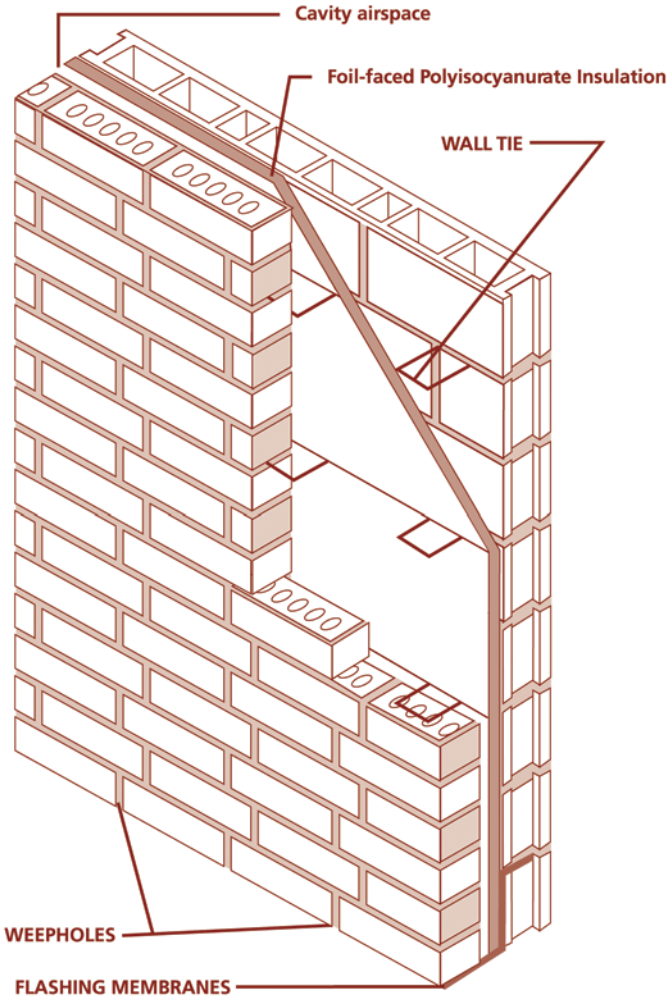
Use of Rigid Foam Insulation in Masonry Sidewall Construction

By Jared O. Blum

No one needs to tell product manufacturers and building professionals that they face challenges of greater complexity with virtually every passing day. Those challenges include the need to improve systems that meet their clients' desire for cost efficiency and long-term performance. It also likely requires them to increase the energy efficiency of their buildings using products and methods that can decrease a structure's carbon footprint.

Architects, specifiers, building owners, and contractors also have to meet or surpass the standards imposed by various governmental bodies and regulatory agencies. Some do so in order to achieve certification such as LEED, Energy Star, Building America, and other rating systems. Others simply seek the economic and environmental rewards inherent in such forward-thinking building.

Meanwhile, the very standards being used as benchmarks continue to change. For example, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recently adopted the first change in 19 years in the minimum required prescriptive resistance to heat flow (R-value) for roof and wall insulation levels in Standard 90.1, the national model energy code for commercial buildings. This new standard shifts above-deck roof insulation requirements from the current level of R-15 to R-20 in climate zones 2 through 8 in the U.S.



Similar increases were approved for walls. These increased roof and wall insulation values apply to all commercial and high-rise residential buildings covered by Standard 90.1. These changes now become a part of the newest edition of the Standard – 90.1-2007.

Fortunately, many proven methods exist to enable building professionals to both meet these standards and achieve their economic targets. One particular method for enhancing the thermal performance of a building is the application of insulation with a high R-value in masonry cavity walls. Combining sufficient levels of high-performance insulation with good structural design, appropriate details, quality materials, and good workmanship results in high-performance cavity walls.

In masonry sidewall construction, wythes are generally tied together with corrosion-resistant wall ties and are separated by an airspace and a layer of insulation board on the exterior of the inner wythe. The wythes may consist of solid

brick, hollow brick, structural clay tile, solid concrete, or hollow concrete units (blocks). This system takes into account possible moisture penetration that can come through the outer wythe during rain events. The small amount of moisture that does penetrate seeps primarily through microscopic cracks between the masonry and mortar bond and down the cavity face of the outer wythe.

Organizations that provide cavity-wall design details recommend an unobstructed airspace. This airspace allows the moisture to seep to the lowest level, where wall flashings direct it to the building's exterior via weep holes. As stated by the Masonry Advisory Council:

> *For this reason, airspace is designed between the veneer and backup to allow moisture to drain down the cavity and exit at flashing and weep holes. A clean airspace provides a space for water to drain down where it can be directed to the exterior at flashing locations. The purpose of a cavity wall is to manage water by removing it to the outside, not collect it in the cavity space.*[1]

When rigid insulation is placed inside the cavity, a 1-in airspace must be maintained. Since the required thickness of insulation affects the cost of construction, this requirement makes the selection of the proper insulation critical. Utilization of high R-value, foil-faced insulation allows the architect, designer, specifier, and contractor to provide the best insulation value while maintaining the correct airspace design requirement and the most cost-effective wall design.

Designers can increase the effective R-value of the wall by placing the reflective foil-facer so that it faces the cavity. ASHRAE assigns a 2.77 R-value for an airspace of approximately 1 in. This statement is supported by the Masonry Advisory Council, which states, "A foil-faced polyisocyanurate insulation is the most beneficial … its foil-back enclosure creates a reflective airspace that increases the wall's overall R-value by approximately 2.8."[2]

Although a cavity wall is not designed as a wet environment, a cavity wall performs by taking the small amount of water penetrating the outer wythe and draining it down the cavity face of the outer wythe to a flashing which directs the water back to the exterior. Some insulation products assist in this process because of their moisture-resistant properties.

FACTORS TO CONSIDER ABOUT INSULATION

- It is also important to consider the possible impact on insulation of other construction materials such as adhesives, water-repellent and preservative coatings, and bituminous damp proofing and waterproofing materials often used in cavity-wall designs.
- It is beneficial to use insulation that is lightweight and easy to handle, can easily be cut and shaped, and can be easily detailed at the job site for proper installation.

Extruded polystyrene foam insulation and foil-faced polyiso insulation are frequently used in masonry cavity-wall construction. Foil-faced polyiso has the highest R-value per inch.

For more information about the use of rigid foam insulation in construction, visit **www.polyiso.org**.

REFERENCES

1 Yana, Jason, "Think Systems," *A Guide to the Design and Detailing of Masonry Wall Systems*, Masonry Advisory Council, www.maconline.org/tech/design/thinksystems/thinksystems.html

2 *Design Guide for Taller Cavity Walls*, Masonry Advisory Council, www.maconline.org/tech/design/cavity2web.pdf

Jared O. Blum

Jared O. Blum is the president of the Polyisocyanurate Insulation Manufacturers Association (PIMA), the Washington-based North American trade association representing manufacturers of polyiso foam insulation. The association is committed to working both independently and with public and private organizations to educate Americans about the critical importance of national energy conservation. To learn more, visit PIMA's Web site at **www.pima.org.**