POWER AND WATER AUTHORITY

STANDARDS BRANCH
– Power Division

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PREPARED BY : P McCormack
AUTHORISED BY : Brian Kent

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SUBJECT: SAG & TENSION CHARTS

The PAWA sag and tension chart have been revised to show the following design tensions, in accordance with c(b) -1 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines.

Hydrogen - 15% of the calculated UTS

Banana)
Cherry) 17.3% of the calculated UTS
Sultana)

Mars)
Mercury) 18% of the calculated UTS
Pluto)

The design tensions are at the following conditions:

20 deg C No wind Northern Region
15 deg C No wind Central Region
5 deg C No Wind Southern Region

Example: 'Hydrogen' Darwin region

S&T chart S1-3-1-5 shows that at 20 deg C, the conductor tension increases. This effect is more pronounced at shorter spans. As the temperature rises, the conductor expands, hence the tension drops. Again, the effect being more pronounced for short spans. This is shown on the S&T charts.

At a given temperature, the tension in an overhead line is a function of the span, sag and conductor mass.

$$T = \frac{Wl^2}{8S}$$

T=tension
l=span length - metres
W=mass force (weight) - Newtons/metre
S=sag - metres

The effect of this wind pressure on a conductor at 20 deg C is shown by the line labelled.50 % UTS 20 deg C + 500Pa wind, on chart S1-3-1-5.

The line is used to determine the maximum expected design load on overhead hardware and poles. The horizontal tension corresponding to the appropriate span for each conductor is added to other wind loadings, such as those on poles and crossarms, and the resultant force is used to determine the type of pole, footing or guy required.

A publication by G H Johnston and W H Stewart of Metal Manufacturers, titled "Properties of Aluminium Alloy Conductors" recommends a design tension of 18% UTS for AAAC without dampers.

This would support the case for continued application of PAWA's S&T charts, providing they are properly used.

When tensioning overhead conductors, it is important to measure the conductors temperature, and apply the correct sag for the prevailing temperature. In most cases this will result in a tension well bellow the 18% UTS, however when the temperature drops to 20 deg C (or 15 deg C in central Region of 5 deg C in the Southern Region) the conductors shrink and the tension increases to the 18% UTS.

BRIAN KENT
STANDARDS MANAGER POWER