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The hydraulics of exchange flow between adjacent confined building zones SALEH NABI, MORRIS FLYNN, Dept. of Mechanical Engineering, Univ. of Alberta — Buoyancy-driven flow between two finite zones containing fluid of slightly different density is investigated. The two zones are connected through a common opening that spans the channel width so that a two layer exchange flow develops once it is removed. In the zone that initially contained dense fluid, a buoyant plume of light fluid mixes with the dense fluid leading, over time, to the development of a nontrivial ambient density stratification. Meanwhile, dense fluid flows as a gravity current into the zone that initially contained light fluid. This gravity current reflects from the end wall and propagates back toward the opening in the form of an internal bore. When the bore reaches the opening, the dynamics of the exchange flow (and consequently the source conditions of the buoyant plume) are substantially altered. Such dynamics are modeled by combining elements of gravity current, internal bore, plume and exchange flow theory; model predictions, such as that the density jump across the first front steadily decreases once the exchange flow becomes transient, are corroborated by salt-bath laboratory experiments. Substantially different predictions arise when either or both of the adjacent zones are assumed to be well-mixed so that no vertical gradient of density is allowed.

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