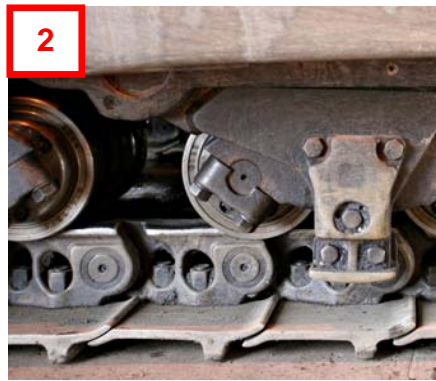


### Risks to be mitigated



### 4. Whole-body Vibration

<b>Objective</b>	The objective is to minimise (to ALARP) the risk of events related to exposures to harmful whole-body vibration (WBV) from equipment or the operating environment, that might lead to injury, illness or damage, including consideration in design to foreseeable human error.
<b>General outcome</b>	<p>The intended design outcome should include the following:</p> <ul style="list-style-type: none"> <li>▶ Operator WBV exposure levels that do not exceed the levels specified in ISO 2631.1:1997, extrapolated for 12-hour shifts</li> <li>▶ Where various operating modes and conditions (e.g. dozer ripping) lead to levels in excess of ISO 2631.1:1997 exposure levels (extrapolated for 12-hour shifts) clear and practical limitations on exposure time should be provided</li> <li>▶ For equipment where operating modes and conditions are likely to exceed ISO 2631.1:1997 exposure levels, vibration monitoring that allows the operator to identify excessive vibration should be provided</li> </ul>
<b>Risks to be mitigated</b>	<ol style="list-style-type: none"> <li>1. Risk of WBV induced occupational injury and illness to operators and trainers (long latency)</li> <li>2. Risk of acute (jolts and jars) injury to operators and trainers</li> <li>3. Risk of posture induced occupational illness to operators and trainers</li> <li>4. Risk of unconstrained persons being injured from impact incidents</li> <li>5. Risk of vibration injury from use of passenger seats that do not have adequate suspension</li> <li>6. Risk that operator is not aware of machine degradation, design limits or conditions that cause excessive vibration</li> </ol>
<b>Examples of industry attempts to mitigate risks</b>	<ol style="list-style-type: none"> <li>a. Cab isolation designs that address the WBV issues</li> <li>b. Cab design and layout of controls to avoid damaging postures</li> <li>c. Seats designed as follows:             <ol style="list-style-type: none"> <li>i. In accordance with AS2670 and/or SANS 2631-1.</li> <li>ii. High backed, fully suspended and adjustable</li> <li>iii. Robust and anchored securely to provide adequate anchorage for safety belts</li> <li>iv. Adjustable damping for vertical suspension</li> </ol> </li> <li>d. Seat belts and anchorages for operator and all passengers as follows:             <ol style="list-style-type: none"> <li>i. In accordance with AS 2664 or SAE J386 or ISO 6683</li> <li>ii. In other than tracked equipment, three-point anchorage inertia-reel seat belts fitted (tracked equipment should be two-point anchorage)</li> <li>iii. Audible and visual alarm system to indicate seatbelt is not being worn when machine is in motion</li> </ol> </li> <li>e. Remote control of vehicles</li> <li>f. Suitable vehicle suspension for the task</li> </ol>

### Industry attempts to mitigate risks

