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To replace DL/T 5076 — 1997 and DL/T 5146 — 2001

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# **Technical Code of Exploration and Surveying for 220kV and Lower Level Overhead Transmission Line**

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# **Technical Code of Exploration and Surveying for 220kV and Lower Level Overhead Transmission Line**

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## Foreword

This code is prepared as arranged by the *Notice on Printing and Distributing Industrial Standards Project Plan of the Year 2004* (FGBGY (2004) No.872) issued by the General Office of the National Development and Reform Commission.

This code is an integration of and revision to DL/T 5146—2001 *Technical Code for the Surveying of 35 kV–220 kV Overhead Transmission Lines* and DL/T 5076—1997 *Technical Specifications for Hydrological Exploration of 220 kV Overhead Transmission Lines*. In addition, some provisions of the above standards are amended and some new provisions are supplemented based on the current development of the electric power technology in recent years and with reference to DLGJ 103—1991 *Technical Specifications for Geological Exploration of 220 kV Overhead Transmission Lines*.

As compared with the previous standards, the major modifications are as follows:

- To keep abreast with development of the electric power industry technology, the inapplicable provisions of the previous standards are revised and some contents related to the application of new technologies and methods are added.
- The standards of DL/T 5146—2001 and DL/T 5076—1997 are integrated, unifying the relevant technical requirements.
- The provisions that are of general nature for three work stages (i.e., feasibility study, preliminary design and construction drawings design) are centrally included in the General section. The contents that are respectively associated

with the three working stages involving three disciplines (geological exploration, survey and hydrological exploration) are integrated and organized into three work stages. The contents or methods that are common to the three work stages are organized into separate sections.

- The work contents involved in the feasibility study stage are added.

This code will supersede DL/T 5146—2001 and DL/T 5076—1997 after it is implemented.

Appendix A – Appendix U to this code are informative.

This code is proposed by the China Electricity Council.

This code is solely managed and interpreted by the Technical Committee on Electric Power Planning and Engineering of Standardization Administration of Power Industry.

This code is mainly drafted by the organizations including North East Electric Power Design Institute under China Power Engineering Consulting Group Corporation, Shanxi Electric Power Exploration and Design Institute and Shandong Electric Power Engineering Consulting Institute.

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The standards DL/T 5146—2001 and DL/T 5076—1997 superseded by this code were respectively issued on December 26, 2001 and September 26, 1997. This is the first revision of this code.

Any opinions and suggestions proposed during the implementation of this code are to be referred to the Standardization Center of China Electricity Council (at the following address: No.1, Ertiao, Baiguang Road, Beijing, 100761).

This code is translated by SUNTHER Consulting Co., Ltd. under the authority of China Electric Power Planning & Engineering Association.



# 1 Scope

This code specifies the basic technical requirements for exploration 220 kV and 110 kV overhead transmission lines engineering.

This code is applicable to the geotechnical engineering, survey and engineering hydrological exploration of 220 kV and 110 kV overhead transmission lines that are newly built and modified. The exploration of overhead transmission lines engineering at a voltage level below 110 kV may refer to the relevant requirements of this code according to the actual conditions.

## 2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments (excluding the contents of errata) to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard 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 20257.2 *Cartographic Symbols for National Fundamental Scale Maps—Part 2: Specifications for Cartographic Symbols 1:5000 & 1:10 000 Topographic Maps*

GB 50007 *Code for Design of Building Foundation*

GB 50011 *Code for Seismic Design of Buildings*

GB 50025 *Code for Building Construction in Collapsible Loess Regions*

GB 50324 *Code for Engineering Geological Investigation of Frozen Ground*

GB 50139 *Navigation Standard of Inland Waterway*

GB 50286 *Code for Design of Levee Project*

GBJ 112 *Technical Code for Buildings in Expansive Soil Zones*

DL/T 5001 *Technical Code for Engineering Survey of Fossil-fueled Power Plant*

DL/T 5092 *Technical Code for Designing 110 kV–500 kV Overhead Transmission Line*

DL/T 5156.1—5156.5 *Electric Power Engineering Exploration Drawings*

### 3 General Provisions

3.0.1 This code is developed to unify the technical standards for exploration of 220 kV and 110 kV overhead transmission lines for the purpose of ensuring technical progress, cost effectiveness, effective investment and high engineering quality.

3.0.2 In exploration of 220 kV and 110 kV overhead transmission lines, new technologies and methods capable of accelerating the project progress and improving the exploration quality shall be proactively promoted.

3.0.3 In addition to this code, the exploration of 220 kV and 110 kV overhead transmission lines shall further comply with related national and industrial standards currently in force.

3.0.4 The exploration of 220 kV and 110 kV overhead transmission lines shall keep pace with the design working stage. Generally, it is divided into three stages: feasibility study, preliminary design and construction drawings design.

## 4 Exploration in Feasibility Study Stage

### 4.1 General Requirements

4.1.1 The information regarding project planning should be obtained from the design department, including the start and end of the line project, voltage level, the regions that the lines will run through, project construction and the design work plans.

4.1.2 The work in this stage mainly involves data collection. Where necessary, field reconnaissance may be carried out.

### 4.2 Survey

4.2.1 The indoor routing scheme shall comply with the following provisions.

1 The surveyors shall cooperate with the designer to collect the 1:50 000 or 1:10 000 topographic maps of the areas along the lines. Where the information including satellite remote sensing images is available for use, the surveyor should cooperate with the designer to select the routing scheme with such information.

2 The surveyor shall understand the start and end point of the routing scheme selected indoors by the designer and the cities, towns and crowded areas close to the route and the major cross-over sections.

4.2.2 When selecting the routing scheme in the field, the surveyor shall cooperate with the designer to reconnoiter the regions on which relevant agreements are reached, the crowded areas, the large-span sections and major cross-over sections, and the areas with complicated

landform, geological, hydrological and meteorological conditions that influence the finalization of the routing scheme.

### **4.3 Geotechnical Engineering**

4.3.1 The work at this stage mainly involves data collection. The information regarding the landform characteristics, types, distribution and current exploitation conditions of the minerals, geotechnical characteristics and its distribution feature, and the distribution and burial conditions of ground water of the areas where the lines will run through as well as the unfavorable geologic conditions and their distribution range in the areas shall be preliminarily obtained.

4.3.2 The regions or sections which the proposed line route needs to bypass and the further study tasks at the next stage shall be proposed based on the information of the relevant areas in hand.

### **4.4 Engineering Hydrology**

4.4.1 In this stage, the surveyors shall carry out field reconnaissance for special line crossing sections and the routing sections with complicated hydrological conditions, collect the existing basic hydrologic information and the planning and engineering information of water conservancy and waterways and carry out feasibility analysis on the major sections affecting the routing scheme.

4.4.2 When selecting the line route through the use of satellite photos and aircapes, the hydrological remote sensing information shall be extracted from the satellite photos and aircapes before they are judged and interpreted.

4.4.3 In this stage, the surveyors shall collect the hydrological information of special crossing sections and the sections with complicated hydrological conditions, the engineering information of

water conservancy and waterway projects and the information regarding river basin planning, the conclusions or historical investigation information of the riverbed evolvement and seashore changes as well as the existing information in respect of investigation, exploration and study results.

4.4.4 The surveyors shall analyze the hydrological conditions of the proposed routes and the special crossing sections and assess the routing scheme from a hydrological point of view by means of data collection and field reconnaissance.

4.4.5 When selecting large crossing points in cooperation with the designer, the surveyors shall reconnoiter and preliminarily investigate the proposed crossing points and compare them from the hydrological conditions and suggest two or more feasible schemes.

## **4.5 Exploration Results**

4.5.1 The surveyors shall cooperate with the designer to finalize the line routing scheme map and submit the relevant survey achievements as required by the designer.

### **4.5.2 Geotechnical exploration report**

1 The surveyors shall systematically provide the regional geological data in hand and analyze and study it. Based on the analysis and study, they shall describe the factors that potentially affect the line routing within the range of the areas, preliminarily predict the degree to which these factors affect the line routing and propose the sections which the lines need to bypass. If it is undesirable to present definite conclusive results temporarily, the surveyors shall make suggestions for the study tasks in the next stage.

2 The surveyors shall provide the basic geotechnical engineering conditions and geotechnical parameters for the regions

where the line route will run through.

#### 4.5.3 Engineering hydrological report

1 The hydrological characteristics of the basin where the project site is located and the relevant planning for water conservancy and hydropower, flood control (tide control) and river regulation projects.

2 Description and preliminary analysis on the stable conditions of river banks or bottomlands (lakeshore, reservoir bank and seacoast) within the major crossing sections.

3 The highest flood (waterlogging and tidal) water level and the controlled water level for flood (waterlogging), the highest navigable water level of the navigable water and other relevant characteristic water levels for the major crossing scheme.

4 The current status of the navigable waters and planned class of waterways, the general conditions of shipping and the planning for waterway regulation project.

5 The various routing schemes shall be subject to feasibility analysis and hydrological evaluation from engineering hydrological conditions standpoint.

## 5 Exploration in Preliminary Design Stage

### 5.1 General Requirements

5.1.1 The exploration shall be conducted after the preliminary indoor routing is accomplished and the engineering department works out the exploration specifications, define the exploration tasks and establish the exploration program.

5.1.2 Before the exploration commences, the following information shall be obtained:

- 1 Line topographical map and line routing scheme map in scale of 1:10 000–1:50 000.

- 2 Requirements placed by engineering department on exploration of major crossings and complicated sections.

5.1.3 The work in this stage is dominated by data collection and field reconnaissance, which can be supplemented by small quantity of field exploration where necessary.

### 5.2 Survey

5.2.1 The indoor routing scheme shall comply with the provisions below:

- 1 The surveyors shall cooperate with the designer to collect the latest topographical maps in scale of 1:50 000 or 1:10 000 of the areas along the lines. Where the information including aerial photographs or satellite remote sensing images is available for use, the surveyors should cooperate with the designer to select the routing scheme with such information.



2 The surveyors shall cooperate with the designer to select the routing scheme indoors, understand the start and end point of the routing scheme, the landform, surface features and vegetation along the lines, the cities, towns and crowded areas close to the route, the major cross-over and the traffic conditions.

3 The surveyors shall collect the relevant information regarding level and elevation control on an as needed basis.

5.2.2 The field routing scheme shall comply with the provisions below:

1 The surveyors shall cooperate with the designer in comparing the routing schemes through field reconnaissance so as to select the routing scheme characterized by favorable cost effectiveness, easy construction and safe operation.

2 When selecting the routing scheme in the field in cooperation with the designer, the surveyors shall inspect the areas along the lines while reconnaissance the critical areas. Special emphasis shall be given to reconnoiter the regions on which relevant agreements are reached, the crowded areas, the large-span sections, major cross-over sections and the areas with complicated landform, geological, hydrological and meteorological conditions that influence the finalization of the routing scheme. Where necessary, these sections shall be actually measured with apparatus and instruments.

3 Any non-conformance of surface features (such as buildings, roads, industrial and mining areas, military installations) and landform affecting the routing scheme with those shown in the maps as found by the surveyors shall necessitate supplemental annotation, modification and supplemental survey. The surveyors shall cooperate with the designer in finalizing the routing scheme map.

4 Where large crossings, large spans or major cross-over