

PENNSYLVANIA STATE UNIVERSITY



IE 553

Engineering of Human Work

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Class #29

maintenance of body postures:*

$$\text{Sitting } \dot{E} = 0.023 \text{ BW} \quad (2)$$

$$\text{Standing } \dot{E} = 0.024 \text{ BW} \quad (3)$$

$$\text{Standing, bent position } \dot{E} = 0.028 \text{ BW} \quad (4)$$

Garg's Model (metric)

Posture, lifting/lowering

net metabolic cost of tasks:

stoop lift (Kcal/lift)

$$\Delta E = 10^{-3} [0.325 \text{ BW } (0.81-h_1) + (1.41L + 0.76 S \times L) (h_2 - h_1)] \text{ for } h_1 < h_2 \leq 0.81 \quad (5)$$

squat lift (kcal/lift)

$$\Delta E = 10^{-3} [0.514 \text{ BW } (0.81-h_1) + (2.19L + 0.62 S \times L) (h_2 - h_1)] \text{ for } h_1 < h_2 \leq 0.81 \quad (6)$$

one hand lift (Kcal/lift)

$$\Delta E = 10^{-3} [0.352 \text{ BW } (0.81-h_1) + 3.03L (h_2-h_1)] \text{ for } h_1 < h_2 \leq 0.81 \quad (7)$$

arm lift (Kcal/lift)

$$\Delta E = 10^{-3} [0.062 \text{ BW } (h_2-0.81) + (3.19L - 0.52 S \times L)(h_2-h_1)] \text{ for } 0.81 < h_1 < h_2 \quad (8)$$

stoop lower (Kcal/lower)

$$\Delta E = 10^{-3} [0.268 \text{ BW } (0.81-h_1) + 0.675L (h_2-h_1) + 5.22 S (0.81-h_1)] \text{ for } h_1 < h_2 < 0.81 \quad (9)$$

squat lower (Kcal/lower)

$$\Delta E = 10^{-3} [0.511 \text{ BW } (0.81-h_1) + 0.701L (h_2-h_1)] \text{ for } h_1 < h_2 \leq 0.81 \quad (10)$$

arm lower (Kcal/lower)

$$\Delta E = 10^{-3} [0.093 \text{ BW } (h_2-0.81) + (1.02L + 0.37 S \times L) (h_2-h_1)] \text{ for } 0.81 < h_1 < h_2 \quad (11)$$

Walking, carrying, holding

walking (Kcal)

$$\Delta E = 10^{-2} (51 + 2.54 BW \times V^2 + 0.379 BW \times G \times V) t \quad (12)$$

carrying, loads held at arms length at sides (in one or both hands) (Kcal)

$$\Delta E = 10^{-2} [80 + 2.43 BW \times V^2 + 4.63L \times V^2 + 4.62L + 0.379 (L + BW) G \times V] t \quad (13)$$

carrying, loads held against thighs or against waist (Kcal)

$$\Delta E = 10^{-2} [68 + 2.54 BW \times V^2 + 4.08 L \times V^2 + 11.4L + 0.379 (L + BW) G \times V] t \quad (14)$$

holding, at arms length, against thighs or at sides (both hands) (Kcal)

$$\Delta E = 0.037 L \times t \quad (15)$$

holding, against waist (Kcal)

$$\Delta E = 0.062 L \times t \quad (16)$$

holding, at arms length in one hand (Kcal)

$$\Delta E = 0.088 L \times t \quad (17)$$