

CORRELATION BETWEEN RESPIRATOR FIT AND RESPIRATOR FIT TEST PANEL CELLS BY RESPIRATOR SIZE

Ziqing Zhuang¹, Dennis Groce^{2,3}, Heinz W. Ahlers¹, Wafik Iskander³, Douglas Landsittel^{1,4}, Steve Guffey³, Stacey Benson², Dennis Viscusi¹, and Ronald E. Shaffer¹

¹ National Institute for Occupational Safety and Health,
National Personal Protective Technology Laboratory,
Pittsburgh, PA 15236

² EG&G Technical Services Inc., Pittsburgh, PA 15236

³ Department of Industrial and Management Systems
Engineering, West Virginia University, Morgantown, WV 26506

⁴ Duquesne University, Department of Mathematics and
Computer Science, Pittsburgh, PA 15282

The National Institute for Occupational Safety and Health (NIOSH) recently completed a study to develop an anthropometric database of the measurements of heads and faces of civilian respirator users. Based on the data collected NIOSH researchers developed two new panels for fit testing half-facepiece and full-facepiece respirators. The objective of this study was to investigate the correlation between respirator fit and the new NIOSH respirator fit test panel cells for various respirator sizes. This study was conducted using 30 subjects who were selected in part using one of the new panels (NIOSH bivariate). Fit tests were conducted on the test subjects using a TSI PortaCount[®] and three exercises. Each subject performed three replicate fit test using four models of P-100 half- facepiece respirators in three sizes. This study found that respirator size significantly influenced fit within a given panel cell. Face size categories matched the respirator sizing reasonably well in that the small medium and large face size categories achieved the highest geometric mean fit factors in the small medium and large respirator sizes respectively. The same pattern holds for fit test passing rate. Therefore a correlation was found between respirator fit and the new NIOSH bivariate fit test panel cells for various respirator sizes. These findings support the selection of the facial dimensions for developing the new NIOSH bivariate respirator fit test panel.