

Introduction to the Main Technical Points of the 66 kv Overhead Steel Tube

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Abstract-This paper introduces the 66 kv overhead multi steel tube pole in some of the problems existing in the engineering application, And combined with the design and operation experience, in the steel tube pole selection of design parameters and the steel tube pole design pay attention to two aspects of the main points of the paper analyzed the main technical points of steel tube pole design, In Liaoning province and puts forward a set of 66 kv overhead multi pole typical design scheme, And to standardize construction management, the reasonable control of engineering cost.

Keywords-steel tube; load economic; a typical design

I. INTRODUCTION

Steel tube pole in recent years because of its simple structure, beautiful shape, cover an area of an area small, etc are widely used in cities and suburbs, in the new district of overhead transmission lines. However, at present the design of the steel tube pole parameters also does not have a standard data, General design and the state grid corporation of power transmission and transformation project (66) 110 KV transmission line wei (2011 edition) "hereinafter referred to as the" standard setting ") of the general design of steel tube pole in the modules do not completely conform to the regional situation, Now regions are the design of their habits to design, although can meet the requirements of relevant regulations, but the design finished each are not identical. The following combined with own work experience, in view of 66 kv overhead multi will make the brief analysis of the main technical points of the steel tube pole.

II. THE APPLICATION STATUS IN LIAONING PROVINCE

In liaoning province according to the survey, design units in the project design of steel tube pole design mostly refer to the standard set of steel tube pole universal design module, Or provide the electrical layout and conditions of use to the winning manufacturer after design complete solution by the manufacturer.

But, in the design of general 06 gg steel tube pole double overhead ground wire type in terms of universal design module for double wire line and the general design of 06 b tower universal design module of double overhead ground wire type single wire drawing is not corresponding, General part 06 gg steel pipe stem design module can't be used in the practical work, and the range is too large, the general design tower without drawing processing indexes of figure, guidance is not strong. In addition, when the designer according to the steel tube pole electrical layout and conditions of use provided to the winning factory design,

the winning manufacturers tend to artificially increase the steel tube pole under the driven of root diameter and wall thickness, a little interested in increasing the weight of tower, at the same time cause the poles foundation is too big, cause the tower area increase, resulting in greatly increased overall project cost.

III. STEEL TUBE POLE SELECTION OF DESIGN PARAMETERS

A. The Choice Of Steel

According to the requirement of the specification by current regulations and on the current steel market supply situation and steel pipe rod processing factory production capacity, design should use of Q345 low alloy steel, steel tube pole in order to reduce steel tube pole overall weight, increase the safety margin, the design of the steel tube pole taper is small, beautiful appearance.

B. The Determination Of Cross Section Shape

Usually USES the round, 12 and 16 while cross section, the more number of edges, the closer the circular force is, the better, steel consumption is small, but the processing difficulty increase. These three section of circular cross section, the optimal, but circular cross section processing difficulty is big, often is the oval processing of steel tube pole section, this will affect the stress of the shaft, for the safe operation of lines. So in the general case 66 kv tube rod shaft section usually takes 12 edges.

C. The Choice Of Tip Diameter

The deflection control of the steel tube pole is the value of the tip diameter in one of the decisive, reasonable choice of tip diameter can effectively reduce the amounts of steel, And a little diameter also affects the root diameter of steel tube pole, thus affecting the area. The mechanical model of steel tube pole is a cantilever beam, the deflection is inversely proportional to the section moment of inertia of the I, according to the steel tube pole design provisions on the overhead transmission lines of calculation formula:

$$I=c \times D^3 \times t$$

Of them and the number of edges of section C constant, visible, steel tube pole diameter D's contribution to the deflection is much greater than the wall thickness t, in the case of other parameters constant appearance, expand the tip diameter size, can make the whole stiffness of steel tube pole improved significantly. According to my design experience, sums up the tip diameter value range.

TABLE I. TABLE TIP DIAMETER RANGE SELECTION TABLE(UNITS: mm)

The lever type	0°	0°~30°	30°~60°	60°~90°
A diameter range	300	300	400	500

D. The Choice Of The Taper

Taper size is determined by the size of rod load, the steel tube pole by the load, the greater the bending envelope the greater the slope, and the greater the need to ensure that the taper force is reasonable. But as a result of the deflection control requirements, the tip diameter cannot be too small,

so the taper is too large and will inevitably lead to root diameter is too large, on the one hand, waste materials, at the same time, the serious influence is beautiful. Comprehensive cover, beautiful, factors such as material quantity, deflection, according to my design experience, summed up the optimum taper range.

TABLE II. TABLE TAPER RANGE TABLE

The lever type	00~300	300~600	600~900
The optimal taper	1/65	1/55	1/50

E. The Choice Of Wall Thickness

The steel tube pole wall thickness should be selected considering processing problems, usually should be not more than 20 mm, otherwise should confirm factory equipment capability. As a result of the stress of the steel tube pole, wall thickness from top to bottom is gradually enlarged, the segment on the most thin, according to my design experience, wall thickness should be not less than 6 mm.

F. Shaft Section

Shaft needs into several segments, segment can choose more reasonable wall thickness, thus reduce the steel consumption, but increase the shaft connection, increasing the difficulty of construction installation, but also undermines the integrity of the shaft. Usually is limited by transportation and processing, the craft of hot dip galvanized, each section of the rod length should be determined in about 10 m, when the wall thickness is bigger (22 mm) >, still should according to the processing plant equipment ability to appropriately reduce the long.

G. Deflection Of Consideration

Steel tube pole and tower, steel tube pole in most cases is a deflection to control the selection of the structure. If only calculate strength meet the requirements, the deflection of the runtime can reach more than 30 %, the serious influence is beautiful, and the deflection calculation meets the demand of restrictions, strength of materials often has a large surplus. Procedures proposed in the straight rod for 15 % 5 %, tension rod for the peak of the deflection limit.

IV. PAY ATTENTION TO THE MAIN POINTS OF THE STEEL TUBE POLE DESIGN

A. Design A New Type Of Rod Head Type

According to the concrete conditions of liaoning, in meet the overhead power line design specification "66 kv and below, Perch on the ground to protect the side wire Angle, appropriate USES 20 ~ 30 degrees requirements under the premise of, According to the standard set of design, the design should adopt the single ground design approach of the head. Save a piece of ground in transmission line at the same time, the body does not increase overall weight, And single ground wire arrangement on the application of Angle steel tube pole is more convenient and flexible, reduces the construction difficulty.

B. To Design Complex Load Of The Wire

Meteorological conditions and load against the new specifications of steel rod load calculation standard of the redesign, Increase the steel tube pole on the ice and the wind load resistance, Increase the reply of double guide rod body large load capacity.

C. Shaft Welding

Must clear a mandatory principle, due to the difficult to assure the quality of spot welding, steel pipe shaft are strictly prohibited in the spot welding; It is forbidden to cross weld longitudinal seam is to reduce as far as possible. Unlike conventional tower, steel tube pole is a hydraulic structure, the force is given priority to with bending moment, a pull at the side of the shaft there is a huge, Transverse

weld quality is a bit not pass will be easily torn, accident shaft transverse fracture of stem.

D. Shaft Connection

Should be based on load size reasonable choose connection mode, when using the straight-line or $0^\circ \sim 10^\circ$ corner when using the socket connection, The tension or $10^\circ \sim 90^\circ$ Angle when use flange connection. When using flange connection, the picture should indicate the direction of x, y, and said clear screw hole with x, y direction of the relative position (as shown in figure 1), Otherwise after assembly, will cause the cross arm the perpendicular to the line direction is not irreparable consequences.

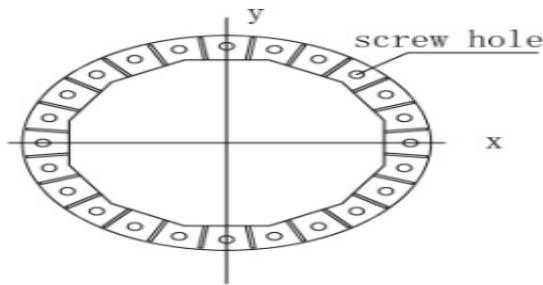


Figure 1 Flange floor plan.

V. THE ECONOMIC BENEFIT ANALYSIS

To meet the 66 kv and below overhead power line design specification "requirements, According to the standard set of design, the project put forward a set of suitable liaoning region of more than 66 kv overhead rib steel tube pole typical design scheme, Specifications of steel tube pole line the standardization of design and construction, improve the quality of the whole project. Single ground by cooperate with the OPGW cable design, reduce weight, from the tower body, foundation construction and other aspects, engineering cost saving target at more than 10%, to standardize the construction management, the reasonable control of engineering cost.

VI. CONCLUSION

With the improvement of China's comprehensive national strength and the rapid development of power grid construction, the application of steel tube pole is more and more widely, steel tube pole to become an important part in the design of overhead line, In terms of the standard set of 66 kv standard set after the experience of the steel tube pole, the typical design of popularization and application of liaoning region, will avoid a lot of repetitive design work, For unified design standard, to ensure the engineering quality, has a positive role in promoting. Based on the part of the circuit engineering design experience and puts forward some experience in design parameters and main technical points, the optimal design of the steel tube pole is still a long way to go, we need to work together.

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