Critical surfaces for general two dimensional bond percolation problems CHRIS SCULLARD, University of Chicago, ROBERT ZIFF, University of Michigan — We present a general method for deriving approximate bond percolation critical surfaces for general two dimensional lattices. Our approach is to assume that the critical surface is at most first order in its arguments and then to impose symmetries and known special cases until the function is completely determined. We show also that allowing higher powers of the arguments gives increasingly accurate approximations. For the Archimedean lattices the critical thresholds we find by this method are accurate to at least 4 significant figures. In two other cases, the checkerboard and inhomogeneous bow-tie we find critical surfaces that appear, from our numerical investigation, to be exact but that apparently cannot be rigorously derived by any existing technique. The checkerboard formula that we find is same as that conjectured by Wu (Rev. Mod. Phys. 54, 235 - 268 (1982))

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