

Standing Hand Working Height



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Guidelines

Hand working height from standing surface:

- Optimal zone: adjustable 38"–47" (965–1194 mm)
- Acceptable zone: adjustable 30"–57" (762–1448 mm)
- Fixed height: 42" (1067 mm)
- Precision or visually demanding tasks: adjustable 40"–51" (1016–1295 mm), or fixed height 45" (1143 mm)
- Not-to-exceed hand working heights: $\leq 30"$ (762 mm) and $\geq 57"$ (1448 mm)

Countermeasures

- Use height adjustable work surface, platforms
- Improve fixture design
- Prioritize workstation layout based on task importance

Work Examples

- Subassembly
- Light assembly tasks

Other Considerations

- Difference between optimal standing hand working height for a task and work surface height is determined by size of product being assembled
- Know height or location at which operator's hand interacts with product (top, bottom, middle, front, side, or back)
- Prioritize assembly tasks based on highest priority, such as highest frequency or most critical to quality
- Provide 10" (254 mm) of vertical height adjustability
- Part bins:
 - ▶ Place in front of operator, not to the side
 - ▶ Horizontal reach distance: $\leq 16"$ (406 mm)
 - ▶ Vertical height: 24"–70" (610–1778 mm)
- Tool location:
 - ▶ Balanced overhead at $\leq 74"$ (1880 mm) above floor surface, or
 - ▶ Tool holster at 42" (1067 mm) above floor surface

Measurement Criteria

- Tape measure

Spray Guns



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Priority Guidelines

Trigger Design:

- Recommended: lever with recommended length ≤ 3.0 " (76 mm)
- Acceptable: 2-finger trigger (index, middle finger) with recommended length 1.5"–2.5" (38.1–63.5 mm)

Trigger Force:

- Lever: ≤ 6.8 lb (3.1 kg)
- 2-finger trigger: ≤ 5.0 lb (2.3 kg)

Handle (Grip) Diameter Cross-Sectional Shape:

- Recommended: oval or egg-shaped
- Acceptable: cylindrical

Handle (Grip) Diameter:

- Recommended: 1.6" (41 mm)
- Acceptable: 1.2"–2.0" (31–51 mm)
- Provide larger diameter flange at bottom of handle

Priority Guidelines (Cont.)

Handle (Grip) Shape:

- Recommended: trapezoid (largest diameter at index finger)
- Acceptable: cylindrical (symmetrical diameter)
- Shape handle to maximize hand contact surface area

Handle (Grip) Length:

- Recommended: 5.5" (140 mm)
- Acceptable: 4.0"–6.0" (102–152 mm)
- Add 0.5" (13 mm) for tools requiring gloves

Handle Angle:

- Recommended: 102° angle from handle to aiming axis
- Acceptable: 90° angle from handle to aiming axis

Handle (Grip) Surface, Texture, Material:

- Recommended:
 - ▶ High-friction or slightly etched surface
 - ▶ Slightly soft composite or rubber surface
 - ▶ Water resistant
- Avoid:
 - ▶ Sharp edges or hard surfaces
 - ▶ Cold temperatures or metal surfaces that retain heat

Segmental Vibration

Standards: USA: ANSI S3.34, ACGIH-HAV TLV. European: European Union Directive 2002/44/EC for HAV. International: ISO 5349.

Guidelines (ACGIH)

Table 10.1 All Threshold Limit Values for Hand Vibration Exposure

Total daily exposure duration (hours)	Max. value of frequency weighted acceleration (m/s ²) in any direction
4 to less than 8	4
2 to less than 4	6
1 to less than 2	8
less than 1	12

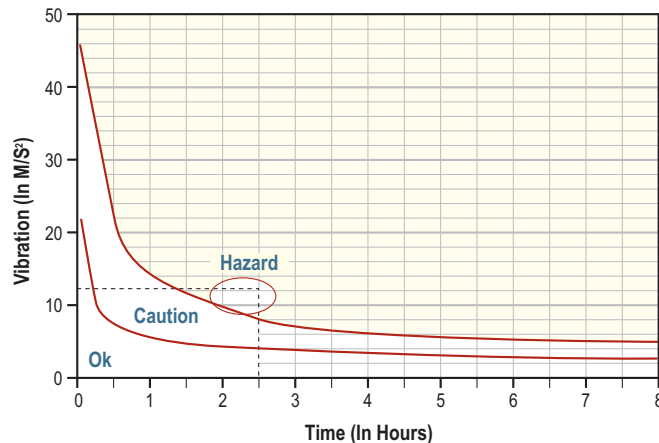


Figure 10.1 Vibration TLVs (m/s²) as a Function of Exposure Time (Hours)

Countermeasures

- Avoid tools that operate within the 6-1000 Hz frequency range
- Provide vibration-dampened tools (integral to design of tool, vibration dampening handle wraps, etc.)
- Provide pulse tools instead of mechanical impact tools
- Worker should be able to operate the tool when grasping it as lightly as possible (balance tool or provide lightest-weight alternative)
- Provide full-finger anti-vibration gloves

Tools That Cause Segmental Vibration

- Grinder
- Sander
- Chipping hammer
- Nut runner
- Impact wrench
- Jackhammer
- Chain saw
- Hammer drill
- Weed trimmer
- Lawn mower

Other Considerations

- Cold temperatures worsen the effects of vibration exposure on hands.
- Direct heating (using electrically heated gloves to keep the fingers warm) and indirect heating (warming the fingers indirectly by actively heating the torso) increase blood flow, reducing the effects of vibration.

Measurement Criteria

1. Find the vibration value of the tool (typically available through the manufacturer) or measure with an accelerometer as close to the tool handle as possible.
2. Define total hours the worker uses the tool.
3. Use Figure 10.1 to determine the intersection point and whether the exposure is acceptable, or if controls should be implemented. If vibration exposure is in the
 - **Hazard zone**, ergonomic controls are required.
 - **Caution zone**, evaluate other risk that may be present.
 - **OK zone**, no further steps are required.