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Cleanrooms and associated controlled environments - Technical requirements for microvibration control

洁净室及相关受控环境 微振动控制技术要求

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2 Normative references

This document has no normative references.

4 General Requirements

4.1 The permissible vibration values for precision equipment and instruments used in cleanroom production, experimentation, and measurement should be determined based on their technical requirements. Typical precision equipment. The permissible vibration values for the instrument are shown in Appendix A.

4.2 The micro-vibration control requirements for the structure, precision equipment, and instrument vibration isolation devices of the cleanroom should be based on the precision equipment used for production, experimentation, and measurement in the cleanroom. The permissible vibration values or process requirements of the equipment and instruments are determined.

4.3 Based on the micro-vibration control requirements of the cleanroom, factors that may affect the micro-vibration environment of the cleanroom should be identified and risk assessments should be conducted.

5 Control methods and measures

5.1 Control Methods The methods for controlling micro-vibration in cleanrooms are as follows:

---Vibration sources inside and outside the cleanroom can be isolated or their transmission paths blocked through methods such as vibration isolation;

---The structure of a cleanroom can be improved by increasing its mass, rigidity, damping, and installing vibration absorbers;

---Precision equipment and instruments can be isolated through passive control, active control, or a combination of passive and active control methods.

5.2 Control Measures

5.2.1 Vibration Source Control The following measures are taken to control vibration sources inside and outside the cleanroom.

---Cleanrooms should be located away from areas with strong vibration sources such as high-speed rail, subway, highway, and heavy machinery manufacturing plants;

---Vibration isolation trenches and barriers can be installed to isolate traffic vibrations and construction vibrations outside the cleanroom;

---Vibration isolation joints can be installed to reduce the impact of vibration from external power equipment and pipelines in the cleanroom;

---Vibration isolation devices such as vibration damping pads, steel springs, or air springs can be installed to isolate vibrations from power equipment and pipelines inside and outside the cleanroom. vibration;

Note. Examples of vibration control and isolation measures for power equipment and pipelines in electronic cleanrooms are provided in Appendix B. When the noise generated by the power equipment and pipelines in the air conditioning room and power station is relatively high, it is advisable to lay floating slabs and use sound-absorbing walls. Panels and sound-absorbing ceilings reduce noise and vibration;

---Power equipment should be centrally located and zoned, away from precision equipment and instruments requiring micro-vibration control within the cleanroom;

---It is advisable to use power equipment that operates smoothly and with low noise;

---Power pipelines should be equipped with vibration-damping supports where they pass through the cleanroom wall panels, and flexible joints should be installed before entering the cleanroom;

---The flow rate of the medium in the power pipeline should be controlled.

5.2.2 Cleanroom Structural Micro-vibration Control The micro-vibration control of cleanroom structures shall comply with the following regulations.

---The foundation of a cleanroom should preferably be built in an area with relatively hard soil or shallow bedrock;

---In cleanroom areas housing precision equipment and instruments requiring micro-vibration control, it is advisable to reduce column spacing and increase beam and column cross-sectional dimensions. Measures to increase stiffness and mass include increasing floor slab thickness, installing shear walls or supports, etc. The number and size

of airflow openings in the cleanroom floor structure should be determined based on cleanliness requirements.

---Cleanroom wall panels and raised floors should have sufficient rigidity.

6 Material Requirements

6.1 The surface materials of independent foundations, rigid bases, and vibration isolation devices within cleanrooms should meet the requirements of the corresponding cleanroom class and antistatic properties. It should be resistant to any chemicals it may encounter, and the surface should be easy to clean.

6.2 The connecting materials of rigid bases, vibration isolation devices, and structures within the cleanroom, as well as the fixing materials of detection and monitoring sensors to the objects being measured, should... It meets the corresponding cleanliness level and anti-static requirements of the cleanroom.

6.3 The filling and sealing materials for the connection points between the rigid base and vibration isolation device and the structure, as well as the vibration isolation joints and vibration isolation trenches in the cleanroom, shall meet the requirements of cleanroom standards. The corresponding cleanliness level and anti-static requirements of the room.

7 Assignment Requirements

7.1 Personnel When performing micro-vibration testing in a cleanroom after it has been emptied, and during the fabrication, handling, installation, and commissioning of rigid bases and vibration isolation devices, personnel attire and... The code of conduct should meet the requirements of the corresponding cleanliness level of the cleanroom.

7.2 Requirements for manufacturing, handling, and installation

7.2.1 Precast rigid bases in cleanrooms should be reliably connected to the structure using structural adhesives, epoxy mortar, or similar methods. The connection points should be coated with epoxy. Layered closure.

7.2.2 The space between the independent base and the floor in the cleanroom shall be filled and sealed.

7.2.3 Vibration isolation joints and trenches in clean rooms should be filled and sealed.

7.2.4 The fabrication, handling, and installation of the rigid base and vibration isolation device should preferably be completed before the device is placed in an empty state. After installation, the rigid base should be wiped clean with a lint-free cloth. Wipe the outer surfaces of the base and vibration isolation device.

7.2.5 The fabrication, handling, and installation of rigid bases and vibration isolation devices

in the cleanroom after the cleanroom is emptied shall comply with the following regulations.

---The transport channels and work areas for rigid bases and vibration isolation devices should be physically isolated from the surrounding environment. When entering the clean area from the transport channel... A clean buffer zone should be set up in front of the clean room.

---The handling and installation tools for rigid bases and vibration isolation devices should be cleaned by wrapping them with clean tape or painting them. When using hovercraft, the air source should also meet the corresponding cleanliness requirements.

---A clean booth should be set up and equipped with a dust collection device before drilling or grinding operations.

---Raised floor cutting should preferably be carried out outside the cleanroom. When raised floor cutting is carried out inside the cleanroom, a cleanroom tent should be erected and equipped with suction devices. Dust control device.

8.Detection and monitoring The detection and monitoring of micro-vibrations in cleanrooms shall comply with the following regulations.

---Micro vibration testing in cleanrooms should include site environment, empty state, static and dynamic micro vibration testing.

---When the micro-vibration environment of the cleanroom changes due to increased surrounding traffic, power equipment malfunctions, construction, or other reasons, appropriate measures should be taken. Micro-vibration testing is conducted in the cleanroom.

---The results of the micro-vibration test should be compiled into a report. The test report should include the purpose of the test, the test time, the test equipment, the test conditions, and the test points. The content includes layout, data analysis, and conclusions.

---During the dynamic phase of a cleanroom, monitoring should be conducted according to the micro-vibration control requirements of precision equipment and instruments.