

Chapter V. Environmental Factors – Selected Excerpts from Chapter

V C1. Whole Body Vibration

Guidelines

Table V.3. Guidelines for Minimizing Whole Body Vibration

Characteristic	Guideline
Vibrating Surface	<ul style="list-style-type: none"> • Design the job so the worker only spends time on the vibrating surface when absolutely necessary. • Pad the surface appropriately (provide damping).
Controls	Place machine controls off the vibrating surface whenever possible.
Source	Isolate the vibrating source where the workers are stationed to reduce exposure.
Maintenance	Carefully maintain vibrating machinery to prevent the development of excess vibration.
Training / Work Practices Issues	Avoid lifting immediately following prolonged exposure to vibration (e.g., after driving a vehicle)
Driving a Vehicle	<ul style="list-style-type: none"> • Refer to seat suspension guidelines in Table V.4. • Make sure tires are properly inflated. • Tire Selection. Depending on road/floor surface, consider pneumatic versus solid rubber tires. • Develop road / floor maintenance schedule and reporting system. • Training Issue – Avoid heavy lifting immediately upon stopping the vehicle.
Overhead Cranes (from Petite and Malchaire, 1992)	<ul style="list-style-type: none"> • Vibration accelerations increase with span of the overhead crane. Limit the span as much as possible. • Vibration transmission dependent on state of the crane runway. Use runways made of carefully welded joints leaving no gaps or bumps at the joints. • Locate the cabin at the end of the crane. • Select seats based on transmissibility characteristics. • The suspension system of the cabin should be selected so that the resonance frequency is less than 2 Hz. Suspension systems should be installed for the three axes of movement of the crane. • Use elastomers under rails and clips. • Grease rails and wheels routinely. • Speed regulation system should control acceleration over the entire speed range.

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V D3. Thermal Comfort

Guidelines The previous sections dealt with avoiding extremes in heat and cold. However, more generally we are interested in achieving **thermal comfort** for the inhabitants of the workplace. Thermal comfort is defined as “that condition of mind which expresses satisfaction with the thermal environment” (ISO 7730). Thermal comfort will be dependent on the activities performed as well as air temperature, and basically satisfies the following requirements:

- The combination of skin temperature and core temperature provides a sensation of thermal neutrality.
- The heat produced by metabolism should be equal to the heat lost from the body.

For sedentary workers, ISO 7730 suggests the following guidelines be utilized:

- Predicted Mean Vote (PMV). The PMV scale is a 7-point thermal-sensation scale ranging from -3 (cold) to +3 (hot), where 0 represents the thermally neutral (preferred) sensation. It is recommended that PMV be between -0.5 and +0.5.
- Draught Rate (DR). DR represents the percentage of people predicted to be dissatisfied because of a draught. DR should be less than 15% at the neck and ankle. DR is calculated using the following equation:

$$DR = (34 - t_a) \times (v_a - 0.05)^{0.62} \times (37 \times SD + 3.14)$$

Where

DR = Draught Rating (%)

t_a = Air Temperature (degrees centigrade)

v_a = Local Mean Air Velocity (m/s)

SD = Standard Deviation of Air Velocity (m/s).

- Vertical Air Temperature Differences from ankle to head should be less than 10 degrees Centigrade
- Radiant Temperature Asymmetry from cold windows should be less than 10 degrees Centigrade
- Radiant Temperature Asymmetry from warm ceilings should be less than 5 degrees Centigrade
- Surface temperature of floors should be between 19 and 29 degrees Centigrade
- Relative humidity should be between 30 and 70%.

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VF. Slip / Fall Risk

Table V.9 (Continued from previous page). Floor (and Related) Design Issues to Minimize Slip/Fall Risk

SLIP/FALL ISSUE	STRATEGIES
Drainage of water on the floor	<ul style="list-style-type: none"> • Floors should be sloped properly such that water drains. Slope of floor should carry water away from workers. • Drains should be large enough and of adequate number to accommodate water without overflowing. <ul style="list-style-type: none"> ○ Drains under sinks should be outfitted with sleeves to minimize water overflow when the sink is drained.
Drain Traps	<ul style="list-style-type: none"> • Drain traps should not be present in walkways (e.g., place them under sinks). • If the drain trap is in the walkway, cover the trap with a mat.
Work Environments associated with Increased Slip/Fall Risk	<ul style="list-style-type: none"> • Minimize work from elevated platforms (separate safety issue – provide appropriate safety gear when work from elevated platforms is required). • Minimize ramps / inclined surfaces in the workplace. • Minimize the need to work from ladders. • Avoid creating task conditions requiring drivers to enter/exit their vehicles on a frequent basis. Provide proper training for drivers regarding (e.g.) maintaining 3 points of contact whenever entering/exiting their vehicle.