

Preface

Natural convective heat transfer from wide flat vertical plates, i.e., from plates whose horizontal width is relatively large compared to their vertical height, has been extensively studied over many years. However, situations frequently arise in engineering practice that effectively involve natural convective heat transfer from plates that are relatively narrow, i.e., plates whose horizontal width is comparable to or smaller than their vertical height. In such cases the mean heat transfer rate can be much greater than that from wide plates of the same height, the increase often being said to be due to “edge” effects. However, it is only comparatively recently that relatively general equations have been derived that allow heat transfer rates in such narrow plate situations to be calculated. The heat transfer rate from a narrow plate can depend on the conditions existing at the sides of the plate. For example, it can depend on whether the plate is recessed within or protrudes from a surrounding adiabatic surface. And it can depend on the conditions existing at the plate surface, i.e., for example, on whether the plate is isothermal or whether there is a uniform rate of heat generation over the plate surface. These effects on natural convective heat transfer from narrow flat plates have also only relatively recently been extensively investigated. The magnitude of the edge effect is also dependent on whether the flow is in the laminar, transitional, or turbulent flow regions and studies of this have only recently become available. When the plate is not vertical, but rather inclined to the vertical, pressure changes normal to the plate surface arise. These pressure changes can alter the nature and the magnitude of the edge effects and these effects of plate inclination on the heat transfer rate from narrow plates have also only been recently studied to a significant extent. While most attention has been given to the heat transfer from single plates when there are two narrow rectangular flat plates of the same size separated vertically or horizontally but relatively close together, the flow interaction between these heated plates can also have a significant effect on the nature of the edge effect, i.e., on the heat transfer rates from the plates. Again, this effect has only recently been extensively studied. Thus, a number of both numerical and experimental results that allow the natural convective heat transfer rate from narrow plates in various situations to be

calculated have recently become available. This book presents reviews of some of these results.

This book attempts, therefore, to provide information about the effect of plate aspect ratio (width to “height” ratio) on the natural convective heat transfer from flat plates in a variety of situations that can occur in practice. This book will hopefully provide background information for researchers in the field and assist practitioners in determining the heat transfer rates in various situations that they encounter in their work.

Kingston, Canada
Shuweikh, Kuwait

Patrick H. Oosthuizen
Abdulrahim Y. Kalendar

Natural Convective Heat Transfer from Narrow Plates

Oosthuizen, P.H.; Alkandari, M.

2013, XIII, 113 p. 112 illus., 8 illus. in color., Softcover

ISBN: 978-1-4614-5157-0