BANGLASESH RURAL ELECTRIFICATION BOARD

PBS INSTRUCTION 100-70

Line Construction Design
For
636 MCM & 795 MCM Conductors
In 33 kV Sub-Transmission Line

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BANGLADESH RURAL ELECTRIFICATION BOARD
PBS INSTRUCTION 100-70

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SUBJECT: LINE CONSTRUCTION DESIGN FOR GROSSBEAK (636 MCM) AND MALLARD (795 MCM) CONDUCTORS

1. INTRODUCTION:

BREB is licensee for electricity business in the rural segment of the country by the government of Bangladesh since 29th October 1977 through an Ordinance. BREB started RE (Rural Electric) program from January 1978. At the initial stage of RE program, electric connection rate was very few but at present BREB has covered about 92%. Within this year 2019, BREB is determined to complete hundred percent electric connection in it's commending area.

KWH demand of BREB is increasing dramatically for the following reasons-

(a) Within city area value of land is high, which will incur higher cost for industrial development. So industrial development in rural area is higher than city area;

(b) Space is not available in city area for industrial development. So industrial development in rural area is higher than city area;

(c) Industrial development in city area is not environment friendly. So industrial development in rural area is higher than city area;

(d) People migration rate from rural segment to city area is not higher than past because of available citizen facility in rural area;

BREB has been using 4/0 ACSR, 1/0 ACSR and # 3 ACSR conductor for 11/6.35 KV HT line and 477 mcm conductor for 33 KV source line. Due to rapid load growth these

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conductors are not capable to carry higher amount of current. To ensure adequate level of voltage at the consumer end and to reduce system loss, higher size conductor, such Grosbeak, Mallard etc. can be used for PBS system construction. But BREB has no construction standard for such type of higher size conductors. Considering the above discussed issue a separate PBS Instruction 100-70: LINE CONSTRUCTION DESIGN FOR 795 MCM AND 636 MCM CONDUCTORS is developed.

2. RULING SPAN LENGTH AND ITS ESTABLISHMENT:

At the beginning of this design the ruling span must be estimated, Ruling span length may be considered as an assumed design span that assures the best average tension through a line between dead ends non-uniform span length. The actual tension, under loaded and unloaded conditions may be greater or less than the ruling span tension due to various span lengths, ground slope, loading conditions etc.. The ruling span length depends on various factor. It must be within the limit of conductor's tension, pole strength, cross-arm strength, bolt strength and so on. It is a quantitative procedure. However, as the pole height has got narrower limit, so this can be estimated by assuming a height of base structure. Base structure is the structure that is expected to be used mostly throughout the line. The structure or the pole height must be such that the clearance between the lowest conductor and the ground level in still air meets the requirement of the Overhead Line Regulations. So the base structure's height minus the minimum ground clearance minus the height of the lowest phase conductor from the top of the structure/pole. The result is the allowable sag as limited by ground clearance. The ruling span may be chosen whose value is approximately equal to the allowable sag of the base structure. The sag value is to be taken at 120^{o} F. The ruling span value is to be checked whether it is conformed with the following customary approximate equation-

$RS = L_{avg} + 2/3(L_{max} - L_{avg})$, Where RS = Ruling Span

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L_{avg} = Average Span
L_{max} = Average Span

If the above estimate does not hold good, the value should be changed and the procedure is to be repeated again. If the differences between estimated ruling span and the actual ruling span is more than 15% approximately, the procedure is to be repeated. So, to find allowable sag limited by ground clearance, structure/ pole height, minimum vertical clearances of conductors are required. Followings are the vertical clearances of conductors to ground.

3. MINIMUM VERTICAL CLEARANCE IN METER OR FEET:

The minimum vertical clearance under different situations for different conditions are tabulated below-

Table 3.1
Minimum Vertical Clearance Required Between Conductors and Ground When Conductors Cross Over

Sl No.	Location	Clearance (m/ft)
01	Rail road & Tracks	9.4 (31′)
02	Roads, Streets, Alleys	7.0 (23′)
03	Land that may be traversed by	7.0 (23′)
04	Spaces and ways accessible to pedestrians only or Water areas not suitable for sail boating	5.5 (18′)
05	Water ways suitable for sail boating including lakes, rivers less than 20 acre	7.0 (23′)

Table 3.2
Vertical Clearance Required Between Conductors

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PBS Instruction 100-70: LINE CONSTRUCTION DESIGN FOR 795 MCM AND 636 MCM CONDUCTORS				
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and Ground When Run the Travelled Way or Adjacent Land

Sl No.	Location	Clearance (m/ft)
01	Road in rural district	6.4 (21′)
02	Streets or alleys in urban district	7.0 (23′)

For safety measures when the conductors cross over buildings and other following clearance are to be maintained-

Table 3.3
Clearance when Conductors Cross Over

Sl No.	Location	Clearance (m/ft)
01	Building roofs or projections not accessible to	4.0 (13′)
02	Building roofs or projections accessible to	5.5 (18′)
03	Sign, Chimneys, radio & television antennas, tanks, bridges & other installations like	3.4 (11′)
04	Lighting support, traffic signals, or a supporting structure of another line	2.5 (8′)
05	Swimming pools	8.6 (28′)

To avoid ground fault where the conductors of one line cross over the conductors of another line, the following clearances are to be maintained-For safety measures when the conductors cross over buildings and other following clearance are to be maintained-

Table 3.4
Clearance Required Between upper and lower level Conductors when Crosses Over (when upper conductor has ground fault relaying)

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