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Specification for risk management of freezing sinking method

冻结法凿井风险管理规范

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Foreword

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Introduction

This document provides technical reference for risk management of shaft sinking by the freezing method. The safety requirements for shaft sinking by the freezing method are subject to laws and regulations, mandatory national standards and other relevant provisions.

1 Scope

NB/T 11454-2023 governs risk management for mine shafts sunk by the artificial ground freezing method. Where a shaft must pass through deep water-bearing sand, gravel and clay, the ground around it is frozen by circulating chilled brine through a ring of boreholes, creating a wall of frozen soil inside which the shaft is excavated and lined. It works, but its failure modes are severe: a gap in the frozen wall lets water and sand rush into the shaft, a freeze pipe breaks, the lining cracks under frost heave or thaw settlement. The specification sets the scope, the normative references and a full set of defined terms, then the basic requirements of the risk management system and the process it follows - identification, analysis, evaluation, response and monitoring - with the responsibilities of owner, designer, contractor and supervisor. It then applies that process stage by stage: the design of the shaft lining, the design of the freezing scheme with its borehole layout and frozen wall thickness, the refrigeration plant and its reliability, the drilling of the freeze holes and their

deviation control, the active freezing period and the verification that the wall has closed, the excavation and lining inside the frozen ground, and the grouting that follows thawing. Risk grades, emergency response and the records of the risk management process complete the standard.

This document specifies the risk management requirements for shaft sinking projects by the freezing method using a brine refrigeration system, covering shaft lining design, freezing scheme design, freezing system and power supply system design, freezing hole drilling construction, refrigeration plant installation construction, the freezing process, shaft excavation and lining construction, and grouting construction between shaft linings, as well as the requirements for special risk control measures for shaft sinking by the freezing method.

This document is applicable to risk management in the design, construction and management of shaft sinking by the freezing method in mining engineering. Freezing method construction in other engineering fields may refer to it.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 29639 Guidelines for enterprises to develop emergency response plans for production safety accidents

GB/T 39963 Technical specification for C80 to C100 concrete applied to the shaft lining of vertical shafts sunk by the freezing method

GB 50016 Code for fire protection design of buildings

GB 50072 Code for design of cold store

GB 50148 Code for construction and acceptance of power transformers, oil-immersed reactors and mutual inductors in electric equipment installation engineering

GB 50169 Code for construction and acceptance of grounding connections in electric equipment installation engineering

GB 50171 Code for construction and acceptance of switchboards, cabinets and secondary circuit wiring in electric equipment installation engineering

GB 50204 Standard for acceptance of construction quality of concrete structures

GB 50213 Code for quality acceptance of shaft and roadway engineering in coal mines

GB 50231 General code for construction and acceptance of mechanical equipment