INSULATION CONTRACTORS ASSOCIATION OF AMERICA

Technical Bulletin

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No. 21: Insulating Basements and Crawl Spaces (Revised 7/04)

In all cases, consult with the project architect, engineer, or building code official. ICAA Technical Bulletins are provided for informational purposes only. ICAA and/or its members are not responsible for loss or damage caused by errors or omissions or any other cause.

SCOPE: This bulletin describes various application techniques for insulating walls and ceilings of basements and crawl spaces.

INTRODUCTION: The International Energy Conservation Code establishes minimum energy efficiency standards for insulating basements and crawl spaces. The choice of a particular method or material will depend upon many factors, such as presence of water lines, HVAC ducting and mechanicals, type of floor support structure and subflooring materials, and other building code requirements. This bulletin provides information about where and how various insulation materials should be used to insulate basements and crawl spaces to meet local building code requirements and avoid potential problems. Consult with your local jurisdiction regarding codes in your area.

LIMITATIONS: This bulletin does not cover all possible methods and materials suitable for insulating basements and crawl spaces. Recommendations from the material manufacturer should be solicited. However, it remains the final responsibility of the architect/engineer to ensure proper design and application of the materials in question.

BASEMENTS: If the basement space is heated or is unconditioned but contains heating units, ducts and pipes, or other appliances, the walls should be insulated instead of the floor/ceiling. If the basement space is unheated, it may be appropriate to insulate the floor/ceiling. As an alternative, insulation may be applied to the walls, and, in some cases, this may be the only alternative. However, insulation should always be applied to the band joist.

CRAWL SPACES: Crawl spaces may have cement or dirt floors, provide combustion air to furnaces, and include pipes and ducts. Either the walls or the floor/ceiling should be insulated, but not both. If the floor/ceiling is insulated, all pipes and ducts must be insulated as well. Regardless of where insulation is placed, the entire floor area should be covered with a 4 mil or thicker plastic sheeting (ground cover) extending partially up the vertical wall to reduce moisture problems. Check codes on how far the ground cover should extend up the vertical wall.

FLOOR/CEILING:

- If faced insulation is used, the facing must always be in substantial contact with the subflooring, unless the facing has a Flame Spread Index (FSI) of 25 or less.
- All types of unfaced insulation and faced insulation with the facing rated FSI of 25 or less are not required to contact the subflooring, and may form an air space between the insulation and subflooring.
- All types of insulating materials must be securely held in place by means of support rods, wire mesh, netting, drive pins, or other mechanical means.
- Currently, the International Residential Code requires a vapor retarder on the warm-in-winter side of insulation; however, some exceptions are granted. Consult with the material manufacturer and the local code official. Plywood subflooring of ½ inch thickness or greater may be an approved vapor retarder. There are also approved vapor retarder paints.
- If an "encapsulated insulation" product is used, the vapor retarder should be installed on the warm-in-winter side of the insulation. Consult with the material manufacturer and the local code official for the proper location of the vapor retarder.
- Most codes require protection of foam plastic insulation with an approved fire rated barrier unless an exception been granted. Requirements differ for basement and crawl space floor/ceilings. Consult with the material manufacturer and local building codes.
- All exposed insulation and facings must have a FSI of 25 or less. Refer to the local building code with jurisdiction.

- When truss type or wood I-beam joists are present, it may be more practical to insulate the walls of the floor/ceiling.

WALLS:

- Basement or crawl space walls are constructed of masonry or wood framing and may be subject to below grade water leakage from the exterior side. Because of this, particular attention should be given to protecting the insulation from becoming wet and subject to deterioration and loss in R-value. It should be determined whether the exterior of the wall has been treated to reduce or eliminate water leakage.

- It is a good practice to apply vapor retardant paint or attach an approved vapor retarder to the interior wall surface from one foot above the outside ground level to the floor before insulating. In crawl spaces with dirt floors, plastic film should cover the entire horizontal surface of the ground and at least 6 inches vertically up the walls. This practice will all but eliminate moisture related problems.

- Insulation should be continuous from the top of the wall to the floor of crawl spaces less than 12 inches in height and should extend horizontally across the floor of crawl spaces for a minimum of 12 inches.

- Any rigid, flexible, or spray applied insulation material may be used. Consult with the material manufacturer for proper application techniques. The important criteria is that it remain in place.

- Most codes require protection of foam plastic insulation with an approved fire rated barrier unless an exception has been granted. Requirements differ for basement and crawl space walls. Consult with the material manufacturer and local building codes.

- All exposed insulation and facings must have a FSC of 25 or less. Refer to the local building code with jurisdiction. Note that there have been some cases where the foil facing of FSC of 25 or less insulation has given electrical shocks to installers when a "hot" electrical wire is in contact with the facing.

- Basement walls which will be enclosed with an interior finish should be insulated in the same manner as exterior walls on floors above the basement.

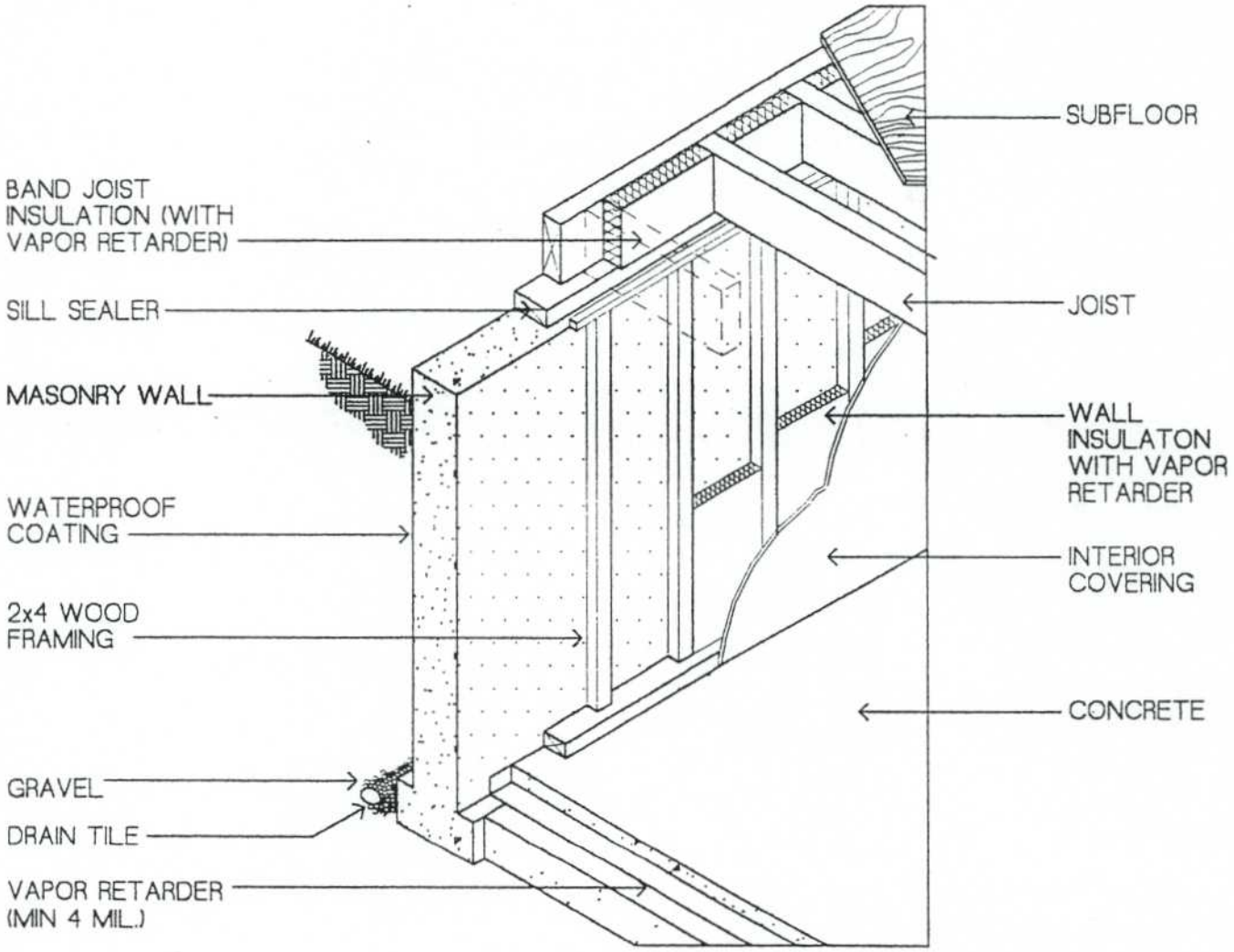
- Apply insulation to all band joist areas so that it is securely in place. If faced insulation is used, the facing should be in contact with the joist. Many code officials do not permit exposed facings.

- When crawl space wall insulation techniques are chosen over floor/ceiling insulation, ventilation is unnecessary and not energy efficient according to today's building scientists. Check building codes as they are subject to change. Vents must be provided, but it is suggested they be closed and insulated if the walls are insulated AND proper moisture control measures have been taken.

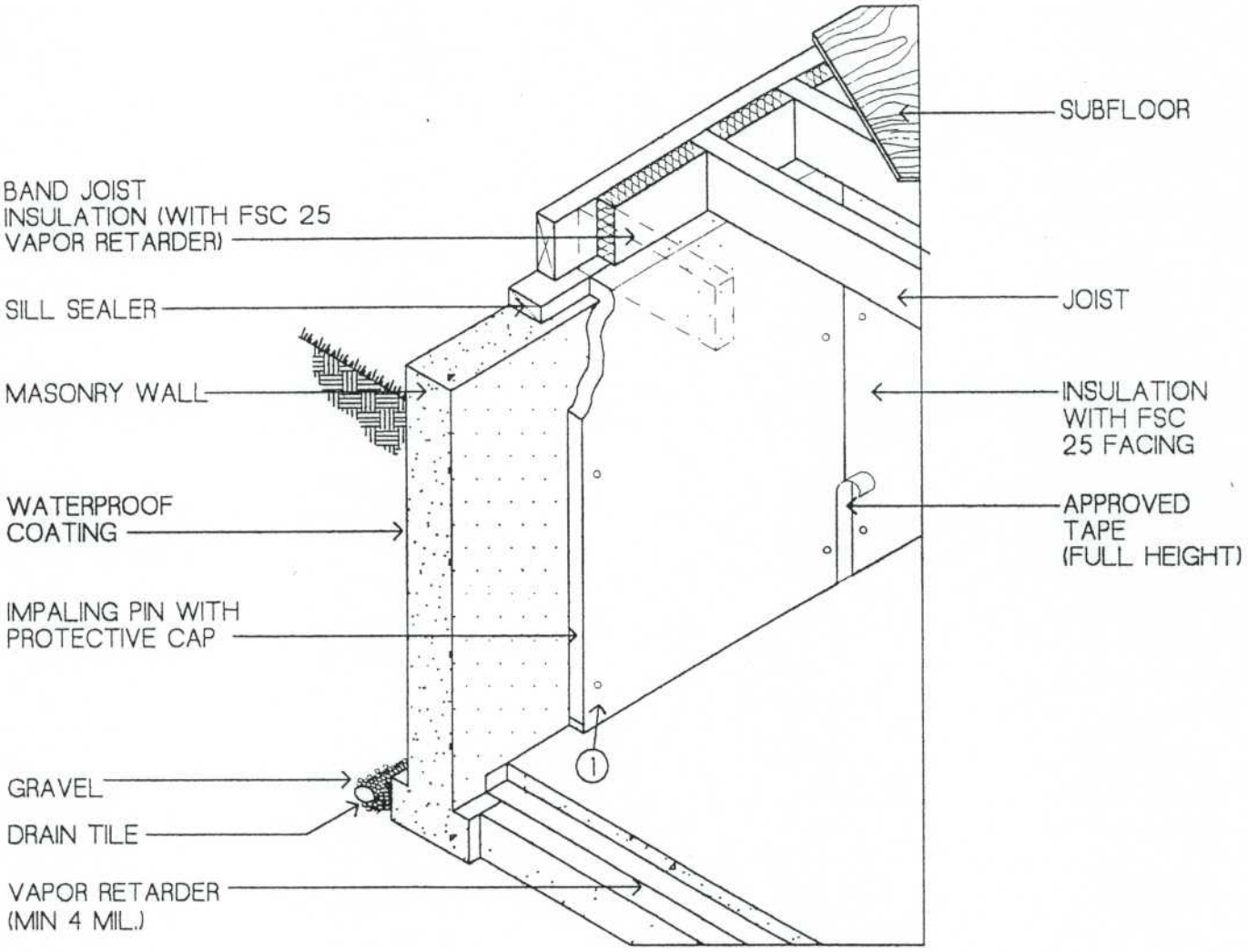
- In regions where termite infestation is common, local code officials may require a continuous 6 inch high "inspection strip" around the perimeter at the top of insulated exterior basement and crawl space walls. This may also be required at the bottom of insulated exterior walls where there is no finished floor (i.e., soil, stone, etc.). In some areas, use of foam plastic insulation below grade on the external of foundation walls is prohibited. Consult with your local building code official.

- There are many acceptable wall insulation techniques. Some are identified in Figures A - F. For further information, contact the Energy & Environmental Building Association at www.eeba.org.

WOOD FRAMED INTERIOR BASEMENT INSULATION INSTALLATION



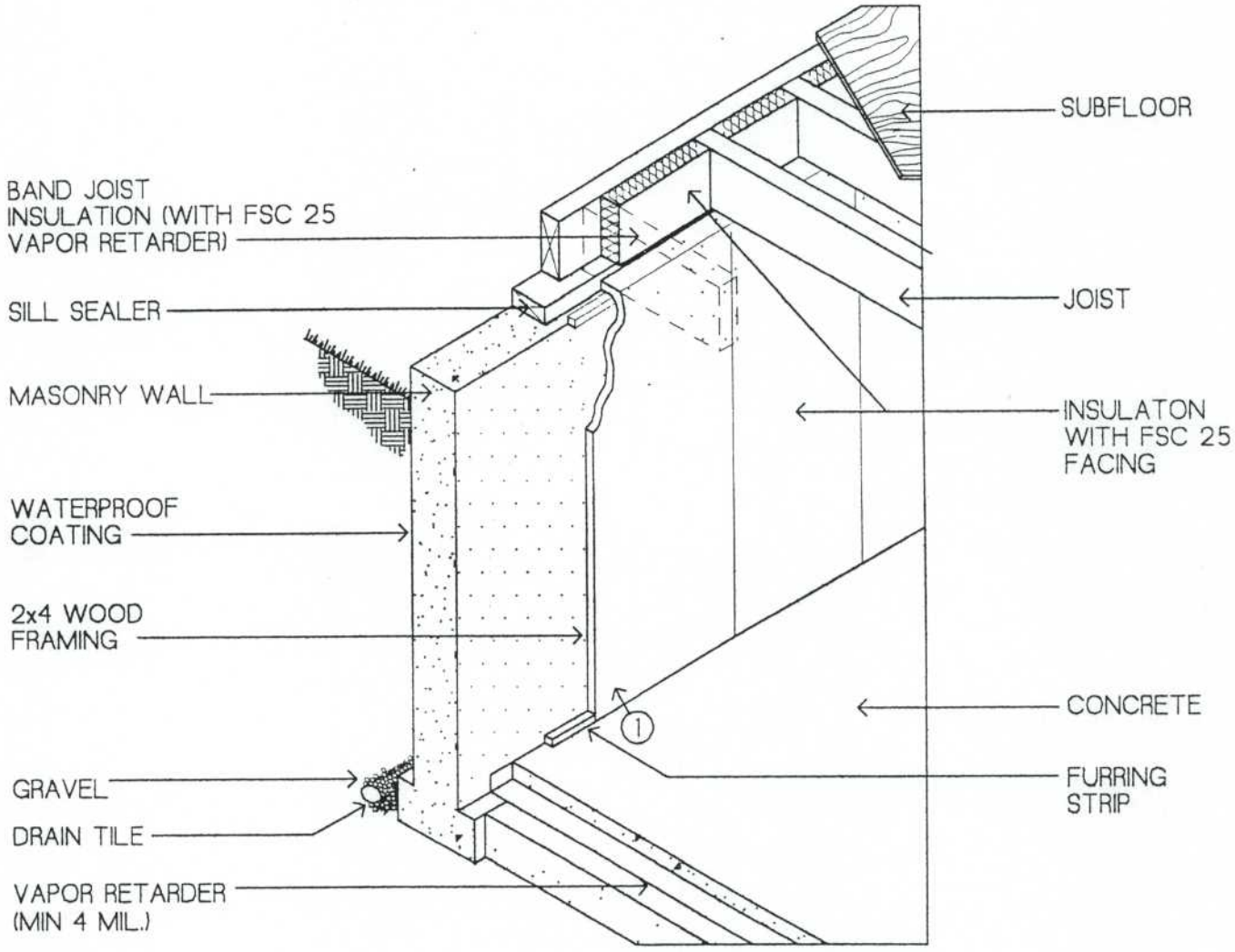
INTERIOR BOARD - TYPE INSULATION INSTALLATION ②



NOTES: ① WHEN FLOOR IS UNFINISHED (IE. SOIL, STONE, ETC.), IN REGIONS OF HEAVY TERMITE INFESTATION, LOCAL INSPECTORS MAY REQUIRE AN "INSULATION STRIP" AT BOTTOM OF THE INTERIOR FOUNDATION WALL. IF SO REQUIRED, INSTALL INSULATION 6" INCHES UP FROM TH BOTTOM OF THE WALL.

② FOR BASEMENT OR CRAWL (GREATER THAN 12" IN HEIGHT APPLICATIONS.)

INTERIOR BATT/BLANKET INSULATION INSTALLATION ②



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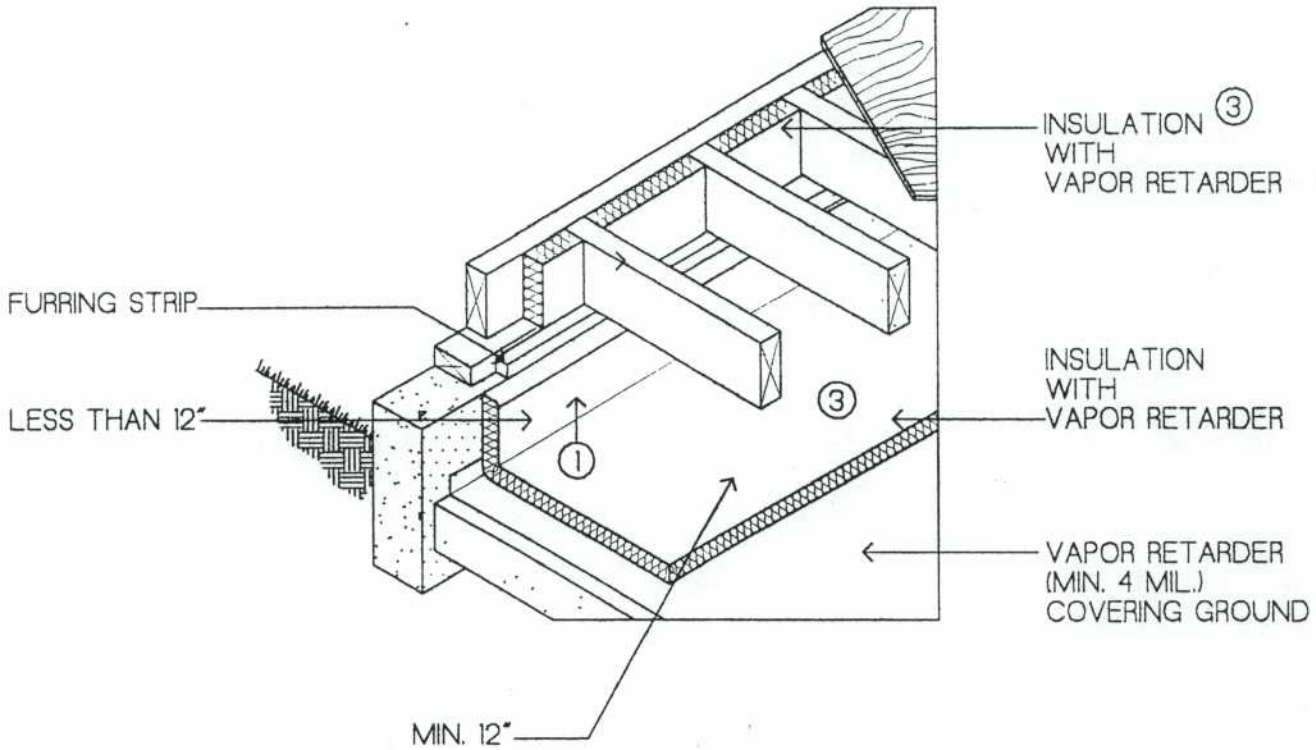
② FOR BASEMENT OR CRAWL (GREATER THAN 12" IN HEIGHT APPLICATIONS.)

INTERIOR CRAWL SPACE INSULATION INSTALLATION ②



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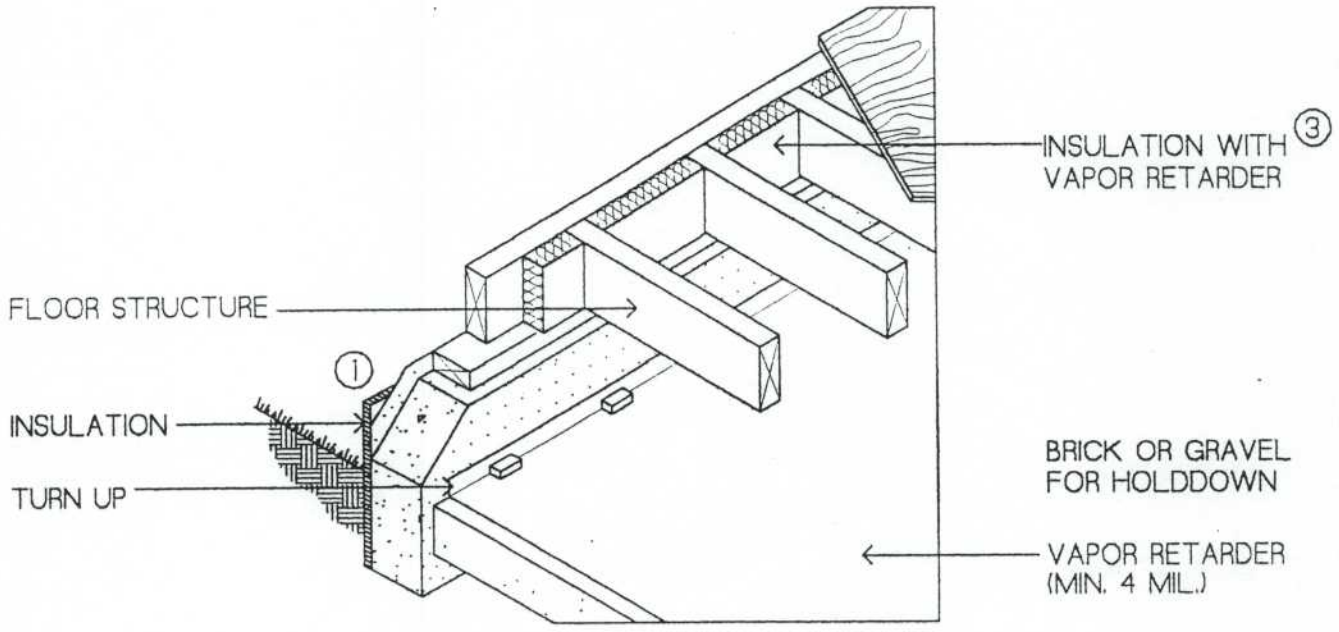
② FOR CRAWL SPACE APPLICATIONS LESS THAN 12" IN HEIGHT

③ SOME JURISDICTIONS MAY REQUIRE FSC 25 FACING ON EXPOSED CRAWL SPACE INSULATION.

EXTERIOR CRAWL SPACE INSULATION INSTALLATION ②

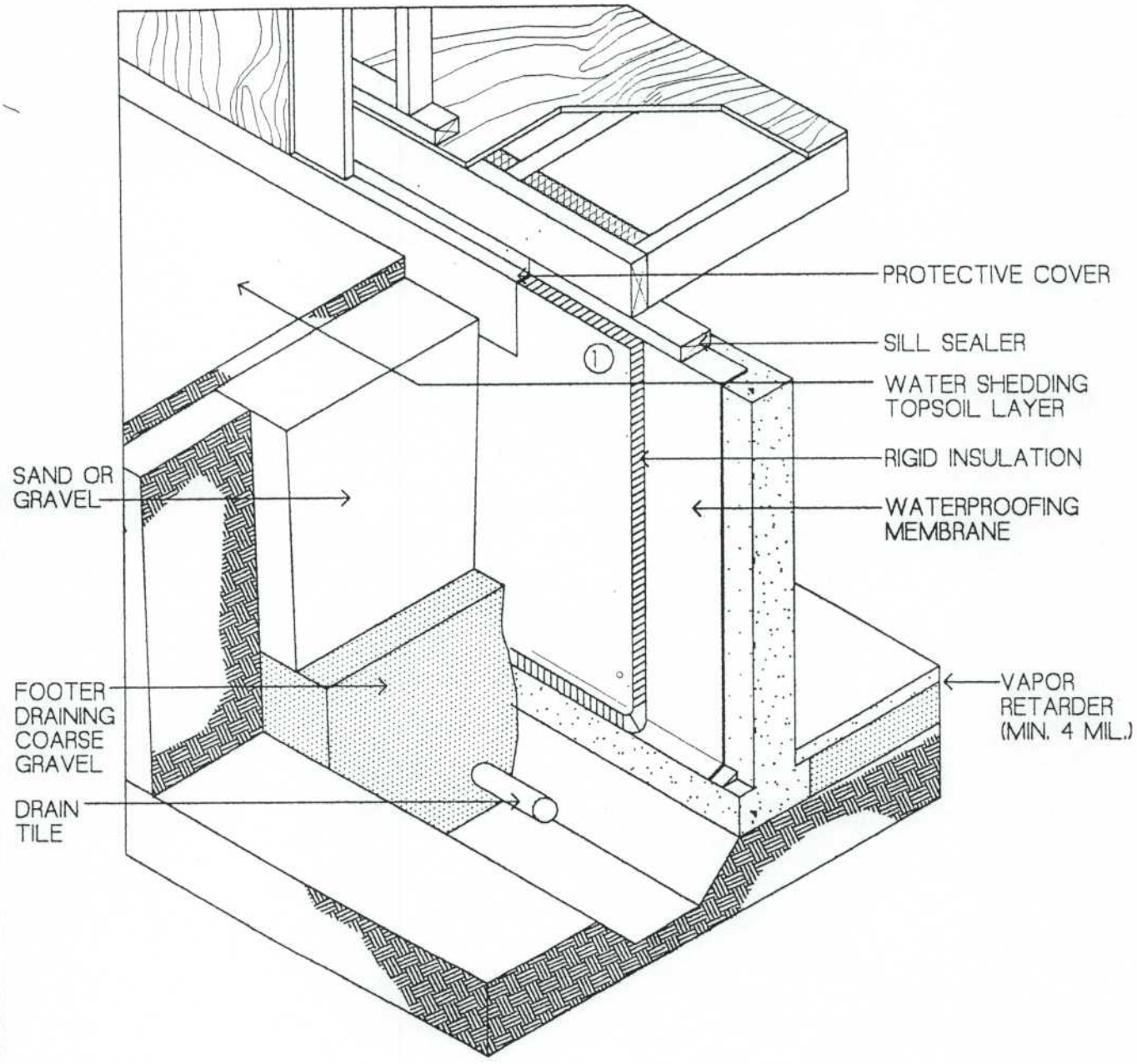


NOTES: ① IN REGIONS OF HEAVY TERMITE INFESTATION, LOCAL INSPECTORS MAY REQUIRE A "INSPECTIION STRIP" AT THE TOP OF THE EXTERIOR FOUNDATION WALL. IF SO REQUIRED, INSTALL INSULATION 6 INCHES DOWN FROM THE TOP OF THE WALL.

② FOR CRAWL SPACE APPLICATIONS REGARDLESS OF HEIGHT

③ SAME JURISDICTIONS MAY REQUIRE FSC 25 FACING ON EXPOSED CRAWL SPACE INSULATION.

EXTERIOR BASEMENT INSULATION INSTALLATION



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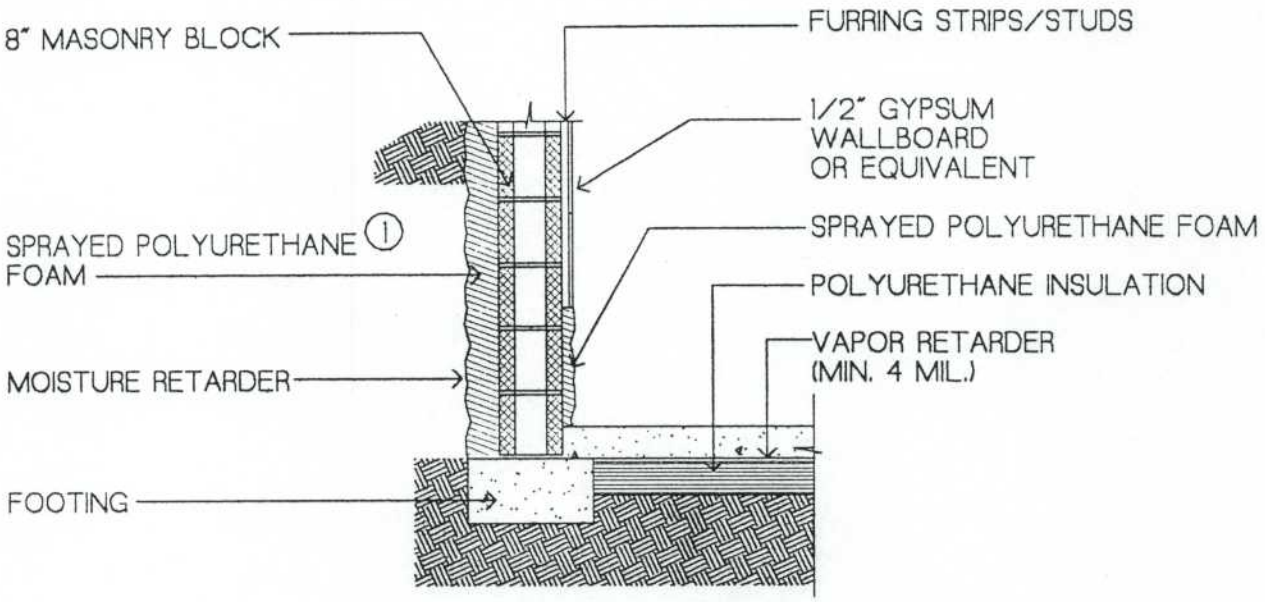
EXTERIOR INSULATED WITH SPRAY APPLIED POLYURETHANE FOAM INSULATION ②



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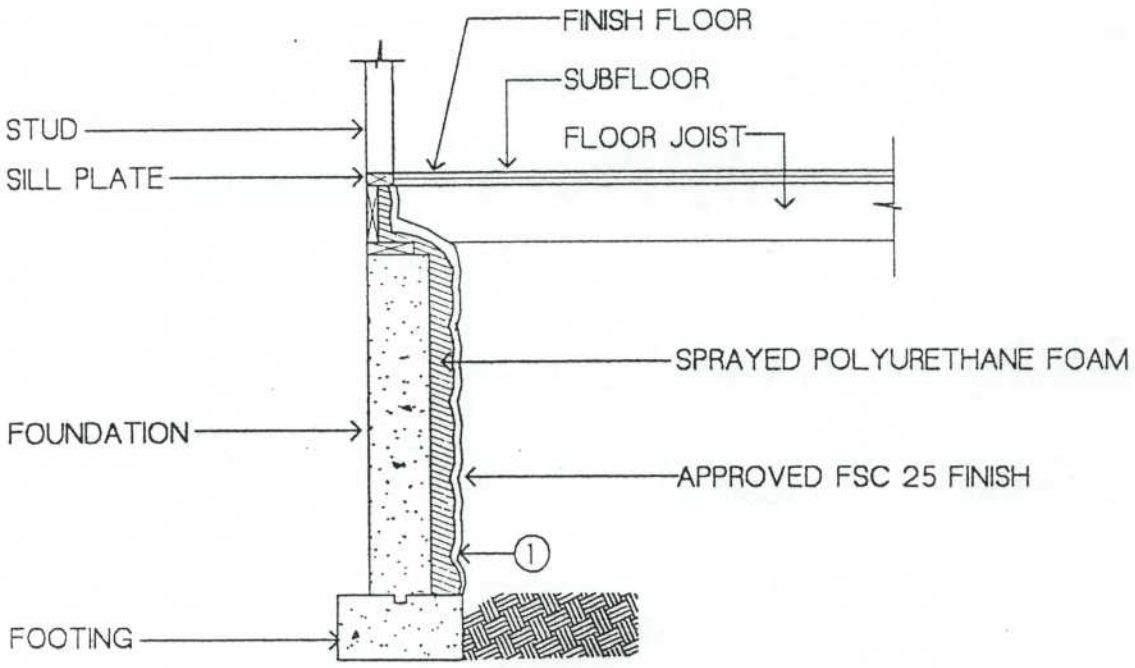
② FOR CRAWL SPACE APPLICATIONS REGARDLESS OF HEIGHT

INTERIOR INSULATED WITH SPRAY APPLIED POLYURETHANE FOAM INSULATION ②



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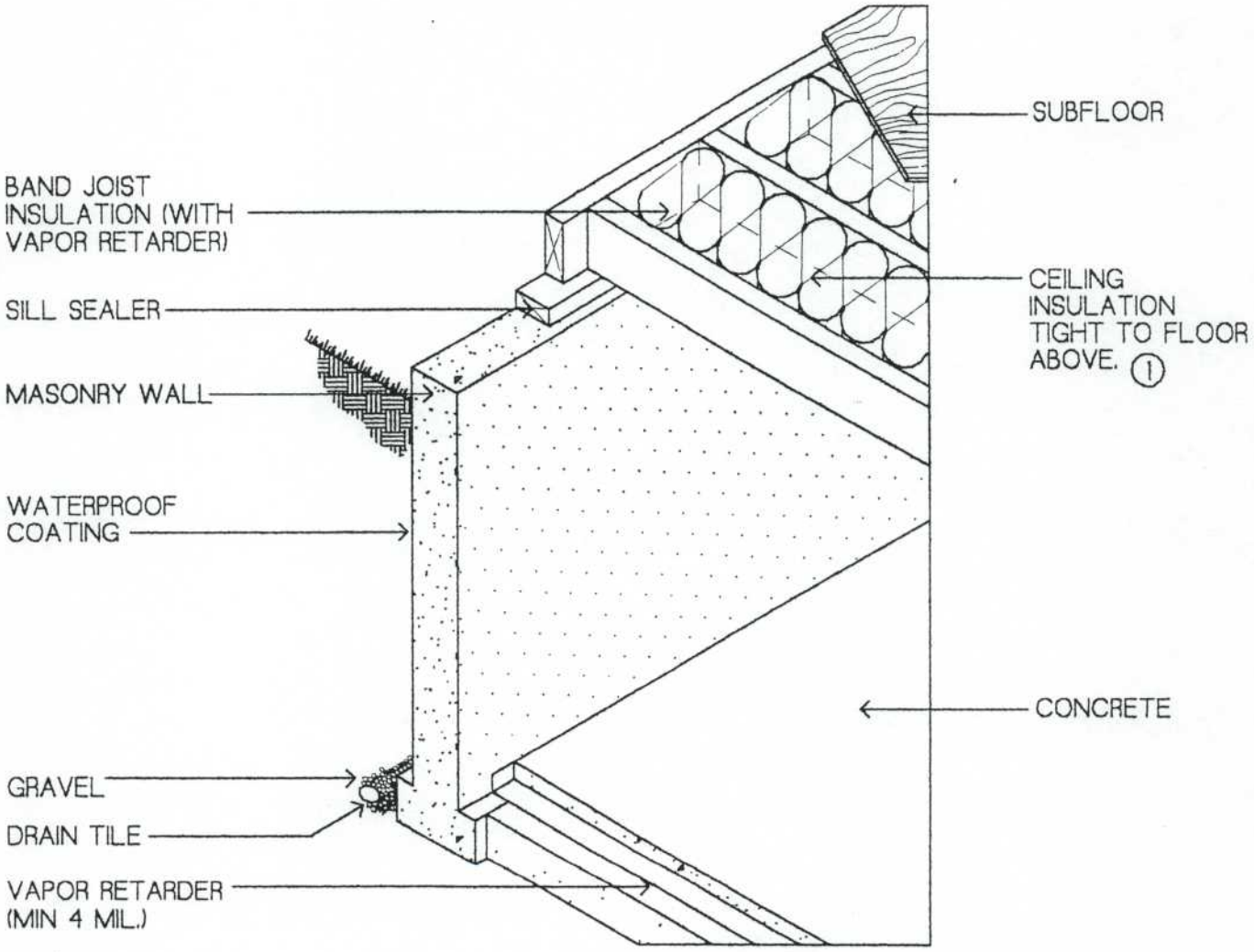
BASEMENT CEILING INSULATION INSTALLATION



NOTES: (1) VAPOR RETARDER TO FACE WARM SIDE IN WINTER