# TR42.7 Update to IEEE 802.3at

Current Carrying Capacity of Cabling

# Introduction

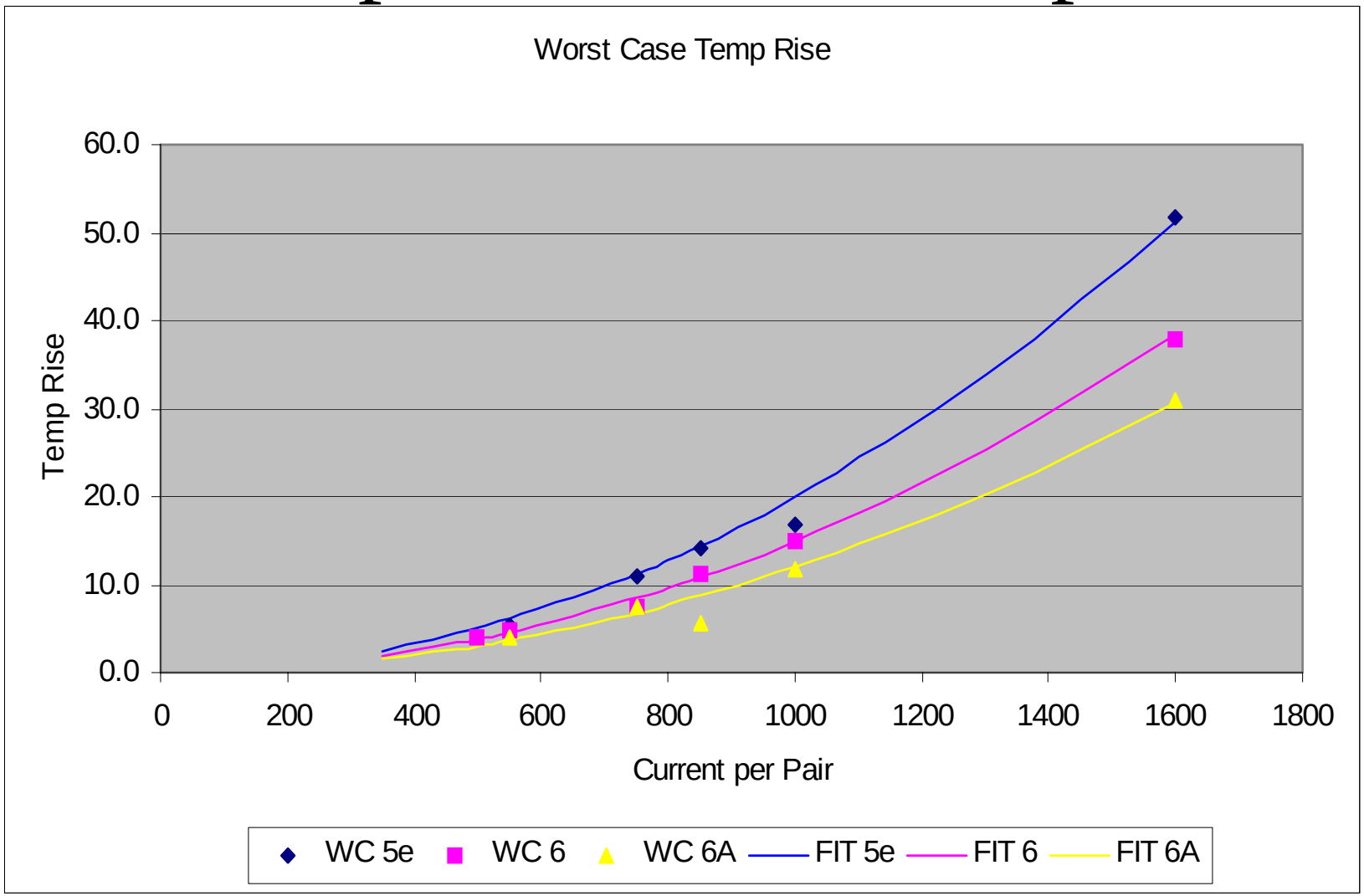
- TR42.7 is pleased to provide IEEE 802.3at with the following update on the progress of the specification of dc current carrying capacity of balanced twisted pair cabling.
- Work on maximum current is complete. Details of implementation, special guidance and effect on installation are being developed.

# Temperature Rise Data

Testing was completed by multiple manufacturers on multiple samples of plenum and riser cable. The compiled worst case results are shown below.

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | m | 0 | 0 | 0 |
| | | | b | 20 | 15 | 12 |
| **Current Level** | **WC 5e** | **WC 6** | **WC 6A** | **FIT 5e** | **FIT 6** | **FIT 6A** |
| **350** | | | | 2.45 | 1.8375 | 1.47 |
| **500** | | **4.0** | | 5 | 3.75 | 3 |
| **550** | **5.4** | **4.7** | **4.0** | 6.05 | 4.5375 | 3.63 |
| **750** | **10.8** | **7.4** | **7.4** | 11.25 | 8.4375 | 6.75 |
| **800** | | | | 12.8 | 9.6 | 7.68 |
| **850** | **14.1** | **11.3** | **5.6** | 14.45 | 10.8375 | 8.67 |
| **1000** | **16.8** | **15.0** | **11.7** | 20 | 15 | 12 |
| **1300** | | | | 33.8 | 25.35 | 20.28 |
| **1600** | **51.8** | **38.0** | **31.1** | 51.2 | 38.4 | 30.72 |
| | | | | | | |

# Temperature Rise Graph




**Fitting functions follow expected form $\Delta T = mI^2 + b$**

# Recommendations for Maximum Current Carrying Capacity

- Maximum dc current is **720** mA per pair (360 mA per conductor) up to 45 °C maximum ambient temperature for Category 5e, 6 and 6A.
- Beyond 45 °C ambient de-rate to 0 mA at 60(TBD) °C on a squared current basis.
- Maximum power inserted into (transmitted over) any individual cable bundle should not exceed 5000 W (TBD) up to 45 °C. From 45 °C to 60 °C (TBD) de-rate to 0 W as above.

# NOTES

- The specified current and power limits are designed to maintain cabling temperature rise of less than 12 degrees and a maximum cabling temperature lower than 60 degrees C. The maximum temperature is a combination of ambient temperature and expected temperature rise in the cabling.
- Specification assumes all 4 pairs energized. The worst case temperature rise data was either measured or extrapolated to a 100-cable bundle. The group is further investigating this extrapolation.
- The 5000 W (TBD) is an estimate for a 10 degree temperature rise in a 100-cable bundle.
- A minimum voltage of 51VDC was assumed in estimating the power delivered to a load at the end of the cabling system while still delivering 30W/60W over 2/4 pairs.

# General Comments

- TR42.7 are investigating how to take advantage of improved cabling for PoE+ applications. At this time we are not recommending specifying different current maxima for different resistances or categories.
- Temperature rise is a function of several factors including current, bundling, cable construction, DC resistance, and installation conditions. Smaller bundles are helpful. Higher performing cables having lower DC resistance (e.g. category 6, category 6A) generally have lower temperature rise and therefore fewer bundling constraints.