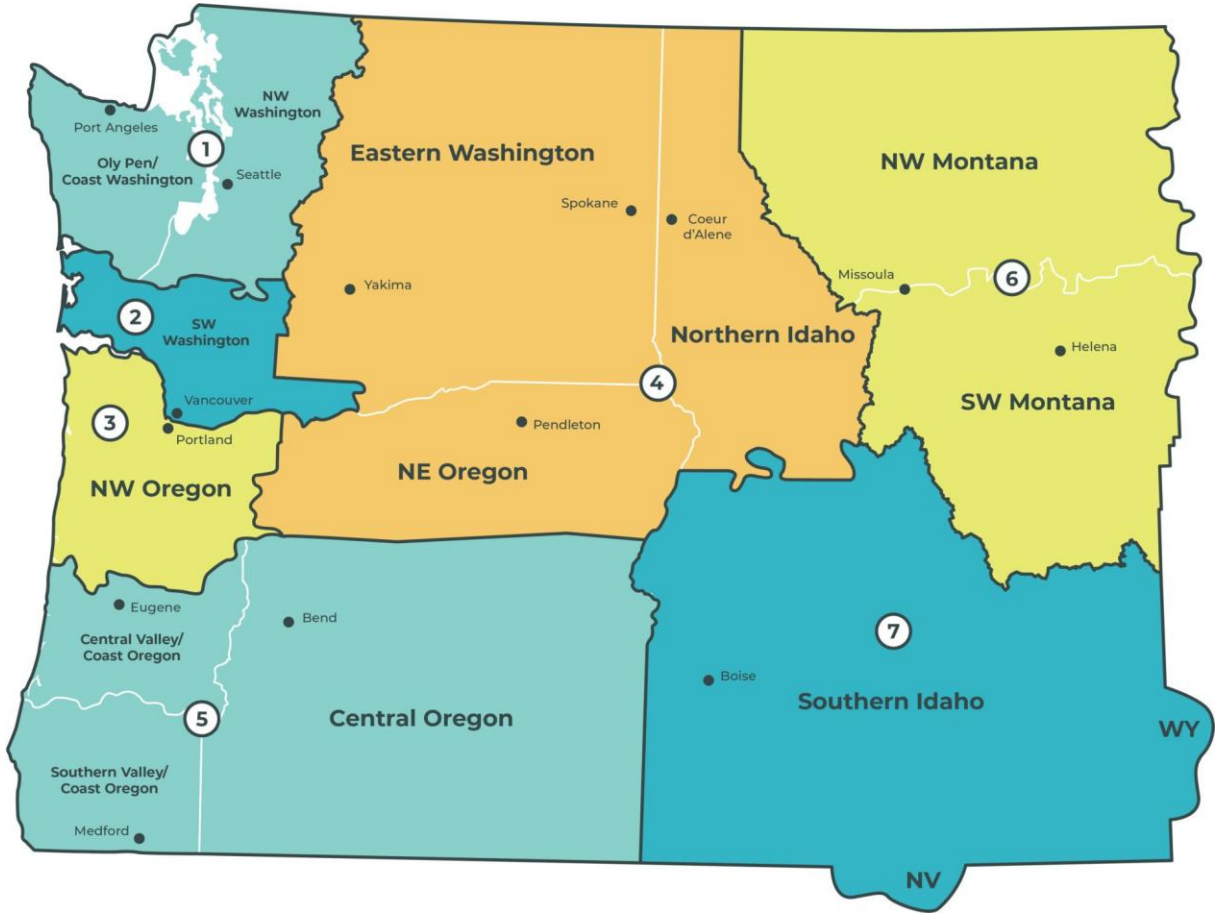
Comfort Ready Home Field Team



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What we'll cover today

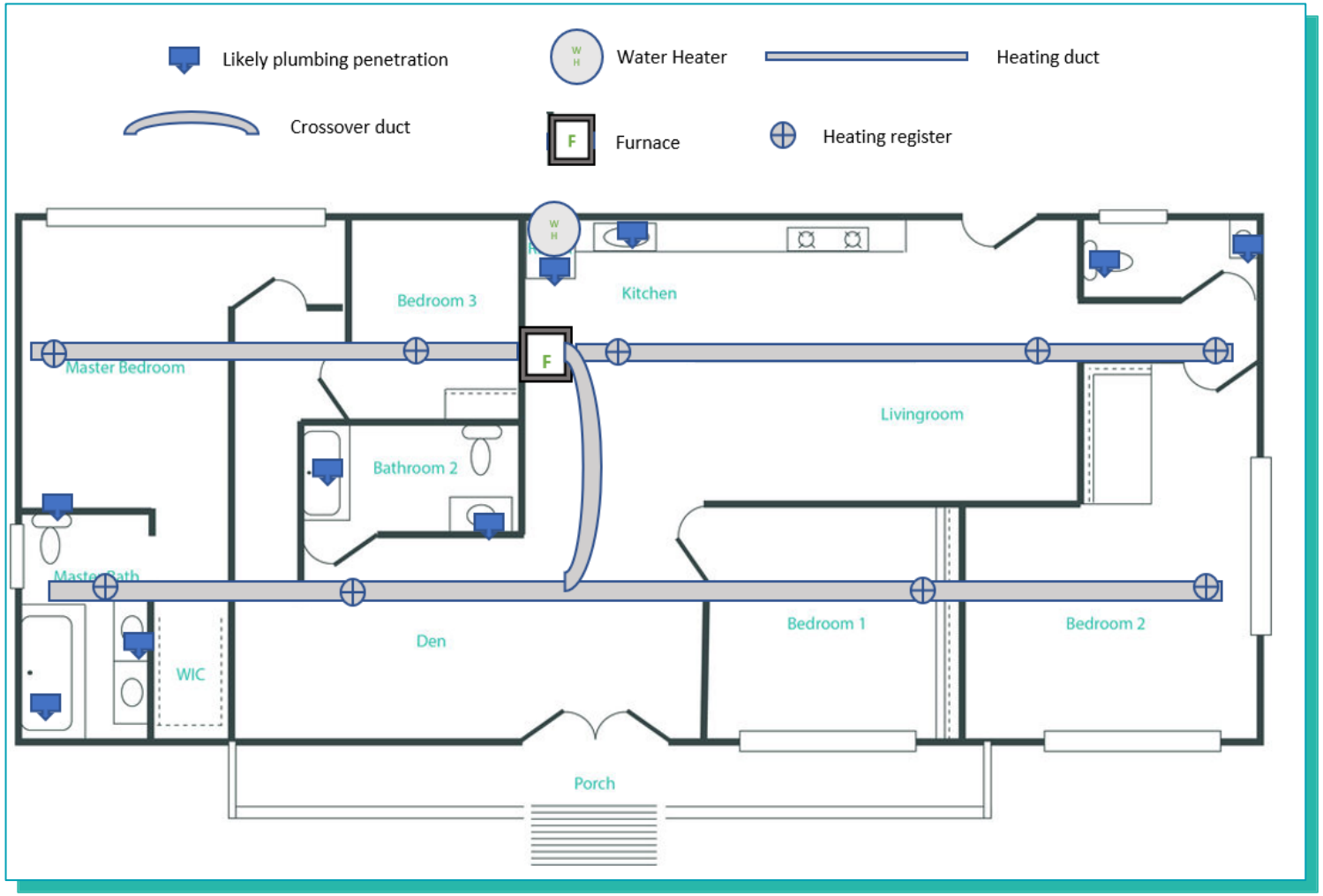
- Manufactured Home Types
- Walls
- Windows
- Attic or roof cavity
- Belly/Floor
- HVAC
- Ductwork

How are Manufactured Homes Different?

What is a manufactured home?

- Housing that is built entirely in a factory.
- Transported to its final site, where it is installed on either a permanent or temporary foundation.
- Regulated by the U.S. Department of Housing and Urban Development (HUD), which sets standards for design, construction, energy efficiency, and safety.

HOW ARE MANUFACTURED HOMES DIFFERENT?



How is a manufactured home built?

- Wooden frame bolted to a steel chassis.
- Constructed in long, narrow segments in a factory.
- Delivered and completed on site.

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Belly contains

- Insulation.
- Duct system and plumbing.
- Under the sub finished floors.
- Rodent barrier.

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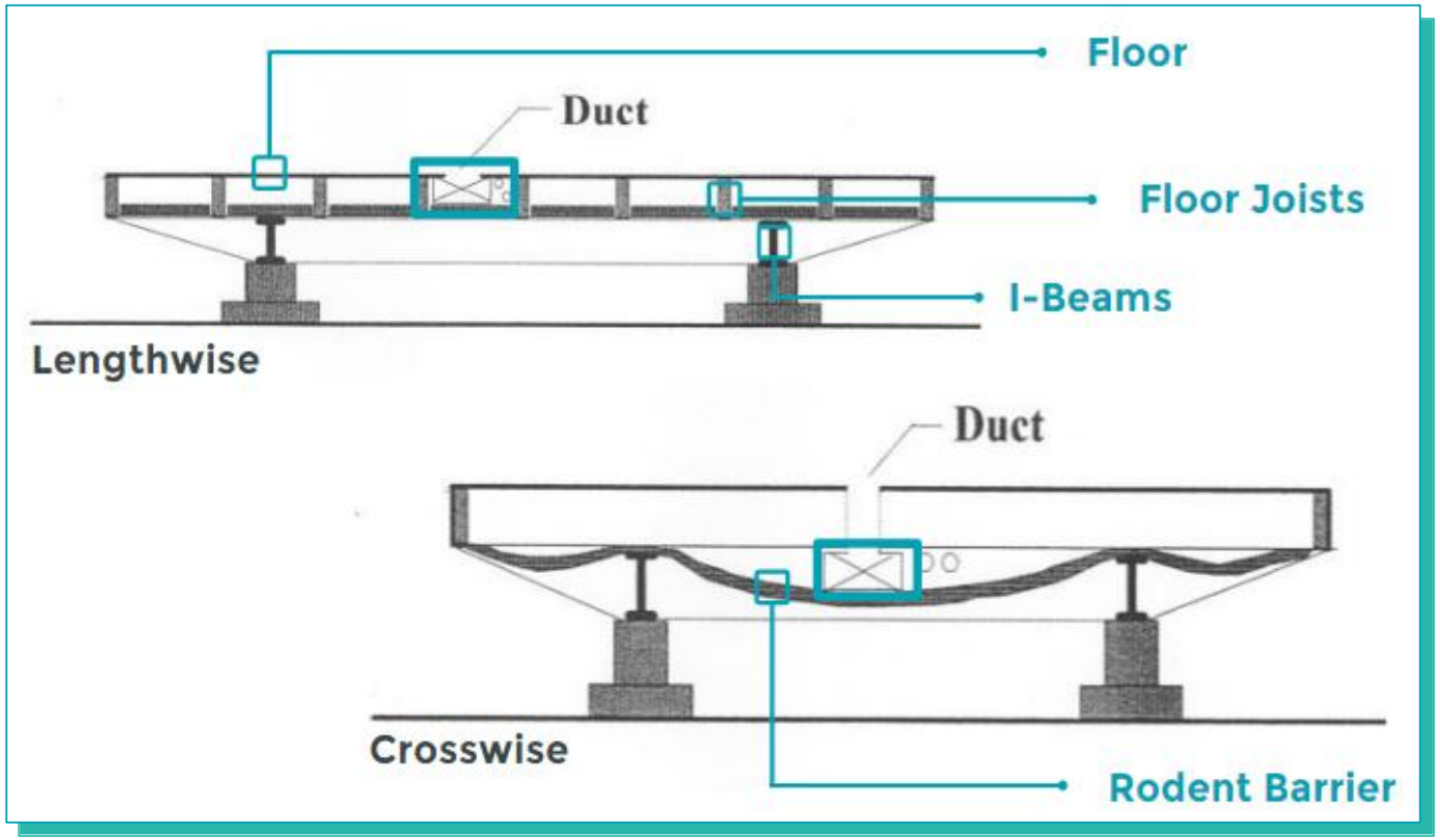
Types of manufactured home joists



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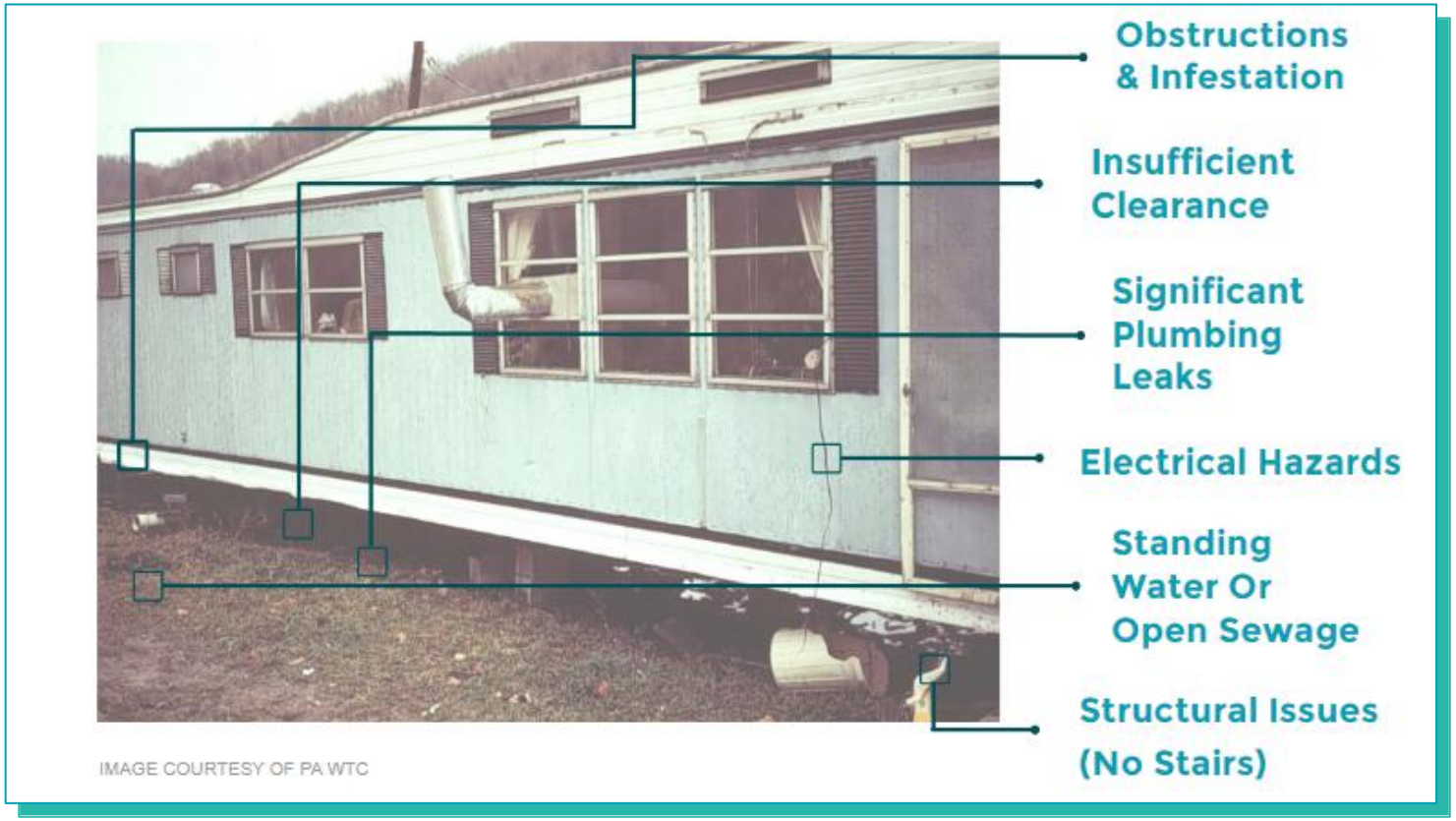
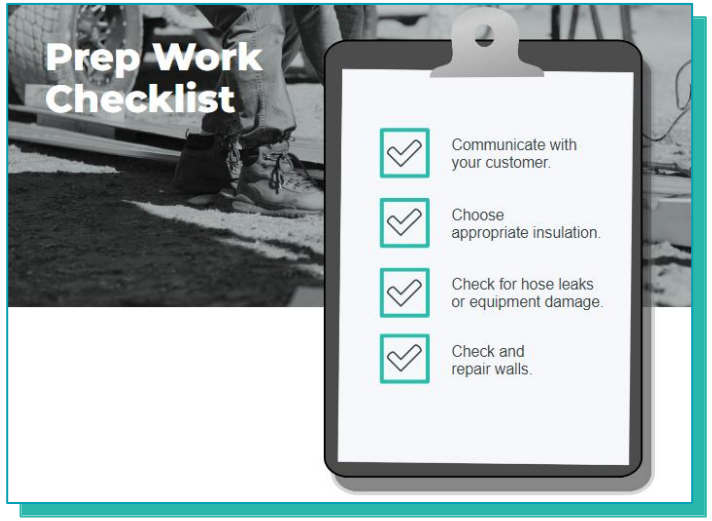
Do no harm!

What would stop us from continuing?

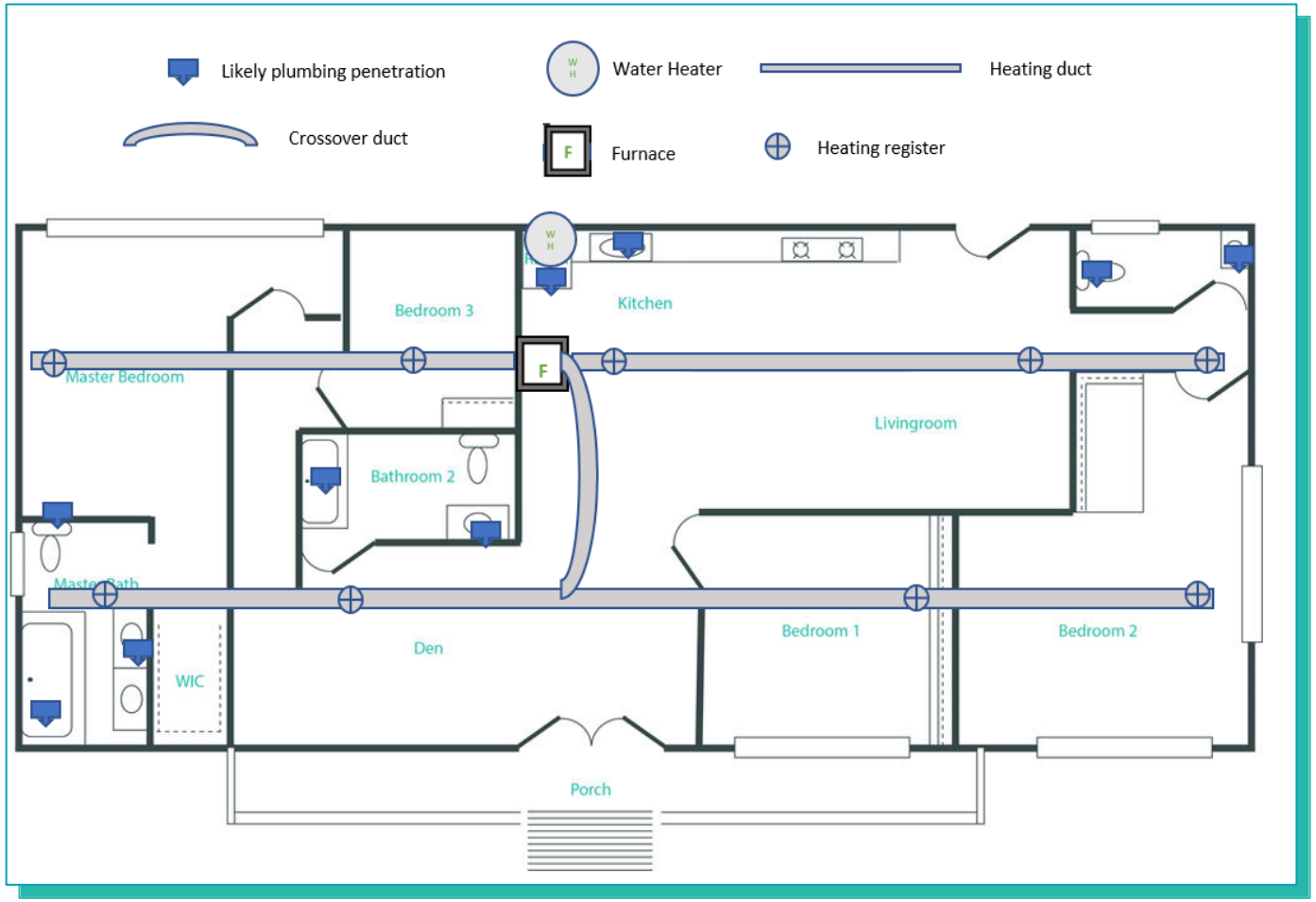


Communication & Preparation



Understanding the job site

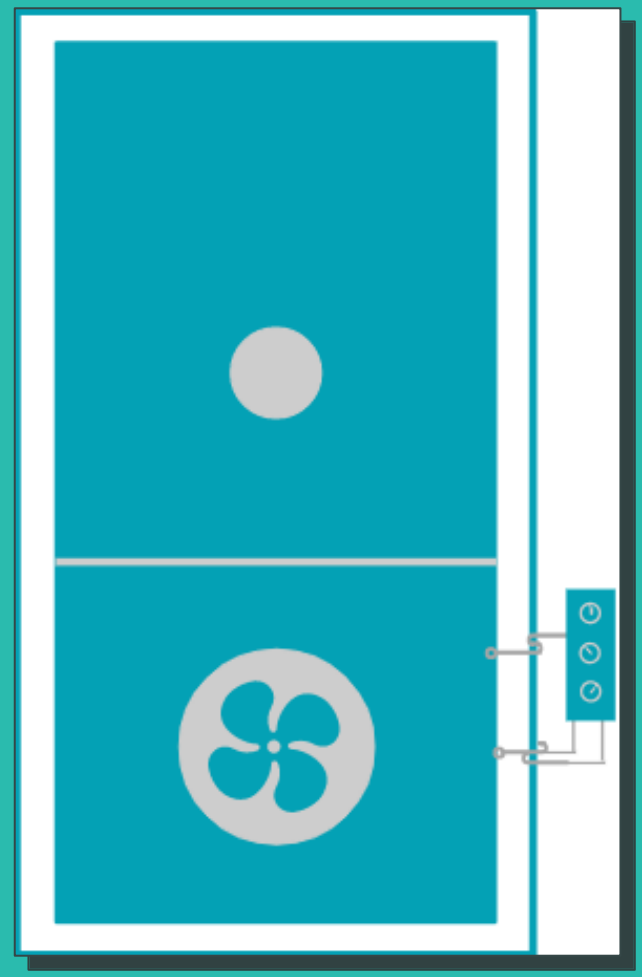
Layout of manufactured home belly insulation.



The blower door test

The blower door test is a great way to assess air infiltration.

Pro tip: *Checking to see if the home has a gas pilot light or electronic ignition is important to know before doing a blower door test*



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Walls

Wall insulation

Era/Standard	Wall Framing	Typical Insulation	Approximate R-Value
Pre-1976 (Mobile Homes)	2×3	Minimal fiberglass or none	R-5 to R-7
Post-1976 (Early HUD Code)	2×4	Fiberglass batts	R-11 to R-13
1994 HUD Thermal Zone 3 Homes	2×6	Fiberglass or blown cellulose	R-19
Modern ENERGY STAR/ High-Efficiency Manufactured Homes	2×6	Fiberglass, cellulose, or spray foam	R-19 to R-25

Wall insulation

HUD Thermal Zone	Typical States	Minimum Wall R-Value (approx.)
Zone 1	Southern states	R-11
Zone 2	Mid-southern / coastal	R-13
Zone 3	Northern U.S. (includes WA, ID, MT, etc.)	R-19

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Windows

Common problems in older manufactured home windows

- Leaking or plugged weep holes
- Condensation on aluminum frames
- Rot and/or mold under sills due to high condensation
- Poorly sealed factory flanges, causing drafts
- Difficult operation due to track wear or broken parts
- Single-pane glass

Manufactured home windows may be different than those of stick-built homes

Manufactured home windows often require:

- Exterior “flush fin” / lap siding fin – integral flange that sits on the siding plane
- Slim or low-profile windows

Site-built homes generally use:

- Nailing flanges behind siding

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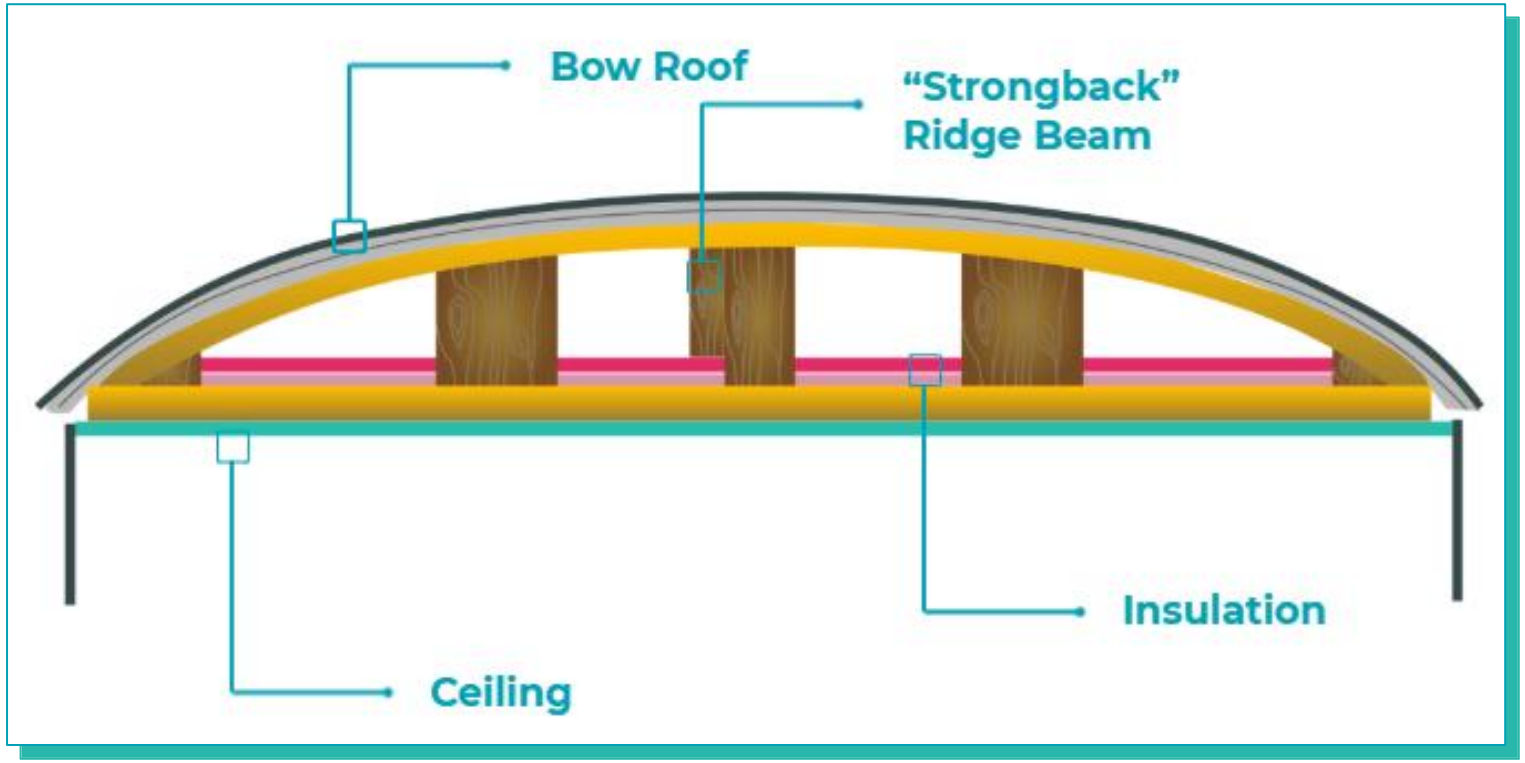
Attic or Roof Cavity

Manufactured home features: view from end wall



EPDM Roofing

MANUFACTURED HOME ATTIC OR ROOF CAVITY

MANUFACTURED HOME ATTIC OR ROOF CAVITY

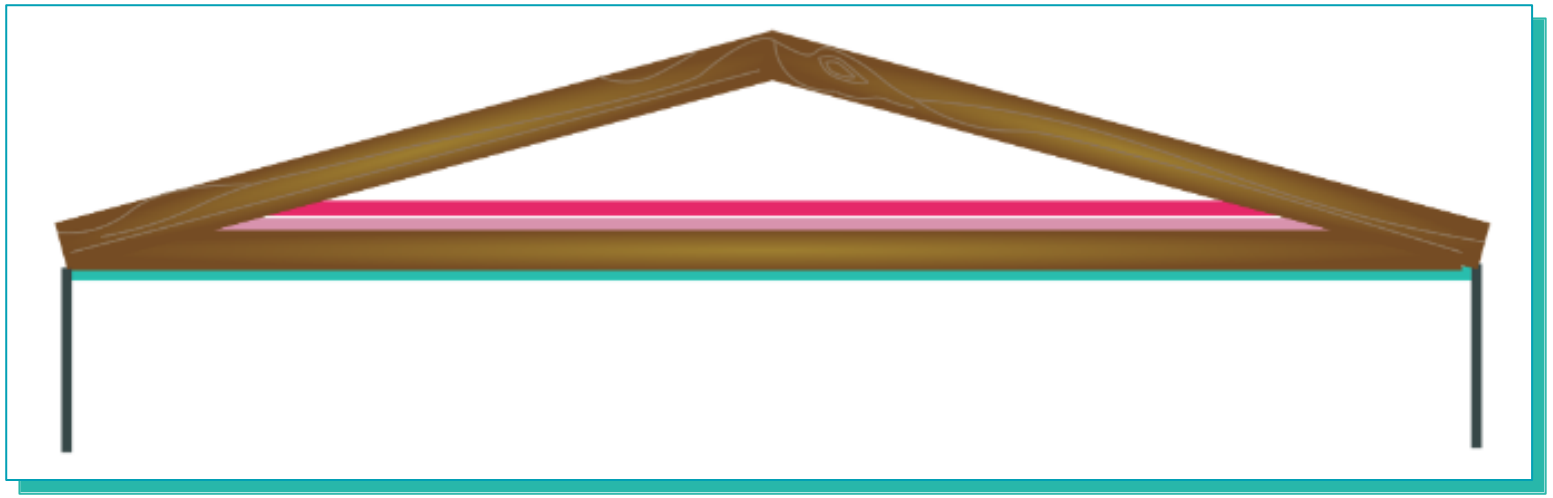
Top fill

Ceiling access

Edge fill

- Not commonly done.
- Re-attaching the roof at the ‘heel’ can be very difficult.

Manufactured home features: Low-pitch roof



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Belly/Floor Insulation

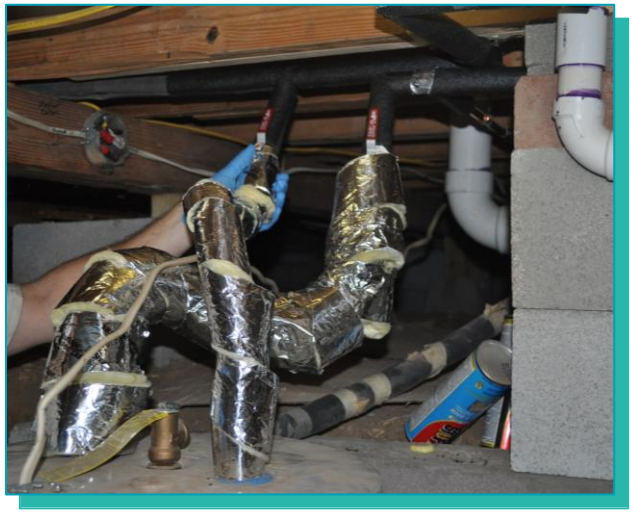
Manufactured home floor insulation

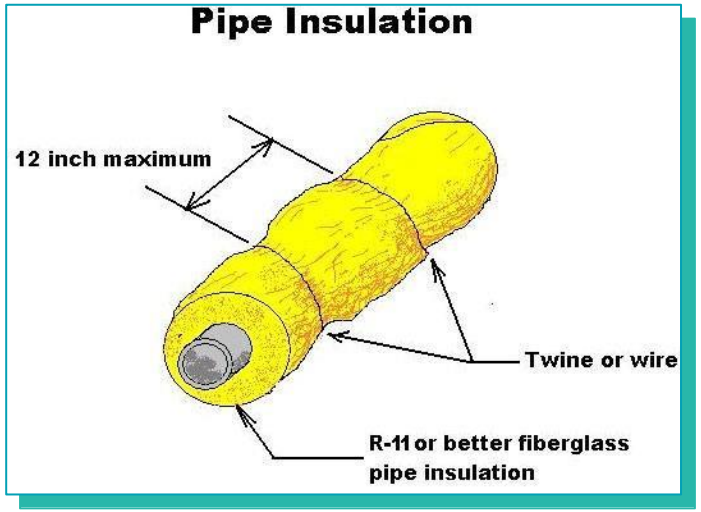
- Required repairs
- Prep and installation
- **Do No Harm!**
  - Follow all EPA, HUD, DOE & BPA standards.

Repair and seal damaged flooring

- Provide minor incidental repairs.
- Common structural problem is water-damaged floors.

Support and insulate water lines





Complete vapor barrier

Vapor protection:

- Prevents ground moisture.
- Prevents attracting critters and bacteria-laden pools.

Specify a 6-mil sheet plastic to cover a crawl space.

Repair or replace rodent barrier

- Remove old barrier and damaged insulation.
- Install fiberglass batt insulation.
- Fit sheeting around penetrations and seal.
- Repeat.
- Reinforce with lath strips.

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Manufactured home floor insulation process

- Choose appropriate insulation.
- Select blow-in site.
- Remove skirting.

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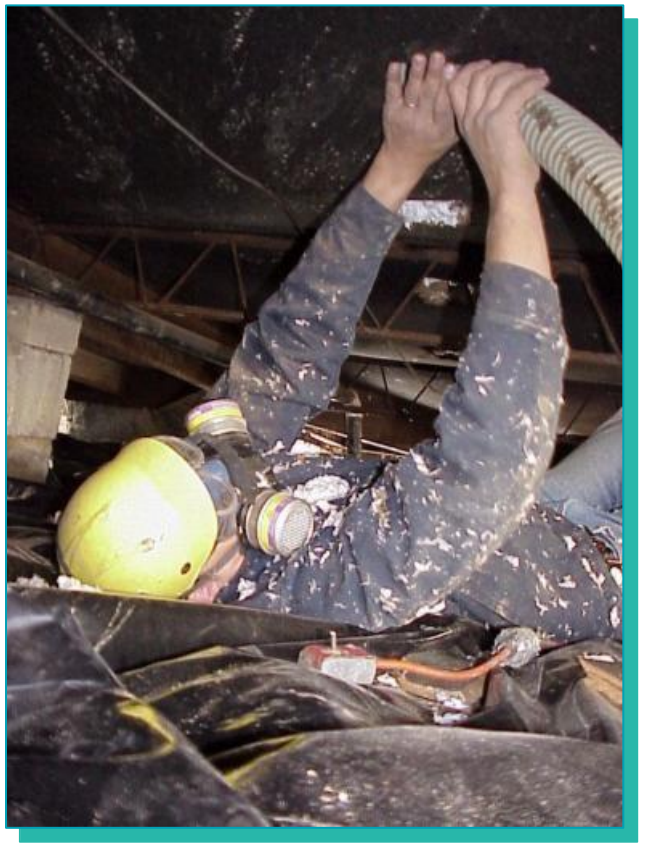
Insulation information

Insulation Type	R-Value	Density
Blown fiberglass loose fill (attics)	2.2 – 2.7 per inch	0.8 (0.5 – 1.0) lb/ft^3
Blown rockwool loose fill (attics)	~3.2 per inch	1.7 lb/ft^3

Santa Fe Community College

Find an access point



Insulation fill process

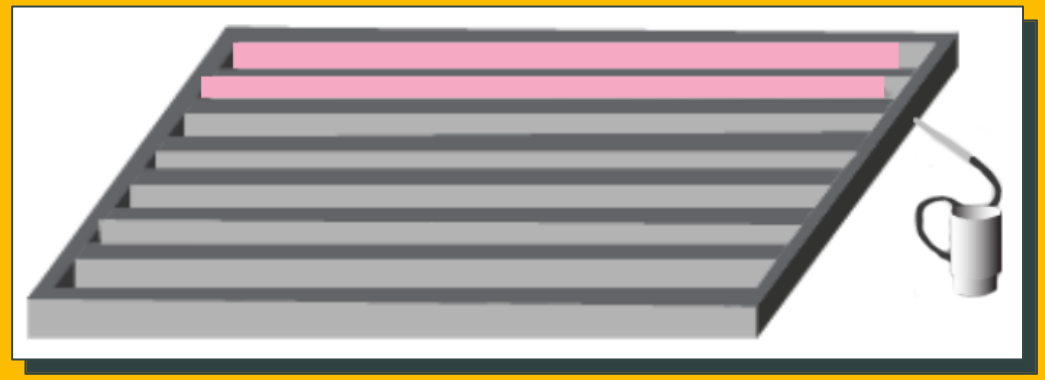
Insulation steps:

1. Access the belly cavity.
2. Repair or reseal holes.
3. Reinstall or add skirting.

Fill process

Pro tip:

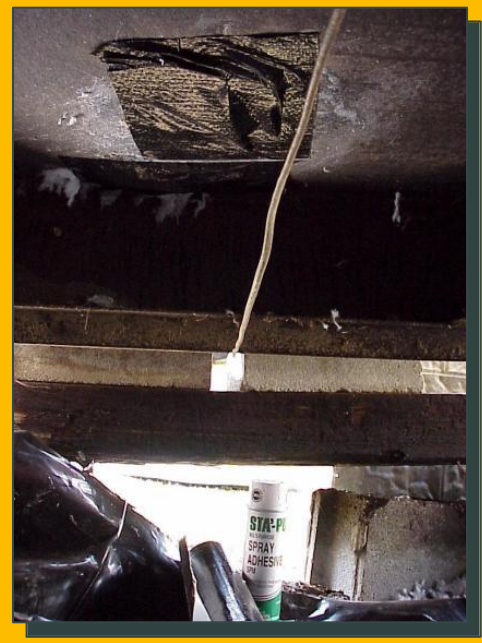
1. Visually monitor the belly to ensure proper filling.
2. If you are doing a lengthwise fill, avoid cavity with main duct and water pipes.



Repair and seal belly holes

Important steps that confirm quality:

1. Repair belly after insulation is done.
2. Staple: high quality adhesive and stitch stapler to adhere patch.



Reinstall skirting

- Reinstall skirting, adding vents as required.
- Share non-energy benefits of skirting.

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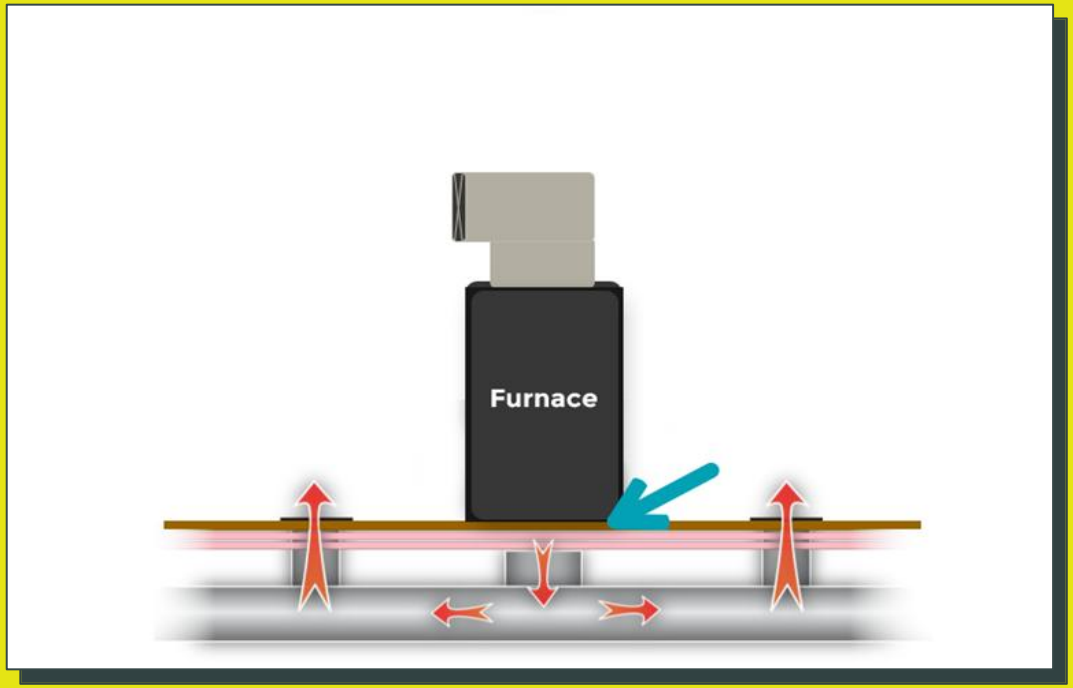
HVAC Systems

Common features of manufactured home HVAC systems

Manufactured homes often use heating systems designed for compact ductwork and tighter mechanical spaces than site-built homes

- Typically, the furnace or air handler is located in a small closet or utility area.
- Air is distributed through underfloor ducts that run beneath the home in the belly cavity.
- Return air is usually drawn from a central grille near the furnace.



Most common types of heating

1. Electric furnace
   - Most common in older manufactured homes.
   - Ductwork located in the belly.
2. Heat pump (air-source)
   - Common retrofit into existing ducted system.
   - DHPs are often a great option!
3. Gas Furnace (natural gas or propane)
   - Less common, particularly in single wide-manufactured homes.

HVAC upgrades and considerations

- Space constraints.
- Weatherization work and the equipment sizing.
- Damaged or inadequate ducts.
- Is a DHP a better option?
- Limitations apply!

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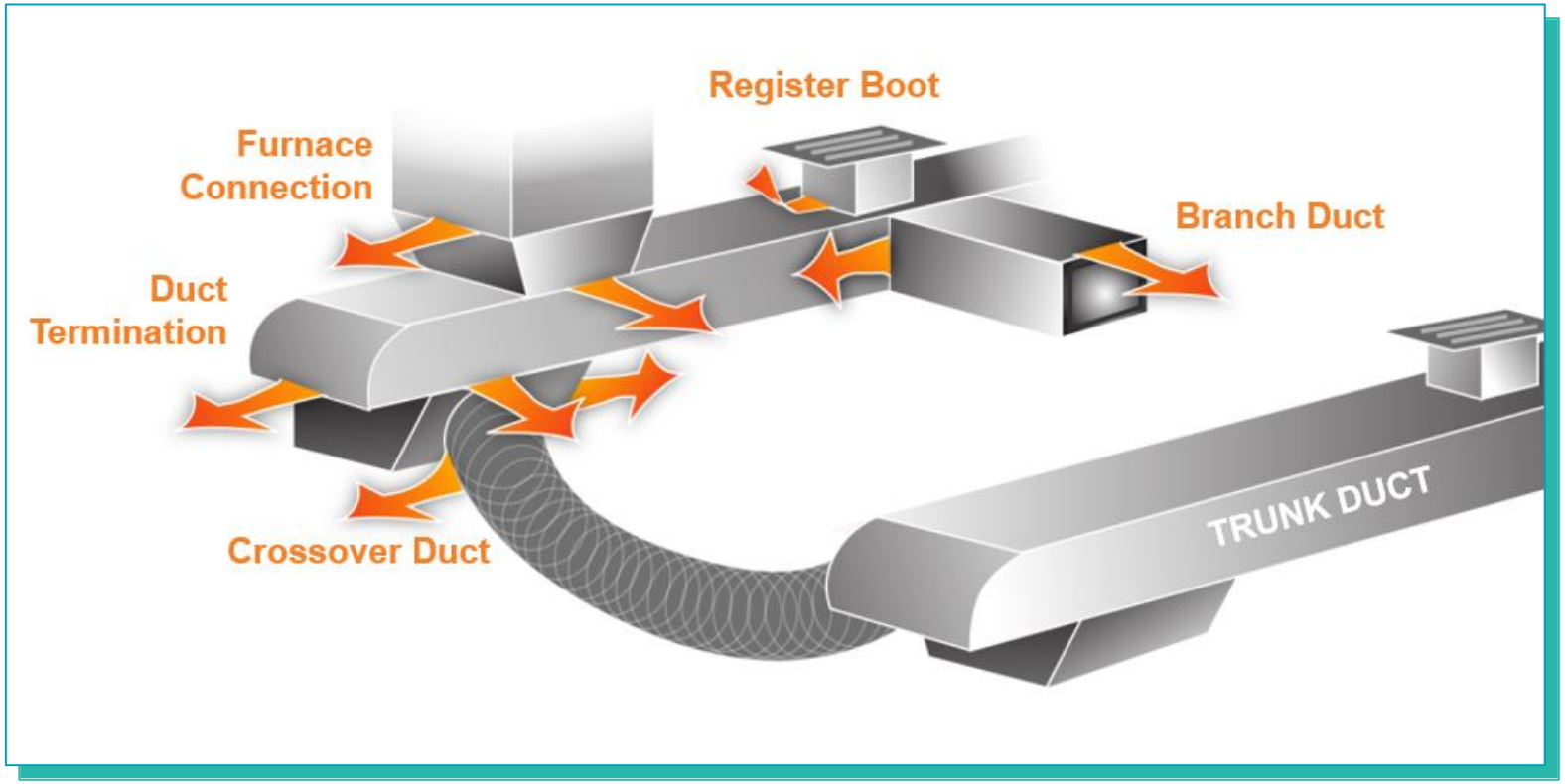
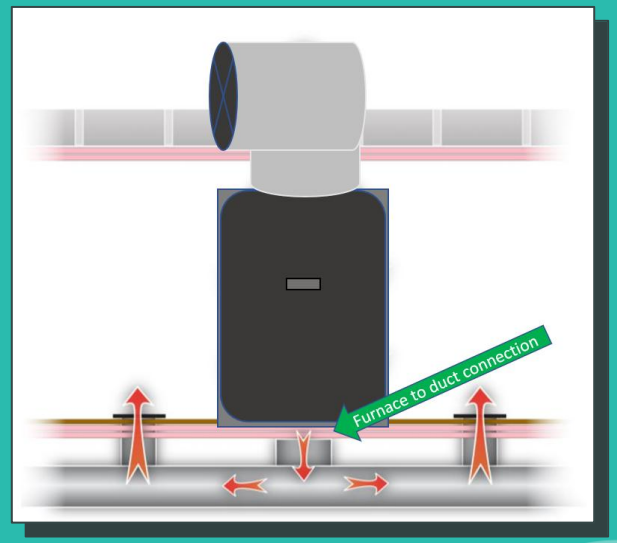
Ductwork

Furnace to ductwork connections



Repair and seal ducts

- Clean ducts and vacuum the boot.
- Repair or replace plastic flex ducts.



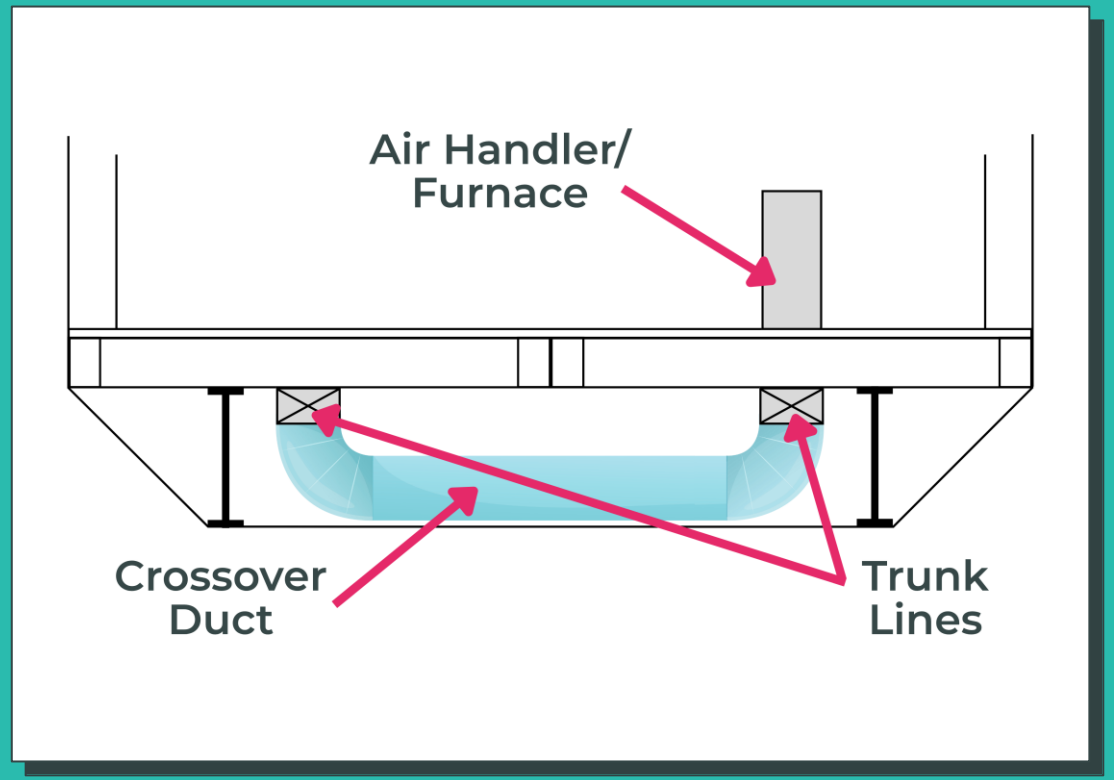
Repair and seal ducts

Repair and seal ducts

- Secure sagging ductwork and water lines.
- Repair and seal furnace base.

Crossover duct

Connects two sections of duct runs in a manufactured home with two or more sections.



Fix ductwork: remove old crossover duct

Systems Building Research Alliance and the California Energy Commission

Crossover duct

Screws and mastic are required. Tape is not sufficient.






Systems Building Research Alliance and the California Energy Commission

Airflow

Undercut doors or provide passive vents to create airflow.

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Dryer and Exhaust Venting

Repair and replace venting:

- Dryers and exhaust fans must vent outdoors.
- For dryers, use a smooth metal pipe.
- Repair or replace inoperable fans with energy efficient ones.
- Replace plastic flex duct.

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Water Heating

Considerations for water heaters

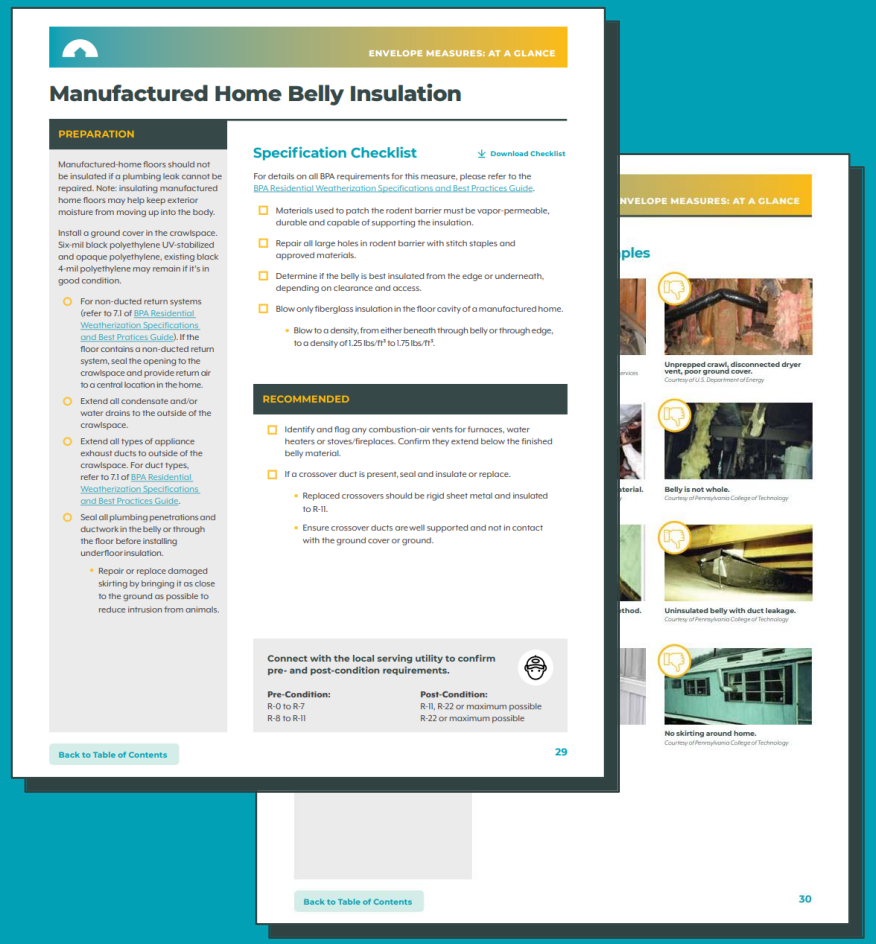
- Fuel
  - Primarily electric
- Location
  - Exterior closet
  - Interior closet
  - Laundry room
- Space constraints
  - Limited space for HPWH airflow

Have a plan and a process

- Remember Rule #1. DO NO HARM!
- Standards exist to manage risks for both the customer and your business!
- Leave every job site like you found it…or better!
- Find relevant requirements and resources on the Comfort Ready Home website

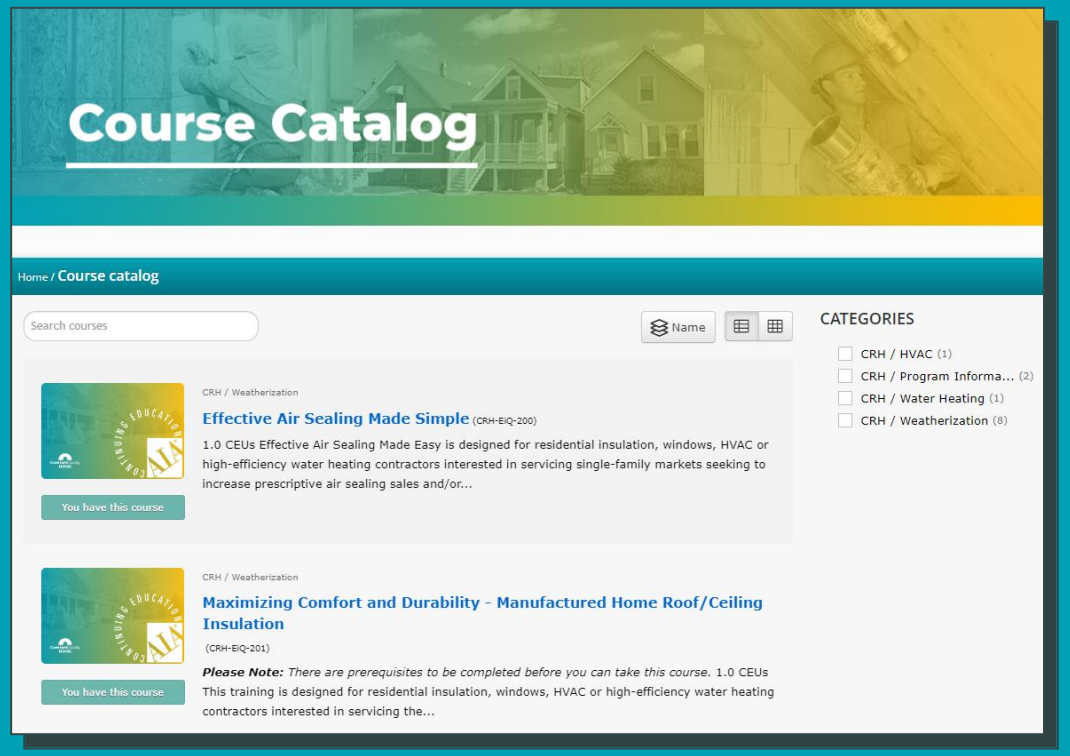
Residential Field Guide

Pro tip: Check out the Comfort Ready Home website for Residential Weatherization Specifications and Field Guide for related information.



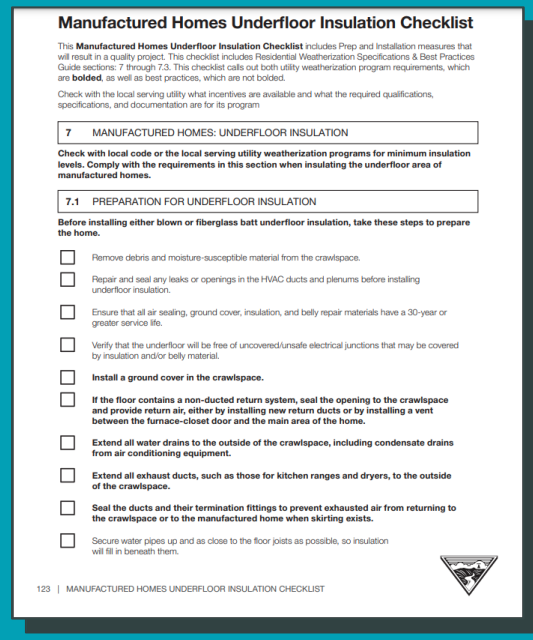
Comfort Ready Home training

Pro tip: Be sure to check out the Comfort Ready Home website for information on upcoming live and webinar trainings to help you learn and expand your business.



BPA checklists

Step-by-step requirements for underfloor insulation measure.



Manufactured Homes Underfloor Insulation Checklist

This **Manufactured Homes Underfloor Insulation Checklist** includes Prep and Installation measures that will result in a quality project. This checklist includes Residential Weatherization Specifications & Best Practices Guide sections: 7 through 7.3. This checklist calls out both utility weatherization program requirements, which are **bolded**, as well as best practices, which are not bolded.

Check with the local serving utility what incentives are available and what the required qualifications, specifications, and documentation are for its program

7 MANUFACTURED HOMES: UNDERFLOOR INSULATION

Check with local code or the local serving utility weatherization programs for minimum insulation levels. Comply with the requirements in this section when insulating the underfloor area of manufactured homes.

7.1 PREPARATION FOR UNDERFLOOR INSULATION

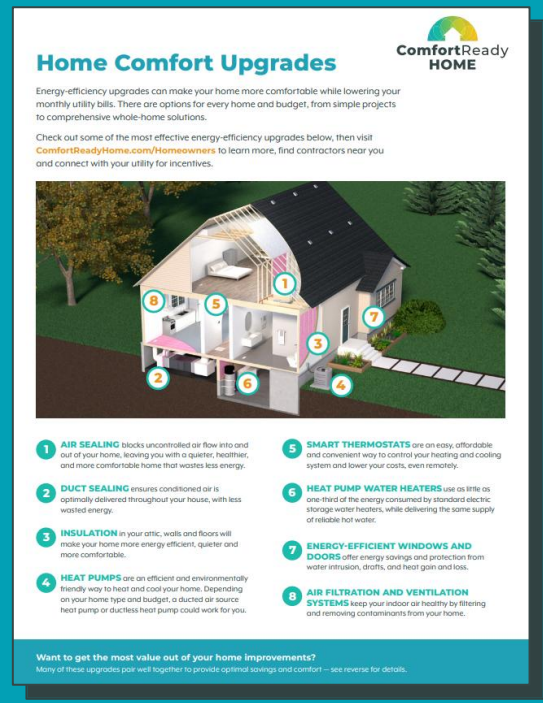
Before installing either blown or fiberglass batt underfloor insulation, take these steps to prepare the home.

- ☐ Remove debris and moisture-susceptible material from the crawlspace.
- ☐ Repair and seal any leaks or openings in the HVAC ducts and plenums before installing underfloor insulation.
- ☐ Ensure that all air sealing, ground cover, insulation, and belly repair materials have a 30-year or greater service life.
- ☐ Verify that the underfloor will be free of uncovered/unsafe electrical junctions that may be covered by insulation and/or belly material.
- ☐ **Install a ground cover in the crawlspace.**
- ☐ **If the floor contains a non-ducted return system, seal the opening to the crawlspace and provide return air, either by installing new return ducts or by installing a vent between the furnace-closet door and the main area of the home.**
- ☐ **Extend all water drains to the outside of the crawlspace, including condensate drains from air conditioning equipment.**
- ☐ **Extend all exhaust ducts, such as those for kitchen ranges and dryers, to the outside of the crawlspace.**
- ☐ **Seal the ducts and their termination fittings to prevent exhausted air from returning to the crawlspace or to the manufactured home when skirting exists.**
- ☐ Secure water pipes up and as close to the floor joists as possible, so insulation will fill in beneath them.

123 | MANUFACTURED HOMES UNDERFLOOR INSULATION CHECKLIST

Comfort Ready Home homeowner webpage

- Infographics.
- Product guides.
- Contractor and utility search tools.
- Comfort Ready Home YouTube channel.



Home Comfort Upgrades

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Energy-efficiency upgrades can make your home more comfortable while lowering your monthly utility bills. There are options for every home and budget, from simple projects to comprehensive whole-home solutions.

Check out some of the most effective energy-efficiency upgrades below, then visit ComfortReadyHome.com/Homeowners to learn more, find contractors near you and connect with your utility for incentives.

1 AIR SEALING blocks uncontrolled air flow into and out of your home, leaving you with a quieter, healthier, and more comfortable home that wastes less energy.

2 DUCT SEALING ensures conditioned air is optimally delivered throughout your house, with less wasted energy.

3 INSULATION in your attic, walls and floors will make your home more energy efficient, quieter and more comfortable.

4 HEAT PUMPS are an efficient and environmentally friendly way to heat and cool your home. Depending on your home type and budget, a ducted air source heat pump or ductless heat pump could work for you.

5 SMART THERMOSTATS are an easy, affordable and convenient way to control your heating and cooling system and lower your costs, even remotely.

6 HEAT PUMP WATER HEATERS use as little as one-third of the energy consumed by standard electric storage water heaters, while delivering the same supply of reliable hot water.

7 ENERGY-EFFICIENT WINDOWS AND DOORS offer energy savings and protection from water intrusion, drafts, and heat gain and loss.

8 AIR FILTRATION AND VENTILATION SYSTEMS keep your indoor air healthy by filtering and removing contaminants from your home.

Want to get the most value out of your home improvements?
Many of these upgrades pair well together to provide optimal savings and comfort – see reverse for details.

Many upgrades pair well and complement each other.

When investing in your home's energy efficiency, it's worth considering which upgrades work well together to maximize comfort while delivering the best value. Ask your contractor about combing different upgrades and check with your utility for available incentives.

AIR SEALING
Pairs well with: Insulation; Duct sealing; Air source heat pumps; Ductless heat pumps; Windows and doors; Ventilation
Good for: Indoor Air Quality; Utility Bills; Comfort; Environmental Footprint; Noise Reduction

DUCT SEALING
Pairs well with: Air sealing; Air source heat pumps
Good for: Indoor Air Quality; Utility Bills; Comfort; Environmental Footprint; Noise Reduction

INSULATION
Pairs well with: Air sealing; Ventilation; Ductless heat pumps; Air source heat pumps; Windows and doors
Good for: Indoor Air Quality; Utility Bills; Comfort; Environmental Footprint; Noise Reduction

HEAT PUMPS
Pairs well with: Air sealing; Insulation; Duct sealing; Smart thermostats
Good for: Utility Bills; Comfort; Environmental Footprint

SMART THERMOSTATS
Pairs well with: Air source heat pumps
Good for: Utility Bills; Comfort; Environmental Footprint

WINDOWS AND DOORS
Pairs well with: Air sealing; Insulation
Good for: Indoor Air Quality; Utility Bills; Comfort; Environmental Footprint; Noise Reduction

AIR FILTRATION AND VENTILATION
Pairs well with: Air sealing; Insulation
Good for: Indoor Air Quality

Visit ComfortReadyHome.com/Homeowners to learn more about these upgrades, find installers near you and connect with your utility for incentives.

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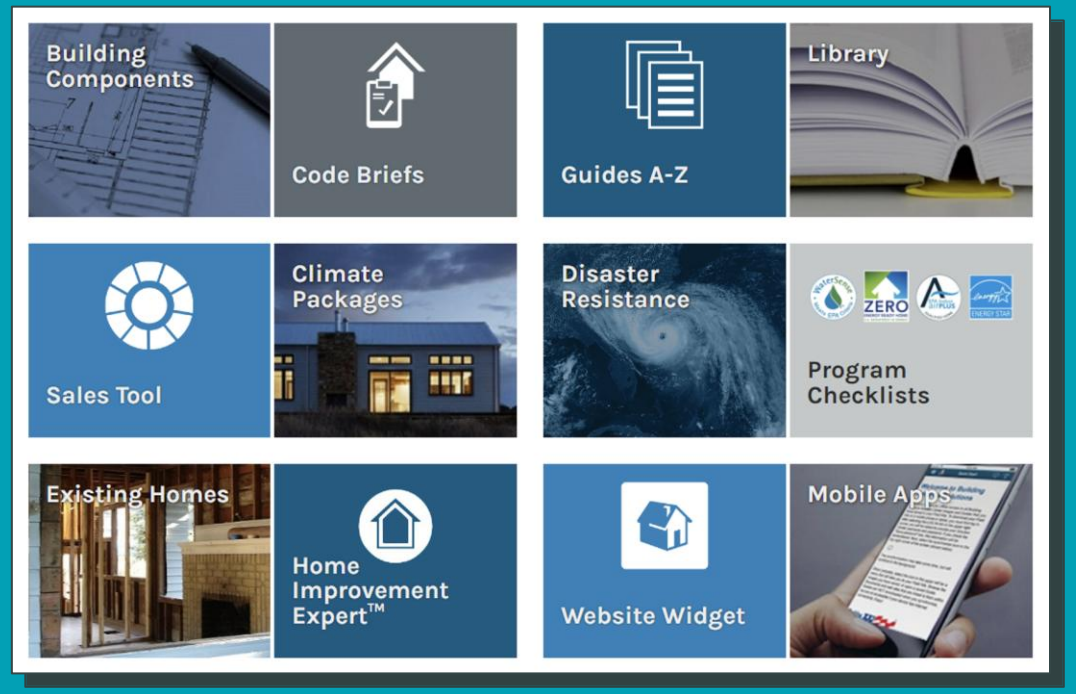
Building America Solution Center

- Technical information and guides.
- Checklists.
- Sales material.
- Mobile apps.



Questions?

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Thank you!