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An Analytic Theory of Reconnection in MHD

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The steady-state, resistive, MHD equations form the basis of an analytic theory of magnetic reconnection in an MHD plasma. Specifically, we assume the existence of a rectangular diffusion region within which the plasma evolution is determined by resistive diffusion and heating, and outside of which the plasma obeys ideal MHD constraints. Implicit expressions for the reconnection rate and other reconnection parameters are then derived based on requirements of current sheet maintenance, i.e. of provision of sufficient plasma pressure to balance the total pressure in the inflow region. These expressions are solved via simple iterative procedures. Implications specifically for low Lunquist number/high resistivity are being discussed.