

## ERRATA SHEET

Applied Occupational Ergonomics – A Textbook, 2<sup>nd</sup> Edition (2007), 2<sup>nd</sup> Print  
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### Pg 42

#### Case Study 3.2.: Evaluating Population Accommodation (REVISED - July 2011)

Using Table 3.2, we can also estimate the percentage of the population accommodated by an existing design parameter. Assume that we wish to determine the population percentile who can adequately reach materials on a given storage shelf.

Given:

- Shelf height = 2060 mm (81.1 inches)
- Average (standard deviation) standing vertical grip reach (from Table 3.1, Dimension #34)  
= 1925(73) mm (females) and 2080(80) mm (males)

Assume: Correction for shoes for standing grip reach to be 25 mm (males)

Solution:

Adding the correction for shoes to the average standing vertical grip reach yields the following values

Females:  $1925 + 25 \text{ mm} = 1950 \text{ mm}$

Males =  $2080 + 25 \text{ mm} = 2105 \text{ mm}$

Use equation 3.1 from above to yield density estimates:

$$Z = \frac{x - \mu}{\sigma}$$

**Females**

$$Z = \frac{2060 - 1950}{73}$$

$$Z = +1.507$$

**Males**

$$Z = \frac{2060 - 2105}{80}$$

$$Z = -0.563$$

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#### Example 4.2.: Two Link Planer Model (REVISED – June 2009)

Assume the free body diagram in Figure 4.3 represents the human arm system with the elbow as the fulcrum. The distance “b” (= 17” ) is the distance from the fulcrum to center of load being held, the distance “c” (= 11” ) is the distance from the muscle insertion to the top of the upper-arm shoulder joint, and the weight of load that can be held in the palm is 20 lbs. Assume the weight of the hand-forearm and upper arm is negligible and there is no movement. Determine the forces (Rs) and moments (Ms) at the shoulder assuming that the upper arm and forearm-hand is held horizontal to the ground.

### Solution

In Example 4.1, the hand and forearm was considered as one body segment (i.e. a single link). In this example, the upper arm is considered as a second body segment (i.e. a second link). In order to perform the analyses on the second link, the forces and moments on the first link will have to be computed and then transferred to the second link. Considering only the first link, the reaction force at the elbow ( $R_E$ ) and the moment at elbow ( $M_E$ ) need to be calculated.

$$\Sigma \text{ Forces} = 0$$

$$-20 \text{ lbs} + R_E = 0; \text{ therefore, } R_E = 20 \text{ lbs (acting upwards)}$$

$$\Sigma \text{ Moments} = 0$$

$$-20 \text{ lbs} * 17'' + M_E = 0; \text{ therefore, } M_E = 340 \text{ lbs-in (acting anti-clockwise)}$$

Now considering only the second link: the upper arm, the reaction force at the elbow ( $R_E'$ ) and moment at elbow ( $M_E'$ ) is opposite in direction but equal in magnitude to  $R_E$  and  $M_E$ , respectively.

$$\Sigma \text{ Forces} = 0$$

$$R_E' + R_S = 0; \text{ therefore, } R_S = 20 \text{ lbs (acting upwards)}$$

$$\Sigma \text{ Moments} = 0$$

$$-R_E' * 11'' - M_E' + M_S = 0; \text{ therefore, } M_S = 20 * 11 + 340 \text{ lbs-in} = 560 \text{ lbs-in (acting anti-clockwise)}$$

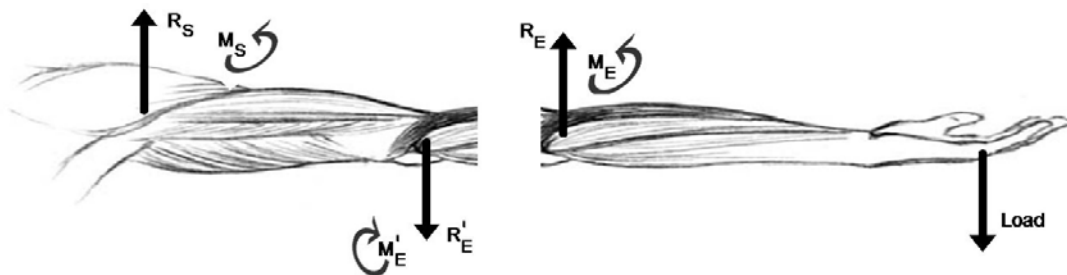


Figure 4.3  
Free body diagram for Example 4.2

**Note:** In the above examples, the weight of the hand and forearm was neglected. Also, only static cases were examined. If dynamic cases were to be analyzed, one would require mass, center-of-mass, moments of inertia, etc. of the body segments. The analyses of dynamic models are beyond the purview of this text and for further information refer to Chaffin et al. (2006).

### Pg 113. 8.4. Low-back Disorders (REVISED – July 2011)

On paragraph 3, line 3 – the abbreviation “WBV” stands for Whole Body Vibration

**Pg 116. Table 8.4 (RWL Multiplier Functions) (REVISED – June 2009)**

Replace Table 8.2 (for FM multiplier) by Table 8.5 in both Metric (kg,cm) and English (lbs,in) columns.

Replace Table 8.3 (for CM multiplier) by Table 8.6 in both Metric (kg,cm) and English (lbs,in) columns.

Multiplier	FUNCTION	
	Metric (kg,cm)	English (lbs,in)
LC	23	51
HM	25/H	10/H
VM	1 - (0.003* V-75 )	1 - (0.0075 V-30 )
DM	0.82 + (4.5/D)	0.82 + (1.8/D)
AM	1 - 0.0032*A	1 - 0.0032*A
FM	<b>TABLE 8.5</b>	<b>TABLE 8.5</b>
CM	<b>TABLE 8.6</b>	<b>TABLE 8.6</b>

**Pg 184. Example 12.1 (REVISED – July 2011)**

In the equation

$$T_1 = \frac{8}{2 \exp\left[\left(\frac{110-90}{5}\right)\right]} = 1.74$$

Replace 110 in the denominator by 101 as shown below

$$T_1 = \frac{8}{2 \exp\left[\left(\frac{101-90}{5}\right)\right]} = 1.74$$