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# Scale-dependent air permeability and electrical conductivity

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Some experimenters searching for scale-effects on the permeability have concentrated on air flow. While the same general principles apply to air flow and electrical conductivity as to hydraulic conductivity, the details of the calculations differ. The electrical conductivity is typically given by universal scaling of percolation, which establishes the validity of Archie’s law, rather than through the pore size distribution. The reason for this is that the critical volume fraction for percolation in granular materials such as rocks is typically a small fraction of the porosity. Effects of experimental volume shape effects will tend to invalidate Archie’s law, however, since they will introduce a non-universal contribution to the critical volume fraction for percolation which is dependent on experimental volume shape.