

GUIDANCE FOR FITTINGS-ONLY OVERHEAD LINE REFURBISHMENTS

PURPOSE AND SCOPE

The purpose of this document is to provide additional guidance on the application of TS 3.4.17 and TS 2.4 to overhead line “fittings only” refurbishments, where the conductor is not replaced.

PART 1 – GUIDANCE

1 INTRODUCTION

For full refurbishments of overhead lines, all components other than the tower are replaced. TS 3.4.17 and TS 2.4 define the requirements for ensuring that the towers are structurally capable of supporting the new conductor system, and that the new conductor system meets the requirements for electrical clearances to ground at the design rated temperature. For “fittings-only” refurbishments, structural and clearance checks are not necessarily needed, as the mechanical and electrical duty on the line is not being changed.

However, when replacing the insulators and fittings of an existing overhead line, potentially significant changes to sags and tensions can occur. The aim of this note is to provide guidance to ensure that these potential changes are taken into account.

2 MAINTAINING ORIGINAL DESIGN SAGS, TENSIONS, AND CLEARANCES

2.1 Insulator Set Lengths

The length of the insulator sets has a direct impact on the sags, tensions, and clearances to ground of overhead lines. When a new conductor system is erected and sagged, the length of the tension insulator set it is to be attached to determines the length to which the conductor is cut prior to the joint being fitted. Furthermore, when electrical clearances (both to ground and to the tower body) are being assessed, the length of the suspension insulator sets is one of the design parameters.

If, during the service life of an overhead line, the length of either the conductor or the insulator sets change, then there will be a corresponding change in the sags and tensions of the line. In normal service, the lengths of insulator sets do not change, and conductor creep is taken into account as part of the design. However, during a fittings-only refurbishment, new insulator sets are fitted onto the original conductor system, and these are very likely to have a different length as a result of specification changes since the original installation.

The greatest impact of insulator set length change will be at tension towers. Small changes in length can result in large changes in tension, especially for short sections or spans. If the new sets are too short, tension may rise above recommended levels, both with respect to tower strength and to Aeolian vibration, potentially compromising the reliability of the line. If the new sets are too long, then there may be an unacceptable increase in sag.

It is therefore essential that the replacement of tension insulator sets does not result in changes to conductor sag or tension. Ideally, this should be achieved by ensuring that the new set results in a dimension from tower to anchor clamp that is unchanged from the original. Where this is not possible, then consideration should be given to replacing the conductor joint, lengthening the set by means of a sag adjuster or extra links if necessary to allow for the reduction in conductor length resulting from the old joint being cut off, and the new one being pressed on. Checks on final sags should not be necessary, provided that the distance from the tower attachment point to a reference point on the conductor is unchanged after works have been completed.

The impact of changes to suspension set lengths will be less significant, and can be taken into account at the design stage. It is suggested that a clearance study is carried out for the new suspension set lengths, where these are longer, in addition to the clearance study carried out for the existing installation. This includes both clearances to ground and clearances to the tower body. If clearances are shown to be unacceptable, then the design of the insulator set would need to be modified (in the case of tower clearances), and/or measures would need to be taken to increase clearances to ground. Further guidance in this case can be found in TGN(E)136.

Where the new suspension insulator set is shorter than the original, the impact on tensions will be insignificant and no further modifications will be necessary. This assumes, however, that the length reduction is not excessive.

2.2 Bundle Regulation

It is not uncommon for the subconductors in a bundle to have slightly different sags. This could be as a result of original construction errors, the impact of maintenance and repair activities, or simply due to differing creep rates in service. The result is a bundle that is out of regulation. This is not a problem for small sag differences, but for larger differences, where the distance between subconductors is significantly increased, there is an impact on spacer-damper performance.

Ideally, bundles should be re-regulated during a fittings-only refurbishment, but this is often impractical owing to the need to effectively re-sag an entire section, putting the conductor in blocks at the suspension positions. It is therefore recommended that advice be sought from the manufacturer of the spacer-dampers to be fitted as to the acceptable tolerance on bundle regulation. Where spans are identified as being outside this tolerance, corrective action should be taken.

A further area where bundle regulation might be an issue is on large-deviation angle towers where the span lengths for the subconductors might, effectively, be different. This can also result in the individual insulators not being perfectly in alignment, a condition known as “pot-lead”. Again, this is not considered a problem unless the mis-match is likely to result in degraded performance. New tension sets should take the possibility of pot-lead into account, such that the insulator strings can be matched up to within a reasonable tolerance.

2.3 Jumpers and Jumper Fittings

Although these are not replaced as a matter of course during a fittings-only refurbishment, there may be a requirement to do so as a result of poor condition of either the conductor or its fittings. In addition to condition, however, is the issue of wire clearances to the tower body or the crossarms (above and below). If, as a result of the guidance given in 2.1 above, the distance between anchor clamp jumper flags changes, then the jumper will need to be replaced with a new one, even if the original can be re-attached. This is due to the fact that the clearance to the arm above will be reduced if the jumper span length is increased without an increase in the jumper length.

Further, a check on final jumper clearances should be carried out after the insulator sets have been replaced, even where no change in jumper length is required, to confirm that specified clearance requirements are met. If these requirements are not met, then the jumper will need to be replaced.

3 FORMS AND RECORDS

Not applicable.