



CHECK LIST FOR PURCHASE/RENT OF VEHICLES AND MACHINE TOOLS (short edition) ERGONOMICS AND SAFETY

BOARDING AND DESCENDING

Footboard/steps and handles should be shaped so that boarding and descending can be done as convenient as possible. Also users with reduced ability must be able to board and descend without risk of injury.

Comment:

DRIVER'S CAB

The driver's cab should be adapted to drivers of different lengths (160 - 190 cm). The need to rotate the driver's cab must be considered after way of use.

Check specially:

- Sufficient headroom (Regulation about machinery order No. 522)
- ✓ Fork-lift truck 100 cm
- ✓ Machines for mass transfer 110 cm

Comment:

DRIVER'S SEAT

Type BE-GE 9100 is specified in "Gul Spekk"❖ as an approved driver's seat. In case of divergence it is recommended to use the main check list chap. 3.

Comment:

❖ "Gul spekk" is specifications in the HAMP-system. Other units gear to their own requirements.

MANOEUVRE INSTRUMENTS

The placing should be in convenient reach. This goes specially for the manoeuvre instruments that affects safety and/or are often used.

Check specially:

- ✓ Handles shall fit good in the hand
- ✓ The spikes movement should be logical (left movement – left reaction)
- ✓ Placing of pedals (not too close to each other)
- ✓ Pedals should have a friction pad
- ✓ The manoeuvre instruments should be equipped with approved symbols
- ✓ The brake pedal should be operated by the right foot

Comment:

VISIBILITY

Poor visibility increases the risk of accidents. The requirement for visibility should be judged regarding to the vehicle's speed and area of use. The visibility must be investigated both with and without cargo. Look for sensible placing of mirrors, use a reverse camera if the visibility is poor.

Comment:

INSTRUMENTS AND SIGNALS

Instruments should only give necessary information and be placed so that they easily can be read from the driver's cab. Use of warning gadgets must not be overdone. Dark text on light background is recommended on signs, with Norwegian text (in Norway) and/or international symbols in accordance to CE-marking.

Comment:

ILLUMINATION

All vehicles/machine tools that are used in the factory's area, should be equipped with illumination in accordance to The Road Traffic Act's requirements for tractors with driving speed less than 30 km/hour, that means headlight, indicator, reversing lamp and brake light. If needed extra lights and/or working lights must be installed (ref. "Gul Spekk").

Comment:

NOISE

Noise measurements are recommended in accordance to standards and measuring form in appendix 2.



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Comment:

WHOLE-BODY VIBRATIONS

In the short run exposure to whole-body vibrations can give the driver of the vehicle/machine tool physical and psychical tiredness. In the longer terms this may lead to pain especially in lower back and neck. Measurement of vibrations is recommended carried out and then in accordance with standards and vibration report in appendix 3 and 4.



Sjekkliste_vibrasjonerevedlegg3_eng.doc



Sjekkliste_vibrasjonerevedlegg4_eng.xls

Comment:

CLIMATIC CONDITIONS

The need and requirements for air conditioning must be considered according to the climate that exists in the vehicle's area of use. There must be arranged adjustment possibilities to avoid troublesome air distribution.

Comment:

SERVICE AND MAINTENANCE

This must be arranged so that service and maintenance can be executed free of risk in appropriate working positions, especially with a view on oil, filters, points of lubrication, coolant and batteries.

Comment:

SAFETY

Vehicles/machine tools that are bought for use within HAMP should be CE-marked, this is especially with a view on safety (stability, brakes, driver's protection etc.).

Factors that can be emphasized in each case, depending on area of use and driving speed, are:

- ✓ need for safety belts
- ✓ placing of main switch
- ✓ start prevention

Comment:

APPENDIX 2

CHECK LIST FOR PURCHASE/RENT OF VEHICLES AND MACHINE TOOLS

8.1. NOISE CONTROL WHEN PURCHASING VEHICLES

8.1.1. PURCHASING OF STANDARD VEHICLES

Items 8.1.1.1. and 8.1.1.2. give the normal requirements for noise levels internally and externally of standard vehicles. For standard vehicles the vendor will normally have done noise measurements of the vehicles. Dependent on the vendor different standards are referred to in the performance results. Items 8.1.1.3. and 8.1.1.4. give standards that are acceptable for noise measurements of vehicles in the aluminium industry. At the delivery time of the vehicles simplified control measurements can be done according to chapter 8.2. of this check list.

8.1.1.1. Requirement to the internal noise

Normal existing requirement: Leq = 75 dBA

Special requirement: Leq = _____ dBA

8.1.1.2. Requirement to the external noise

Normal existing requirement: Leq = 78 dBA

Special requirement: Leq = _____ dBA

8.1.1.3. Acceptable standards for internal noise measurement of standard vehicles

ISO 5128 - Measurements of noise inside motor vehicles

ISO 6394 - Measurements at the operator's position of noise emitted by earth-moving machinery - Stationary test conditions

ISO 6396 - Measurements at the operator's position of noise emitted by earth-moving machinery - Dynamic test conditions

NS-EN 12053 - Safety of industrial trucks - Test methods for measuring noise

8.1.1.4. Acceptable standards for external noise measurement of standards vehicles

ISO 362 - Measurement of noise emitted by accelerating road vehicles - Engineering method

ISO 6393 - Measurements of exterior noise emitted by earth-moving machinery - Stationary test conditions

ISO 6395 - Measurements of exterior noise emitted by earth-moving machinery - Dynamic test conditions

NS-EN 12053 - Safety of industrial trucks - Test methods for measuring noise

8.1.2. PURCHASING OF SPECIALLY SPECIFIED VEHICLES

Items 8.1.2.1. and 8.1.2.2. give the normal requirements for internal and external noise levels of specially specified vehicles. When purchasing such vehicles noise measurement will normally take place after delivery. Items 8.1.2.3. and 8.1.2.4. give the acceptable standards for noise measurements of specially specified vehicles. Control measurements can be done according to the simplified method described in chapter 8.2. of this check list.

8.1.2.1. Requirement to the internal noise

Normal existing requirement: Leq = 75 dBA

Special requirement: Leq = _____ dBA

8.1.2.2. Requirement to the external noise

Normal existing requirement: Leq = 78 dBA

Special requirement: Leq = _____ dBA

8.1.2.3. Acceptable standards for internal noise measurement of specially specified vehicles

ISO 5128 - Measurements of noise inside motor vehicles

8.1.2.4. Acceptable standards for external noise measurement of specially specified vehicles

ISO 362 - Measurement of noise emitted by accelerating road vehicles - Engineering method

APPENDIX 2
CHECK LIST FOR PURCHASE/RENT OF
VEHICLES AND MACHINE TOOLS

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8.2. SIMPLIFIED NOISE TEST OF THE VEHICLE

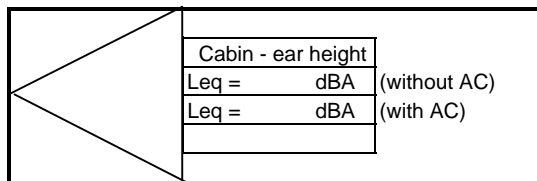
8.2.1. NAME/TYPE OF THE VEHICLE:

Date: _____

8.2.2. NOISE MEASUREMENT OF VEHICLE - PART 1 STANDSTILL:

Right - 7,5 m
Leq = dBA

Front - 7,5 m
Leq = dBA



Rear - 7,5 m
Leq = dBA

Left - 7,5 m
Leq = dBA

Comments: _____

The following measuring conditions should apply:

Full revolution and load during the measurements. Background noise minimum 10 dB lower than the noise from object, microphone 1,2 meter above ground level, no reflecting surfaces within 50 meter radius, dry ground (no rain or snow/ice on the ground during the measurements). Wind speed below 5 m/s, temperature between 0 - 40° C.

Measured by: _____

Measuring instrument: _____

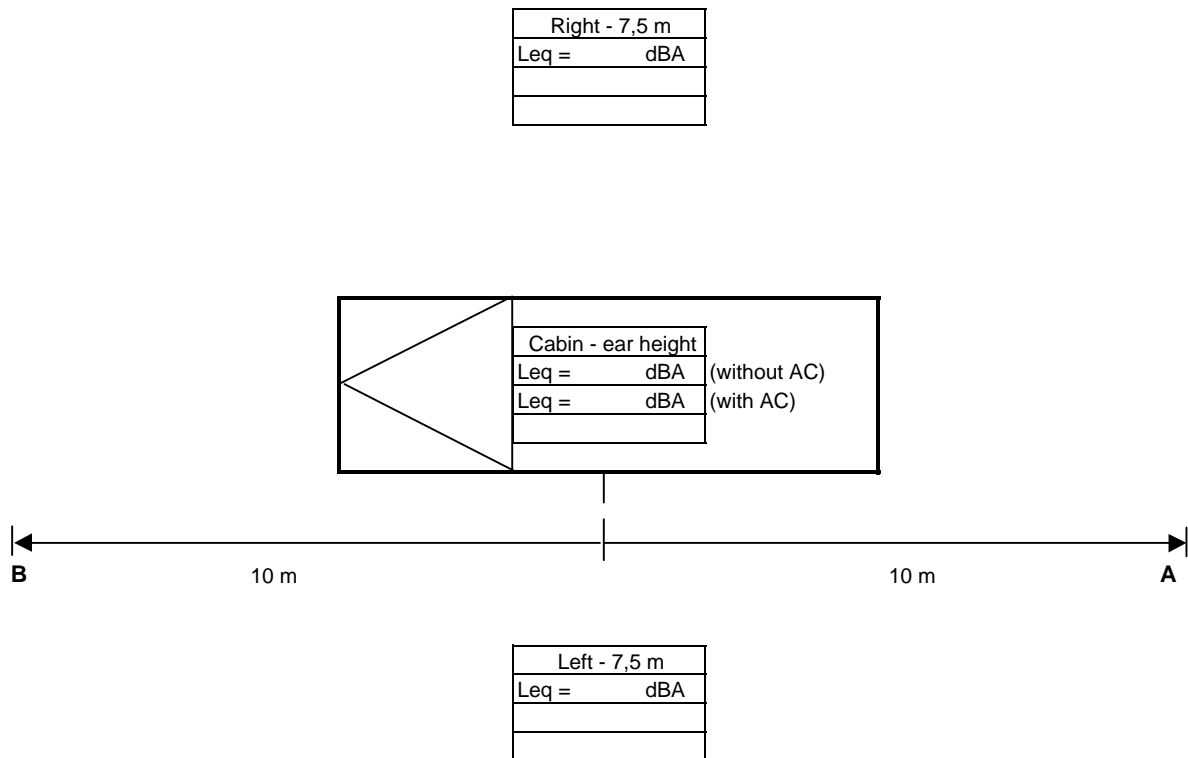
Signature: _____

Calibration date: _____

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8.2.3. NOISE MEASUREMENT OF VEHICLE - PART 2 IN MOTION:



Comments: _____

The following measuring conditions should apply:

Full revolution and load during the measurements. Background noise minimum 10 dB lower than the noise from object, microphone 1,2 meter above ground level, no reflecting surfaces within 50 meter radius, dry ground (no rain or snow/ice on the ground during the measurements). Wind speed below 5 m/s, temperature between 0 - 40° C. Measurements should be performed with the vehicle passing 2 times in each direction. Equivalent sound pressure level is to be measured from the vehicle is passing point A until passing B.

Measured by: _____

Measuring instrument: _____

Signature: _____

Calibration date: _____



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APPENDIX 2
CHECK LIST FOR PURCHASE/RENT OF VEHICLES AND MACHINE TOOLS

8.3. NOISE CONTROL OF DELIVERED VEHICLES

8.3.1. NOISE TEST FOR STANDARD VEHICLES

For standard vehicles the vendor will normally have done noise measurements which can be evaluated against stated requirements. Nevertheless control measurements can be done for own purposes for evaluation of the noise conditions at each site. This can normally be done according to a simplified method as described in chapt 8.2. or by use of ISO 362 (externally) and ISO 5128 (internally). Under items 8.3.1.1. and 8.3.1.2. the noise requirements and the results of the noise measurements are filled in, including a statement if the noise levels are acceptable or not. Under items 8.3.1.3. and 8.3.1.4. results from eventual earlier measurements by the vendor can be filled in.

8.3.1.1. Acceptance of internal noise requirements

Existing noise requirements: Leq = dBA
Measured noise level: Leq = dBA
Internal noise level acceptable: Yes No Comments: _____

8.3.1.2. Acceptance of external noise requirements

Existing noise requirements: Leq = dBA
Measured noise level: Leq = dBA
External noise level acceptable: Yes No Comments: _____

8.3.1.3. Internal noise level measured by vendor

ISO 5128 Leq = dBA
ISO 6394 Leq = dBA
ISO 6396 Leq = dBA
NS-EN 12053 Leq = dBA

8.3.1.4. External noise level measured by vendor

ISO 362 Leq = dBA
ISO 6393 Leq = dBA
ISO 6395 Leq = dBA
NS-EN 12053 Leq = dBA

8.3.2. NOISE TEST OF SPECIALLY SPECIFIED VEHICLES

For specially specified vehicles noise measurements will normally not have been done in advance. After delivery control measurements can be done for own purposes for evaluation of the noise conditions at each site. This can normally be done according to the simplified method as described in chapter 8.2. or by use of ISO 362 (externally) and ISO 5128 (internally). Under item 8.3.2.1. and 8.3.2.2. the noise requirements and the results of the noise measurements are filled in, including a statement if the noise levels are acceptable or not.

8.3.2.1. Acceptance of internal noise requirements

Existing noise requirements: Leq = dBA
Measured noise level: Leq = dBA
Internal noise level acceptable: Yes No Comments: _____

8.3.2.2. Acceptance of external noise requirements

Existing noise requirements: Leq = dBA
Measured noise level: Leq = dBA
External noise level acceptable: Yes No Comments: _____

APPENDIX 3

CHECK LIST FOR PURCHASE/RENT OF VEHICLES AND MACHINE TOOLS

9.1 CONTROL OF WHOLE-BODY VIBRATION WHEN ORDERING AND BEFORE TAKING OVER VEHICLES/MACHINE TOOLS

9.1.1 WHEN ORDERING AND BEFORE TAKING OVER STANDARD VEHICLE/MACHINE TOOL AND SPECIALLY SPECIFIED VEHICLE

Items 9.1.1.1 and 9.1.1.2 indicate which action value that must not be exceeded when exposed to whole-body vibration in standard vehicles/machine tools and specially specified vehicles.

When ordering:

- ◆ When ordering standard vehicle/machine tool, measurements of vibration should be stated from the supplier. It should be specified during which conditions the measurements are done.
- ◆ When ordering specially specified vehicle, measurements of vibration will normally not have been carried out or vibration data stated for these vehicles. It exists normally not stated vibration data before they have been built. However, during the building process one should measure and check before taking over the specially specified vehicle. The requirements of vibration level must be included in the stated requirement specification and must not be over $0,3 \text{ m/s}^2$, see *Handbook of Risk assessment of the work environment AMS (WERA)*. According to the regulation, Norwegian Labour Inspection Authority order no. 582, the action value is $0,5 \text{ m/s}^2$.

Item 9.1.1.4 indicates standards that are accepted for measurements of whole-body vibration.

Before taking over:

- ◆ Before taking over, check of measurements should be accomplished in accordance with the vibration report in chapter 9.2 in this check list. The measurements should be carried out when vehicle/machine tool executes ordinary tasks.

9.1.1.1 Action value

The action value for the daily exposure for whole-body vibration [A(8) = eight-hour reference period]: $0,5 \text{ m/s}^2$. That the action value is not exceeded, is certainly not any guarantee that vibration injury can be avoided.

9.1.1.2 Requirement of vibration levels in the aluminium industry for those that use WERA

The value for the daily exposure for whole-body vibration [A(8) = eight-hour reference period]: $\leq 0,3 \text{ m/s}^2$.

9.1.1.3 Crest factor and vibration dose value (VDV)

If the crest factor is above 9, alternative measuring methods (VDV) are to be used to determine possible health effects. The crest factor is the ratio of crest value and RMS value (effective mean value of the vibrations). By calculating vibration dose value as given in $\text{m/s}^{1,75}$, one will get a better picture of vibrations with shocks. In Norway the regulations do not state action and limit values for VDV.

9.1.1.4 Approved and recommended standards for measuring of whole-body vibrations in standard machine tools

NS-EN 14253 (2003) + A1 (2007): Mechanical vibration – Measurement and calculation of occupational exposure to whole-body vibration with reference to health – Practical guidance.
NS-EN ISO 2631-1 (1997): Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration.

9.2 MEASURING FORM FOR WHOLE-BODY VIBRATIONS IN VEHICLE/MACHINE TOOL

See appendix 4 in MSEXcel (use tabulator by moving from cell to cell that are to be filled in).

APPENDIX 4
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Vibration report

<i>Type of vehicle/machine tool (name and number)</i>	<i>Date</i>
<i>Accomplished by</i>	
<i>Name of operators (3 persons)</i>	
<i>Place of measurement</i>	
<i>Type of measuring equipment</i>	
Time of measurement is one working sequence or at least 20 minutes. Number of measurements is at least 3.	
<i>Description of the working sequence</i>	
<i>Conditions during the measurement (underlay, temperature, space, type of seat, maintenance etc.)</i>	

Measurement	Measuring time min.	Vibration in axes x, y og z measured in m/s ²			Highest value in m/s ²
		x	y	z	
1	39	0,307	0,251	1,040	1,040
2					0,000
3					0,000
Average	39	Number of measurements	1	Average	1,040

Explanation axes



Daily period of use given in hours	3,0
Daily vibration exposure in m/s ²	0,6

Max period of use before recommended WERA requirements are exceeded (above 0,3 m/s ²) in hours	0,7
Max period of use before action value is exceeded (above 0,5 m/s ²) in hours	1,8
Max period of use before limit value is exceeded (above 1,1 m/s ²) in hours	8,9

Example:

Action value 1,8 hours = 1 hour and 48 min. (0,8 x 60 min. = 48 min.)

Are jolts registered (crest factor > 9.0)?	yes/no
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Conclusion	Picture
Signature	

Explanation in use of colours (as in WERA)

Below or equal 0,1 m/s ²	Above 0,1 m/s ²	Above 0,3 m/s ²	Above 0,5 m/s ²	Above 1,1 m/s ²
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Measuremen t	Measuring time min.	Vibration dose value (VDV) i axes x, y og z measured in $m/s^{1,75}$			Highest value $m/s^{1,75}$	Daily exposure
		x	y	z		
1	39	4,600	3,400	10,800	10,800	15,8
2	60				0,000	0,0
3	120				0,000	0,0
Daily vibration exposure in $m/s^{1,75}$						15,8

According to EU Directive 1992/0449 (2002):

VDV action value $9,1 m/s^{1,75}$

VDV limit value $21 m/s^{1,75}$