GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 53.020.20

J 80

GB/T 20062-2017

Replacing GB/T 20062-2006

Mobile Cranes - Limits and Measurement Methods for Operating Noise

流动式起重机

作业噪声限值及测量方法

Issued on: December 29, 2017 **Implemented on: July 1, 2018**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine;

Standardization Administration of the People's Republic of China.

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Mobile Cranes - Limits and Measurement Methods for Operating Noise

1 Scope

This Standard specifies the limits for external radiated noise, and the limits and measurement methods for noise in operator's cabin of mobile cranes.

This Standard is applicable to the mobile cranes defined in GB/T 6974.2 (hereinafter referred to as "cranes").

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 3767 Acoustics - Determination of Sound Power Levels and Sound Energy Levels of Noise Sources Using Sound Pressure - Engineering Methods for an Essentially Free Field over a Reflecting Plane

GB/T 3785.1-2010 Electroacoustics - Sound Level Meters - Part 1: Specifications

GB/T 8170 Rules of Rounding off for Numerical Values & Expression and Judgement of Limiting Values

GB/T 17248.2 Acoustics - Noise Emitted by Machinery and Equipment - Determination of Emission Sound Pressure Levels at a Work Station and at Other Specified Positions in an Essentially Free Field over a Reflecting Plane with Negligible Environmental Corrections

GB/T 21457 Cranes and Related Equipment - Accuracy Requirements for Measuring Parameters during Testing

3 Terms and Definitions

The following terms and definitions are applicable to this Standard.

3.1 Time-averaged A-weighted Sound Pressure Level

$L_{pA,T}$

5.1.1 The instrument system for data collection shall preferentially select an integral average sound level meter that complies with the requirements of Level-I in 5.1.5 of GB/T 3785.1-2010.

5.1.2 The measuring instrument shall be periodically verified in accordance with the stipulations of the relevant measuring instruments and respectively calibrated before and after the measurement.

5.1.3 During the measurement, A frequency weighting character and S time weighting character shall be used.

5.1.4 During the measurement, records shall be kept. If obvious noise peaks appear, they shall be recorded.

5.2 Measurement Environment

5.2.1 The test site shall comply with the stipulations of GB/T 3767.

5.2.2 At the microphone position, the averaged background noise level should be lower than the measured sound pressure level by more than 15 dB, and at least 6 dB lower.

5.2.3 The ambient temperature during the test is between -10 °C ~ + 35 °C.

5.2.4 During the test, the wind speed 1.5 m from the ground shall not be greater than 8 m/s.

5.2.5 During the test, if the wind speed exceeds the maximum allowable wind speed range provided by the microphone manufacturer, a windproof device shall be added to the microphone.

5.3 Positioning of Crane Noise Measurement Center

The noise measurement surface of the crane is a hemispherical surface (see Figure 1), with a radius of 16 m. If the crane is not suitable for this radius, it may also be selected in accordance with GB/T 3767.

For cranes equipped with two engines, then, the crane noise measurement center is the geometric center of the engine used for lifting operations and shall coincide with the center of the hemisphere. During the measurement, the driving direction of the crane is along the + *X* direction; the boom is along the - *X* direction. If the crane driving direction is consistent with the working direction of the boom (for cranes without rotating function), then, the crane (whole body) is along the - *X* direction.

For cranes equipped with one engine, which is simultaneously provided for driving and operation, then, the crane noise measurement center is the middle position of the engine and the hoisting machine and shall coincide with the center of the hemisphere.

5.4 Layout of Microphone

The measurement state of the cranes shall comply with the following stipulations:

a) Before measurement, in accordance with the operating manual provided by the manufacturer, pre-heat the crane's engine and hydraulic system to the temperature of normal use; in accordance with the operating manual, perform all safety-related procedures;

b) For cranes equipped with two engines, then, only the engine for lifting operations is used; the engine for driving is turned off;

c) For cranes whose engine is equipped with an exhaust device, during the test, the device shall be turned on. If the exhaust device has multiple speeds, then, the measurement shall be performed when the exhaust device is running at the highest speed;

d) During the measurement, the engine speed is 75% ± 2% of the rated speed;

e) Under the circumstance where heavy objects and hooks will not generate dangerous movements, operate at the maximum acceleration and deceleration;

f) Under the working conditions determined in 5.6.2 ~ 5.6.5, operate at the maximum lifting, turning, luffing and telescopic speeds provided in the instruction manual.

5.6.2 Working conditions of lifting

The crane lifts 50% of the rated weighted; select an appropriate boom length; the measurement duration is 15 s ~ 20 s.

5.6.3 Working conditions of turning

When the crane is unloaded and has the shortest basic boom, adjust the boom to the position at 40° ~ 50° with the horizontal plane; rotate by 90° to the left; immediately reversely rotate to the initial position. The measurement time is the time required for one work cycle.

5.6.4 Working conditions of luffing

When the crane is unloaded and has the shortest basic boom, lift the boom from the maximum working range to the minimum working range, and immediately descend to the initial position. The measurement time is at least 20 s.

5.6.5 Telescopic working conditions of boom

When the crane is unloaded, adjust the fully retracted boom to a position at 40° ~ 50° with the horizontal plane; fully extend the first grade of the telescopic cylinder, then, immediately return to the fully retracted state. The measurement time shall be the time

NOTE 1: if the reflective surface of the measurement site is a hard and flat ground (for example, asphalt or concrete ground), then, when there is no reflector within 3 times the radius of the measured hemisphere from the sound source, and the absolute value of the environmental correction value K_{2A} is less than or equal to 0.5 dB, then, K_{2A} equals to 0 dB.

NOTE 2: for sand and gravel ground, when K_{2A} is greater than 0.5 dB, the environmental correction value is included in the calculation of sound power.

S---the area of the hemisphere measurement plane, expressed in (m^2);

S_0---constant, $S_0 = 1\ m^2$;

$10\lg\left(\frac{S}{S_0}\right)$---constant value of sound power level. When the hemisphere radius is 4 m, take 20.0 dB; when the hemisphere radius is 10 m, take 28.0 dB; when the hemisphere radius is 16 m, take 32.1 dB.

5.8 Determination of Measurement Results

5.8.1 All intermediate calculation results (such as: sound pressure level and area calculation, etc.) shall retain one decimal place. The measurement accuracy of the parameters in the tests shall comply with the stipulations of GB/T 21457.

5.8.2 When the difference between two of the three A-weighted measurement values does not exceed 1 dB, no measurement is necessary. Otherwise, the measurement shall be continued, until the difference between two values does not exceed 1 dB. Use the arithmetic mean value of the two higher values that differ by no more than 1 dB as the report value.

6 Information of Record

6.1 The information of the test prototype shall include:

---Prototype manufacturer;

---Prototype model;

---Prototype No.;

---Engine manufacturer;

---Engine model;

---Net power of engine;

---Maximum rated speed of engine;

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