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Technical Code of General Plan Design for Substation

变电站总布置设计技术规程

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Technical Code of General Plan Design for Substation

1 Scope

This Standard stipulates the basic technical requirements of general plan design for substations.

This Standard is applicable to the general plan design for newly constructed or expanded substations with the voltage level of 110 kV ~ 750 kV. The general plan design for substations with the voltage level of above 750 kV, reconstructed substations and converter stations may also take this as a reference.

2 Normative References

Through the reference in this Standard, clauses in the following documents become clauses of this Standard. In terms of references with a specific date, all the subsequent modification orders (excluding the corrected content) or revised editions are not applicable to this Standard. However, all parties that reach an agreement in accordance with this Standard are encouraged to explore the possibility of adopting the latest versions of these documents. In terms of references without a specific date, the latest versions are applicable to this Standard.

GB 50007 *Code for Design of Building Foundation*

GB 50016 *Code for Fire Protection Design of Buildings*

GB 50187 *Code for Design of General Layout of Industrial Enterprises*

GB 50201 *Standard for Flood Control*

GB 50229 *Code for Design of Fire Protection for Fossil Fuel Power Plants and Substations*

GB 50330 *Technical Code for Building Slope Engineering*

GBJ 22 *Specifications for the Design of Factory and Mine Roads*

DL/T 5032 *Technical Code of General Plan Transportation Design for Fossil Fuel Power Plants*

3 General Principles

3.0.1 The general plan design for substations must comprehensively implement the nation's fundamental construction policies; reflect the nation's technical and economic policies; unify and clarify construction standards; guarantee that newly constructed (expanded) substations are safe, reliable, technologically advanced, affordable and consistent with the national conditions.

3.0.2 The general plan design for substations must establish an overall viewpoint; conduct in-depth investigation and survey; rely on technological progress; design meticulously; continuously summarize experience; energetically and deliberately promote domestic and foreign advanced technologies; adapt measures to local conditions and adopt mature new materials, processes and plans; satisfy the requirements of sustainable development.

3.0.3 The general plan design for substations shall comply with relevant stipulations of *Land Administration Law of the People's Republic of China*; comply with the nation's land utilization policies; adapt measures to local conditions; implement land conservation and reasonable land utilization; enhance land utilization rate; make the most of wastelands, badlands and sloping lands; refuse to occupy, or, occupy very little farmlands. Furthermore, the general plan design for substations shall reasonably utilize landforms, decrease site leveling soil (stone) quantity and demolition of the existing facilities and constructions (structures); avoid or reduce land acquisition on behalf of others. Through the techno-economic comparison of multiple plans, optimize design plans; reduce construction costs; shorten construction periods; create conditions for civilized construction.

3.0.4 This Standard was formulated in accordance with the principles of GB 50187 *Code for Design of General Layout of Industrial Enterprises*. Except from the execution of this Standard, the general plan design for substations constructed under special natural conditions, such as mountainous areas, earthquake areas, collapsible loess areas, expansive soil areas, soft soil areas, permafrost areas and salinized soil areas, shall still comply with the relevant stipulations in the existing national standards and industry standards.

3.0.5 The general plan design for expanded and reconstructed substations shall combine the characteristics of the previous general plane layout, vertical plan and equipment setting, so as to reach coordinative unity of the integrity.

4 General Planning

4.0.1 The general planning for substations shall coordinate with the local town planning, industrial park planning, natural reserve planning or tourism area planning. Substations shall not be located in geological disaster-stricken sections, such as landslide, debris flow, large water-eroded cave and mined-out area. Substations shall not be constructed over mineral products or cultural relics. Avoid mutual interference with military, aviation and communication facilities. Off-site traffic shall satisfy the requirements of the transportation of large-sized equipment. Thoroughly utilize nearby public facilities in livelihood, culture and education, sanitation, traffic, fire protection and water supply and drainage, etc.

In terms of substations in special landforms, for example, mountainous areas, the overall planning shall consider the influence of landforms, stability of mountain massif, slope excavation, flood and waterlogging. Construction of substations in areas affected by torrential flood and waterlogging should thoroughly utilize the existing flood control and waterlogging control facilities in the locality.

4.0.2 The overall planning of urban underground (indoor) substations shall satisfy the requirements of local urban planning; avoid mutual interference with adjacent neighbors, enterprises and facilities.

4.0.3 The overall planning of substations shall base on the requirements of process layout, and the demands for construction, operation, overhauling and ecological environmental protection; combine site location's natural conditions; implement overall planning in accordance with the final scale; combine the short-term and long-term planning, and focus on the short-term planning. In staged construction, in accordance with the requirements of load development, implement reasonable planning; expropriate land by stages or at a time.

The overall planning shall base on the above-mentioned principles, make overall arrangements of substation areas, water sources, water supply and drainage facilities, entry roads, flood control and discharge facilities, entry and exit corridors, terminal tower, external power supply and the influence of ambient environment; implement reasonable layout.

4.0.4 When there are pollution sources near substations, the overall planning shall base on the category of pollution sources and the prevailing wind direction throughout the year to prevent adverse influence on the substations.

4.0.5 Substations shall be equipped with reliable water sources. The quality of drinking water shall comply with the national standard on drinking water hygiene. Production waste drainage or raindrops and domestic sewage of the substations shall comply with national or local standards on emission.

5 General Plane Layout

5.1 General Regulations

5.1.1 The general plane layout for substations shall comply with the final scale in planning and design. In accordance with the requirements of systematic load development, the possibility of expansion should not be cut down; the general plane layout for substations shall be as structured as possible.

5.1.2 The general plane layout for substations shall satisfy the overall planning requirements; process layout in the substations shall be reasonable. Function division shall be clarified; traffic shall be convenient; land utilization shall be optimal.

5.1.3 The general plane layout for substations shall centralize the recently constructed constructions (structures), so as to facilitate staged construction and land conservation. The civil engineering of urban underground (indoor) substation construction shall be constructed at a time in accordance with the final scale.

5.1.4 The main production and auxiliary (affiliated) buildings of substations shall be intensively or jointly arranged. When substations are jointly constructed with convertor stations, they may be intensively or jointly arranged in front of substation areas in accordance with the nature of auxiliary (affiliated) buildings and the classification of functional requirements.

5.1.5 On the premise of taking smooth outlet planning and reasonable process layout into consideration, substations shall combine the layout of natural landform and reduce soil (stone) quantity to the minimum. When landform height difference of substation areas is relatively large, stepped-style layout may be adopted.

When the main production constructions (structures) and equipment structural support of substations in mountainous areas are close to side slopes, the safe distance from the constructions (structures) to the slope top and slope toe shall be determined in accordance with 6.3.4 in this Standard.

5.1.6 Between urban underground (indoor) substations and off-site adjacent buildings, fire exits shall be reserved. The net width and net height of fire lanes shall satisfy relevant stipulations in GB 50016 *Code for Fire Protection Design of Buildings*.

5.1.7 Important constructions (structures), such as main control communication building (room), indoor power distribution unit building (room), large-scale substation framework, and large-sized equipment, such as GIS composite apparatus, main transformer, high-voltage reactor and capacitor, should be set up in sections with uniform soil texture and reliable soil foundation.

5.1.8 In terms of substations located in expansive soil areas, constructions (structures) which have rigorous requirements towards deformation should be arranged in sections

5.3.3 Rain valve chamber or foam fire-fighting equipment room should be arranged near oiled equipment, such as main transformer and electric reactor, etc.

5.3.4 When setting up diesel generator room, the arrangement should avoid noise and vibration effect on the main control communication building; the arrangement should be as close to AC and DC power distribution rooms as possible.

5.3.5 Water supply and drainage facilities of substations should be separately arranged. The minimum clear distance shall satisfy relevant stipulations of the existing national standards.

5.3.6 Water supply constructions (structures) of substations, such as deep-well pumping room, domestic fire-fighting pumping room and reservoir, should be intensively arranged in front of substation area in accordance with the process flow.

5.3.7 Buried domestic sewage treatment units should be arranged nearby on a secluded side near the main control communication building, or, arranged in the edge zone in front of substation area.

5.3.8 When substation area adopts strong drainage, rain pumping room should be arranged in relatively low edge zone in the substation area.

5.4 Walls, Fences and Main Entrances

5.4.1 The type of substation walls shall be comprehensively determined in accordance with certain factors, such as substation location, urban planning and environmental requirements.

Substations should adopt tangible walls with the height of not lower than 2.3 m. In filing areas, the height of walls may be properly reduced. In terms of urban substations, or substations that have requirements towards the environment of substation area, grillwork walls or other decorative walls may be adopted.

5.4.2 Walls in the substation area shall base on the principle of land conservation and security guard, strive to be smooth and flat. Walls in the substation area in complex landforms or mountainous areas shall be arranged in accordance with the landforms.

5.4.3 Tangible walls in the substation area shall set up expansion joint. The spacing between expansion joints should not be more than 30 m. In areas where wall height and geological conditions might change, settlement joints shall be set up.

5.4.4 In accordance with the layout and requirements of electrical equipment, if necessary, fences may be set up around the equipment.

5.4.5 The main entrance to substations should face main roads in the locality, which makes it convenient for the connection to entrance roads. The orientation and handling requirements of main entrances to urban substations shall coordinate with urban

6 Vertical Layout

6.1 General Regulations

6.1.1 The design elevation of substation areas shall be determined in accordance with substations' voltage level.

In terms of 220 kV hub substations and above 220 kV voltage level of substations, the design elevation of substation areas shall be higher than flood water level at the frequency of 1% (recurrence interval, same below) or the historically highest inland water level. The design elevation of substation areas of other voltage levels shall be higher than flood water level at the frequency of 2% or the historically highest inland water level.

When the design elevation of substation areas cannot satisfy the above-mentioned requirements, respectively adopt the following three different measures in accordance with the distinction of different circumstances.

1. When measures are adopted in the elevation of the site, the design elevation shall be not lower than flood water level or the historically highest inland water level.
2. When flood control or waterlogging control measures are adopted in the substation area, the elevation of flood control or waterlogging control measures shall be 0.5 m higher than the above-mentioned flood water level or the historically highest inland water level.
3. Adopt reliable measures, so that the main equipment base and indoor ground elevation of production buildings is not lower than the above-mentioned high-water level.

In terms of substations along storm-affected areas, such as rivers, lakes and the sea, the elevation of flood control facilities shall also consider storm height at the frequency of 2% and 0.5 m of free height.

6.1.2 The design elevation of substation in-station areas should be higher than, or, partially higher than the off-site natural ground, so as to satisfy the requirements of water drainage of the substation areas.

6.1.3 The vertical layout of substation areas shall reasonably utilize natural landform. In accordance with the comprehensive consideration of process requirements, the general plane layout of substation areas, transportation, rain drainage direction, water drainage spot, and soil (stone) balance, adapt measures to local conditions to determine the form of the vertical layout. Reduce the quantity of work in slope land, site leveling soil (stone) quantity, retaining walls and slope protection to the minimum. Site water drainage route shall be short and smooth.

1. Generally speaking, the vertical layout of substation areas shall consider minimum site leveling soil (stone) quantity on the premise of comprehensive balance of in-station and off-site soil (stone) digging and filling (including entrance roads, base soil, and flood control and drainage facilities, etc.).
2. In terms of vertical layout of substations in mountainous areas and hilly areas, on the premise of satisfying the process requirements, reasonably utilize the landform; properly adopt stepped-style layout; try to avoid deep excavation and high filling; guarantee the stability of side slopes.

6.1.4 In terms of substations located in expansive soil areas, the vertical design should maintain the natural landform; avoid excessive excavation and filling. In terms of substations located in mountain-front slope zones in collapsible loess areas, substation areas should be planned along the natural contour lines; the thickness of filling should not be excessive large.

6.1.5 The vertical layout of expanded and reconstructed substations shall coordinate with the previous vertical layout of the substation area; thoroughly utilize the previous water drainage facilities.

6.2 Determination of Design elevation

6.2.1 Indoor ground of substation buildings shall be comprehensively determined in accordance with certain factors, such as the form of vertical layout of substation area, process requirements, site water drainage and soil texture conditions.

1. Indoor ground of buildings shall be not lower than 0.3 m of outdoor ground.
2. In collapsible loess areas, the indoor ground of multi-story buildings shall be 0.45 m higher than the outdoor ground.

6.2.2 The comprehensive gradient in site design shall be comprehensively determined in accordance with certain factors, such as natural landform, process setting (mainly, the form of outdoor power distribution units), soil texture conditions, water drainage mode and road longitudinal slopes, and shall preferable be 0.5% ~ 2%. When there are reliable water drainage measures, the comprehensive gradient may be less than 0.5%, but, more than 0.3%. The partial maximum gradient should not be more than 6%, If necessary, there should be erosion prevention measures.

The site design gradient of outdoor power distribution units which are parallel to the direction of the bus should not be more than 1%.

6.2.3 The determination of elevation of in-station and off-site road connection points shall make it convenient for vehicle passage and water drainage. The pavement elevation of entry and exit of the substation areas should be higher than the elevation of off-site pavement. Otherwise, there shall be measures that prevent rains from flowing into the substation.

6.3.8 The allowable value of slope rate of the following side slopes shall be determined through the analysis and calculation of stability:

1. Slope height exceeds the range of side slope listed in Table 6.3.6-1 and Table 6.3.6-2.
2. Side slope with relatively soft soil.
3. There is side slope with relatively large load near the edges of slope top.
4. Rocky side slope with relatively developed underground water, or with extruded weak structural surface.
5. Side slope with adverse geological conditions.

6.3.9 When the surface layer of side slope manifests sediment wetland, outflow or outcrop of underground water, in accordance with the practical situation, set up corresponding water diversion and drainage measures.

6.4 Water Drainage of Site

6.4.1 Water drainage of site shall comply with the landform of substation area, regional rainfall capacity, classification of soil texture, and vertical and road layout of substation area. The mode of water drainage shall be reasonably selected. Natural ground dispersive seepage drainage, rainwater ditch, underground drainage ditch (pipe) or mixed water drainage mode should be adopted.

6.4.2 Water drainage of outdoor power distribution unit site shall be smooth. In terms of rainwater intercepted by cable trenches and patrol inspection paths which are higher than the ground level, water drainage aqueduct should be adopted, or, gutter inlet should be set up, and rainwater sewer should be laid for water drainage.

6.4.3 When rainwater open ditch is adopted for water drainage, the water drainage ditch should be set up along the roads; minimize the crossing of ditches. When crossing is indispensable, orthogonal crossing should be preferred; in oblique crossing, the crossing angle shall not be less than 45°. Open ditch should receive surface protection treatment. The fracture surface and the form of open ditch shall be determined in accordance with hydraulic calculation. The depth of open ditch's starting point shall not be less than 0.2 m. The longitudinal slope of open ditch shall be consistent with the longitudinal slope of roads; and should not be less than 0.3%. The longitudinal slope of open ditch in collapsible loess areas shall not be less than 0.5%. When the longitudinal slope of open ditch is relatively large, hydraulic drop or rapid flow trough shall be set up; the location of the hydraulic drop and rapid flow trough should not be at the turning of open ditch.

6.4.4 When rainwater sewer drainage system is adopted, rainwater inlet shall be located in sections of water catchment. The form, quantity and layout of rainwater inlets

are no conditions for self-flowing discharge, rainwater pumping room shall be set up and strong water drainage shall be adopted.

6.5 Soil (stone) Engineering

6.5.1 Soil (stone) quantity in substation areas should reach a basic balance of the total quantity of excavation and filling. Its content shall include: soil (stone) quantity of site leveling, construction (structure) foundation, underground facility foundation trench residual soil, in-station and off-site roads, and flood control and discharge facilities.

When entry road is relatively long, give priority to its own soil (stone) balance. Try to avoid or reduce secondary re-shipment of earthwork.

When due to conditional restrictions, soil (stone) quantity in substation area cannot reach a balance, reasonable spoil or earth sampling site shall be selected. In addition, the possibility of returning soil to farmland shall also be taken into consideration.

In terms of substations in mountainous areas and hilly areas, when earthwork and stonework emerge, respectively enumerate them; list out the proportion of soil and stone.

6.5.2 Surface soil leveling treatment of substation area shall comply with the following requirements:

1. When surface soil of substation area is farming oil or silt, and the content of organic matters is more than 5%, excavation must be conducted before backfilling. This layer of surface soil should be intensively piled up and covered on the soil surface of substation area for the purpose of afforestation or reclamation of soil to make farmlands; it may be included as soil (stone) quantity.
2. When the surface oil in the filling area has favorable soil texture, and the content of organic matters is less than 5%, conduct rolling compaction (tamping) of the surface soil, then, conduct backfilling.

6.5.3 The quality of site leveling filling shall comply with the requirements of relevant specifications. The filling shall be stratified and rolling-compacted; the thickness of stratification shall be around 300 mm; the site leveling compaction coefficient shall be not less than 0.94.

In terms of collapsible loess areas, within 6 m around the buildings, site shall be leveled. When it is filling, stratification and tamping (or compaction) shall be conducted. The compaction coefficient shall not be less than 0.95. When it is excavation, in self-weight collapsible loess site, after surface tamping (or compaction), gray soil surface with the thickness of 150 mm ~ 300 mm should be set up; the compaction coefficient shall not be less than 0.95.

6.5.4 Within site leveling range of substation area, when retaining wall also serves as

7 Underground Pipeline (trough) Layout

7.1 General Regulations

7.1.1 The layout of underground pipelines (troughs) shall comply with the overall planning of the final scale of substation. Pipelines (troughs), construction (structure) foundations and roads shall mutually coordinate with each other horizontally and vertically. Combine the short-term and long-term planning; conduct reasonable planning, so as to make it convenient for expansion.

The layout of underground pipelines (troughs) shall comply with the following requirements:

1. Satisfy process requirements; process shall be short and prompt, so as to make it convenient for construction and overhauling.
2. On the premise of satisfying the process and usage requirements, try to implement shallow embedment. Try to maintain consistency with the vertical gradient and slope direction of substation area; avoid adverse slope.
3. When underground pipelines (troughs) have any breakdown, construction (structure) foundation shall not be impaired. Sewage shall not contaminate drinking water or permeate into other troughs.
4. Trough shall have water drainage and anti-small animal measures.

7.1.2 Underground pipelines (troughs) should be parallelly arranged along the roads and constructions (structures). Generally speaking, it should be arranged beyond the road traffic part. Main pipelines (troughs) shall be arranged on the side of road with more users or more branch grooves; or, pipelines (troughs) shall be classified and arranged on both sides of roads.

The layout of underground pipelines (troughs) shall be in short route, properly centralized, and in reasonable spacing. Crossings shall be reduced. When underground pipelines (troughs) cross, they should be in vertical crossing.

7.1.3 The layout of underground pipelines has two forms, namely, direct embedment and trough laying. The forms shall be determined in accordance with certain factors, such as process requirements, geological conditions, pipe characteristics and layout of underground constructions (structures).

Under the condition of satisfying safe operation and making it convenient for overhauling, the same type of pipelines, or pipelines of different purposes but without any mutual influence, may adopt the form of same-trough layout.

7.1.4 When there are conflicts during the layout of underground pipelines (troughs),

horizontal water drainage gradient. The vertical water drainage gradient should not be less than 0.5%, when it is difficult to implement this, the gradient should not be less than 0.3%. The horizontal water drainage gradient is generally 1.5% ~ 2 %; in sites that are advantageous to water drainage and the lowest point in the channels, set up catchment pit and water drainage outlet pipe. The elevation of the bottom of the catchment pit shall be 200 mm ~ 300 mm higher than the elevation of the water drainage outlet of water drainage well.

3. Underground channels (tunnels) should adopt self-flowing water drainage. When the elevation of the bottom surface of the catchment pit is lower than the elevation of the sewer pipe surface, mechanical water drainage may be adopted.
4. Underground channels (tunnels) should be arranged above the underground water level. When the elevation of channel (tunnel) bottom is lower than the underground water level, there shall be waterproof measures. In addition, the requirement of anti-floating shall be satisfied.
5. Underground channels (tunnels) that cross-roads shall satisfy the process requirement of the minimum clearance; guarantee the safety of channels (tunnels) and traffic safety.

7.3.2 When the underground water level is relatively low, the annual average precipitation is small, the soil texture of the site is strongly permeable sandy soil or gravel soil, cable trough may not set up trough bottom. In a certain spacing, seepage pit shall be set up.

7.3.3 In outdoor power distribution unit site, the wall of cable trench should be 0.1 m ~ 0.15 m higher than the design elevation of the site. In the trench wall's supporting area, the cover plate may adopt the embedded mode or the imbricated mode.

Channel materials shall be comprehensively determined in accordance with geological conditions, underground water level and the class of loading. If brick channel is adopted, the top shall be concrete roof.

7.3.4 Channel cover plate may adopt angle-wrapped (flat) steel frame cover plate, or, finished covered plate.

7.3.5 Underground channels (tunnels) located in backfilling sections and under special geological conditions shall adopt measures to prevent channels (tunnels) from asymmetrical sinking.

7.3.6 Cable tunnels shall set up safety entries and exits, ventilation openings and lighting facilities. Their spacing shall be professional determined by process, and generally less than 75 m.

7.3.7 In parts where cable channels (tunnels) cross walls of substation area, or the

8 Roads

8.1 General Regulations

8.1.1 The design of substation areas shall base on the requirements of operation, overhauling, fire protection and large-size equipment transportation, and be comprehensively determined in accordance with certain factors, such as the general layout and the vertical layout of substation area, off-site road condition, natural conditions and local development planning, etc.

8.1.2 The plane layout of in-station and off-site roads, the longitudinal gradient and the design elevation shall be coordinated to be consistent and mutually connected.

8.2 Entry Roads

8.2.1 Substation entry roads should adopt the highway type; urban substation entry roads should adopt the urban type. The width of roads shall be determined in accordance with the voltage level of substations.

1. Substations of 110 kV and below: 4.0 m.
2. Substations of 220 kV: 4.5 m.
3. Substations of 300 kV and above: 6 m.

When entry roads are relatively long, the width of entry roads of substations of 330 kV and above may uniformly adopt 4.5 m; passing bays shall also be set up. The layout of passing bays shall comply with the stipulations in Figure 8.2.4.

The width of road shoulder shall be 0.5 m on each side. Both sides of the entry roads may set up water drainage ditches in accordance with the demands.

8.2.2 The route of entry roads should be straight, smooth and short. The existing roads or roadbeds should be utilized. Try to reduce the work quantity of bridges, culverts and artificial constructions. Avoid unfavorable geological sections and underground worked out sections. Avoid compressing mining deposits.

In terms of entry roads located in the planning area, on the basis of survey and investigation, they shall still comply with the requirements of local road planning.

The design of entry roads should implement unified use by industrial and mining enterprises along the line; consider the requirements of local traffic and transportation.

8.2.3 Entry roads should comply with the stipulations of Level-4 industrial and mining road design in GBJ 22 *Specifications for the Design of Factory and Mine Roads*: the minimum curvature radius: plains and small hills: 100 m; mountain ridges and large hills: 30 m. When it is restricted by the landform or other conditions, the limit minimum

8.3.2 In-station roads shall combine the mode of site water drainage in type selection. Urban-type or highway-type may be adopted. When highway-type is adopted, pavements shall be 100 mm higher than the design elevation of the site. In collapsible loess areas and expansive soil areas, urban-type should be adopted.

8.3.3 In substations, the width of the main annular fire-fighting pavements should be 4 m.

The width of transportation road from the gate of the substation area to the main transformer:

1. Substations of 110 kV: 4 m;
2. Substations of 220 kV: 4.5 m;
3. Substations of 330 kV and above: 5.5 m.

Generally speaking, the width of transportation roads for high-voltage reactors is 4 m. In terms of substations of 750 kV and above, the width of transportation roads for high-voltage reactors is 4.5 m.

The width of overhauling roads in outdoor power distribution units in substations of 300 kV and below, and the width of inter-roads in substations of 500 kV and above shall be 3 m.

8.3.4 The turning radius of in-station roads shall be determined in accordance with the driving requirements and the requirements of driving organizations. Generally speaking, it shall not be less than 7 m. The turning radius of main roads shall be determined by the technical performance of the passage of giant flat truck. The turning radius of main roads in substations of 330 kV and 500 kV shall be 7 m~ 9 m. The turning radius of 750 kV high-voltage reactor transportation roads shall not be less than 9 m. The turning radius of main transformer transportation roads shall not be less than 12 m.

8.3.5 The longitudinal slope of in-station roads shall not be more than 6%. In terms of substations in mountainous areas, or sections with conditional restrictions, the longitudinal slope may be increased to 8%. However, corresponding skid resistance measures shall be considered.

8.3.6 In-station roads should adopt concrete pavements. When there are conditions for construction and maintenance, asphalt concrete pavement may also be adopted.

8.3.7 In-station patrol inspection roads shall be set up in accordance with the demands of operation patrol inspection and operation; be determined in accordance with the layout of ground cable trenches.

8.3.8 The width of patrol inspection road pavements should be 0.6 m ~ 1.0 m. When

9 Treatment and Afforestation of Outdoor Power Distribution Unit Site

9.1 Treatment of Outdoor Power Distribution Unit Site

9.1.1 Outdoor power distribution unit site should adopt terraces like gravel, pebble and lime earth-sealing. When gravel and pebble terraces are adopted, the lower layer of ground shall receive certain treatment. In areas that are deficient in gravel or pebble, and with abundant rainfalls, proper afforestation may be adopted. However, artificial afforestation lawn should not be adopted.

9.1.2 In terms of equipment that need patrol inspection, operation and overhauling in outdoor power distribution unit area, paved ground should be adopted within the range that needs operation in accordance with process requirements. The paving materials and range shall be professional determined by process.

9.1.3 The selection of ground paving materials shall comply with the principle of being economical and practical, and obtaining materials from local sources.

9.2 Afforestation

9.2.1 Afforestation of substations shall implement land conservation. On the premise of not increasing land utilization, conduct afforestation of sites without coverage protection in the substation area, so as to satisfy the demands of water and soil conservation and the improvement of operating environment in the substation area. Afforestation should thoroughly utilize the areas near buildings in front of the substation area, road-side areas and other idle sites. Expansion and reconstruction projects shall protect the previous afforested site; try to retain the previous greenbelts and trees. The areas destroyed by construction shall restore afforestation.

9.2.2 The afforestation of substations shall adjust measures to regional characteristics. In accordance with the local soil texture, natural conditions and plants' ecological habits, reasonably select the type of grass, trees or other plants; coordinate with the ambient environment.

9.2.3 Substations in collapsible loess areas and expansive soil areas should not adopt large-area afforestation. In accordance with the specific situation of project, intensive afforestation may be adopted in front of the substation area, or near the main roads. In collapsible loess areas, measures that prevent foundation soil from being wetted by water shall be adopted, so as to prevent adverse influence generated by water permeation into the foundation soil. In expansive soil areas, prevent trees from absorbing moisture, which will destroy houses.

9.2.4 Afforestation of urban substations shall coordinate with afforestation of the streets and satisfy the requirements of beautifying the cityscape. The top of urban

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