



## Manual Materials Handling Planning Tools

There are many tools available for the evaluation and design or re-design of manual materials handling tasks. These tools can assist with planning activities by allowing manual materials handling tasks to be prioritized and by determining when assisted lifting may be required. The majority of these tools are based on a North American population, but some do exist for international populations. Table 1, “Material Handling Planning and Analysis Tools,” identifies several tools, their uses and their sources.

**TABLE 1**  
**Material Handling Planning and Analysis Tools**

<i>Analysis Tool</i>	<i>Uses</i>	<i>Source</i>
NIOSH Lifting Equation	Analysis of lifting with several constraints on its application	Waters, T., Putz-Anderson, V., and Garg, A. (1994). <i>Applications Manual for the Revised NIOSH Lifting Equation</i> . US Department of Health and Human Services (NIOSH) Publication No. 94-110.
Psychophysical Tables	Analysis of lifting, lowering pushing, pulling, carrying	Snook, S. H. and Ciriello, V. M. (1991). <i>The design of manual handling tasks: Revised tables of maximum acceptable weights and forces</i> . <i>Ergonomics</i> 34:1197.
Psychophysical Lifting Capacity for Chinese Subjects	Lifting capacity of Chinese subjects, as well as anthropometric considerations	Wu, Swei-Pi. (1999). <i>Psychophysically determined infrequent lifting capacity of Chinese participants</i> , <i>Ergonomics</i> 42(7).
Job Stress Index	Analysis of lifting	Mital, A., Nicholson, A., and Ayoub, M. (1993). <i>A Guide to Manual materials Handling</i> , Taylor and Francis, Washington, DC.
Energy Expenditure Model	Analysis of lifting, lowering, and carrying	Garg, A., Chaffin, D., and Herrin, G.: <i>Prediction of Metabolic Rates for Manual Materials Handling Jobs</i> , <i>American Industrial Hygiene Journal</i> , 38, 661 – 674 (1978).

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The values in Table 2, “Design Weight Limits for Lifting” and Table 3, “Design Weight Limits for Carrying,” provide recommended maximum values based on the “ideal” lift or carry for manual material handling tasks. The “ideal” lift or carry includes ergonomic consideration of all the factors and considerations listed in “Materials Handling Factors” above. The “ideal” lift is a lift of a box with a stable load and good handholds, with the center of the load, or center of mass, placed 150 mm (6 in) away from the lifter’s body, at elbow height, carried to the final destination, less than 10 m (33 ft.) away, over a dry deck, and placed on a surface at elbow height.

**Personnel Lifting Limits.** The weight limits in Table 2, “Design Weight Limits for Lifting,” should be considered as maximum values in determining the design weight of items requiring one person lifting with two hands. The weight limits may be doubled for two person lifts, provided the load is split equally between the lifters and both lifters have the same handles or handholds. If the weight of the load is not split equally, the weight limit applies to the heavier lift point.

**Object Load Size.** The weight limits in Table 2, “Design Weight Limits for Lifting,” apply to an object with equally distributed weight and a compact size not exceeding 460 mm (18 in) high, 460 mm (18 in) wide, and 300 mm (12 in) deep (see Figure 1, “Ideal Object Size and Carrying Mode”). This places the center of the load at half the object’s depth, or 150 mm (6 in)