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NB

**ENERGY INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

NB/T 10391-2020

Replacing DL/T 5195-2004

Code for design of hydraulic tunnel

水工隧洞设计规范

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Foreword

This document was issued on 23 October 2020 by the National Energy Administration of the PRC and takes effect on 1 February 2021.

It is a NB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 27.140, Chinese classification P 59.

It replaces DL/T 5195-2004, which is superseded.

This code has been revised by the drafting group in accordance with the requirements of the Notice of the National Energy Administration on Issuing the Second Batch of Plans for Formulation and Revision of Industry Standards in the Energy Field in 2014 (Guo Neng Ke Ji [2015] No. 12), on the basis of extensive investigation and research, careful

summarization of practical experience and wide solicitation of opinions.

The main technical contents of this code are: general provisions, terms, basic requirements, tunnel layout, shape and size of cross section, hydraulic design, unlined tunnel and anchor-shotcrete tunnel, basic principles for structural design, concrete and reinforced concrete lining, prestressed concrete lining, high pressure bifurcation tunnel with reinforced concrete lining, design for machine bored tunnel, design for special rock mass and poor geological tunnel, plugging body design, grouting and seepage control and drainage, safety monitoring, and operation and maintenance.

The main technical contents revised in this code are as follows.

Added the design of high pressure reinforced concrete lining tunnels, the design of machine bored tunnels, and the design of tunnel sections in special rock masses and poor geological conditions.

Added the technical requirements related to water filling and emptying of power generation tunnels.

Added the contents on discharge capacity, aerated water depth, external water pressure, and stress calculation of circular tunnel lining bearing uniform external water load.

Added design situations such as the tunnel construction period, the maintenance period and the operation period of the discharge tunnel, and added the action of backfill grouting pressure together with its partial factor.

Added the seepage stability requirements for the design of the plugging body.

Revised the relevant contents concerning the layout and the hydraulic design of high flow velocity hydraulic tunnels.

Revised the expression for the stability calculation of surrounding rock blocks, changing the partial factor expression into a safety factor expression.

Deleted from the original code Appendix A engineering geological classification of surrounding rock, Appendix B materials, Appendix F types and parameters of anchor-shotcrete support, and Appendix I calculation of circular free-flow tunnel lining and non-circular tunnel lining; the contents of Appendix D and Appendix E of the original code have been incorporated into the body text.

Integrated the contents of Appendix J of the original code, concrete lining cracks and measures for their prevention, into the relevant provisions.

This code is under the administration of the National Energy Administration; it is proposed by and under the routine administration of the China Renewable Energy Engineering Institute, and the specific technical contents are interpreted by the Energy Industry Standardization Technical Committee for Hydropower Survey and Design. Comments and suggestions arising in the course of implementation should be sent to the China Renewable

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Structure of the code

Chapter 4 Tunnel Layout, beginning on page 6, is organized in three sections: 4.1 Tunnel Line Selection, 4.2 Tunnel Inlet and Outlet Layout, and 4.3 Multipurpose Tunnel.

Chapter 5 Shape and Size of Cross Section, beginning on page 12, is organized in three sections: 5.1 General Requirements, 5.2 Cross Section Shape, and 5.3 Cross Section Size.

Chapter 6 Hydraulic Design, beginning on page 15, is organized in two sections: 6.1 Principles for Hydraulic Calculation, and 6.2 Design of Cavitation Erosion Control for Water Boundary with High Flow.

Chapter 7 Unlined Tunnel and Anchor-Shotcrete Tunnel, beginning on page 19, is organized in five sections: 7.1 General Requirements, 7.2 Shotcrete Support, 7.3 Anchor Bolt Support, 7.4 Anchor-Shotcrete Support with Mesh, and 7.5 Combined Support.

Chapter 8 Basic Principles for Structural Design occupies page 25 and is presented without subdivision into sections.

Chapter 9 Concrete and Reinforced Concrete Lining, beginning on page 26, is organized in four sections: 9.1 General Requirements, 9.2 Action and Combination of Action Effects, 9.3 Lining Calculation, and 9.4 Lining Joint.

Chapter 10 Prestressed Concrete Lining, beginning on page 32, is organized in three sections: 10.1 General Requirements, 10.2 Grouting-Type Prestressed Concrete Lining, and 10.3 Circular Anchored Prestressed Concrete Lining.

Chapter 11 High Pressure Bifurcation Tunnel with Reinforced Concrete Lining begins on