ICS 27.100
P 60
Record No. J181—2002

DL

Electric Power Industry Standard of the People's Republic of China

P DL / T 5159 — 2002

Technical Code for Geophysical Exploration Electric Power Engineering

Issue Date: April 27, 2002 Implementation Date: September 1, 2002

Issued by the State Economic and Trade Commission of the People's Republic of China

Electric Power Industry Standard of the People's Republic of China

P DL / T 5159 — 2002

Technical Code for Geophysical Exploration Electric Power Engineering

Translation sponsored by: China Electric Power Planning & Engineering Association

Translated by: SUNTHER Consulting Co., Ltd.

Reviewed by: Northwest Electric Power Design Institute

CHINA ELECTRIC POWER PRESS

BEIJING, 2013

图书在版编目（CIP）数据

DL/T 5159—2002 电力工程物探技术规程=Technical code for geophysical exploration electric power engineering：英文 / 中华人民共和国国家经济贸易委员会发布. —北京：中国电力出版社，2013.5

ISBN 978-7-5123-4548-5

Ⅰ. ①D… Ⅱ. ①中… Ⅲ. ①电力工程–地下物探–技术操作规程–中国–英文 Ⅳ. ①TM7–65

中国版本图书馆 CIP 数据核字（2013）第 121005 号

中国电力出版社出版

（北京市东城区北京站西街 19 号 100005 http://www.cepp.sgcc.com.cn）

北京博图彩色印刷有限公司印刷

*

2013 年 5 月第一版 2013 年 5 月北京第一次印刷

850 毫米×1168 毫米 32 开本 9 印张 226 千字

Contents

Foreword

The code is a revision required by Item 69 of the *Notice on Confirmation of Development & Revision Plan of Electric Power Industry Standards in 1999* issued by the department of electric power of the State Economic and Trade Commission (DL〔2000〕22), and revised by the Northwest Electric Power Design Institute based on SDGJ 81—88 *Technical Code for Geophysical Exploration Electric Power Engineering (Trial)*.

In the course of revision, the drafters have done a lot of sorious work in investigation and data collection, asked for comments from various power design institutes across China, summarized the implementation of SDGJ 81—88 *Technical Code for Geophysical Exploration Electric Power Engineering (Trial),* and absorbed advanced technologies and successful experience from peer industries. Some parts of the original code have been emendated with emerging technologies and methods in the past decade. The original SDGJ 81—88 *Technical Code for Geophysical Exploration Electric Power Engineering (Trial)* will be abolished since the date this code is issued.

The emendatory contents are as follows:

1 The descriptions of electrical prospecting and well logging stay roughly unchanged; the original Chapter 1 to Chapter 7 are renumbered as Chapter 3 to Chapter 9; where the shallow seismic reflection survey is introduced in seismic prospecting; the original Chapter 9 is renumbered as Chapter 10; the original Chapter 8 is renumbered as Chapter 13 with added sonic wave method test, single

hole wave velocity test, and Rayleigh wave method test; the original Chapter 10 is renumbered as Chapter 16.

2 The six new chapters are "Scope" (Chapter 1), "Normative References" (Chapter 2), "Radon Detection" (Chapter 11), "Technologies for Detection of Underground Pipelines and Cables" (Chapter 12), "Low Strain Method" (Chapter 14), and "High Strain Method" (Chapter 15).

Appendices A, B, C, and D to this code are normative, while Appendices E and F are informative.

This code is proposed and managed by the Electric Power Planning & Engineering Institute and administered by China Electric Power Planning & Engineering Association.

Chief development Orgauization Northwest Electric Power Design Institute.

Chief drafting staff: Zhang Xumeng, Hou Shougui, Liu Houjian, and Zhu Songmo.

This code is interpreted by Northwest Electric Power Design Institute.

This code is translated by SUNTHER Translation & Solutions under the authority of China Electric Power Planning & Engineering Association.

1 Scope

This code specifies the technical methods, requirements, measurements, data analysis and interpretation methods for engineering geophysical exploration, and is applicable to newly built or expanded fossil fuel power plants, nuclear power plants, substations, overhead transmission lines, and planning of electric power systems. This code may be taken as a reference for other types of geophysical exploration activities.

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute the provisions of this code. For dated references, subsequent amendments (excluding the contents of errata) to, or revision of, any of these publications do not apply. However, parties to agreements based on this code are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative documents apply.

GB/T 50269—1997 *Code for Measurement Method of Dynamic Properties of Subsoil*

DL 5001—1991 *Technical Code for Engineering Survey of Fossil Fuel Power Plants*

DL 5010—1992 *Code for Engineering Geophysical Exploration Hydropower and Water Resources*

DL/T 5156.5—2002 *Electric Power Engineering Surveying Drawings Part 5: Geophysical Prospecting*

CJJ 61—1994 *Technical Specification for Detecting and Surveying of Underground Pipelines and Cables in City*

JGJ/T 93—1995 *Specification for Low Strain Dynamic Testing of Piles*

JGJ 106—1997 *Specification for High Strain Dynamic Testing of Piles*

JGJ 944—1994 *Technical Code for Building Pile Foundation*

3 General Provisions

3.0.1 The geophysical exploration used in hydrogeological and geotechnical investigation for electric power construction purposes is collectively called electric power engineering geophysical exploration (hereinafter referred to as geophysical exploration). Nowadays commonly used methods include electrical method, seismic method, well logging method, rock-soil in-situ test, non destructive testing of piles, underground pipelines and cables detection technology, radon detection technology, sonic test technology, and Rayleigh wave test technology.

3.0.2 Geophysical exploration is an important means of geological exploration, ground treatment, and quality examination. Its proper use in conjunction with electric power surveying and design characteristics may help improve the surveying quality, shorten the time, and reduce the cost.

3.0.3 Geophysical exploration must be carried out in close conjunction with geological survey. Attention is drawn to tests and determination of various physical parameters of rock and soil, which shall be utilized in an extensive manner to overcome the limitations of a single method in conditional use and multiple interpretations, and obtain correct conclusions.

3.0.4 New geophysical exploration technologies shall be actively used and promoted. Attention is to be given to the verification of geophysical exploration results and the return visit for geologic effects.

3.0.5 In electric power engineering, the geophysical exploration work processes are generally as follows: acceptance of task; data collection; reconnaissance survey; plan preparation; method testing; field work; data organization; submission of results. The above processes may be streamlined under special circumstances.

4 Basic Conditions for the Application of Geophysical Exploration

4.0.1 The exploration objects shall show obvious difference in physical properties (electric property, resilience, density, and radio activity) from the media surrounding them.

4.0.2 The thickness, width, and diameter of exploration objects shall be large enough in comparison with their buried depth.

4.0.3 The physical anomaly of exploration objects can be distinguished from the interfering background.

4.0.4 The topographic influence shall not affect field work and data interpretation, or it can be corrected by available means.

4.0.5 The effectiveness of geophysical exploration is determined by to what extent can it meet 4.0.1. In practice, the geophysical exploration methods shall be determined based on the following requirements as the topography, landform and geological conditions are complex and variable:

1 Select proper methods through investigation and test.

2 Use the known geophysical characteristics for comprehensive study through various methods.

3 Apply exploration means to verify the nature of anomaly; make further judgment in conjunction with the actual geological conditions.

5 Acceptance of Geophysical Exploration Task and Preparation of Work Plan Outline

5.0.1 Geophysical exploration task assignments are generally issued by competent authorities. The main contents of an assignment include:

1 Project name, location, number, and scope;

2 Work task and technical requirements;

3 Required results and submission deadline;

4 An overview of the geographic and geology of the surveyed area;

5 An index of known geological data and topographic maps related to the assignment.

5.0.2 Before acceptance of an assignment, a reconnaissance survey shall be performed with geological surveyors. Method testing shall be conducted where necessary. If, after reconnaissance survey and method testing, it is concluded that the conditions for geophysical exploration are not available, a request for canceling or changing the assignment can be raised with reasons stated.

5.0.3 The work plan outline shall be prepared according to the assignment requirements and local actual situation by extensively collecting and analyzing the topography, landform, water system, meteorology, traffic, and geological data and known geophysical exploration data of the survey area and its neighboring areas.

5.0.4 The work plan outline shall include:

1 Geophysical exploration task, scope, deadline, and location

of the survey area.

2 Overview of the topography, landform, hydrogeology, engineering geology, and geophysical characteristics of the survey area.

3 Selected geophysical methods and selection basis, technical requirements, analysis of method effectiveness, and field work arrangement. These include the estimation of work amount, selection of survey line orientation, arrangement of survey grid, determination of electrode spacing, geophone interval, and source-receiver offset, selection of observation system, distribution of survey work amount, determination of parameter, and implementation steps of various methods.

4 Coordination with other disciplines (geology and surveying).

5 Instrument, material, and vehicle use schedule.

6 Labor organization and work schedule.

7 Survey results to be submitted.

8 Financial budget and budget estimation.

9 Topographic map of the survey area and work amount distribution of geophysical exploration.

6 Geophysical Exploration Tasks in Various Design Stages of Electric Power Engineering

6.1 Preliminary Feasibility Study Stage and Feasibility Study Stage

6.1.1 General Survey of Water Source

1 Investigate the thickness of overburden;

2 Look for latent landforms and lithological boundaries;

3 Understand the karst development in limestone area and look for karst development zone;

4 Investigate the buried depth and thickness of main aquifers;

5 Determine the location and width of fault fracture zone and water filled fissure zone;

6 Look for the location of paleochannel and buried alluvial-proluvial fan;

7 Trace the underground river;

8 Divide water-enriched zone and poor water district as well as the water storage capacity;

9 Mark off salt water and fresh water boundary in coastal region.

6.1.2 Geological Survey of Plant (Station) Site

1 Understand the location, width and attitude of fracture zone which is at or close to the plant (station) site and affects site stability, where a site stability analysis is required;

2 Understand the range and surface of sliding mass which may endanger the plant (station) site;

3 Observe slope stability.

6.1.3 Foundation Survey

1 Investigate the buried depth of site bedrock and its variation;.

2 Investigate the sandy gravel, clay, soft soil, and perennially frozen soil strata that are in the Quaternary System and have certain thickness;

3 Determine the liquefaction potential of saturated sand and silt;

4 Investigate the weathering thickness or crushing degree of bedrock foundation;

5 Investigate the distribution and development of karst cave and earth cave which are at the site and have influence on the foundation;

6 Investigate the lens and heterogeneous bodies which are of certain size in the overburden;

7 Measure the depth, thickness, and wave velocity of various strata through a borehole;

8 Obtain dynamic parameters of the foundation for analysis and calculation of the dynamic response of structures (buildings), such as longitudinal wave velocity, transverse wave velocity, dynamic elastic modulus, dynamic shear modulus, dynamic Poisson’s ratio, and predominant period.

6.2 Preliminary Design Stage

6.2.1 Use hydrogeological boreholes to:

1 Mark off the borehole columnar section and conduct stratigraphic correlation;

2 Determine the porosity, penetrability, moisture content of various strata and the number, depth, and thickness of main aquifers;