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Supersede SDJ 206 — 1987

**Code for Designing Over-head
Distribution Transmission
Line up to 10kV**

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Foreword

The code is revised from SDJ 206—1987 *Code for Designing Overhead Distribution Line* issued by the former Ministry of Water Conservancy and Electric Power in January 1987, according to the *Notice concerning Release of the Development & Revision Plan of Electric Power Industry Standard* in 2000 (GJMDL [2000] No.70) issued by the former State Economic and Trade Commission.

As compared with the original version, the following major revisions are made in this code:

(1) The code is specific to the design of overhead electric power lines at 10kV and below so as to meet the power supply demand in urban and rural areas.

(2) To meet the growing requirements on reliability of power supply and energy quality in urban network, since 1990, insulated overhead conductors have been gradually applied for distribution lines in large-and middle-sized cities in China. Therefore, the information regarding the design of insulated overhead conductors at 10kV and below is supplemented in this revision.

(3) Supplemental contents on line crossing has been included in the revision. Additionally, typical meteorological regions are incorporated herein.

(4) The sections and articles in the original code that are not applicable to the current production requirements are either deleted or modified.

This code upon its issuance will supersede SDJ 206—1987.

Appendix A, Appendix B, Appendix C and Appendix D to this

code are normative.

This code is proposed by China Electricity Council.

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

This code is drafted by Tianjin Electric Power Design Institute.

The participants in the development of this code also include Beijing Power Supply Design Institute, Wuhan Power Supply Design Institute and Nanjing Electric Power Design and Research Institute.

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1 Scope

1.0.1 This code specifies the design principles for the AC overhead distribution line at 10kV and below (hereinafter referred to as “distribution line/lines”).

1.0.2 This code is applicable to the design of AC overhead distribution lines at 10kV and below.

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 thereof applies to this code.

GB/T 1179 *Round Wire Concentric Lay Overhead Electrical Stranded Conductors*

GB 12527 *Aerial Insulated Cables for Rated Voltages up to and Including 1kV*

GB 14049 *Aerial Insulated Cables for Rated Voltage of 10kV and 35kV*

GB/T 16434 *Environmental Pollution Classification and External Insulation Selection for High Voltage Transmission Line, Power Plant and Substation*

GB 50060 *Code for Design of High Voltage Electrical Installation (3kV–110kV)*

GB 50061 *Code for Design of 66kV or Below Overhead Electrical Power Transmission Line*

DL/T 765.1 *Technical Requirements for Distribution Fittings*

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

Overhead Transmission Line

DL/T 5130 *Technical Regulation for Design of Steel
Transmission Pole*

JTJ 001 *Technical Standard of Highway Engineering*

3 Terms and Symbols

3.1 Terms

3.1.1

Everyday Tension

The calculated tension at the lowest point of the sag of conductors at the annual average temperature.

3.1.2

Reinforced Concrete Pole

A general name for common reinforced concrete poles, partially pre-stressed concrete poles and pre-stressed reinforced concrete poles.

3.1.3

Residential Area

Densely populated areas such as urban areas, industrial areas, ports, wharfs and bus and railway stations.

3.1.4

Nonresidential Area

Areas other than the residential area defined above. Nonresidential areas also include the areas with frequent access of people, vehicles or agricultural machinery, but having few or even none of houses.

3.1.5

Difficult Transport Area

Areas not accessible for vehicles and agricultural machinery.

3.1.6

Large Span

A span within tension sections of a distribution line crossing

wide navigable rivers, lakes or valleys, which exceeds the normal range, and, thus requires the special design of conductor type and structure and is extremely difficult to repair in the event of faults.

3.2 Symbols

W_x —characteristic value of conductor wind load, kN;

W_0 —characteristic value of reference wind pressure, kN/m²;

μ_s —shape coefficient of wind load;

μ_z —coefficient of wind pressure change as a function of elevation;

β —wind fluttering factor;

a —span factor of wind load;

L_w —wind span, m.

4 General

4.0.1 The design of distribution lines must be in compliance with the national construction strategy and technical and economic policies and be safe, reliable, economic and applicable.

4.0.2 The design of distribution lines must be based on the practical conditions with due consideration of regional characteristics. New materials, processes, technologies and equipment shall be actively and prudently employed.

4.0.3 The conductor layout and tower structure of trunk distribution lines shall be designed to allow for live line work.

4.0.4 Large spans of distribution lines shall be designed according to DL/T 5092.

4.0.5 In addition to this code, relevant provisions of current national standards and electric power industry standards shall also be observed during the design of distribution lines.

5 Routing

5.0.1 In selecting the route of distribution lines, careful investigations and studies are required taking into account factors such as operation, construction, traffic conditions and length of route in a comprehensive and systematic manner so as to ensure the safety, applicability and cost effectiveness.

5.0.2 The distribution lines shall be routed to accommodate the overall planning of urban area and be harmonious with the layout of various pipelines and other utilities. The structures shall be located to match the landscape of urban areas.

5.0.3 The line routing and structure locations shall be kept clear of low-laying lands, areas vulnerable to frequent scouring and other areas where the safe operation of lines is affected.

5.0.4 The distribution lines in rural areas shall be routed in harmony with roads, rivers and irrigation channels to minimize and avoid the occupation of arable land.

5.0.5 Distribution lines shall be kept clear of warehouse areas for flammables and explosives. It shall be ensured that a fire separation distance equal to 1.5 times the structure height is provided between distribution lines and the manufacturing factories and warehouses with fire risks, stockyards for flammable and explosive materials and tanks for flammable and explosive liquid or gas.

6 Meteorological Conditions

6.0.1 The meteorological conditions as a basis for designing distribution lines shall be determined according to the meteorological information of local areas and the operating experiences from the existing lines nearby. If the meteorological conditions of local area are similar to those as specified for typical meteorological area in Appendix A, the data for the latter should be used.

6.0.2 The maximum design wind velocity of distribution lines shall be the mean maximum wind velocity in 10 minutes at 10-year recurrence period at 10 m height above the ground. If no reliable data is available, the selected maximum design wind velocity shall not be less than 25m/s in flat and open areas, and should be 1.1 times the wind velocity of nearby flat areas and shall not be less than 25m/s in mountainous regions.

6.0.3 For distribution lines running through urban areas or forests, the maximum design wind velocity should be 20% lower than that of the local area if the shields at either side of the lines have an average height larger than 2/3 of the structure.

6.0.4 For distribution lines routed around high-rise buildings in cities, the wind velocity designed for windward areas shall be appropriately increased with respect to other areas. Where no reliable data is available, it shall be 20% higher than that of the flat land nearby.

6.0.5 The annual average temperature for designing distribution lines shall be determined by using the following methods:

- (1) Where the annual average temperature is between 3°C and

17°C, the multiple of five closest to the actual annual average temperature shall be taken.

(2) Where the actual annual average temperature is lower than 3°C or higher than 17°C, the multiple of 5 closest to the value obtained by subtracting a value in the range of 3°C to 5°C from the actual annual average temperature shall be taken.

6.0.6 The design icing thickness of conductors of distribution lines shall be determined based on the operating experience of the existing lines nearby and should be the multiples of 5mm.

7 Conductors

7.0.1 Distribution lines shall employ stranded conductors whose technical performance shall comply with the requirements of GB/T 1179, GB 14049 and GB 12527.

7.0.2 Aluminum conductor Steel-reinforced (ACSR) and other composite conductors shall be calculated according to the maximum operating tension or everyday tension.

7.0.3 Where wind direction is perpendicular to lines, the characteristic value of conductor wind load shall be calculated from:

$$W_X = \alpha \mu_s d L_w W_0 \quad (7.0.3)$$

Where:

W_X —the characteristic value of conductor wind load, kN;

α —the span factor of wind load as per Article 10.0.7 of this code;

μ_s —the shape factor of wind load, which is 1.2 if $d < 17\text{mm}$,
1.1 if $d \geq 17\text{mm}$ and 1.2 if there occurs icing;

d —the calculated outside diameter of conductors when coated with ice, m;

L_w —the wind span, m;

W_0 —the characteristic value of reference wind pressure, kN/m^2 .

7.0.4 In urban areas, overhead insulated conductors shall be used for distribution lines erected in the following areas:

- 1 Areas where the line corridors are confined;
- 2 Areas neighboring high-rise buildings;
- 3 Bustling streets or densely-populated regions;
- 4 Tourism or green areas;

- 5 Areas where ambient air is heavily polluted;
- 6 Building construction sites.

7.0.5 The design safety coefficient of conductors shall not be lower than the values listed in Table 7.0.5 below:

Table 7.0.5 Minimum Design Safety Coefficient of Conductors

Type of Insulated Conductors	Ordinary Areas	Important Areas
Aluminum stranded conductors, aluminum conductor steel-reinforced (ACSR), aluminum alloy conductors	2.5	3.0
Copper stranded conductors	2.0	2.5

7.0.6 The cross-sectional area of conductors of distribution lines shall be determined according to the following provisions:

1 Three or four types of conductors should be used for each area, taking into account the development planning of local power distribution network. The cross-sectional area of conductors should not be less than the values given in Table 7.0.6 for the areas without such planning.

Table 7.0.6 Cross-sectional Area of Conductors mm²

Type of Conductors	Distribution Lines at 1kV–10kV			Distribution Lines below 1 kV		
	Main Trunks	Sub-trunks	Branches	Main Trunks	Sub-trunks	Branches
Aluminum stranded conductors and aluminum alloy conductors	120 (125)	70 (63)	50 (40)	95 (100)	70 (63)	50 (40)
Aluminum conductor steel-reinforced	120 (125)	70 (63)	50 (40)	95 (100)	70 (63)	50 (40)
Copper stranded conductors	—	—	16	50	35	16

Table 7.0.6 (continued)

Type of Conductors	Distribution Lines at 1kV–10kV			Distribution Lines below 1 kV		
	Main Trunks	Sub- trunks	Branches	Main Trunks	Sub- trunks	Branches
Insulated aluminum stranded conductors	150	95	50	95	70	50
Insulated copper stranded conductors	—	—	—	70	50	35
Note: The values in brackets are applicable for round concentric-lay stranded conductors (refer to GB/T 1179).						

2 Checking in terms of permissible voltage drop:

- 1) For distribution lines at 1kV–10kV, the maximum voltage drop from the outlet of the secondary side of the feeding substation to the inlet of the primary side of the transformer or receiving substation at the terminal end of the line shall be 5% of the rated voltage at the secondary side of the feeding substation.
- 2) For distribution lines below 1kV, the permissible voltage drop from the outlet of the secondary side of distribution transformer to the terminal end of the line (excluding service mains) shall be 4% of the rated voltage.

7.0.7 When checking the ampacity of conductors, the permissible temperature of bare conductors, poly-ethylene (PE) insulated conductors and poly-vinyl chloride (PVC) insulated conductors shall be +70°C, while that of cross-linked polyethylene (XLPE) insulated conductors shall be +90°C.

7.0.8 In a three-phase four-wire system below 1kV, the cross-sectional area of the neutral line shall be the same as that of the phase lines.

7.0.9 The connection of conductors shall be made in accordance with the following provisions:

1 The connection of conductors of dissimilar metallic materials, sizes or stranding directions within a span is prohibited.

2 There shall be no more than one connection per conductor within one span.

3 The distance between the connection and the attachment point of the conductor within a span shall not be less than 0.5m.

4 The connection of aluminum conductor steel-reinforced (ACSR) or aluminum stranded conductors within a span should be made by means of mechanical clamping.

5 The connection of copper stranded conductors in a span should be made by means of plugging or mechanical clamping.

6 The jumper connection between copper stranded conductor and aluminum stranded conductor should be made with Cu-Al transition clamps and Cu-Al transition wires.

7 The jumper connection between copper stranded conductor and aluminum stranded conductor should be made with clamps and by means of clamping.

7.0.10 The resistance at the conductor connection shall not be higher than that of conductors of equal length. The mechanical strength of the connection within a span shall not be less than 95% of calculated tensile strength of conductors.

7.0.11 The sag of conductors shall be determined through calculation. The effects of creep resulting from conductor erection on the sag should be compensated through reducing the sag by a percentage as follows:

1 20% for aluminum stranded conductors and aluminum cored insulated conductors;

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- 2 12% for aluminum conductor steel-reinforced;
- 3 7%–8% for copper stranded conductors and copper cored insulated wires.

7.0.12 The aluminum stranded conductors and aluminum conductor steel-reinforced of distribution lines shall be wrapped with aluminum armor tapes at locations where they come into contact with insulators and fittings.

8 Insulators and Fittings

8.0.1 The performance of insulators in distribution lines shall be as specified in the current national standards with respect to insulators used on various structures, and shall satisfy the following provisions:

- 1 For distribution lines at 1kV–10kV:
 - 1) Pin insulators or porcelain cross-arms shall be used for suspension structures.
 - 2) Insulator strings consisting of two suspension insulators or consisting of one suspension insulator and one butterfly insulator should be employed for tension structures.
 - 3) Organic composite insulators may be used based on the local operating experience.
- 2 For distribution lines below 1kV:
 - 1) LV pin insulators should be used for suspension structures.
 - 2) A suspension insulator or butterfly insulator shall be used for tension structures.

8.0.2 In air-polluted areas, the electrical porcelain external insulation of distribution lines shall consider an appropriate creepage distance and the use of other anti-pollution measures based on the local operating experience and the local external insulation pollution classes. In case of absence of operating experience, the values in Appendix B shall be observed.

8.0.3 The mechanical strength of insulators and fittings shall be checked with the following Equation (8.0.3):

$$KF < F_u \quad (8.0.3)$$

Where:

K —safety coefficient of mechanical strength, which may be selected from Table 8.0.4;

F —design load, kN;

F_u —electromechanical failing load of suspension insulators, bending failing load of pin insulators and porcelain cross-arm insulators, or the failing load of butterfly insulators and fittings, kN.

8.0.4 The installation of insulators and fittings should be designed by using safety coefficient design method. The safety coefficient of the mechanical strength of insulators and fittings shall be as specified in Table 8.0.4:

Table 8.0.4 Safety Coefficient of Mechanical Strength of Insulators and Fittings

Type	Safety Coefficient	
	Operating Condition	Line-breakage Condition
Suspension insulators	2.7	1.8
Pin insulators	2.5	1.5
Butterfly insulators	2.5	1.5
Porcelain cross-arm insulators	3	2
Organic composite insulators	3	2
Fittings	2.5	1.5

8.0.5 The steel fittings used in distribution lines shall be hot dip galvanized in accordance with the technical requirements of DL/T 765.1.

9 Conductor Configuration

9.0.1 The conductors of distribution lines at 1kV–10kV shall be in vertical, horizontal or triangular configuration. The conductors of distribution lines below 1kV should be arranged horizontally. Distribution lines at 1kV–10kV and below 1kV in suburban areas should be erected on the same structure, clearly marked and shall connect from the same power source.

9.0.2 The conductors of distribution lines below 1kV in the same area shall be arranged on structures in a consistent manner. The neutral line shall be located close to structures or the building. The neutral line in the same circuit shall not be erected higher than live lines.

9.0.3 The street light power lines below 1kV shall not be located at an elevation above other live lines and neutral line on the same structure.

9.0.4 The span of distribution lines should be as shown in Table 9.0.4. The length of a tension section shall not be larger than 1km.

Table 9.0.4 Span of Distribution Lines m

Voltage Areas	1kV–10kV	Below 1kV
	Suburban areas	40-50
Open areas	60-100	40-60

Note: When insulated bundled conductors are used for lines below 1kV, the span should not be larger than 30m.

9.0.5 The distribution lines below 1kV erected along buildings and structures shall employ insulated conductors and the interval between adjacent attachment points of conductors should not be more than 15m.

9.0.6 The spacing between conductors of distribution lines shall be determined based on the local operating experience. If no reliable data is available, the spacing between conductors shall not be less than the values listed in Table 9.0.6.

**Table 9.0.6 Minimum Spacing of Conductors
of Distribution Lines** m

Span Line Voltage	40 and below	50	60	70	80	90	100
1kV–10kV	0.6 (0.4)	0.65 (0.5)	0.7	0.75	0.85	0.9	1.0
Below 1kV	0.3 (0.3)	0.4 (0.4)	0.45	—	—	—	—
Note: The values in brackets are applicable for insulated conductors. As for distribution lines below 1kV, the horizontal distance between the two conductors which are located at the opposite sides of the structure and closest to it shall not be less than 0.5m.							

9.0.7 For double-circuit lines at the same voltage level erected on the same structure, or lines at 1kV–10kV and below 1kV erected on

the same structure, the vertical distance between cross-arms shall not be less than the values listed in Table 9.0.7.

**Table 9.0.7 Minimum Vertical Distance between Cross-arms
of Lines Erected on the Same Structure** m

Line Voltage \ Type of Structures	Suspension Structures	Sub-supports and Angle Structures
10kV lines and 10kV lines	0.80	0.45/0.60 (see note)
Lines at 10kV and below 1kV	1.20	1.00
Lines below 1kV and lines below 1kV	0.60	0.30
<p>Note: For branch lines on single-circuit branching towers, the distance between the cross-arm of branch lines and that of trunk lines is 0.6m; if the branch lines are on double-circuit branching towers, the cross-arm of branch lines is 0.45m apart from the upper cross-arm of trunk lines and 0.6m from the lower cross-arm of trunk lines.</p>		

9.0.8 For double-circuit insulated lines at the same voltage level that are erected on the same structure, or insulated lines at 1kV–10kV and those below 1kV erected on the same structure, the vertical distance between cross-arms shall not be less than the values listed in Table 9.0.8.

**Table 9.0.8 Minimum Vertical Distance between Cross-arms
of Lines Erected on the Same Structure** m

Line Voltage \ Type of Structures	Suspension Structures	Sub-supports and Angle Structures
10kV lines and 10kV lines	0.5	0.5
Lines at 10kV and below 1kV	1.0	—
Lines below 1kV and lines below 1kV	0.3	0.3

9.0.9 When distribution lines at 1kV–10kV and lines at 35kV are erected on the same structure, the vertical distance between conductors of the two classes of distribution lines shall not be less than 2.0m. When distribution lines at 1kV–10kV and 66kV lines are erected on the same structure, the vertical distance between conductors of the two classes of lines should not be less than 3.5m; and when insulated conductors are employed for distribution lines at 1kV–10kV, the said vertical distance shall not be less than 3.0m.

9.0.10 For distribution lines at 1kV–10kV, the cross-sectional areas of the conductors erected on the same cross-arm should not differ by more than three levels.

9.0.11 The clearance from the jumping lines, downloads on one phase to the jumping lines, downloads of the adjacent phases, and the clearance from the jumping lines, downloads of one phase to the conductors of the adjacent phases shall not be less than:

- 1 0.3m for lines at 1kV–10kV;
- 2 0.15m for lines below 1kV;
- 3 The distance from the downleads of lines at 1kV–10kV to the conductors of distribution lines below 1kV shall not be less than 0.2m.

9.0.12 The clearance between the individual conductors and guys, poles or structures shall not be less than:

- 1 0.2m for lines at 1kV–10kV;
- 2 0.1m for lines below 1kV.

10 Structures, Guys and Foundations

10.0.1 Load design values shall be used to calculate the bearing capacity (strength and stability) of the structural members and connections thereof on towers. Load characteristic values shall be used to calculate deformation, anti-cracking, cracking and stability of ground bases and foundations.

10.0.2 The design expressions of bearing capacity of tower structural members under limit condition shall be as given in GB 50061. Also, the design expressions used to calculate deformation, cracks and anti-cracking of tower structural members under limit condition during normal service shall be as given in GB 50061 as well.

Both design values and characteristic values of the strength of profiled steel, concrete and steel bars shall be determined in accordance with GB 50061.

10.0.3 The loads on various types of structures shall be calculated based on the following conditions:

- 1 Maximum wind velocity, without ice and line breakage;
- 2 Ice coating, corresponding wind velocity and without line breakage;
- 3 Minimum ambient temperature, without ice, wind and line breakage (applicable to both angle and terminal structures).

10.0.4 Wind loads applied on various types of structures and conductors shall be calculated based on the following three wind directions:

- 1 Wind direction is perpendicular to the direction of lines (or,

in case of angle structures, perpendicular to the direction of angular bisector);

2 The angle between the wind direction and the line direction is 60° or 45° ;

3 Wind direction is along the line.

10.0.5 With various included angles between the wind direction and line direction, the components of wind loads applied on towers and conductors both perpendicular to and along line direction shall comply with the requirements set forth in GB 50061.

10.0.6 The wind vibration coefficient β shall be determined to be 1.0 in case of a structure height below 30m.

10.0.7 The wind load span coefficient α shall be determined as follows:

- 1 $\alpha = 1.0$ at a wind velocity below 20m/s;
- 2 $\alpha = 0.85$ at a wind velocity of 20m/s-29m/s;
- 3 $\alpha = 0.75$ at a wind velocity of 30m/s-34m/s;
- 4 $\alpha = 0.7$ at a wind velocity of 35m/s and above.

10.0.8 Proven products shall be used for reinforced concrete poles for routing the distribution lines. Construction of structures shall comply with the requirements set forth in currently applicable national standards.

10.0.9 The cross-arms of distribution lines shall be calculated in terms of strength based on the forces applied thereon and shall be selected to have standard specifications. Steel cross-arms, if used, shall have a size of no less than $\angle 63\text{mm} \times \angle 63\text{mm} \times 6\text{mm}$. Steel cross-arms and the accessories shall be hot dip galvanized.

10.0.10 Guys shall be erected based on the forces applied on structures. The included angle between the guys and structures should be 45° . This angle may be reduced appropriately if there are

topographic constraints, but shall never be less than 30°.

10.0.11 Where horizontal guys cross over roads, the vertical distance from them to the road curb shall not be less than 6m. The inclination angle of guyed poles should be 10°–20°. Where horizontal guys cross over tram lines, the vertical distance from them to the road surface shall not be less than 9m.

10.0.12 The guys shall be made of galvanized stranded steel wires. The cross-sectional area thereof shall be determined based on the forces applied thereon and shall not be less than 25mm².

10.0.13 In open areas, if more than ten suspension poles used for distribution lines are continuously erected, they should be provided with wind resistant guys.

10.0.14 Where reinforced concrete poles are provided with guy insulators, in the event that a guy breaks, the vertical distance from the insulators to ground shall not be less than 2.5m and the guys near the ground shall be provided with protective sleeves.

10.0.15 The diameter of anchor rods shall be determined through calculation and shall not be less than 16mm. Guy rods shall be hot dip galvanized. The guy rods in corrosive areas shall have their diameter increased by 2mm-4mm or provided with other effective corrosion protection measures.

10.0.16 The structure foundations shall be designed based on the local operation experiences, sources of the materials thereof and geological conditions.

10.0.17 The buried depth of the structure shall be determined through calculations. The buried depth of the structures for single-circuit distribution lines should be as shown in Table 10.0.17.

**Table 10.0.17 Buried Depth of the Structures for
Single-circuit Distribution Lines** m

Structure height	8.0	9.0	10.0	12.0	13.0	15.0
Buried depth	1.5	1.6	1.7	1.9	2.0	2.3

10.0.18 Compressive stress applied on underside of the structure foundation as well as uplift and overturning stability of the foundation of multiple-circuit distribution lines shall be checked in accordance with GB 50061.

10.0.19 The concrete intensity of cast-in-situ concrete foundations should not be lower than C15 and that of precast foundations should not be lower than C20.

10.0.20 The batholiths, chucks and anchor of rock material (such as granites) shall have complete structure and hard texture and shall be subject to test and certification.

10.0.21 The steel pole for distribution lines shall be selected based on the local conditions. Type and overturning stability of foundations of steel pipe structures shall comply with the requirements in DL/T 5130.

11 Transformer Stands and Switchgears

11.0.1 Distribution transformer stands shall be arranged at the load center or its vicinity where replacement and maintenance of transformers can be easily performed.

11.0.2 Transformer stands should not be provided for the structures of the following types:

- 1 Angle and branch structures;
- 2 Structures on which service conductors or cable terminals are erected;
- 3 Structures on which line switchgears are installed;
- 4 Structures erected at road crossings;
- 5 Structures on which a number of LV service conductors are erected;
- 6 Structures erected in areas accessible to people or in densely populated areas;
- 7 Structures in heavily polluted areas.

11.0.3 Structure-mounted transformer stands should be used for the transformers with a capacity of 400kVA and below. Transformers with a capacity above 400kVA should be of indoor type. Where pad-mounted transformers or floor-type transformer stands are used, the intended purpose and surrounding environmental conditions shall be taken into consideration comprehensively.

11.0.4 The vertical distance from the bottom of structure-mounted transformer stands to ground shall not be less than 2.5m. For the live parts thereof, the surrounding environmental conditions shall be taken into consideration comprehensively.

Floor-type transformers shall be enclosed with stationary fences. The safety clearance from the fences to the live parts shall comply with the requirements in GB 50060.

11.0.5 The incoming lines, outgoing lines and busbars of transformer stands shall employ multi-stranded copper insulated conductors, whose cross-sectional area shall be selected based on the rated current of transformers and shall not be less than 16mm^2 . The primary and secondary sides of transformers shall be equipped with applicable electrical equipment. The vertical distance from the fuses installed at the primary side to ground shall not be less than 4.5m and that from the fuses or CBs installed at the secondary side to ground shall not be less than 3.5m. The horizontal distance between phase fuses installed at the primary and the secondary side shall not be less than 0.5m and 0.3m respectively.

11.0.6 Distribution transformers shall be of energy-saving type and have performances in compliance with the currently applicable national standards.

11.0.7 Fuses or disconnectors and LV CBs at both primary and secondary side shall be preferably minimum-maintenance proven products in compliance with national standards and shall match to the load current, maximum permissible conductor current and operation voltage.

11.0.8 Fuses for the distribution transformers should be in conformity with the following regulations:

- 1 For transformers with a capacity of 100kVA and below, fuses at the HV side should be selected based on 2–3 times the rated current of the transformers.

- 2 For transformers with a capacity of 100kVA and above, fuses at the HV side should be selected based on 1.5–2 times the rated

current of the transformers.

3 Long time-delay setting values of CBs or the fuses at the LV side of transformers should be determined based on the rated current of the transformers.

4 Transformers to be installed in crowding or densely populated areas should be provided with single-phase grounding protection.

11.0.9 Long trunk or branch lines of distribution lines at 1kV–10kV shall be equipped with sectionalized or branch switchgears. Loop power supply networks shall be equipped with tie switchgears. Switchgears should be installed at the battery limits of the distribution lines at 1kV–10kV.

12 Lightning Protection and Grounding

12.0.1 For distribution lines at 1kV–10kV without lightning wires, the reinforced concrete poles erected in residential areas should be grounded and the steel poles shall be grounded and the grounding resistance should not be more than 30Ω .

For the distribution lines at a voltage level below 1kV and power lines at 10kV and below erected on the same structures whose neutral points are solidly grounded, the steel cross-arms on the reinforced concrete poles or metal pipe poles shall be connected with neutral lines. The rebar in the reinforced concrete poles should be connected with neutral lines as well.

For the distribution lines at a voltage level below 1kV whose neutral points are not solidly grounded, the reinforced concrete poles should be grounded and the metal pipe poles shall be grounded and the grounding resistance should not be more than 50Ω .

The reinforced concrete poles and metal pipe poles erected on bituminous roads or in areas where adequate operating experiences are available may not be equipped with additional manual grounding devices. The rebar and steel cross-arms on the reinforced concrete poles as well as the metal pipe poles themselves may not be connected with neutral lines as well.

12.0.2 For the distribution lines provided with lightning wires, the power frequency earthing resistance of the grounding devices should not exceed those as shown in Table 12.0.2 during dry period in rainy seasons.

Table 12.0.2 Grounding Resistance of Structures

Soil Resistivity $\Omega \cdot \text{m}$	Power Frequency Earthing Resistance Ω	Soil Resistivity $\Omega \cdot \text{m}$	Power Frequency Earthing Resistance Ω
100 and below	10	Above 1000 to 2000	25
Above 100 to 500	15	Above 2000	30 ^a
Above 500 to 1000	20	—	—
a Where the soil resistivity is relatively high, causing difficulty in reducing the ground resistance to 30Ω , six or eight radiated grounding electrodes with a total length of no more than 500 m or a continuous grounding electrode may be employed without limiting the grounding resistance thereof.			

12.0.3 Structure-mounted CBs shall be equipped with lightning protection devices. Lightning protection devices shall be installed at both sides of structure-mounted CBs or disconnectors which operate in open-circuit mode frequently while being energized. The grounding wires of these devices shall be connected with the metal enclosures of these CBs or disconnectors and grounded via a grounding resistance no more than 10Ω .

12.0.4 The lightning protection devices to be provided for distribution transformers shall be determined based on the local operating experiences. Lightning protection devices shall be located as close as possible to the transformers and have their grounding wires connected with the metal enclosures and secondary side neutral points of the transformers and grounded.

12.0.5 In heavy lightning areas, for the purpose of preventing the insulation at HV side of distribution transformers from being punctured by lightning stroke or LV-side lightning stroke, the LV side should be provided with lightning arresters or puncture fuses. If the neutral points at the LV sides of the transformers are not grounded,

puncture fuses shall be installed at these points.

12.0.6 Where insulated conductors are used for distribution lines at 1kV–10kV, lightning protection measures should be taken and shall be determined based on the lightning activities in the local areas and actual operating experiences.

12.0.7 In order to protect buildings against intrusion of lightning surge through distribution lines at 1kV and below, the supporting bolts of the insulators on service conductors should be grounded with a grounding resistance no more than 30Ω .

The said supporting bolts may not be grounded if distribution lines are erected in areas below:

Areas with annual average thunderstorm days of no more than 30 days/year;

Areas where distribution lines are shielded by buildings;

Areas where the distance from service conductors to the grounding points of trunk lines at a voltage level below 1kV is no more than 50m.

Where the natural grounding resistance of reinforced concrete poles of the distribution lines at a voltage level below 1kV is not more than 30Ω , grounding devices may not be provided.

12.0.8 The neutral lines of the distribution lines at a voltage level below 1kV with neural points directly grounded shall be grounded at the points of power sources. The neutral lines shall be repeatedly grounded at the terminals of trunk and branch lines.

If the distance from the location where 1kV and below distribution lines enter into buildings to the grounding points exceeds 50m, the neutral lines shall be repeatedly grounded.

12.0.9 The grounding resistance of the grounding devices of the transformers with a total capacity above 100kVA shall not be more than 4Ω . The grounding resistance of each of the repeatedly grounded

devices shall not be more than 10Ω.

The grounding resistance of the grounding devices of the transformers with a total capacity of 100kVA and below shall not be more than 10Ω. The grounding resistance of the repeatedly grounded devices shall not be more than 30Ω and the number of repeated grounding points shall not less than three.

12.0.10 The suspension wires which are used to suspend insulated overhead conductors shall be grounded at both ends, with a grounding resistance being no more than 30Ω.

12.0.11 For the distribution lines consisting of insulated conductors at 1kV–10kV, attachment rings intended for connection of earthing wire as well as fault displays should be installed at the connecting points between trunk line and branch lines and at points where trunk line is sectionalized.

12.0.12 Where distribution lines run over farmlands, the grounding electrodes shall be buried below the tillage depth and should not be at a depth less than 0.6m.

12.0.13 Grounding electrodes should be vertically laid angle, round steel or steel pipes or horizontally laid round or flat steel. The grounding electrodes and grounding wires buried into soil shall have a size no less than the values as shown in Table 12.0.13.

Table 12.0.13 Minimum Size of Grounding Electrodes and Grounding Wires Buried into Soil

Description		Aboveground	Underground
Diameter of round steel mm		8	10
Flat steel	Cross-sectional area mm ²	48	48
	Thickness mm	4	4

Table 12.0.13 (continued)

Description	Aboveground	Underground
Thickness of angle steel mm	—	4
Wall thickness of steel pipes mm	—	3.5
Stranded galvanized steel conductors mm ²	25	50
<p>Note: If the down leads of the grounding terminals provided for electrical devices are made of stranded galvanized steel conductors, their cross-sectional area shall be no less than 25mm². Where the leads are used in corrosive areas, such cross-sectional area shall be increased accordingly and anti-corrosion measures shall be taken.</p>		

13 Clearance to Ground and Cross-over

13.0.1 The distance from conductors to grounds, buildings, trees, railways, roads, rivers, pipes, cableways and various overhead lines shall be calculated according to the maximum sag derived from the condition with the maximum ambient temperature or with ice coating as well as the maximum wind deflection derived from the condition with the maximum wind or with ice coating.

The sag increment caused by current, solar radiation and uneven ice coating may be ignored during the calculation of the above distances, but the impact of plastic elongation of conductor after erection and errors arising from design and construction activities shall be considered.

13.0.2 The distance from conductors to the ground or water surface shall not be less than the values as listed in Table 13.0.2.

**Table 13.0.2 Minimum Distance from Conductors to
Ground or Water Surface** m

Area Where the Line Passes Through	Line Voltage	
	1kV–10kV	Below 1kV
Residential area	6.5	6
Nonresidential area	5.5	5
Rivers and lakes where navigation and floating are unavailable (to the ice surface in winter)	5	5

Table 13.0.2 (continued)

Area Where the Line Passes Through	Line Voltage	
	1kV–10kV	Below 1kV
Rivers and lakes where navigation and floating are unavailable (to flood water level with flood recurrence period of 50 years)	3	3
Difficult transport area	4.5 (3)	4 (3)
Note: The values in brackets are for insulated conductors.		

13.0.3 The clearance from conductors to hillsides, cliffs and rocks shall not be less than the values as listed in Table 13.0.3 under the condition of maximum calculated wind deflection.

Table 13.0.3 Minimum Clearances from Conductors to Hillsides, Cliffs and Rocks m

District Where the Line Passes Through	Line Voltage	
	1kV–10kV	Below 1kV
For mountain slopes that can be accessible on foot	4.5	3.0
Hillsides, cliffs and rocks inaccessible on foot	1.5	1.0

13.0.4 1kV–10kV distribution lines shall not cross buildings with roofs made of combustible materials. For buildings with fire-resistant roof, the situation where the distribution lines cross the buildings shall be avoided as practical as possible, and,

if unavoidable, with the maximum calculated sag, the vertical distance from conductors to buildings shall not be less than 3m in case of bare conductors and 2.5m in case of insulated conductors.

Where distribution lines at a voltage level below 1kV cross buildings, with the maximum calculated sag, the vertical distance from the conductors to buildings shall not be less than 2.5m in case of bare conductors and 2m in case of insulated conductors.

The distance from side phase conductors of distribution lines to permanent buildings shall not be less than the following values under the condition of maximum calculated wind deflection:

For 1kV–10kV distribution lines: 1.5m in case of bare conductors and 0.75m in case of insulated conductors (the adjacent buildings are free of doors, windows or dead walls).

For distribution lines at a voltage level below 1kV: 1m in case of bare conductors and 0.2m in case of insulated conductors (the adjacent buildings are free of doors, windows or dead walls in adjacent buildings).

The horizontal distances from side phase conductors to urban buildings not covered in the scope of planning shall not be less than half of the above values under windless condition.

Note 1: The distance from conductors and multi-floor buildings or planned buildings refers to the horizontal distance therebetween.

Note 2: The distance from conductors to the buildings not included in city planning refers to the clear distance therebetween.

13.0.5 Passages shall be cleared up through cutting down the trees in cases where 1kV–10kV transmission lines run over forest areas. The clear width of the passages shall be such that the side phase

conductor is extended laterally outside by 5m (and 3m in case of insulated conductor).

In the following circumstances, passages may not be cleared up through cutting down trees provided that they do not impede erection of lines:

- 1 The natural growth height of trees does not exceed 2m.
- 2 The vertical distance from conductors to trees (considering the natural growth height) is not less than 3m.

The clear distance from conductors to trees shall not be less than 3m with the maximum wind deflection when transmission lines pass through gardens, green areas or sheltering forest belts.

Passage made through cutting down the trees shall be avoided when transmission lines pass through fruit trees, cash crops or urban shrub areas, provided, however, that the distance from conductors to tree top shall not be less than 1.5.

The vertical distance from conductors to street side trees shall not be less than the values as listed in Table 13.0.5.

**Table 13.0.5 Minimum Distance from Conductors to
Street Side Trees** m

Vertical Distance with Maximum Sag		Horizontal Distance with Maximum Wind Deflection	
1kV–10kV	Below 1kV	1kV–10kV	Below 1kV
1.5 (0.8)	1.0 (0.2)	2.0 (1.0)	1.0 (0.5)
Note: The values in brackets are for insulated conductors.			

Vertical distance from conductors to trees shall be checked by

taking into account the growth height of trees during trimming period.

13.0.6 Where 1kV–10kV distribution lines cross special pipes, they shall be kept clear of inspection pits or holes of the pipes. In addition, all the metal parts of the pipes at the crossing points shall be grounded.

13.0.7 The minimum horizontal distance from distribution lines to the following items shall not be less than 1.5 times the tower height: manufacturing factories and warehouses of Class A, stockyards for combustible materials, tanks for liquid of Class A and B, tanks for liquefied petroleum gas and tanks for combustible and flammable gas. Such distance from distribution lines and tanks for liquid of Class C shall not be less than 1.2 times the height of structures.

13.0.8 Where distribution lines cross weak current lines, the following requirements shall be satisfied:

1 The cross angle shall comply with the requirements as listed in Table 13.0.8.

Table 13.0.8 Cross Angles between Distribution Lines and Weak Current Lines

Class of weak current lines	Class I	Class II	Class III
Cross angle	$\geq 45^\circ$	$\geq 30^\circ$	No limit

2 Distribution lines shall generally be erected above weak current lines. The poles of distribution lines shall be arranged as close to the crossing points as possible but should not be apart from the latter by less than 7m (such limit of 7m may be disregarded for

distribution lines in urban areas).

13.0.9 Where distribution lines run nearby or over railways, roads, rivers, pipes, cableways, pedestrian bridges and various overhead lines, they shall comply with the requirements in Table 13.0.9.

Table 13.0.9 Basic Requirements for Transmission Rivers, Pipes, Cableways and

Item	Railway			Road		Tram Road	River				
	Standard track gauge	Narrow track	Electrified railways	Highways and Class I roads	Class II, III and IV roads	With or without track	Navigable		Non-navigable		
Minimum cross-sectional area of conductors	50 mm ² in case of aluminum conductors and										
Joints of conductors or ground wires within crossing span	No joint is allowed	—	—	No joint is allowed	—	No joint is allowed	No joint is allowed		—		
Supporting method of conductors	Double fixed		—	Double fixed	Single fixed	Double fixed	Double fixed		Single fixed		
Minimum vertical distance m	Item Line voltage	To track top		To carrier cable or contact wire	To road surface	To carrier cable or contact wire	To normal year high water level	To the highest point of masthead at the highest navigation level	To maximum flood water level	To ice surface in winter	
		1kV–10kV	7.5	6.0	Distribution lines to be laid underground in plain areas	7.0	3.0/9.0	6	1.5	3.0	5.0
		Below 1kV	7.5	6.0	Distribution lines to be laid underground in plain areas	6.0	3.0/9.0	6	1.0	3.0	5.0

Lines Running nearby or across Railways, Roads, Various Overhead Lines

Weak Current Lines		Power Lines kV						Special Pipes	Conventional Pipes and Cableways	Pedestrian Bridges
Class I and II	Class III	Below 1	1-10	35- 110	154- 220	330	500			
16 mm ² in case of aluminum alloy conductors										
No joint is allowed	—	No joint is allowed at crossing points	No joint is allowed at crossing points	—	—	—	—	No joint is allowed	—	
Double fixed	Single fixed	Single fixed	Double fixed	—	—	—	—	Double fixed	—	
To lines crossed		To conductors						To the power lines below		—
								To the power lines below	From the power lines below to the protection facilities above the power lines	—
2.0		2	2	3	4	5	8.5	3.0	2.0/2.0	5 (4)
1.0		1	2	3	4	5	8.5	1.5/1.5		4 (3)

Table 13.0.9

Item		Railway			Road		Tram Road	River	
		Standard track gauge	Narrow track	Electrified railways	Highways and Class I roads	Class II, III and IV roads	With or without track	Navigable	Non-navigable
Minimum horizontal distance m	Item	Pole boundary to track center			Pole center to subgrade boundary		Pole center to subgrade boundary	Side phase conductors to upper limb of slope in case of lines in parallel with guying road	
	Line voltage						Pole boundary to track center		
	1kV–10kV	Crossing: 5.0 Parallel: pole height plus 3.0	Parallel: pole height plus 3.0	0.5		0.5/3.0	Height of the highest pole		
Below 1 kV			0.5/3.0						
Remarks			Where there is difficulty in laying the distribution lines underground in mountainous areas, it shall be determined through negotiation and an agreement therefore shall be signed	See Appendix D for classification of roads, as for urban road classes, stipulations for roads may be referred to			The vertical distance for rivers with flood-fighting boats traveling during the period with the maximum flood level shall be determined by negotiation		
<p>Note 1: Where distribution lines at a voltage level below 1kV cross Class II and III weak current lines and Note 2: Where overhead distribution lines cross weak current lines, lightning protection measures shall be Note 3: Where 1kV–10kV service conductors cross the in-house overhead lines of industrial enterprises at the Note 4: Non-navigable river refers to the river where navigation and floating is unavailable; Note 5: For areas with limited route, the maximum wind deflection shall be taken into account in the requirements Note 6: The classification of roads shall comply with the requirements in JTJ001; Note 7: The values in brackets are for the lines with insulated conductors.</p>									

(continued)

Weak Current Lines		Power Lines kV						Special Pipes	Conventional Pipes and Cableways	Pedestrian Bridges
Class I and II	Class III	Below 1	1-10	35- 110	154- 220	330	500			
In route restricted area, between side phase conductors of two power lines		In route restricted area, between side phase conductors of two power lines						In route restricted area, to any part of pipe and cableway		Conductors to the edge of pedestrian bridges
2.0		2.5	2.5	5.0	7.0	9.0	13.0	2.0	4.0	
1.0	1.5							2.0		
1. The horizontal distance between two parallel lines in the open areas shall not be less than the pole height; 2. See Appendix C for classification of weak current lines		The horizontal distance between two parallel lines in the open areas shall not be less than the pole height						1. Special pipes refer to those erected on the ground for transferring combustible and explosive matters; 2. The crossing point shall not be set at the inspection holes. The pipe and cableway running in parallel or across with power line shall be grounded		
roads, the supporting method of conductors; provided for the wood pole of weak current lines within the crossing span; same voltage level, they should be erected above the in-house lines; for the minimum horizontal distance;										

14 Service Conductors

14.0.1 Service conductors refer to the overhead conductors running from distribution lines at 10kV and below to the first supporting point outside the buildings of consumers.

14.0.2 The span of the 1kV–10kV service conductors should not be larger than 40m. Where the span exceeds 40m, the service conductors shall be designed as 1kV–10kV distribution lines. The span of the service conductors at voltage level below 1kV should not be larger than 25m, and, if the span exceeds 25m, the service conductors should be erected on appropriate poles.

14.0.3 Service conductors shall be insulated conductors. The cross-sectional area of 1kV–10kV service conductors shall not be less than the following values:

25mm² in case of copper core insulated conductors;

35mm² in case of aluminum core insulated conductors.

The cross-sectional area of the service conductors at a voltage level below 1kV shall be selected based on the permissible ampacity and shall not be less than the following values:

10mm² in case of copper core insulated conductors;

16mm² in case of aluminum core insulated conductors.

14.0.4 The distance between 1kV–10kV service conductors shall not be less than 0.40m. The distance between the service conductors at a voltage level below 1kV shall not be less than the values as listed in Table 14.0.4. For service conductors at a voltage level below 1kV, a certain distance shall be maintained at points where the neutral line crosses the phase line, or, alternatively, the measures for reinforcing

the insulation shall be taken.

**Table 14.0.4 Minimum Distance between the Service
Conductors at a Voltage Level below 1kV** m

Erection Mode	Span	Distance between Conductors
Running down from the poles	25 and below	0.15
	Above 25	0.20
Running horizontally or vertically along walls	6 and below	0.10
	Above 6	0.15

14.0.5 The vertical distance from the receiving end of service conductors to ground shall not be less than the following values:

4m in case of 1kV–10kV service conductors;

2.5m in case of service conductors at a voltage level below 1kV.

14.0.6 Where service conductors at a voltage level below 1kV cross streets, the vertical distance from them to the center of road surface shall not be less than the following values:

6m in case of the streets through which automotives travel;

3.5m in case of streets not readily available for passing of vehicles and pedestrian ways;

3m in case of alleys;

Where service conductors run along walls, the vertical distance from them to the ground shall be 2.5m.

14.0.7 The distance from the service conductors below 1kV to various parts of buildings shall comply with the following requirements:

Vertical distance from the service conductors to the windows below them: at least 0.3m;

Vertical distance from the service conductors to the balconies or windows above them: at least 0.8m;

Horizontal distance from the service conductors to windows and balconies: at least 0.75m;

Distance from the service conductors to walls and supports: at least 0.05m.

14.0.8 The distance between the service conductors below 1kV and weak current lines that cross shall not be less than:

0.6m if the conductors are erected above weak current lines;

0.3m if the conductors are erected below weak current lines.

If the above requirements can not be satisfied, measures shall be taken to isolate them.

14.0.9 The 1kV–10kV service conductors shall cross various pipelines in accordance with the requirements in Table 13.0.8 and Table 13.0.9.

14.0.10 The service conductors at a voltage level below 1kV shall not run between HV down leads and are prohibited to cross railways.

14.0.11 Service conductors of different sizes and metal materials shall not be connected within one span. Service conductors crossing streets where vehicles pass shall not have joints.

14.0.12 Where the connection between service conductors and line conductors is Cu-Al connection, reliable transition means shall be provided.

14.0.13 Where the service conductors entering the individual residences run along walls, protective measures shall be taken correspondingly.

Appendix A
(Normative)

Typical Meteorological Areas

Appendix A.1 Typical Meteorological Areas

Meteorological Area		I	II	III	IV	V	VI	VII	VIII	IX
Atmospheric temperature ℃	Maximum	+40								
	Minimum	-5	-10	-10	-20	-10	-20	-40	-20	-20
	Ice coating	-5								
	Maximum wind	+10	+10	-5	-5	+10	-5	-5	-5	-5
	Installation	0	0	-5	-10	-5	-10	-15	-10	-10
	Lightning overvoltage	+15								
	Switching overvoltage, annual average temperature	+20	+15	+15	+10	+15	+10	-5	+10	+10
Wind velocity m/s	Maximum wind	35	30	25	25	30	25	30	30	30
	Ice coating	10 ^a							15	
	Installation	10								
	Lightning overvoltage	15	10							
	Switching surge	0.5 × maximum wind speed (no lower than 15 m/s)								
Ice coating thickness mm	0	5	5	5	10	10	10	15	20	
Ice density g/cm ³	0.9									
<p>a Generally, the accompanying wind speed of 10m/s shall be used for ice coating condition, and 15 m/s may be used if the wind speed is required to be increased according to reliable information.</p>										

Appendix B (Normative)

Pollution Classification Standard of Overhead Distribution Lines

Appendix B.1 Pollution Classification Standard of Overhead Distribution Lines

Degree of Pollution	Pollution Flashover Characteristics	Salt Density mg/cm ²	Specific Creepage Distance of Lines cm/kV	
			Neutral-point Not Solidly Grounded	Neutral-point Solidly Grounded
0	Areas with clean ambient air and those which are more than 50km away from costal salt field and do not suffer from noticeable pollution	≤ 0.03	1.9	1.6
I	Areas with low air pollution level, areas with low factory and population densities and areas 10km–50km away from coastal salt fields, with dry air and little fog (including drizzle) or plentiful rainfall during pollution flashover seasons	> 0.03 - 0.06	1.9-2.4	1.6-2.0
II	Areas with medium air pollution level, areas with slight salinization and furnace smoke pollution and areas 3km–10km away from coastal salt field, with humid air and much fog (including drizzle) but less rainfall during pollution flashover seasons	> 0.06 - 0.10	2.4-3.0	2.0-2.5

Appendix B.1 (continued)

Degree of Pollution	Pollution Flashover Characteristics	Salt Density mg/cm ²	Specific Creepage Distance of Lines cm/kV	
			Neutral-point Not Solidly Grounded	Neutral-point Solidly Grounded
III	Areas with severe air pollution; areas with heavy fog and heavy salinization; areas 1km–3km away from coastal salt field; areas with high factory and population densities; severely polluted areas 300m–1500m away from chemical pollution sources and furnace smoke pollution	> 0.10-0.25	3.0-38	2.5-3.2
IV	Areas with extremely severe air pollution; areas within 1km away from coastal salt field and within 300km away from chemical pollution sources and furnace smoke pollution	> 0.25-0.35	3.8-4.5	3.2-3.8
Note: This table is established in accordance with GB/T 16434.				

Appendix C
(Normative)

Classification of Weak Current Lines

C.1 Class I Weak Current Lines

Main communication lines from the Capital to seats of governments of individual provinces (municipalities) and autonomous regions and that between seats of governments of individual provinces (municipalities) and autonomous regions; communication lines from the Capital to important industrial and mining cities and sea ports as well as the international lines from the Capital to foreign countries; other international lines and national defense lines designated by the Posts and Telecommunication Department; communication lines between the Ministry of Railway and Railway Bureaus and that between individual Railway Bureaus; special lines for automatic locking devices for railway signals.

C.2 Class II Weak Current Lines

Communication lines between seats of governments of individual provinces (municipalities), autonomous regions and individual districts (cities) and counties thereunder; mutual communication lines between regions (cities) and counties of neighboring provinces (municipalities); common local telephone lines; lines between the Railway Bureau and individual stations and that between individual stations; lines for locking devices of railway signals.

C.3 Class III Weak Current Lines

Lines within counties and that from counties to towns thereunder as well as lines for suburban areas with less than two pairs of trunks; region lines of railway system and wired broadcasting lines.

Appendix D
(Normative)
Classification of Roads

**D.1 Highway-the trunk road that is especially designed
for high speed run of vehicles in separate directions and
lanes with all entries and exits controlled**

Four-lane highway is generally applicable for an annual average long-term design life traffic volume of 25 000-55 000 passenger cars per day and night converted from various vehicles.

Six-lane highway is generally applicable for an annual average long-term design life traffic volume of 45 000-80 000 passenger cars per day and night converted from various vehicles.

Eight-lane highway is generally applicable for an annual average long-term design life traffic volume of 60 000-100 000 passenger cars per day and night converted from various vehicles.

**D.2 Class I road-the road that is especially designed
for high speed run of vehicles in
separate directions and lanes**

Class I road is generally applicable for an annual average long-term design life traffic volume of 15 000-30 000 passenger cars per day and night converted from various vehicles, for connection of important political and economic centers as well as key industrial and mining regions, sea ports and air ports, and is especially designed for run of vehicles in different lanes, with part of entries and exits controlled.

D.3 Class II Road

The road that is generally applicable for an annual average long-term design life traffic volume of 3000-15 000 medium size trucks per day and night converted from various vehicles, and is designed for connection of economic and political centers or large-scale industrial and mining regions, sea ports and airports.

D.4 Class III Road

The road that is generally applicable for an annual average long-term design life traffic volume of 1000-4000 medium size trucks per day and night converted from various vehicles, and is designed for connection of cities superior to counties.

D.5 Class IV Road

The road that is generally applicable for the following annual average long-term design life traffic volume and is designed for connection of counties, towns and countries: above 1500 medium-sized trucks per day and night converted from various vehicles in case of two-lane Class IV road below 200 medium-sized trucks per day and night converted from various vehicles in case of one-lane Class IV road.

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