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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 38272-2019

**Safety of machinery - Guidelines for the safety upgrading of
machinery**

机械安全 机械设备安全升级指南

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1 Scope

China's national guidelines for upgrading the safety of existing machinery. It addresses the question that every machinery safety regime eventually faces: what to do about the machines already installed. Safety standards apply to new equipment, and a factory's machines may be twenty or thirty years old, built to rules that no longer represent good practice, and still capable of decades of useful service. Replacing them is rarely justifiable and often not possible. Upgrading them is, and doing it well requires a method rather than a shopping list of guards. The guidelines set out the sequence: assess the machine as it is against current requirements, identify the hazards that remain, decide which can be removed by design change and which need guarding or protective devices, and verify that what was fitted actually works and has not introduced a new hazard - which is a real risk when an interlock is added to a machine whose control system was never designed for one.

This standard provides the terms and definitions for the safe upgrade of mechanical equipment, and provides guidelines for the safe upgrade of mechanical equipment. This standard applies to the safety upgrade of in-service machinery and equipment. This standard does not apply to mechanical equipment that has been specifically stipulated by national laws and regulations, such as special equipment.

2 Normative references

The following documents are essential for the application of this document. For dated references, only the dated version applies to this article pieces. For undated references, the

latest edition (including all amendments) applies to this document.

GB/T 15706-2012 General Principles of Mechanical Safety Design Risk Assessment and Risk Reduction

GB/T 16855.1-2018 Safety-related parts of machinery safety control systems - Part

3 Terms and Definitions

The terms and definitions defined in GB/T 15706-2012 and the following terms and definitions apply to this document.

3.1 machinery equipment A combination consisting of several parts and components connected with a specific application purpose, at least one of which is movable, and Equipped or scheduled to be equipped with a powertrain.

Note. The "mechanical equipment" defined by this term is equivalent to the "machine" defined by the term

3.1 in GB/T 15706-2012.

3.2 safetyupgradingsafetyupgrading Based on the results of risk assessment, activities to reduce the risk of mechanical equipment through technical means.

3.3 acceptable risk tolerablerisk The level of risk that is acceptable under given conditions, based on current societal values. [GB/T 35080-2018, Definition 3.2]

4 Security upgrade process

The security upgrade process (see Figure 1) consists of the following 5 steps.

- a) risk assessment;
- b) Security upgrade plan;
- c) Safety upgrade design;
- d) Security upgrade implementation;
- e) Security upgrade confirmation.

5 Risk Assessment

Security upgrades should be based on the results of the risk assessment. Since the Class C standard identifies significant hazards commonly associated with a class of machinery and equipment, and gives the safe handling of these hazards requirements and/or risk mitigation measures. Therefore, if the mechanical equipment or similar mechanical equipment has the corresponding C standard (machine product safety standard Standard), it is advisable to directly target the major hazards identified by the corresponding C

standard, and formulate a safety upgrade plan according to the requirements of the C standard (see 6.2), And carry out safety upgrade design (see 7.2). For other hazard sources not covered by the C standard, it should be based on GB/T 15706-2012 Chapter 5 conducts risk assessment. For mechanical equipment that does not correspond to Class C standards, risk assessment should be carried out in accordance with Chapter 5 of GB/T 15706-2012. After the risk assessment is completed, the identified hazard sources that need to be reduced should be recorded in Table 1, and compiled to meet the requirements of GB/T 15706- Risk assessment report for the relevant requirements of Chapter 7 in.2012.

6 Security upgrade plan

6.1 Overview Appropriate risk reduction measures should be selected based on the results of the risk assessment and technical feasibility, and a safety upgrade plan should be formulated to enable the mechanical equipment. to an acceptable level of risk. When choosing risk reduction measures, it is advisable to seek the opinions of personnel engaged in mechanical equipment operation, debugging, maintenance, repair, etc. The impact of normal use of mechanical equipment is minimized. According to the hazard sources listed in Table 1, the corresponding risk reduction measures should be determined respectively (see 6.2~6.4) to form a safety upgrade plan. if Risk reduction measures need to rely on safety-related control systems to achieve corresponding safety functions, and also need to be based on GB/T 16855.1-2018 Appendix A in the determination of the required performance level (PLr) for safety-related control systems.

6.2 Adopt the risk reduction measures specified in the C standard Adoption of the risk reduction measures specified in the C standard can be regarded as an acceptable level of risk through sufficient risk reduction. in the exact When deciding on risk reduction measures, the C standard should be given priority. If the Class C standard provides several optional risk reduction measures, but does not specify the selection principle, it should be based on the specific risk assessment results. Choose appropriate risk reduction measures.

6.3 Applying the Risk Reduction Process Iterative Three-Step Method to Select Risk Reduction Measures There are no Class C standards for machinery or similar mechanical equipment, and hazards not covered by Class C standards, if it is necessary to take a risk If the risk reduction measures are not taken, then when formulating the security upgrade plan, the three steps of the risk reduction process given in Figure 1 in GB/T 15706-2012 should be iterated. method to select appropriate risk reduction measures. Table 2 from hazard elimination, risk factors (severity of injury, personnel exposure to hazard, hazardous event The three-step method of selecting risk reduction measures according to the iterative three-step method of the risk reduction process is given. guide.

6.4 Consideration of safety-related control systems If the safety protection devices (such as interlocks, emergency stop devices, etc.) used in the risk reduction measures need to rely

on the control system to achieve their safety. If it is fully functional, the safety-related control system should be designed according to GB/T 16855.1-2018 when making a safety upgrade plan.

7 Safety upgrade design

7.1 Principles The ultimate goal of security upgrades is to minimize risk. The safety upgrade design should be based on the hazards identified in the safety upgrade plan and the corresponding solutions, in accordance with the provisions of the corresponding Class C standards And/or the design principles determined in GB/T 15706-2012, and complete the design item by item in combination with relevant standards. If there is a Class C standard, the safety upgrade design should be carried out in accordance with the safety requirements and/or risk reduction measures specified in the Class C standard. When the requirements of Class C standards are different from those of Class A standards or Class B standards, the requirements of Class C standards are given priority. If there is no Class C standard or the Class C standard does not provide clear risk reduction measures, the safety upgrade design should be carried out in accordance with 7.2.

7.2 Design method

7.2.1 Overview Figure 1 in GB/T 15706-2012 presents an iterative three-step approach to the risk reduction process. In order to take full advantage of the available technology to To reduce the risk, this process should be carried out several times in a row if necessary. The following four factors should be considered when undertaking the risk reduction process.

- a) safety at all stages of the life cycle of machinery;
- b) the ability of the mechanical equipment to perform its function;
- c) ease of use of mechanical equipment;
- d) After the safety upgrade, the cost of mechanical equipment operation and subsequent disassembly. Appendix A gives the commonly used Type B standards in the design of security upgrades.

7.2.2 Intrinsically safe design The intrinsically safe design should meet the requirements of 6.2 in GB/T 15706-2012 and the requirements of the relevant Class B and/or Class C standards. If it involves major changes to the structure of the mechanical equipment, the original design data of the mechanical equipment should be obtained.

7.2.3 Safety protection and supplementary protection

7.2.3.1 Safety guards The design or selection of safety guards should meet the requirements of relevant Class B standards, such as the guards that meet GB/T 8196, Interlocking device of GB/T 18831. The design or selection of safety guards should be