

The Key Question: Exterior or Interior Insulation?

Basements may be prone to high humidity. Interior moisture often is removed using dehumidifiers but that is not a complete solution. If thermal conduction between the masonry or concrete walls and floors to the surrounding soil is excessive, then the masonry or concrete may become cold enough for moisture condensation even at moderate humidity levels.

When moisture condenses on or is absorbed into concrete walls and concrete floor slabs, basements can become cold, dank and musty (Fig. 1). The most reliable long-term solution to prevent condensation is to maintain concrete wall and floor temperatures well above the dew point of the ambient air in the basement space. In this manner, condensation on the concrete wall and floor slab can be avoided.

Depending on the types of insulation and the quantity and locations of the insulation on the basement walls and floor, insulation can have a positive effect on managing the condensation of interior moisture.



Figure 1: If basement walls are not insulated from the outside, the wall temperature could drop below the dew point. Moisture condensation in the dark spaces behind interior insulation and sheet rock creates conditions that favor the growth of mold and mildew. (Adobe Stock)

Considering the thermal challenges of basement design, a good question to ask is Where should the insulation be placed relative to the basement walls and floors?

The basic challenge for insulation installation is to meet the required or desired R-value. However, this simple challenge is complicated by the presence of moisture. It makes a big difference where the insulation is installed on the basement wall.



Figure 2: XPS insulation on exterior of basement wall showing damp-proofing, wall insulation and anchors outdoors. (Adobe Stock)

During the cold season, insulation installed on the interior side of the basement wall will be colder on the side facing the exterior of the building, and the interior side of the insulation will be facing the warmer moist air of the basement's interior. This situation can contribute to unwanted moisture condensation on the interior side of the basement wall, and condensation of moisture within the insulation. Moisture condensation typically leads to mold and mildew (Fig. 1).

Conversely, insulation installed on the exterior side of the basement wall will be exposed to exterior moisture as well as the compressive forces of soil around the building. It may also be exposed to ultraviolet radiation if the insulation is left exposed above grade.

In the final analysis, the advantage of locating insulation on the exterior side of basement walls usually outweighs any advantage of locating insulation on the interior side of basement walls for thermal control. (Figures 2-4)

The basement wall stay much warmer during the winter when the insulation is on the exterior side. Since the basement wall is warmer, moisture condensation is far less likely within the basement and mold and mildew can be prevented from forming, provided the interior relative humidity is controlled.



Figure 3: XPS Insulation is a key component of any basement wall assembly. The moisture resistance of XPS makes it ideally suited for below grade applications in the construction of habitable basements. (Courtesy of Owens-Corning)



Figure 4: Exterior insulation and damp-proofing or waterproofing along with effective drainage helps prevent water intrusion into the basement. (Courtesy of Kingspan.)