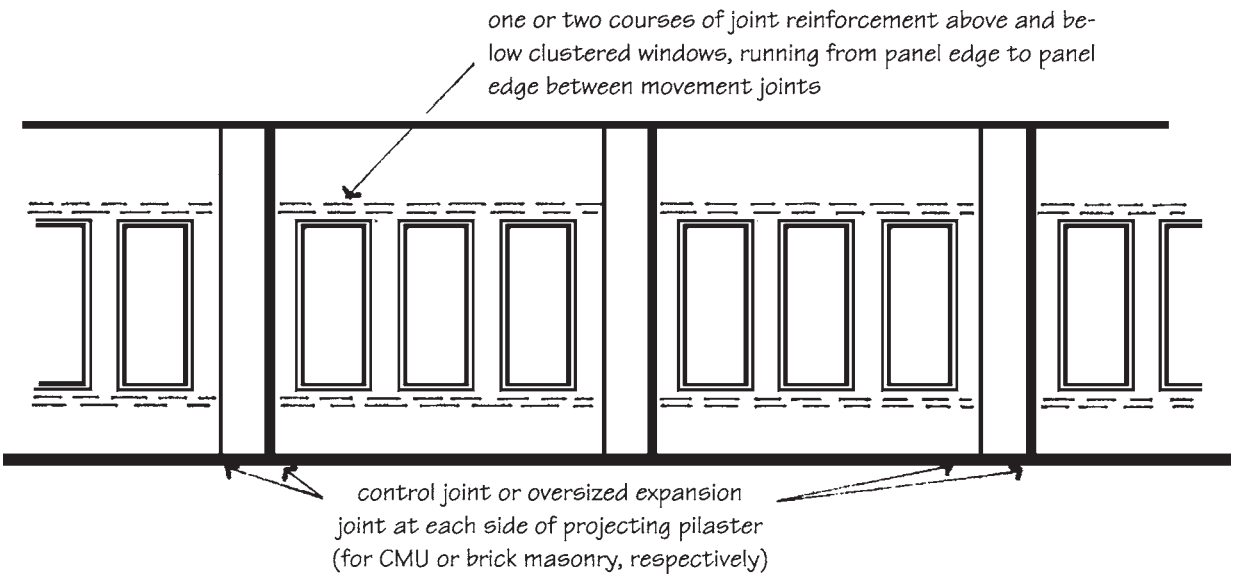

Figure 9-28 Grouping windows between movement joints.

the base of the wall, and at any point where the cavity is interrupted, such as shelf angles, floors, or openings, a layer of flashing must be installed, and with it, a row of weep holes. The cavity in a drainage wall should be at least 2 in. wide (exclusive of insulation or sheathing), because narrower cavities are difficult to keep clean of mortar droppings during construction. Building codes require a minimum of only 1 in., and corrugated metal anchors cannot span more than a 1 in. cavity.

A variation on the drainage wall concept called the *rain screen wall* is based on rapidly equalizing the air pressure between the cavity and the outside atmosphere. Blowing winds during a rain cause a low-pressure condition in the cavity. In seeking a natural state of equilibrium, air moves from the high-pressure zone outside to the low-pressure zone in the cavity. With air infiltration, rainwater is carried through the wall face via any minute cracks which may exist at the mortar-to-unit interface. Under such a pressure differential, rainwater which would normally run down the face of the wall is literally driven or sucked into the wall. Venting and compartmentalizing the cavity equalizes the pressure differential to eliminate the force which pushes or pulls moisture through the wall, and also promotes faster drying.

The rain screen principle was developed in the metal curtain wall industry, and requires some special detailing for adaptation to masonry construction. To function properly as a pressure-equalized rain screen, the wall section must include an air barrier, and the cavity must be divided into smaller compartments. The cavity must be blocked both horizontally and vertically, to prevent wind tunnel and stack effects. Without an air barrier and compartmenting, the horizontal flow of air around building corners and through the backing wall prevents pressure equalization in the wall cavity. Shelf angles in conventional masonry cavity wall and veneer construction provide compartmental barriers to the vertical flow of air, but corners require special detailing. Each “compartment” must be properly vented so that the pressure change occurs as rapidly as possible. Rain screen vents should be located near the top of the wall or panel section, and constructed in the same manner as open head joint weep holes. Theoretically, if the area of the vents

- *Barrier wall systems* must entirely exclude rain penetration at the exterior wall surface because there is no accommodation for moisture drainage. Barrier walls assume that surfaces are impervious and rely on the integrity of joint sealants and perimeter detailing to achieve adequate performance. Some systems require unrealistic perfection in the construction process to prevent moisture damage to component materials. Precast concrete cladding, concrete tilt wall construction, and many EIF systems typically use barrier wall strategies.
- *Drainage wall systems* are more forgiving because they do not require the total exclusion of moisture. A drainage wall can tolerate minor rain penetration because its drainage capability prevents moisture accumulation and damage to materials. A continuous clear and open cavity or drainage plane is required behind the exterior surface. Flashing membranes and weep holes must be properly detailed and installed to control moisture flow and facilitate drying. Masonry cavity and veneer walls, some precast concrete cladding, some newer EIF systems, and most stucco applications are typically designed as drainage walls.
- *Rain screen wall systems* incorporate the elements of a drainage wall plus air pressure equalization for additional protection against wind-driven rain. Rain screen systems require compartmentalization of the drainage cavity or air chamber behind the exterior surface and the incorporation of an air barrier in the backing wall. The rain screen concept works most effectively in glass and metal curtain wall systems where the air chamber size is very small and air pressure equalization is very rapid. Although rain screen technology can be used with concrete and masonry walls, it is not common in the United States and the enhanced performance increases construction costs.

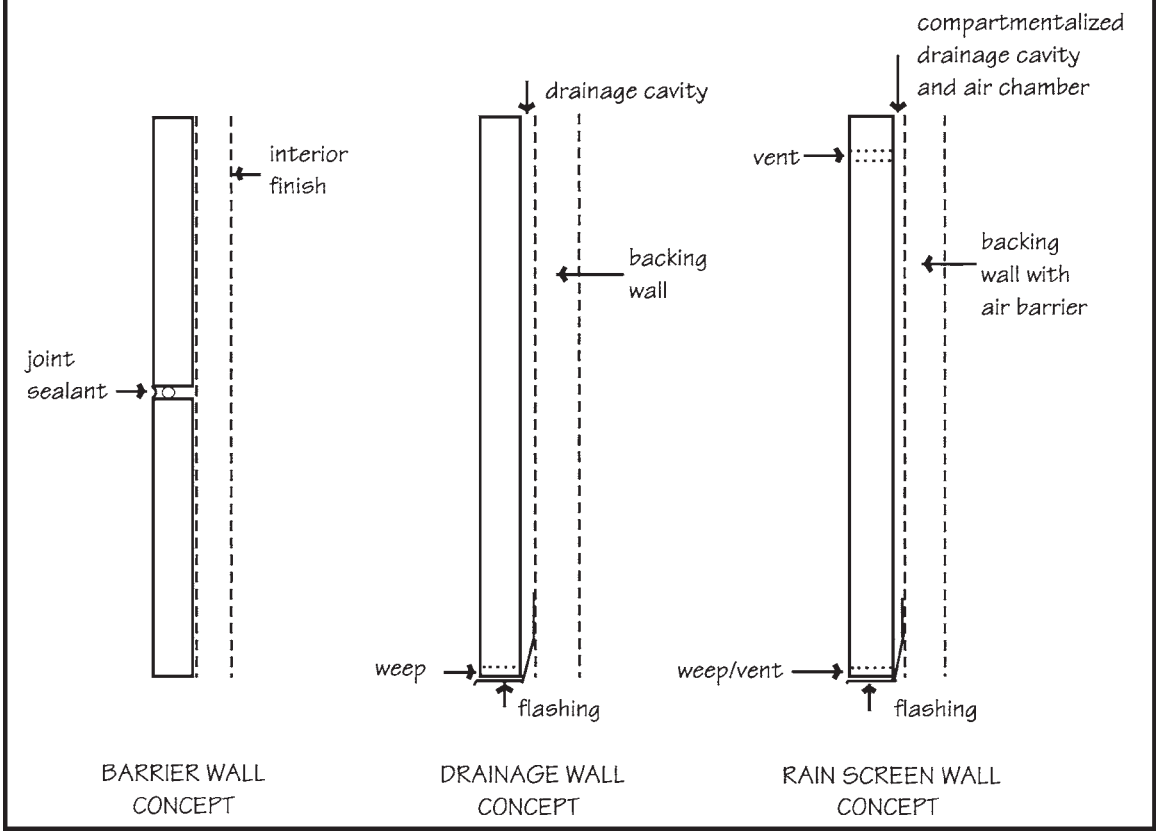

Figure 9-29 Exterior wall systems may incorporate a number of moisture protection strategies, but can generally be divided into three basic wall types: *barrier walls, drainage walls,* and *rain screen walls.* (*From Beall and Jaffe,* Concrete and Masonry Databook, *McGraw-Hill, New York, 2003.*)