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Mobile Cranes – Limits and Measurement Methods for Operating Noise

(For Approval)

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Foreword

This Standard is mandatory.

Appendix A to this Standard is normative and Appendix B is informative. This Standard is proposed by The China Machinery Industry Federation. This Standard is managed by The National Technical Committee for Standardisation of Lifting Appliances (SAC/TC227).

This Standard is drafted by (unit) National Quality Supervision and Inspection Centre for Engineering Machinery, Hunan Puyuan Corporation, Ltd., and Bengbu Zhengchong ANLI Engineering Machinery Co., Ltd.

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Mobile Cranes – Limits and Measurement Methods for Operating Noise

1 Scope

This standard specifies limits and measurement methods for operating noise of mobile cranes (wheel cranes, truck cranes and crawler cranes). This standard applies to the mobile cranes (hereinafter referred to as cranes) with motors rated up to and including 350 kW.

2 Normative Documents Quoted

In the utilization of this Standard, the provisions of the documents mentioned below become provisions of the Standard itself. Revisions (excluding corrigenda) or revised versions of mentioned documents which are dated later than this Standard are not applicable to the Standard. However, parties who have reached agreement under this Standard are encouraged to study whether they can apply the latest versions of these documents. If a document mentioned here is not dated, the latest version of it is applicable.

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|----------------|---|
| GB/T 3785–1983 | Electric, Sonic Properties and Measuring Methods for Sound Level Meters |
| JB/T 3301–1983 | Terms of Truck Cranes and Wheel Cranes |

3 Terms and Definitions

Terms established in JB/T 3301 and the following terms are applicable to this Standard.
Environmental noise

Environmental noise refers to the ambient noise (including wind noise) without the noise of the crane to be measured.

4 Noise limits

When the crane is operating, the sound power level $L_{W(A)}$ of the radiation noise and noise in the operation cab shall not exceed the limits specified in Table 1.

Table 1 Limits for Sound Power Level $L_{W(A)}$ of the Radiation Noise and Noise in the Operation Cab of the Crane

Radiation Noise		Noise in the Operation Cab dB (A)
Motor Rated Power kW	Sound Power Level dB (A)	
>65 ~ 80	112	90
>80 ~ 100	114	
>100 ~ 130	116	
>130 ~ 160	118	
>160 ~ 200	120	
>200 ~ 250	122	
>250 ~ 350	124	

5 Measurement Methods

The operating noise of the crane shall be measured in compliance with Appendix A. Refer to Appendix B for the measurements of the operating noise and the noise in the

operation cab of the crane.

Appendix A (Normative)

Methods for Measuring the Operating Noise of Cranes

A.1 Measurement Environment

A.1.1 The experiment site shall be firmly ground, there must not be any large reflective object within the distance three times that from the centre of the crane chassis to the measurement point, the environmental noise shall be 6 dB (A) ~ 10 dB (A) lower than the noise to be measured, and the measurement results shall be corrected by deducting the correction values in Table A.1. If the difference is smaller than 6 dB (A), the measurement results shall be invalid.

Table A.1 Corrections for the Measured Noise Unit: dB

Difference between Measured Noise and Environmental Noise	Correction
6 ~ 8	1.0
9 ~ 10	0.5
>10	0

A.1.2 The wind speed at the experiment site shall be less than 5 m/s; if the wind speed exceeds 2 m/s, the sound-level meter shall be equipped with a windscreen.

A.1.3 The ambient temperature at the time of the experiment shall be -5°C ~ +35°C.

A.2 Measuring Instruments

A.2.1 Measurement-purpose sound-level meters or other equivalent measuring systems shall at least meet the requirements of type-I sound-level meters specified in GB3785. Frequency weighting characteristic “A” and time weighting characteristic “S” shall be used in measurement.

A.2.2 Measurement of rotational speed

Speed indicators more accurate than $\pm 2\%$ shall be used to monitor the rotational speed of the oil pump or motor.

A.2.3 Measurement of meteorological parameters

Thermometers shall be more accurate than $\pm 0.1^\circ\text{C}$; and anemoscopes shall be more accurate than $\pm 1\%$.

A.2.4 All measuring instruments shall be checked regularly pursuant to relevant regulations, and shall be calibrated before and after measurement.

A.3 Operation modes for measurement

When the oil pump is rotating at the rated speed and the basic object carries no load, measurements should be made in the operation modes of the lifting hook, lifting object, gyroscopic and telescopic objects.

A.4 Measurement methods

A.4.1 Measurement of noise outside the crane

A.4.1.1 Determine the positions of four measurement points according to Figure A.1. For the radius R from the measurement points to the centre of the machine in Figure A.1, refer to Table A.2 according to the Lmax value of the length, width and height of the crane chassis, whichever is the greater.

Table A.2 Positions of Measurement Points		Unit: Meter
Lmax		R
≤ 6		12
> 6		16

The crane stays on axis X, and its front part points to the direction of axis X. Point O is the projection of the middle point of the length and width of the crane chassis. The microphones are located at the measurement points and point-to-point O.

Figure A.1 Layout of Measurement Points

A.4.1.2 Measurement time and readings

For the Measurement of A sound level, take 20 ~ 25s for every measurement point, and read the greatest value within the fluctuations of meter pointers (ignoring instantaneous interference sound level).

A.4.1.3 Calculation of A sound level and sound power level

- a) The average $L_{p(A)}$ of surface A sound level shall be calculated according to formula (A.1):

$$L_{p(A)} = \frac{1}{4} \sum_{i=1}^4 L_{p(A)i} \dots\dots\dots (A.1)$$

Where,

$L_{p(A)i}$ – Readings of the measurement points, dB (A).

b) Sound power level $L_{W(A)}$ shall be calculated according to formula (A.2):

$$L_{W(A)} = L_{p(A)} + 10 \lg \frac{S}{S_0} \dots\dots\dots (A.2)$$

Where,

S – Area of the measurement surface, in m^2 ;

$S_0 = 1m^2$;

For the value of $10 \lg S/S_0$, refer to Table A.3.

Table A.3 Relation Between $10 \lg S/S_0$ and R

R	$10 \lg S/S_0$ dB (A)
M	
12	30
16	32

A.4.1.4 Measurement times, three times for every operation mode

A.4.1.5 Determination of the measured results

The difference between the three measured results for every operation mode shall not exceed 2 dB (A). Otherwise, the experiment must be conducted again. Calculate the arithmetical mean as the reported value of A weighted sound power level. The A weighted sound power level of any operation mode shall not exceed the limits specified in Table 1.

A.4.2 Measurement of noise in the operation cab

A.4.2.1 Keep all the doors and windows of the operation cab closed during measurement. The operation modes for measurement are the same as A.3.

A.4.2.2 The measurement points are usually near the ears ($750 \pm 10mm$ above the surface

of the seat and 200 ± 50 mm from the centre line of the seat), with the microphone pointed forward.

A.4.2.3 The sound level meter shall be set at A weighting and in slow gear

A.4.2.4 Measurement times, three times for every operation mode

A.4.2.5 Determination of the measured results

The difference between the three measured results for every operation mode shall not exceed 2 dB (A). Otherwise, the experiment must be conducted again. Calculate the arithmetical mean as the reported value of the noise in the operation cab. The noise in the operation cab of any operation mode shall not exceed the limits specified in Table 1.

**Appendix B
(Informative)
Measurements of the Operating Noise and the Noise in the
Operation Cab of the Crane.**

Date: _____ Place: _____ Site Description: _____
 Weather: _____ Temperature: _____, Wind speed: _____, Sample crane model: _____
 Rated power of motor: _____ Rated rotational speed of oil pump/Rotational speed of motor: _____
 Environment noise: _____ Instruments used: _____ Measuring Staff: _____

Measurement Point	Operation Mode				Remarks
	Lifting hook	Lifting object	Gyroscopic object	Telescopic object	
1					
2					
3					
4					
$L_p(A)$					
$L_w(A)$					
In operation cab					