Chapter 13

Workstation Design
Guideline 1

Avoid Static Loads and Fixed Work Postures

- Static load increases systolic and diastolic blood pressure.
- Metabolic wastes accumulate in the muscles.
- Consider increasing recovery time.
Standing

- Shoes affect center of gravity and forward bending moment. Cowboy boots or women’s high heel causes CG to move forward.
- Stand with weight equally on both feet.
- Provide bar rail to vary work posture.
- Hard floors cause standing fatigue and increase heart rate. Carpet increases standing heart rate by 5% compared to standing on concrete.
Falls

- Slips and falls are a major cause of unintentional injury deaths and have annual direct cost/capita of $50–400.
- Causes of falls:
  - Slips: unexpected horizontal foot movement during push offs or heel strikes – lubricant, slopes.
  - Trips: restriction of foot movement during foot swing, often associated with visual cause
  - Stepping-on-air: unexpected vertical foot movement—also can happen from visual cause
Solutions for Falls

● **Prevent the fall:**
  ○ Use well-designed ladders, scaffolds, and ramps properly.
  ○ Provide safe steps.
  ○ Use the three-contact rule.
  ○ Provide good friction and reduce lubricants.

● **Reduce the consequences of the fall:**
  ○ Interrupt the fall.
  ○ Soften the impact.
Head Weight

- The head weighs about the same as a bowling ball.
- Keep the line of sight below the horizontal.
- Maintain forward head tilt of $10^\circ$-$15^\circ$
- Avoid backward and sideward tilts.
Hands/Arms

- An arm weighs about 4.4 kg.
- Avoid using the hand to hold up a tool or workpiece.
- Avoid working with elevated hands.
- Support the arms on the worksurface or chair arms.
- Consider using magnification.
Guideline 2

Reduce the risk of Musculoskeletal Disorders

- Set the work height at 50 mm below the elbow.
- Don’t bend your wrist.
- Don’t lift your elbow.
- Don’t reach behind your back.
- Follow guidelines for hand and arm motions.
Guideline 3

Set the Work Height at 50 mm Below the Elbow

- Work height is defined in terms of elbow height.
- Optimum height is slightly below the elbow.
- Optimum height from the elbow is the same for sitting and standing.
- Work height is not table height.
Solutions for Work Height

- Change machine height.
- Adjust elbow height.
- Adjust work height on machine.
VDT Workstations

- Key items: screen, keyboard, document, eyes, hands
- Workstation furniture must be adjustable.
- Locate the primary visual element first: ahead of the eye, perpendicular to the line of sight.
- Train the operator in adjusting the equipment.
- Provide a wrist rest.
Guideline 4

Furnish Every Employee with an Adjustable Chair

- The cost of an adjustable chair is very low compared to labor cost (1 cent/hr).
- Allow users to try chairs in their specific jobs.
- Buy chairs that are easily adjustable.
- Train people in proper adjustment.
Chair Design

- Seats – seat height, angle, depth, width
- Backrests - lumber support
- Armrests
- Legs/pedestals
- Seating posture variability
Guideline 13

Keep Arm Motions in the Normal Work Area

- Avoid long benches.
- Use swingarms and lazy Susans.
- For high use, keep it close.
- Remember the arm pivots on the shoulder, not the nose.
- The shoulder is very sensitive to small changes in workplace layout.
“Windshield Wiper” Pattern
Guideline 14

Let the Small Person Reach; Let the Large Person Fit

- Design so most of the user population can use the design.
- Jobs must be designed for both sexes.
- Multiperson use of equipment and stations is becoming more common.
- Civilian industrial population data are not the same as military data.
- International populations be a consideration.
- The proportion to exclude depends on the seriousness of designing people out and the cost of including more people.