

Risk Control Bulletin

Quick Tips for Ergonomic Design

RISK CONTROL



Solid engineering and design in the workplace can eliminate and/or reduce risk factors and enhance the comfort of the individual. The following ergonomic design principles are simple, yet powerful. They can be integrated into new designs or used to improve existing operations. These guidelines are quick and easy concepts that can be applied to the operational solutions being developed by your engineers and safety professionals.

Design Principles for Workstations

- Do not lower that which must be lifted
- Do not lift that which must be lowered
- Use gravity – do not oppose it
- Provide adequate space to turn the whole body
- Do not reach behind the body
- Avoid extremes of joint movement (deviated postures)
- Avoid postural extremes (e.g., forward/lateral flexion)

Ergonomic Best Practices

- Allow natural, but changing postures
- Avoid static loading of muscles
- Preserve the natural curves of the spine
- The lower the reach target, the better the shoulder posture
- Work should be 2" to 4" below elbow height, in general
- Keep the elbows beside the torso
- If workers must reach forward, keep the reach below heart level
- Keep arm motions within 20" of the torso
- Avoid contact stresses to the arms, wrists, hands and legs
- Reduce repetition (enlarge jobs, rotate, mechanize)
- Reduce force

- Power with motors – not with muscles
- Avoid vibration – especially resonant frequency ranges (4 – 8 Hz)
- Provide adjustability
- Fit a range – not the average
- Accommodate as wide a range as possible

Design for Hand Tools

- Match the tool to the task
- Handles should be smooth, non-conductive, and compressive
- Design for the person with the least strength
- Match the grip to the worker population
 - Dynamic grips – closing tools
 - Grip spans should be 2.6" to 3.3"
 - Recommended for males: 3.2"
 - Recommended for females: 2.8"
 - Static grips
 - Grip spans should be 1.75" to 2.25"
 - Recommended for males: 2.3"
 - Recommended for females: 2.1"
- For tools with round handles, such as many pneumatic tools, the handle diameter should be at or near 1.5".
- Distribute pressure
 - Spread contact over several fingers – not just one
 - Avoid corners and sharp edges on handles
 - Handle length should be at least 3.5" to 4.0" long to avoid direct palm pressure. Add 0.5" when wearing gloves.
 - Bend the tool, not the wrist
 - Design for use by either hand, remember left-handed operators
 - Consider friction and gloves when selecting grip surface
- Use a power grip
 - Design force requirements so that people with the least strength can do the task

- Use special purpose tools and/or customized tools where possible

General Approaches to Solving Ergonomics Problems

- Eliminate the need for the task
- Convert the task to a less stressful task
- Mechanize the task
- Automate the task - assign the task to a machine

Solving Ergonomics Problems: Lifting

- Convert the lift/lower to a push/pull
- Convert the lift and carry to a push/pull
- Mechanize the lift/lower (operator guided, machine lifted)
- Automate the handling task
- Keep lifts between knuckle and shoulder height