

RETROFIT APPLICATION GUIDE

CRAWL SPACES

The following are suggestions for best practices from various sources. Each Company is responsible for its own individual Safety, HCP and PPE programs. Always follow all fire and building codes and equipment manufacturers' manuals, labels, and listings.

OBJECTIVE

To insulate and air seal crawl space walls.

This application particularly benefits:

- Homes without adequate insulation and air-sealing of the crawl space
- Homes with extensive air leakage at the rim/band joist area

Huntsman Building Solutions' spray polyurethane foam (SPF) has been used in crawl space assemblies for over 40 years. These systems continue to perform very well and generate substantial energy savings. For best results and consideration of specific issues with respect to your building, it is recommended that you consult a trained BPI or RESNET rater before and after the retrofit.

Auto CAD drawings for these assemblies are attached. If there are any questions regarding the retrofit application, please contact the Huntsman Building Solutions Building Science/Engineering Department.

Set Customers' Expectation Early

Vacate occupants and pets during and after application according to Product Specific Re-Occupancy times. These guidelines require specific ventilation rates (air changes per hour) for a minimum time after the completed application, before the building can be safely reoccupied. The guidelines can be found on the HBS website.

Before beginning, discuss the project with the homeowner including all health and safety considerations. Instruct the homeowner to remove all portable personal belongings from the work area. Verify that there are no moisture problems in the space. If in doubt have the area reviewed by a Professional Engineer.

Removal of Existing Insulation

HBS spray foam shall not be applied over existing insulation materials. When insulating a crawl space wall, any existing insulation batts and blankets on the wall, sill and rim area shall be removed. This will allow the large gaps at the sill and around other connections, such as anchor bolts, to be accessed.

CONSIDERATIONS

Unvented Crawl Space

HBS spray foam insulation shall be applied directly to the crawl space walls, bands of the floor system and in direct contact with framing materials. Do not use separator sheets between the insulation and the concrete/block masonry wall, as this will provide paths for air leakage around the insulated layer.

Building Codes require that exposed earth in an unvented crawl space be covered with a continuous Class I Vapor Retarder to avoid excessive moisture loads in the crawl space. The Class I Vapor retarder shall be sealed to the crawl space wall and spray foam applied otop to prevent any air leakage.

Additional precautions may be required to prevent termite infestation if applicable. Consult your local building official for their requirements/recommendations in this regard.

There are three options regarding the conditioning of the unvented crawl space.

1. Continuously operated mechanical exhaust ventilation at a rate of 1 ft³/min for each 50 ft² of crawl space floor area, including an air pathway to the common area (such as a duct or transfer grille).
2. Conditioned air supply sized to deliver at a rate of 1 ft³/ min. for each 50 ft² of underfloor area, including a return air pathway to the common area (such as a duct or transfer grille).
3. The crawl space is used as a plenum.

Each HBS spray foam product has a specific code compliance report which outlines the requirements for use of alternate thermal barriers, ignition barriers, or leaving the foam left exposed in unvented crawl spaces. Please contact the Huntsman Building Solutions Engineering/Building Science Department with any questions.

Combustion Appliances

Conventional, naturally aspirated combustion appliances are not able to operate safely within an unvented crawl space because they draw combustion air from the unvented crawl space. Either sealed combustion or power-vented, high-efficiency equipment is needed. A preliminary and post-installation safety inspection of all combustion appliances must be completed whenever changes to the building envelope and/or heating system are part of the work scope.

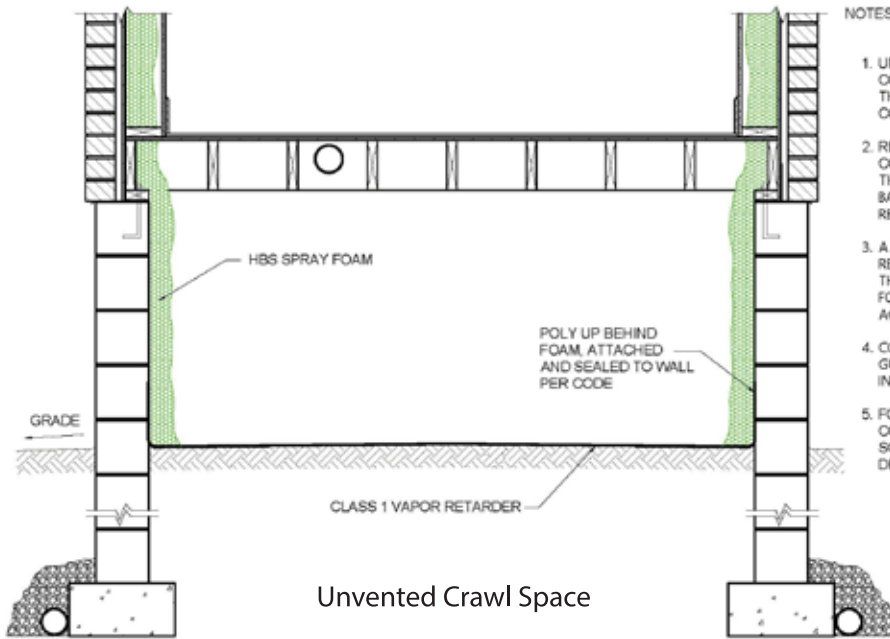
Heat Emitting Devices

Always refer to the manufacturer's information of the heat emitting device for verification of safe distance.

The maximum service temperature for most HBS spray foams (open or closed cell) is 180°F (82°C). Always refer to specific product Technical Data Sheet (TDS) for confirmation. HBS spray foams should not be used in direct contact with chimneys, flues, steam pipes, recessed lighting or other heat emitting devices. A minimum 3" separation distance is recommended.

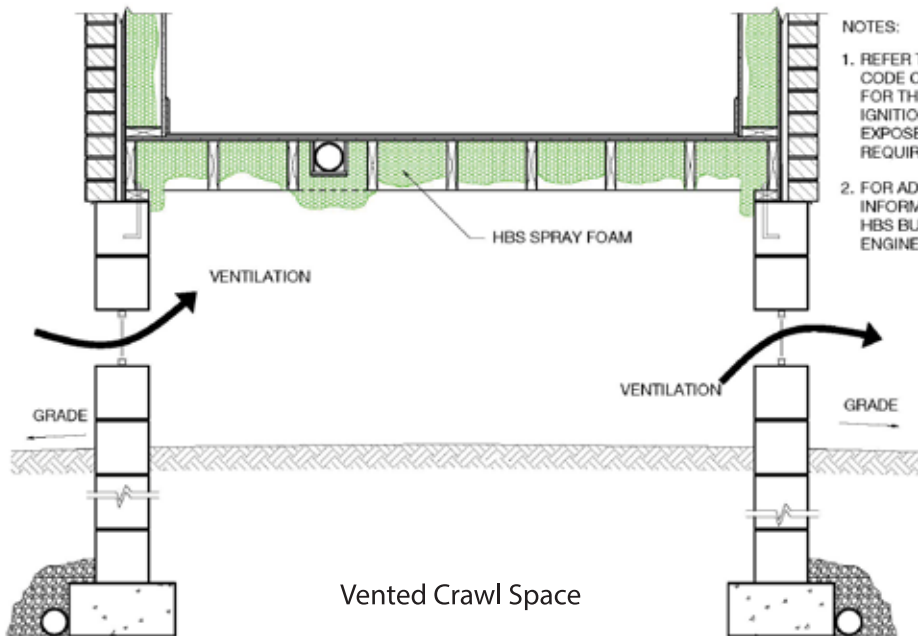
STEP-BY-STEP GUIDELINES for the Huntsman Building Solutions Contractor

1. Prior to removal of existing insulation, ensure all workers are wearing proper PPE as set up by your company's Safety and PPE Guidelines.
2. Remove existing insulation batts and blankets on the wall, sill and rim area.
3. Exposed earth is covered with a continuous Class 1 Vapor Retarder. Joints of the vapor retarder shall be sealed or taped. The edges of the vapor retarder shall extend at least 6" up the crawl space wall and shall be attached and sealed to the wall.
4. Place tarps or polyethylene over possessions left in the space. Remember to consider the area the spray rig is going to be located (Spill Hazard). Seal any openings to separate the work area from the rest of the building. Typical methods could include taping polyethylene tarps over the openings with overlapping flaps that permit access by laborers.
5. Place warning signs on the crawl space access door, restricting entry to the crawl space to workers wearing the prescribed full PPE. At a minimum, warning signage should state: "CAUTION: Spray foam is being applied, personal protective equipment required, otherwise do not enter – No Smoking – No Eating".
6. Shut down and seal off HVAC openings in the work area to prevent migration of contaminants to other areas of the building. Don't forget to unseal and restart the HVAC system prior to re-occupancy after the SPF has fully cured and the work area has been ventilated according to the products specific ventilation rates.
7. Seal all mechanical exhaust vents, including the air pathway to the common area and conditioned air supply vents, in the crawl space area. Shut off any combustion devices such as domestic water heaters, furnaces and fireplaces.
8. Place a suitably sized exhaust fan capable of providing required Air Changes per Hour from the work area, such that it vents directly to the exterior away from the building and begin exhausting air from the space.
9. Ensure Sprayer and Helper are wearing full Personal Protective Equipment (PPE) including a Supply-Air Respirator (SAR) with full-face protection (hood or full- facepiece type) and chemically resistant gloves and full-body protection to prevent skin contact as directed by the company's Safety and Hazard Communication Program.
10. After testing spray equipment outside the building, bring hose and gun into the work area by a direct route.
11. Apply spray foam as required (as per contract) to:
 - Provide specified thickness to rim/band joist area.
 - Provide specified thickness to crawl space walls. In termite areas, follow applicable guidelines for inspection bands.
12. Apply Ignition Barrier/Thermal Barrier coating on areas required by Building Code.
13. Clean up any debris in the work area and remove surplus material and all spray equipment (guns, hoses, coating sprayers, etc.) while wearing PPE.



NOTES:

1. UNVENTED CRAWL SPACE IS COVERED IN SECTION R408.3 IN THE INTERNATIONAL RESIDENTIAL CODE.
2. REFER TO PRODUCT SPECIFIC CODE COMPLIANCE REPORTS FOR THERMAL BARRIER, IGNITION BARRIER AND EXPOSED FOAM REQUIREMENTS.
3. A CLASS II VAPOR RETARDER IS REQUIRED IN CLIMATE ZONES 5-8. THE USE OF CLOSED-CELL SPRAY FOAM IS RECOMMENDED TO ACHIEVE THIS.
4. CONSULT WITH LOCAL CODE FOR GUIDANCE WITH SPRAY FOAM USED IN TERMITE INFESTED AREAS.
5. FOR ADDITIONAL INFORMATION CONTACT THE HBS BUILDING SCIENCE / ENGINEERING DEPARTMENT.



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1. REFER TO PRODUCT SPECIFIC CODE COMPLIANCE REPORTS FOR THERMAL BARRIER, IGNITION BARRIER AND EXPOSED FOAM REQUIREMENTS.
2. FOR ADDITIONAL INFORMATION CONTACT THE HBS BUILDING SCIENCE / ENGINEERING DEPARTMENT.

The logo for Huntsman Building Solutions features the word "HUNTSMAN" in a bold, green, sans-serif font, centered between two thick green horizontal bars. Below this, the words "BUILDING SOLUTIONS" are written in a smaller, brown, sans-serif font.

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