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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Standard for construction and acceptance of 1000kV lattice
frame and support**

1000kV构支架施工及验收标准

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2 Basic requirements

2.0.1 Before construction starts, a construction scheme shall be drawn up according to the approved design documents, this standard and the relevant technical documents, and shall be put into effect only after the scheme has been approved.

2.0.2 Bolts shall be tightened with a torque wrench, and the direction in which they are fitted should be uniform, from the bottom upwards and from the inside outwards; the flange bolts of the chord members of a frame beam should all face the same way.

2.0.3 Flange bolts shall be tightened symmetrically according to the angles of their distribution around the circumference; joint bolts shall be tightened symmetrically in the order running from the centre towards the edge.

2.0.4 The tightening torque of grade 4.8 bolts shall not be less than the values of Table 2.0.4, which gives, for each bolt size, the tightening torque in newton metres: M12, 40; M16, 80; M20, 100; M24, 250. For bolts above grade 4.8 and above size M27 the tightening torque shall comply with the design provisions.

2.0.5 The distance between the bottom of the earthing terminal of the frame or support and the top of the protective cap should not be less than 200 mm; the equipment earthing terminal of the frame or support and the earthing terminal of the equipment body shall face the same way.

2.0.6 The construction quality of frame and support works shall be controlled according to the following provisions: members and fasteners arriving on site shall have passed inspection, shall meet the requirements of the design documents, and shall be accompanied by complete records; a quality check shall be carried out after each process is completed; the galvanising process holes of the members shall be properly closed and

anti-corrosion measures shall be taken; when members are assembled, locating pins shall be used to align and centre the flange bolt holes, and thermal cutting to enlarge holes and forced assembly are not permitted; to secure the bolt tightening torque, power wrenches shall be used for bolts above M27; at joints that the design requires to be pressed tight, more than 75 % of the contact surface area shall be in close contact; and the length of the exposed thread of a bolt shall not be less than two turns.

2.0.7 A stable structure shall be secured throughout the installation of the frames and supports.

3 Construction preparation

3.0.1 The construction site shall be level, firm and laid out sensibly.

3.0.2 The construction roads shall be level and firm, and their width and turning radius shall meet the requirements of the vehicles using them.

3.0.3 Before the frames and supports are erected, the foundation axes and levels and the positions of the anchor bolts shall be checked, and shall meet the following requirements: the strength of the foundation concrete shall have reached the design requirement; the backfilling around the foundation shall be complete and compacted; and the permitted deviations of the foundation shall comply with Table 3.0.3. That table fixes, for each inspection item, the permitted deviation in millimetres, the inspection method and the number of items to be checked. The permitted deviations are: displacement of the foundation axis, not more than 5; deviation of the level of the bearing surface and of the bottom of the socket, minus 3 to 0; displacement of the centre line of the column bases of the same group, not more than 5; offset of the centres of the anchor bolts of one column base, not more than 2; deviation of the exposed length of the anchor bolts, 0 to 10; and thread length, 0 to 10. Every one of these items is subject to full inspection; the methods given are the theodolite with line and rule for the foundation axis, the level for the bearing surface and for the exposed length of the anchor bolts, line and rule for the column base centre lines and for the anchor bolt centres, and rule measurement for the thread length.

3.0.4 The incoming inspection of the frames and supports shall meet the following requirements. The technical documents of the manufacturer shall be complete and shall include the product conformity certificate; the quality certificates or test reports of the steel, the connection materials, the galvanising materials and the anti-corrosion materials; the retest reports of the fasteners, the non-destructive weld inspection reports and the galvanised coating measurement records; the table matching the fabrication numbers of the members with their design numbers; the design change documents; the agreement documents on the handling of technical problems arising during fabrication; the acceptance records of the main members; the trial assembly records; and the delivery list of the members. The members themselves shall meet the following: their type, specification, quantity and dimensions shall comply with the design requirements; they shall be free of

bending and deformation, their welds shall be free of cracking, and the thickness of the galvanised coating shall comply with the design requirements, be uniform in colour and undamaged; the deviation of the bending rise of a single steel tube section shall be kept within L divided by 1500, where L is the length of the single piece, and shall not exceed 5 mm, while the length deviation of a single member shall be plus or minus 3 mm.

3.0.5 The transport and the storage of the members shall meet the following requirements: members shall be loaded and unloaded with lifting machinery, and measures shall be taken to protect the galvanised coating; the vehicle shall be chosen according to the length and the weight of the members, and the support points on the vehicle, the length projecting at either end, the protective measures and the lashing method shall all be such that the members are not deformed and the galvanised coating is not damaged; the storage area shall be level, firm and free of standing water; members shall be stored in separate zones by type, model and installation order; the bottom sleepers shall provide sufficient bearing surface and shall prevent the support points from sinking; and when members are stacked, the support points of the successive layers shall lie on the same vertical line, the stack shall not exceed three layers, and protective measures shall be taken between the layers.

4.1 Construction of frame columns

4.1.1 The ground assembly of the frame columns shall meet the following requirements: assembly shall follow strictly the assembly range fixed for each section by the drawings and the construction scheme; the bearing points of the members shall be level and firm, and the support points shall be set according to the length and the weight of the member; the bottom section of the frame column should be assembled as a single piece or in panels, and the upper sections should be assembled in panels or in sections, the main members being assembled before the web members; after assembly the structural dimensions and the bolt specifications shall be checked, and high-strength bolts shall be checked one by one against the type required by the drawings; and the surface of an assembled frame column shall be clean and free of damage and deformation.

4.1.2 The lifting of the frame columns shall meet the following requirements: lifting machinery shall be used, and protective measures shall be taken at the lashing points of the lifting points to prevent the surface of the member from being damaged; a trial lift shall be made, the lift being stopped when the member is about 10 cm clear of the ground and resumed only after the check has confirmed that all is in order; after the bottom section has been erected, the structural dimensions, the axis, the verticality and the level shall be checked, and the upper section shall be lifted only once these meet the requirements; and after each section of the frame column has been installed in place the verticality shall be checked, the construction of the frame beam following only once it is found acceptable.

4.1.3 Once the bottom section of a frame column has been set in place, the earthing connection shall be made without delay.

4.2 Construction of frame beams

4.2.1 The ground assembly of the frame beams shall meet the following requirements: assembly shall follow the frame beam installation drawing, and the member numbers, types and bolt specifications shall be checked carefully before assembly; the bearing points of the members shall be level and firm, and the support points shall be set according to the length and the weight of the member; the frame beam shall be assembled as a whole on the ground, and the assembly order should run from the bottom chord to the top chord and from the main members to the web members; after assembly the camber height and the length of the beam shall be checked against the design requirements and the position of the stringing joints shall be verified; and the surface of the frame beam shall be clean and free of damage and deformation.

4.2.2 The lifting of the frame beams shall meet the following requirements: the beam shall be lifted as a whole with lifting machinery; before lifting, the installation distance between the two columns shall be measured and checked against the actual installation dimension of the frame beam; before lifting, control ropes shall be tied at both ends of the frame beam to control its direction and guide it into position; a trial lift shall be made, the lift being stopped when the beam is about 10 cm clear of the ground and resumed only after the check has confirmed that all is in order; and once the frame beam is in position, the connecting bolts shall be tightened when the verticality of the frame columns and the position of the frame beam have been adjusted to meet the design requirements.

4.2.3 The tightening of the anchor bolts of the frame shall comply with the design requirements.

4.3 Construction of equipment supports

4.3.1 Equipment supports shall be assembled as a whole on the ground; after assembly the geometrical dimensions of the support and the tightening of the bolts shall be checked, and lifting shall follow only once these meet the requirements.

4.3.2 Equipment supports shall be lifted as a whole with lifting machinery, and once in position the verticality and the level of the support shall be corrected.

4.3.3 The tightening of the anchor bolts of the support shall comply with the design requirements.

4.3.4 Once the support has been set in place, the earthing connection shall be made without delay.

5 Quality acceptance

5.0.1 Quality acceptance shall meet the following requirements: the work shall have been