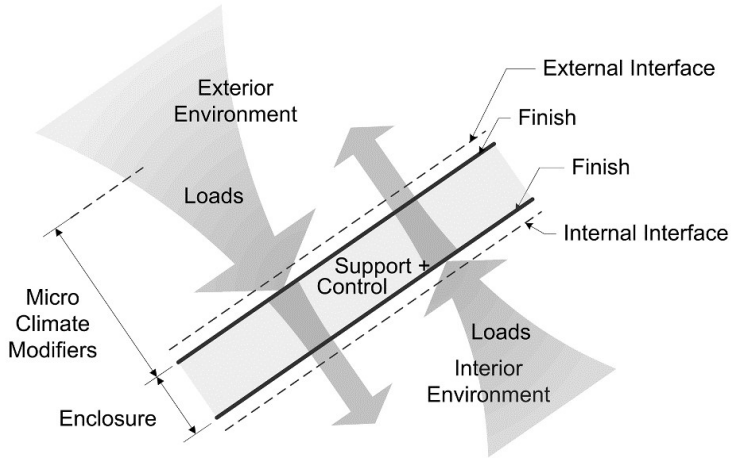
It is far more important than often appreciated to use precise, unambiguous, clear definitions when describing aspects of buildings, building enclosures, and building science performance. The following is an attempt to define some of the most important terms.

Building Science Control Layer Glossary

Building enclosure functions can be divided into categories of support, control and finish. Finish is not needed at every spot in the enclosure, but support of physical loads must be continuous (roof connected to wall connected to foundation, etc.), and the enclosure should be substantially continuous (any discontinuity will result in lower performance).

Building Enclosure
The elements of a building that act as the environmental separator between the interior environment and the exterior environment. Walls, windows roofs slabs, basements, and joints are all part of the building enclosures.

Note: The enclosure is a special type of environmental separator. Environmental separators also exist within buildings as dividers between spaces with different environmental conditions.



Façade
Visible exterior face of a building, usually vertical or nearly so, but imprecisely used.

Control layers are notional concepts used to describe which materials/assemblies provide the control functions in a building enclosure, and as aid to ensure continuity of the functions in design and construction. They are comprised of one or several materials and formed into planes to create a three dimensional boundary.
Critical Barriers appear to be used in a similar manner but the term is not preferred because in many cases there may be no reason to have a barrier (e.g., do we want a vapor barrier? Often we want vapor control) or we may not be able to achieve it (R20 is hardly a barrier to heat flow). Critical is another problematic term. In many walls, vapor control is not a critical layer. And in most enclosures, if the R-value is only 10 instead of 20, nothing critical has been lost.

Thermal Control Layer
The control layer in a building enclosure that is designed, installed, and/or acts to form the primary control of heat flow in an enclosure assembly. It is often partially penetrated by thermally conductive elements, which, if large, are termed *thermal bridges.*

Vapor Control Layer
The control layer in a building enclosure that is (or are) designed to and/or act to provide the primary control of the movement of water by vapor diffusion.

Vapor Barrier
A vapor control layer (often comprised of a single material) that has a water vapor permeance of 0.1 perm (5.7 ng/Pa s m^2) or less, and thus a Class I *vapor control layer*. A vapor barrier is a material that is essentially vapor impermeable. Class II vapor control layers (up to 1.0 US perms or 57 5.7 ng/Pa s m^2) are sometimes described as a vapor retarder but is considered a vapor barrier in Canada. The test procedure for classifying vapor barriers is typically ASTM E-96 Test Method A—the desiccant or dry cup method when the vapor barrier is located on the interior of the enclosure assembly. Examples include metal, glass, polyethylene, asphalt membranes, etc.

Air Control Layer (or Air Barrier)
The complete air control layer system is comprised of materials and assemblies, each with their own performance requirements. *See also Air Control Layer System*.

Air Control Material (or Air Barrier Material)
A material that has sufficiently low air permeance and adequate strength that it can be part of an air control layer system. A common recommended maximum air permeance for a material is 0.02 l/(s-m^2)@ 75 Pa (0.004 cfm/sf @ 0.3" WC) when tested according to ASTM E 2178 or E 283.

Air Control System (or Air Barrier System)
Air control layers are three-dimensional systems of materials designed, constructed, and/or acting to control air flow across a building enclosure, or between a conditioned space and an unconditioned space. In multi-unit residential / multi-use construction an air control layer system should also separate the conditioned air from any given unit and adjacent units. The pressure boundary of the enclosure should, by definition, be coincident with the plane of a functional air control layer system.

Rain/Water Control Layer
The rain control layer is the continuous control layer (comprised of one of several materials and formed into planes to form a three dimensional boundary) in an enclosure assembly that is designed, installed, and/or acts to form the innermost boundary for rainwater penetration. Penetration of any substantial amount of rainwater further into the enclosure is deemed to be or results in a performance failure.

- In face-sealed perfect barrier systems, the rain control layer is the exterior-most face of the enclosure.
- In concealed-barrier perfect barrier systems it is a layer concealed behind the exterior face.
- In drained systems the rain control layer is the combination of the drainage plane, the drainage gap (or drainage layer), the flashing and weep holes.
- In storage/reservoir/mass systems the rain penetration control is the storage mass layer, which is often thick, and may not extend all the way to the inside of the layer.
- Below-grade assemblies essentially deal with ground water (often sourced from rainwater) in exactly the same manner

Drained (or Drainscreen)
A building enclosure rain penetration control strategy (or ground water control) that accepts that some water will penetrate the outer surface (the cladding, which "screens" rain) and removes this water back to the exterior by gravity drainage over a drainage plane, through a drainage gap, and exiting via flashing and weep holes. Many wall systems (lap siding, brick veneer) and sloped roof systems (metal, asphalt shingles) employ drained strategies. *See also Rainscreen, Drainscreen*

Rainscreen
An imprecise term that should be avoided. A building enclosure rain control strategy that accepts that some water will penetrate the outer surface (the cladding, which "screens" rain) and removes this water back to the exterior by gravity drainage over a drainage plane, through a drainage gap, and exiting via flashing and weep holes. The term is used imprecisely in practice, as it may apply to a Drained system, or apply only to drained systems that have larger drainage gaps (e.g., arbitrarily over 1/2") or just to systems that are also vented, or maybe to those that are ventilated (a ventilated-drained approach) or just for systems that attempt to pressure-equalize. Occasionally used to describe the cladding intended to be used in a drained system, i.e., cladding that is expected to pass rain water in service (e.g. "we are using the metal panels as a rainscreen"). *See also Drained, Drainscreen*

Drainage Plane
Water repellent or non-absorbent layer (e.g., building paper, housewrap, foam insulation, sheet metal, polymer coating, etc.) which is designed to be or acts to allow the flow of water by gravity without allowing penetration of the layer. It is a critical part of the *water control layer* of *Drained* enclosure systems, and require interconnection (sealed or lapped) with flashings, window and door openings, and other penetrations of the building enclosure. The materials that form the drainage plane often overlap each other shingle fashion or are sealed so that water flow is downward and outward, and requires an adjoining small drainage gap or water porous material to function.

Water Resistant Barrier (WRB)
A common term for the drainage plane component of a *water control layer* in a drained system: *see also sheathing membrane, drainage plane*

Weather Resistant Barrier.
A nonsensical term often intended to described the WRB, but the words used literally apply to the whole enclosure if anything at all. The entire enclosure, including thermal control and UV resistance, is part of resisting weather. Codes and standards are removing this improper term from use.

Sheathing Membrane
A generic term for a membrane layer that prevents the resists the passage of liquid water (and possibly air and vapor) through vertical, drained surfaces. Asphalt-impregnated building papers and felts and polymeric housewraps are the most common products available, but peel and stick air-water-vapor barrier membranes, trowel applied air and water barriers, etc. are used. *See also Housewrap, Drainage Plane, Water Resistant Barrier*.

Drainage Gap
A layer in an assembly that allows the gravity-driven flow of liquid water, usually as part of a rain control or groundwater control strategy. The gap can be rather small (as little as 1/16") and

still allow drainage, and may have local discontinuities, provided drain water can flow around such discontinuities under the force of gravity.

Flashing
A waterproof material used to redirect from vertical (or shed) drained water, or sometimes to act as a capillary break.

Weep Hole
An opening placed in a wall or window assembly to permit the escape of liquid water from within the assembly. Weep holes can also act as vents.

Pressure-Equalized Rainscreen (or PER)
A specific type of drained wall system that uses spatial compartmentalization, careful venting-to-air-leakage ratios, and stiff components to encourage short-term equalization of drained cavity (also the air chamber) pressures with exterior wind pressures to reduce the wind pressure across the screen (or cladding). Such systems rely on effective drainage to control rain, and if functional, merely reduce the rainwater that the drained system must accommodate. *See also Drained, Rainscreen*.

Perfect Barrier
One of the three available rain penetration control approaches (the other two are drained and mass/storage). A single rain control layer or plane is defined, in design or in service, as the plane beyond which the penetration of rainwater is deemed to be, or results in, a failure. Neither drainage nor drying are required for successful performance. Two types are common: face-sealed, where the control layer is at the surface, and concealed barrier, where the layer is concealed. Perfect barrier layers can be formed of any material defined as waterproof, e.g. glass, steel, dense uncracked concrete, roof membranes, etc. *See also Face Sealed, Perfect Barrier, Drained, Concealed Barrier*.

Face Sealed (or Face-Seal)
A sub-classification of the perfect barrier building enclosure rain control strategy that relies on the exterior face of the enclosure to act as the rain control layer and as a perfect barrier to rain penetration. Like all approaches, it can be applied to an element or to joints. When applied to joints with exposed sealants it is highly reliant on workmanship and maintenance to achieve performance, and has developed a poor reputation. Failure is defined as water penetration of the face. *See also Drained, Barrier System, Concealed Barrier.*

Barrier System
Another term for a perfect barrier rain control approach to enclosure design (often used only to define the face-sealed sub classification, but its use is inconsistent and imprecise). *See also Face Sealed, and Perfect Barrier.* Avoid the use of this term if possible.

Concealed Barrier
A sub-classification of the perfect barrier approach to enclosure rain control that employs a single waterproof layer as a barrier to rain penetration. The barrier is not on the exposed face of the assembly but concealed behind the cladding and other material layers, which reduces the amount of rainwater reaching the barrier. Drainage is by definition not required for good performance in this approach. A subset of perfect barrier approaches. *See also Face Sealed, Drained, Rainscreen.*

Water Shedding Layer/Surface

The outermost layer of a building enclosure exposed to rain. By definition it occurs in all building enclosures and is part of all rain control strategies. The degree of rainwater shedding, however, helps describe the rain control strategy and guides the design of the enclosure. *Face-sealed* systems have 100% rain shedding by definition. However, *concealed barrier systems*, such as inverted roofs, and *drained* systems, such as open joint claddings and window frames, can benefit from high degrees of water shedding, as this reduces the amount of water (load) on the *water control layer*. The selection of materials, fasteners, and joint details in *drained* systems is highly dependent on the degree of water shedding provided by the water shedding surface (other rainwater shedding features in the enclosure).

Sourced Drained
A term for a rain control strategy applied to an enclosure system uses either the perfect barrier or storage/mass approach for the major components and the drained approach at the joints or penetrations assumed to be the point (or source) at which water enters an assembly. Many windows, precast concrete systems, and some EIFS use this approach. *See also Drained*.

Control Layer	Degree of Control in Practise
Water	Perfect control in theory, only small amounts (that can be subsequently dried) are allowed to penetrate
Air	Good control, but some air leakage is always present and accepted.
Thermal	Moderate control, never perfect, but high levels can be set.
Vapor	Wide range, from essentially perfect (IGU) to highly vapor open
Water Shedding	Wide range, from essentially perfect (face-sealed systems) to very little (to open jointed systems with pitched to sky).

Perfect Wall
The perfect wall is a conceptual design aid that identifies the most important control layers, and arranges them in such a manner as to result in a durable, functional enclosure in many climates and applications. It is not the perfect arrangement for all materials, applications, etc., and some or all of the control layers are often combined into one product.

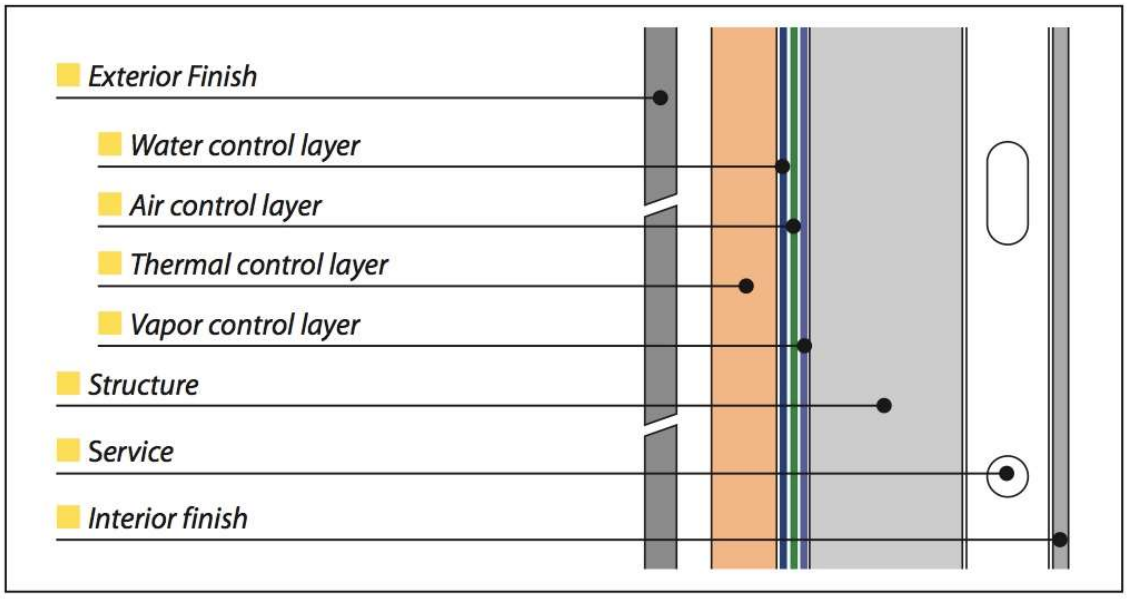


Figure 1: Diagram of the "Perfect" Wall showing ideal sequence of assembly layers
(From John Straube, High Performance Enclosures, Building Science Press)