

Air Barrier Vapor Permeability/ Non-Permeability and Placement in the Wall Assembly

It has been shown that properly designed, specified, and installed air barriers play a critical role in the energy efficiency, long-term durability and indoor air quality of building structures. Vapor permeability, or impermeability, of air barriers is one of the critical design criteria that must be considered. The following provides some general guidance for placement of air barriers in a wall assembly relative to the location of the insulation material and climate. It should not however be used as a replacement for proper wall design and modeling.

Insulation Outside of the Air Barrier

Cold Climates, Hot Climates and Mixed Climates – When insulation is placed on the outside of the air barrier, a vapor impermeable air barrier should be utilized. Condensation of water vapor into liquid water occurs in insulation layers when the temperature of the air lowers to the dew point temperature. This allows the water vapor to be released and to condense into the form of liquid water. Inversely, if the insulation material is outside of the air barrier, then condensation will also take place outside of the air barrier. A continuous, water resistant, vapor impermeable air barrier is used to prevent any liquid water and residual water vapor from passing through the wall.

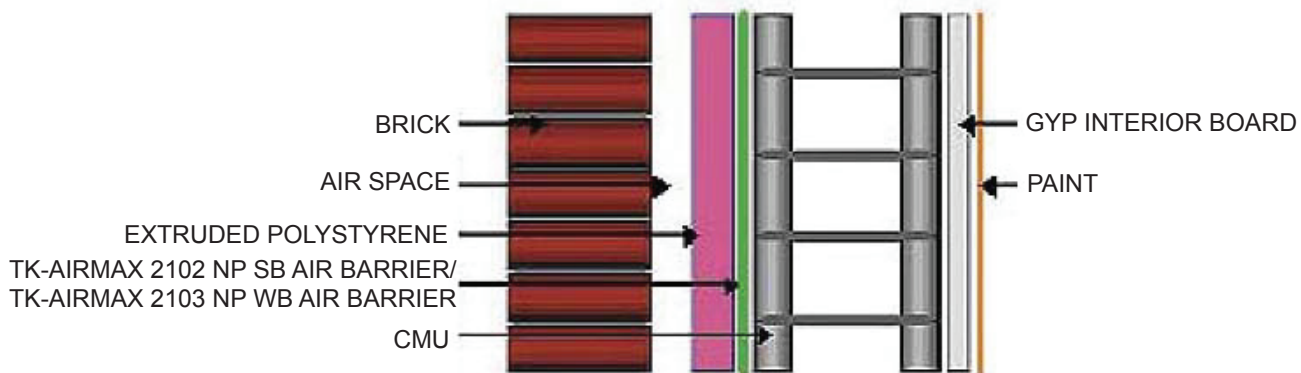


FIGURE 1. BRICK VENEER W/CMU BACK UP WALL

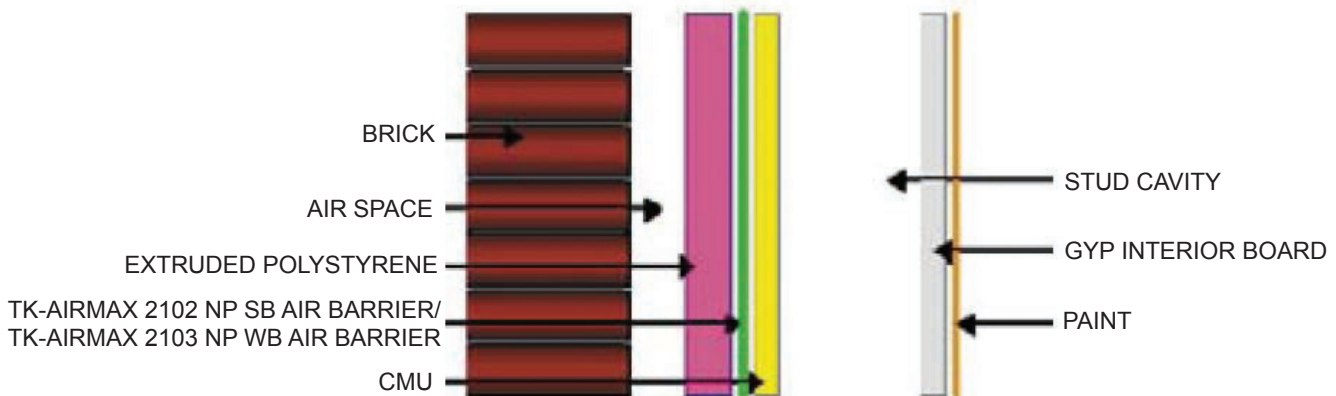


FIGURE 2. BRICK VENEER W/STUD BACK UP WALL

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Insulation Inside of the Air Barrier

Cold Climates – Predominantly heating climates, where diffusion is typically from the inside to the outside, should utilize a vapor permeable air barrier at the outside of the insulation material (a vapor impermeable vapor barrier may be used at the inside of the insulating material to prevent diffusion of moisture into the insulation from the interior of the wall).

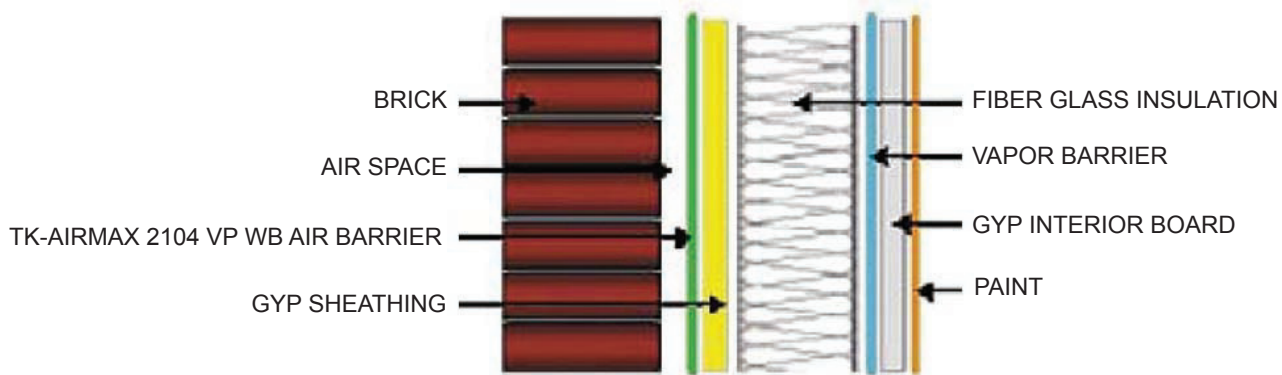


FIGURE 3. BRICK VENEER W/INSULATED STUD BACK UP WALL

Hot Climates – Predominantly cooling climates, where diffusion is typically from the outside to the inside (e.g. climate zone 1), should utilize a vapor impermeable air barrier at the outside of the insulation material. Permeable materials should be used at the inside of the insulation to promote drying toward the interior of the wall.

Mixed Climates – Most US climates are mixed climates, meaning that for a significant portion of the year the vapor drive is from interior to exterior (winter season), and for a significant portion of the year vapor diffusion is from the exterior to the interior of the building (summer season). For this type of climate, proper moisture management requires vapor diffusion in both directions, to the inside during the summer and to the outside during the winter. Consequently, vapor permeable air barriers should be used at the interior of the insulation to promote drying of the insulation to both the exterior and interior of the wall.

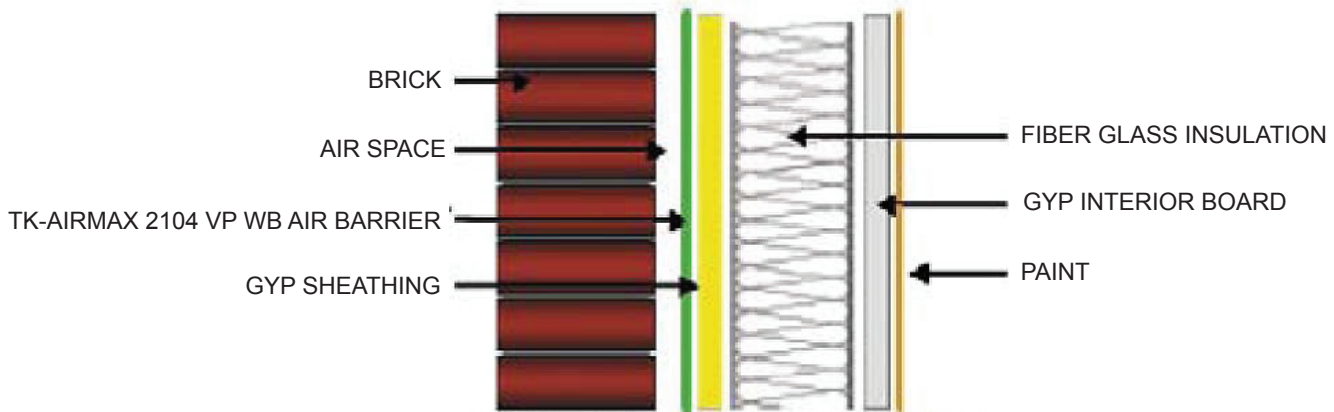


FIGURE 4. BRICK VENEER W/INSULATED STUD BACK UP WALL W/VAPOR BARRIER

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Insulation Inside and Outside of the Air Barrier

Cold Climate & Mixed Climate – Placing insulation on both the inside and outside of the air barrier may effectively move the dew point to the outside of the air barrier if an adequate thickness of insulation is used. The thickness of insulation required to effectively move the dew point to the outside of the air barrier will vary depending on climate. If the dew point is effectively moved to the outside of the air barrier, then a vapor impermeable air barrier may be utilized. If the dew point is not effectively moved to the outside of the air barrier, then a vapor permeable air barrier should be used.

Hot-Humid Climate – Predominantly cooling climates, where diffusion is typically from the outside to the inside (e.g. climate zone 1), should utilize a vapor impermeable air barrier when insulation material is placed on both the inside and outside of the air barrier.

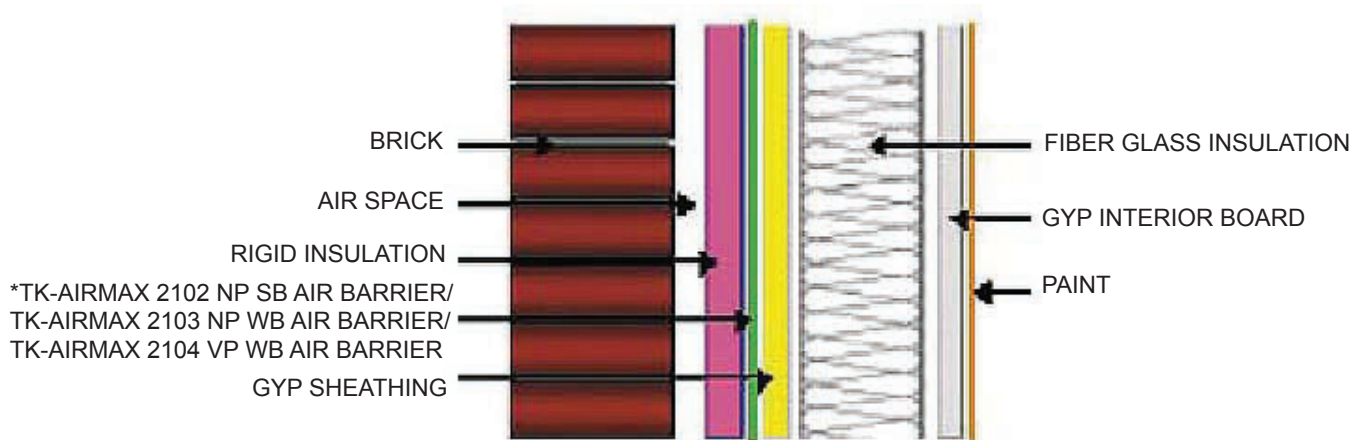


FIGURE 5. BRICK VENEER W/INSULATED STUD BACK UP WALL

* Product selection depends on where the dew point is.

Summary

These general rules are guidelines only and should not be a substitute for proper wall design and modeling. Variables such as type of exterior claddings, interior relative humidity and temperature and insulation type may have an affect on the wall assembly, which would make the general rules provided in this document invalid. The best way to ensure that your air barrier strategy and wall design achieve the desired performance is to consult an air barrier specialist or product systems manufacturer who is familiar with various air barrier technologies. Working with a specialist or manufacturer with both the technical expertise and the modeling tools to fully evaluate your design against real world conditions can save time during the design phase and can provide you with the desired building results.