diffusion resistance to control moisture migrating through the air impermeable insulation such that moisture damage to the roof deck does not occur.

3. Modified Conventional Vented Attics

A conventional, ventilated attic (with fiberglass batt insulation on the ceiling plane) can be modified by adding fiberglass batt (or netted fiberglass or netted cellulose or spray applied fiberglass) insulation to the underside of the roof deck (i.e. on the slope) while leaving the attic air space ventilated to outdoors. Figure 1 shows the placement of deck insulation and the venting details necessary to ensure continued ventilation of the modified attic assembly; Figure 2 shows a range of deck insulation options. The modified conventional vented attic configuration is not well understood and is examined in detail in this study.

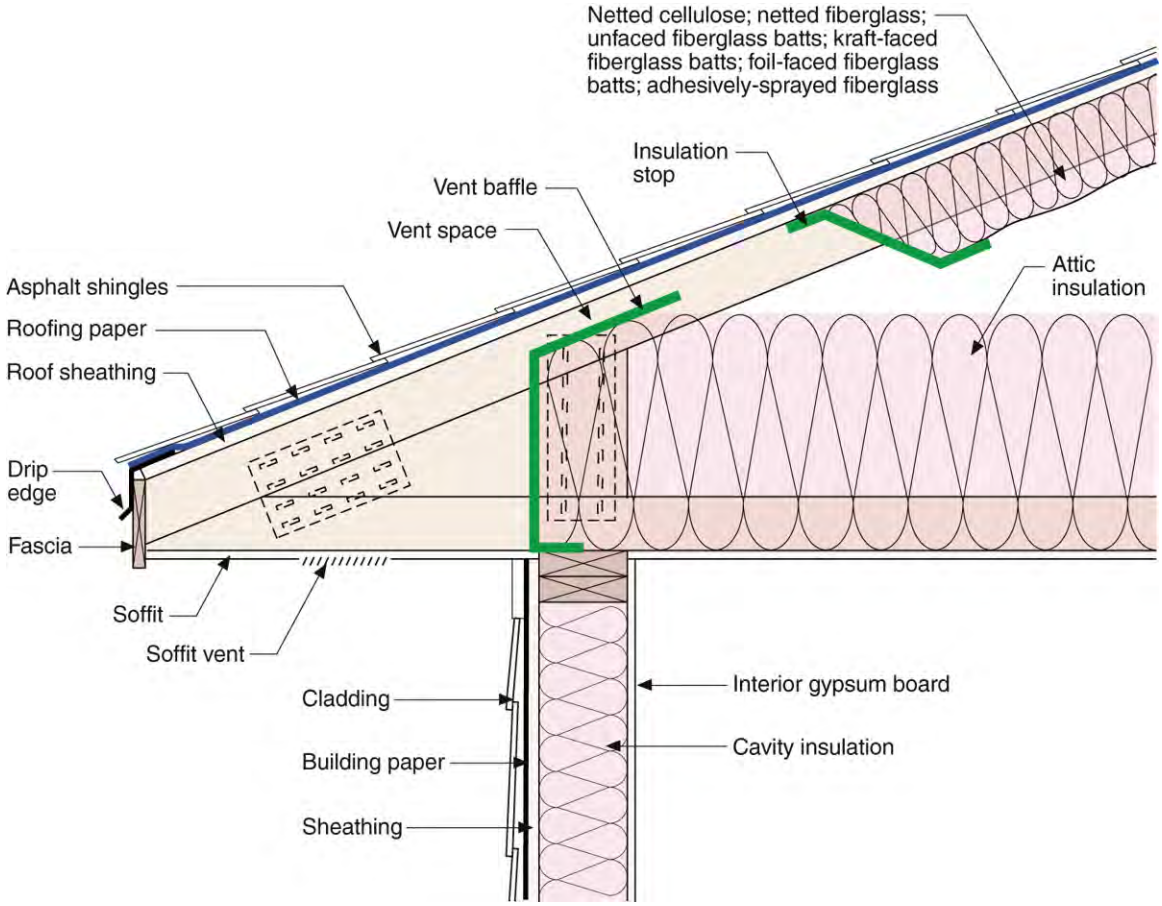

Figure 1: Venting Details for Modified Conventional Vented Attic

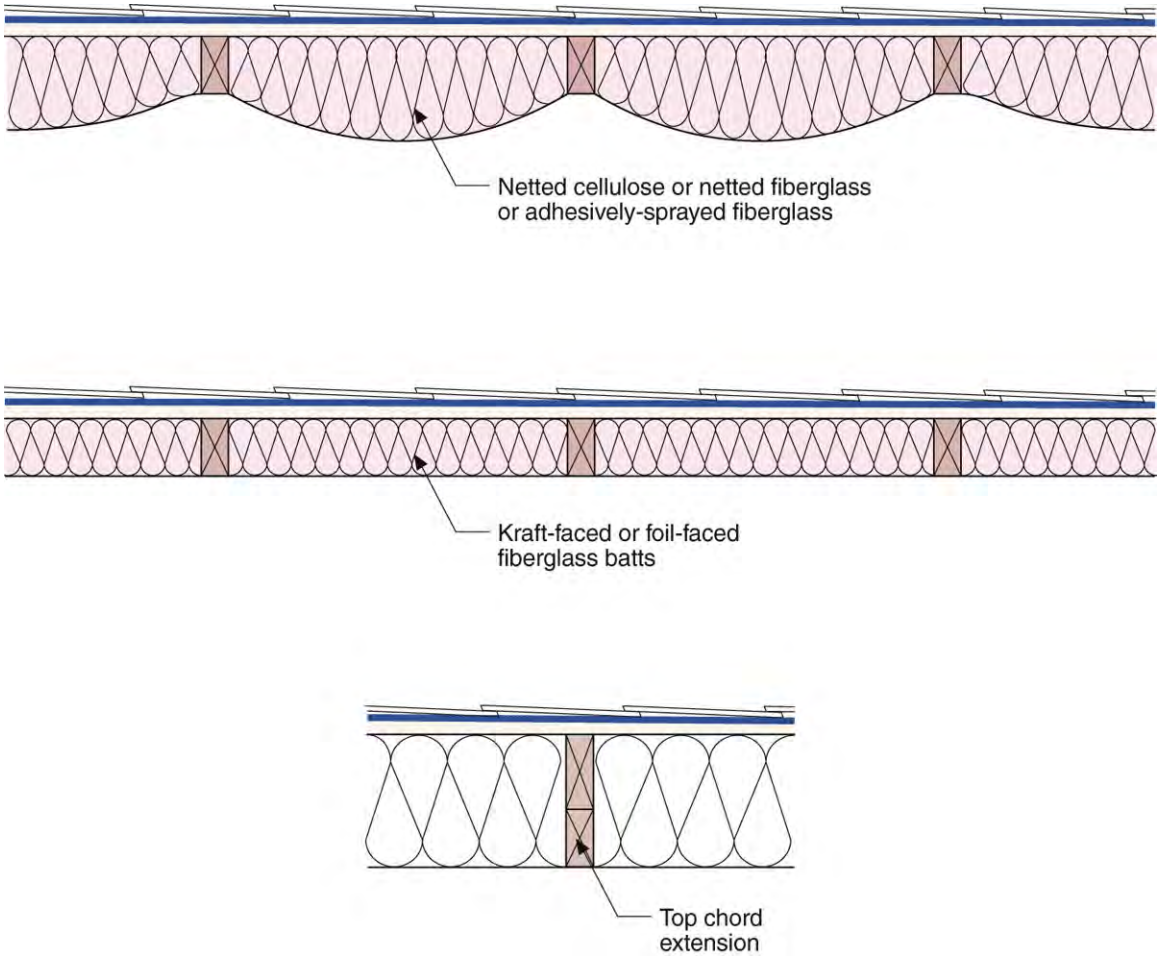

Figure 2: Insulation Options for Modified Conventional Vented Attic Assembly

Modified conventional vented attic assemblies are created through the addition of insulation at the underside of the existing roof deck. This insulation strategy aims to reduce heat transfer between the roof deck and the attic space. On hot, sunny days the roof deck insulation will have the benefit of reducing heat gain from the solar heated roof surfaces so that attic temperatures are lower, there is less heat gain to the living space and cooling loads are smaller. In this scenario, the roof deck temperature will be higher than it would be without insulation.

Conversely, on cool, clear nights, the roof deck insulation will reduce heat transfer from the attic space to the roof deck so roof deck temperatures are lower and the relative humidity at the deck and moisture content of the sheathing are both higher. Night sky radiation may cause the roof deck temperature to be much cooler than the air temperature and the potential for condensation will be greater.

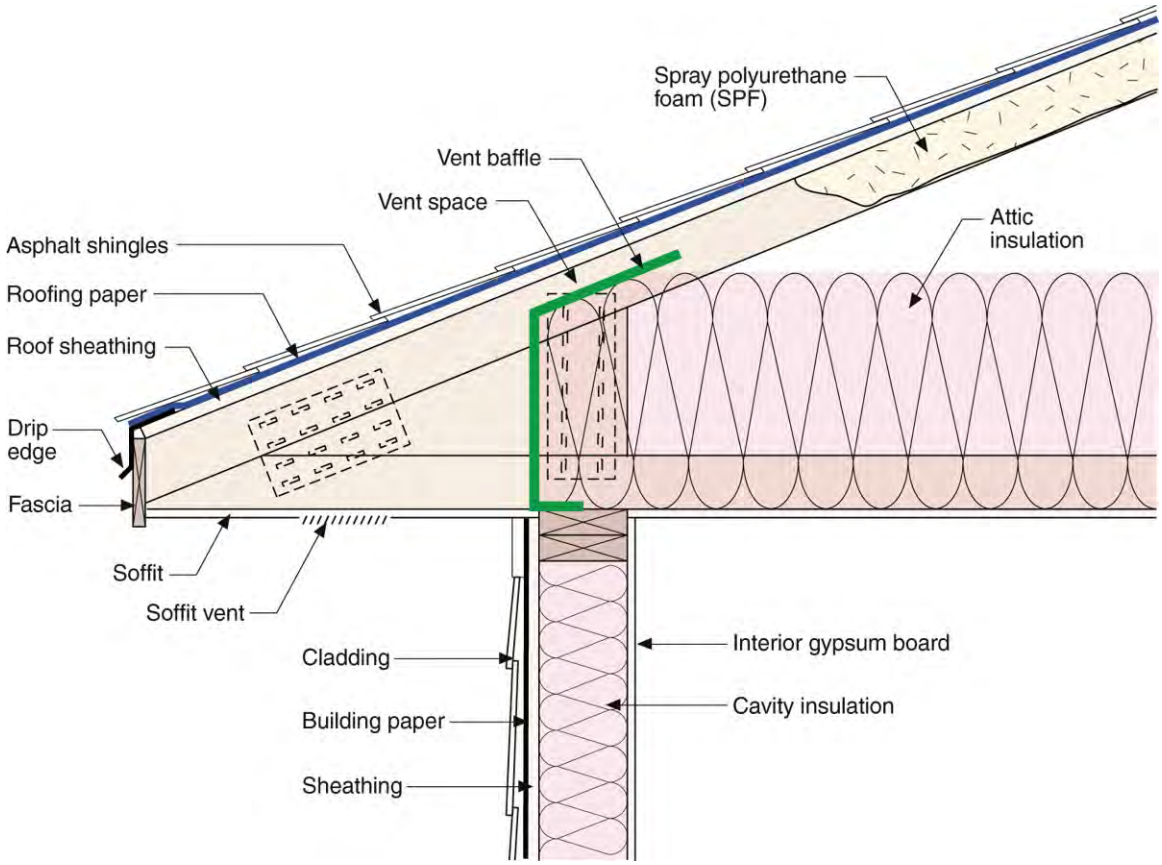

Figure 29: Vented Attic - Asphalt Shingles – Air Impermeable Insulation On Underside of Roof Deck - Can be used in all climate zones. In CEC Zone 16 (IECC Climate Zone 5 or higher) a Class II vapor retarder should be installed at the ceiling plane below the insulation. In all other climate zones a vapor retarder is not required. A ventilation ratio of 1:300 is recommended in all climate zones and is a basic code requirement in the IRC for vented attic assemblies. The roofing paper can be substituted with an impermeable fully adhered impermeable membrane with no apparent moisture risk. In this configuration – the attic space is vented - the vapor transmission characteristics of the SPF are not significant. Accordingly, either low density or high density SPF can be used in all climate zones including CEC Zone 16.

Note that most conventional attics constructed in CA do not use soffit construction. Soffit construction is more typically associated with oversized trusses that allow high levels of thermal resistance at building perimeters (ie. "energy trusses") and are shown for that reason. The recommendations provided are equally valid for attics constructed without soffits.

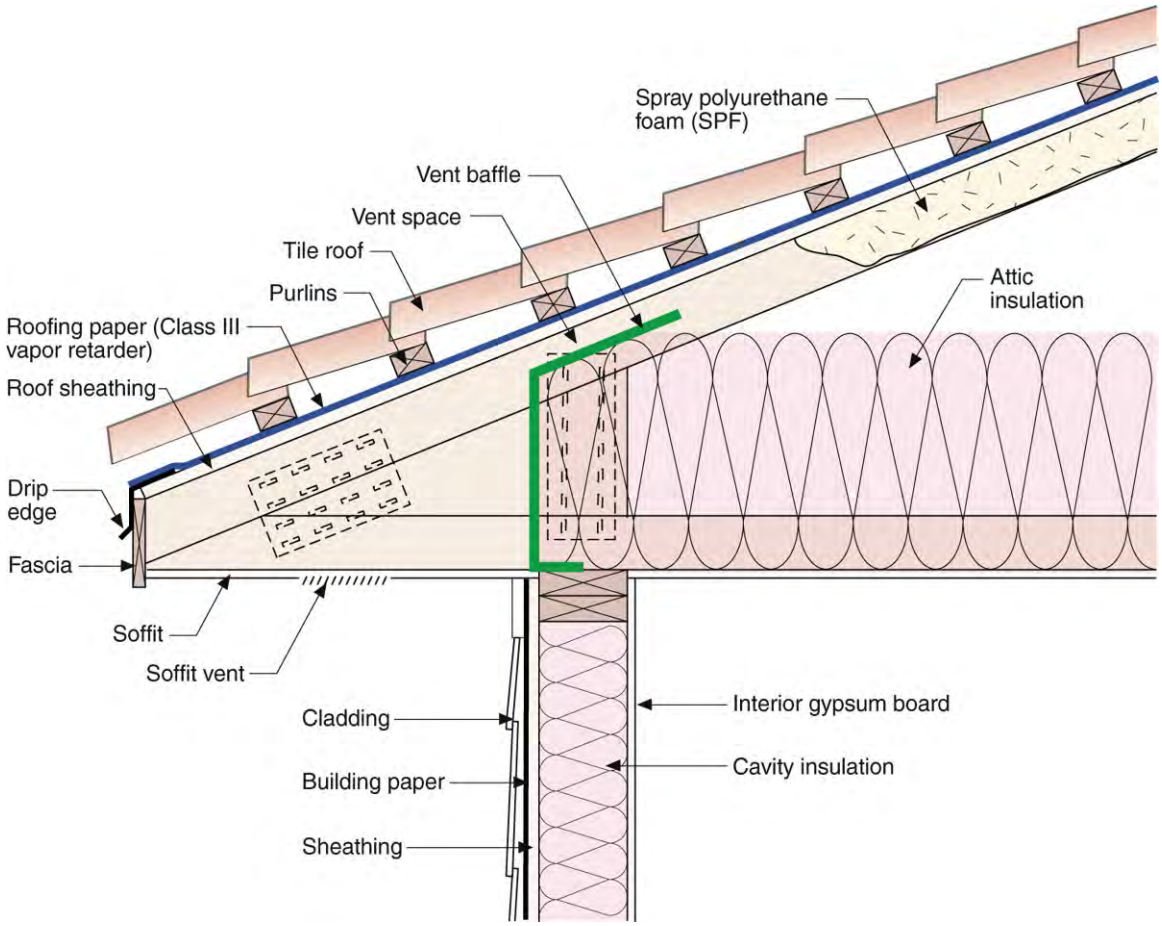

Figure 30: Vented Attic – Tile Roof – Air Impermeable Insulation On Underside of Roof Deck - Can be used in all climate zones. In CEC Zone 16 (IECC Climate Zone 5 or higher) a Class II vapor retarder should be installed at the ceiling plane below the insulation. In all other climate zones a vapor retarder is not required. A ventilation ratio of 1:300 is recommended in all climate zones and is a basic code requirement in the IRC for vented attic assemblies. The roofing paper can be substituted with an impermeable fully adhered impermeable membrane with no apparent moisture risk. In this configuration – the attic space is vented - the vapor transmission characteristics of the SPF are not significant. Accordingly, either low density or high density SPF can be used in all climate zones including CEC Zone 16.

Note that most conventional attics constructed in CA do not use soffit construction. Soffit construction is more typically associated with oversized trusses that allow high levels of thermal resistance at building perimeters (ie. "energy trusses") and are shown for that reason. The recommendations provided are equally valid for attics constructed without soffits.

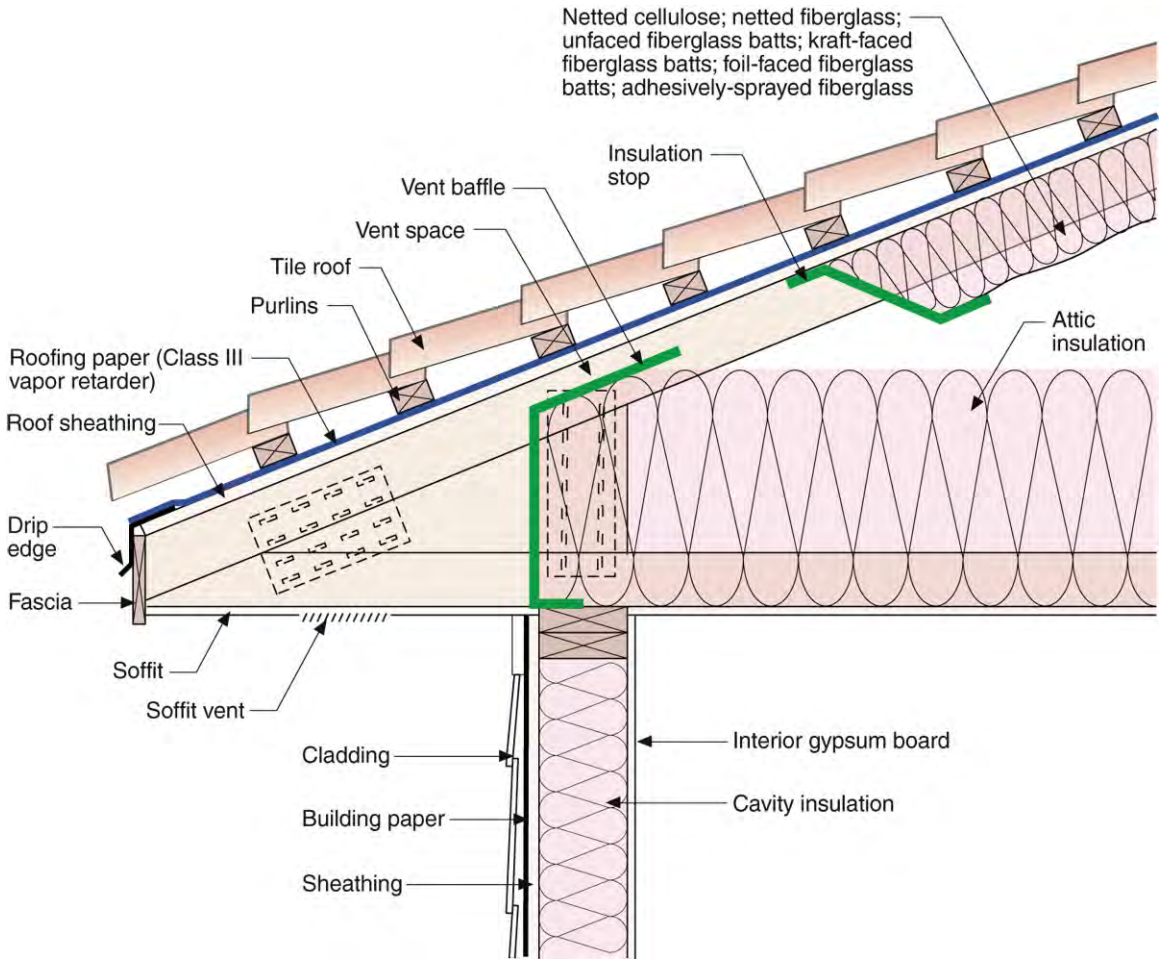

Figure 31: Vented Attic – Tile Roof – Air Permeable Insulation On Underside of Roof Deck - Can be used in all climate zones. In CEC Zone 16 (IECC Climate Zone 5 or higher) a Class II vapor retarder should be installed at the ceiling plane below the insulation. In all other climate zones a vapor retarder is not required. A ventilation ratio of 1:300 is recommended in all climate zones and is a basic code requirement in the IRC for vented attic assemblies.

Note that the tile roof provides top side ventilation of the roof sheathing and this top side ventilation of the roof sheathing should be coupled with a vapor semi permeable roofing paper (Class III vapor retarder). Class II or Class I vapor retarders – typically fully adhered vapor impermeable membranes should not be installed in place of roofing paper in this attic configuration. Because of this top side ventilation of the roof sheathing coupled with a vapor open roofing paper this assembly has fewer restrictions than other assemblies.

Note that most conventional attics constructed in CA do not use soffit construction. Soffit construction is more typically associated with oversized trusses that allow high levels of thermal resistance at building perimeters (ie. "energy trusses") and are shown for that reason. The recommendations provided are equally valid for attics constructed without soffits.