Effect of Organized and Random Bundling on Cable Heating

Wayne Larsen

CommScope

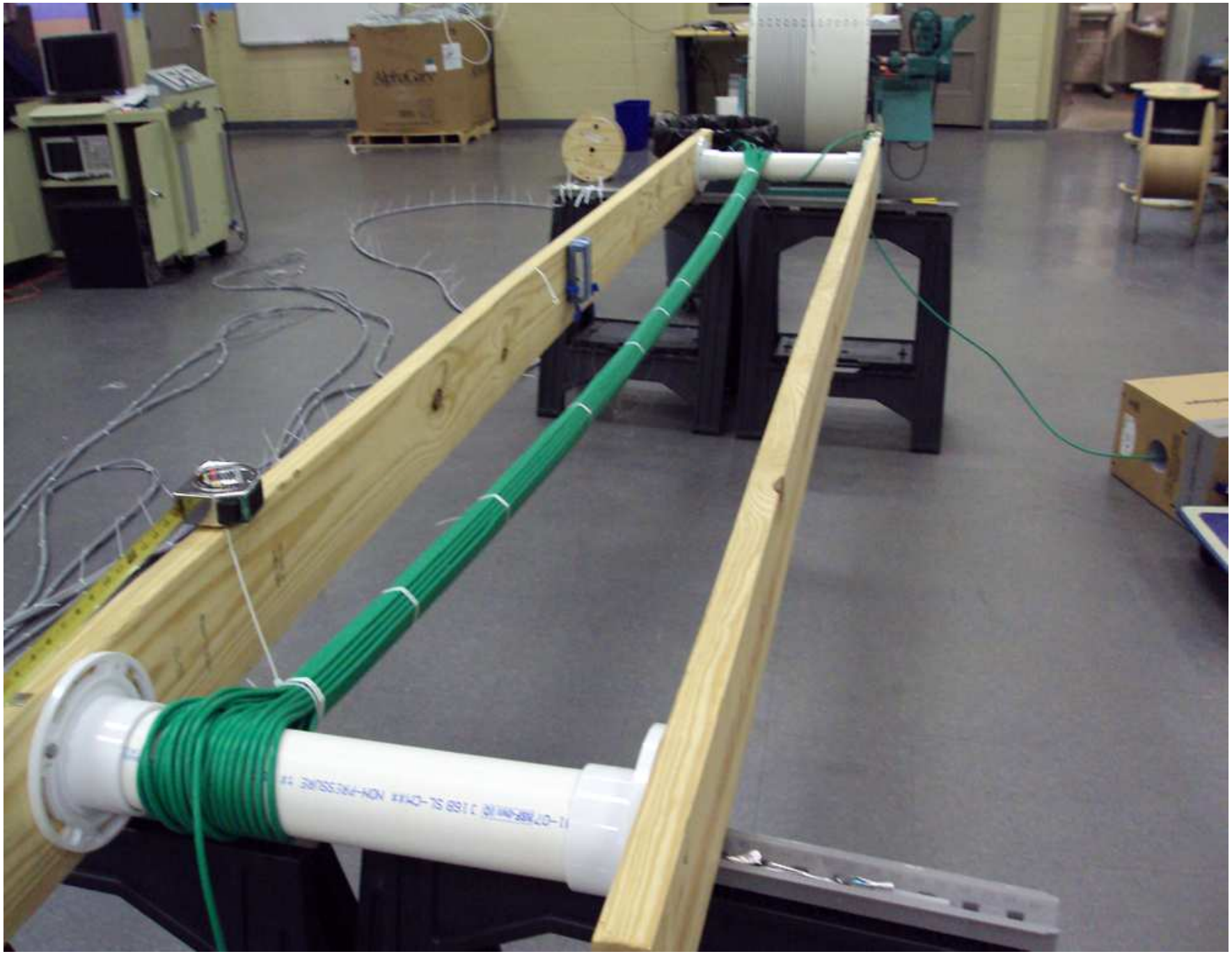
- Special thanks to Wayne Hopkinson who actually did this work.

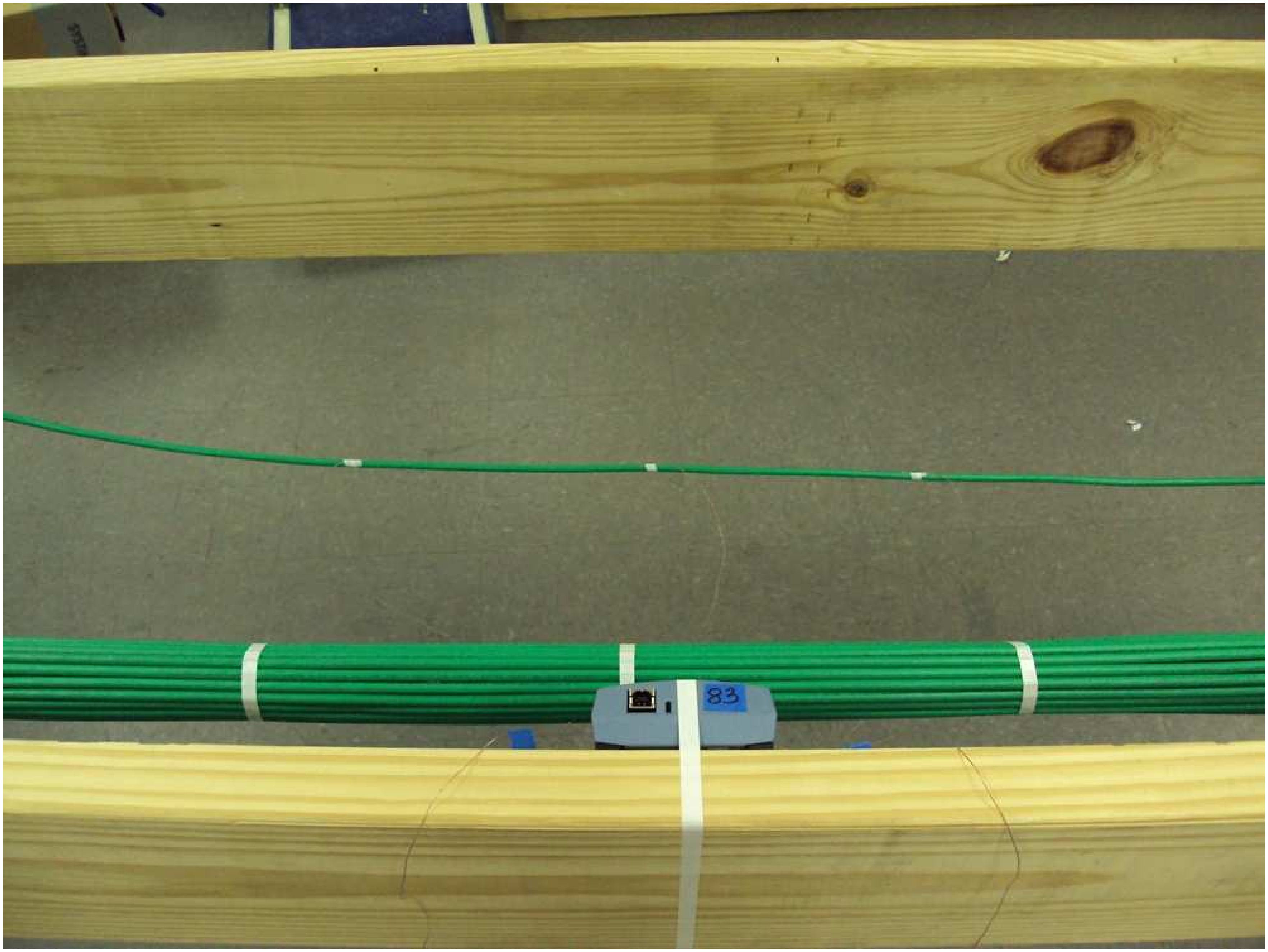
To test the theories

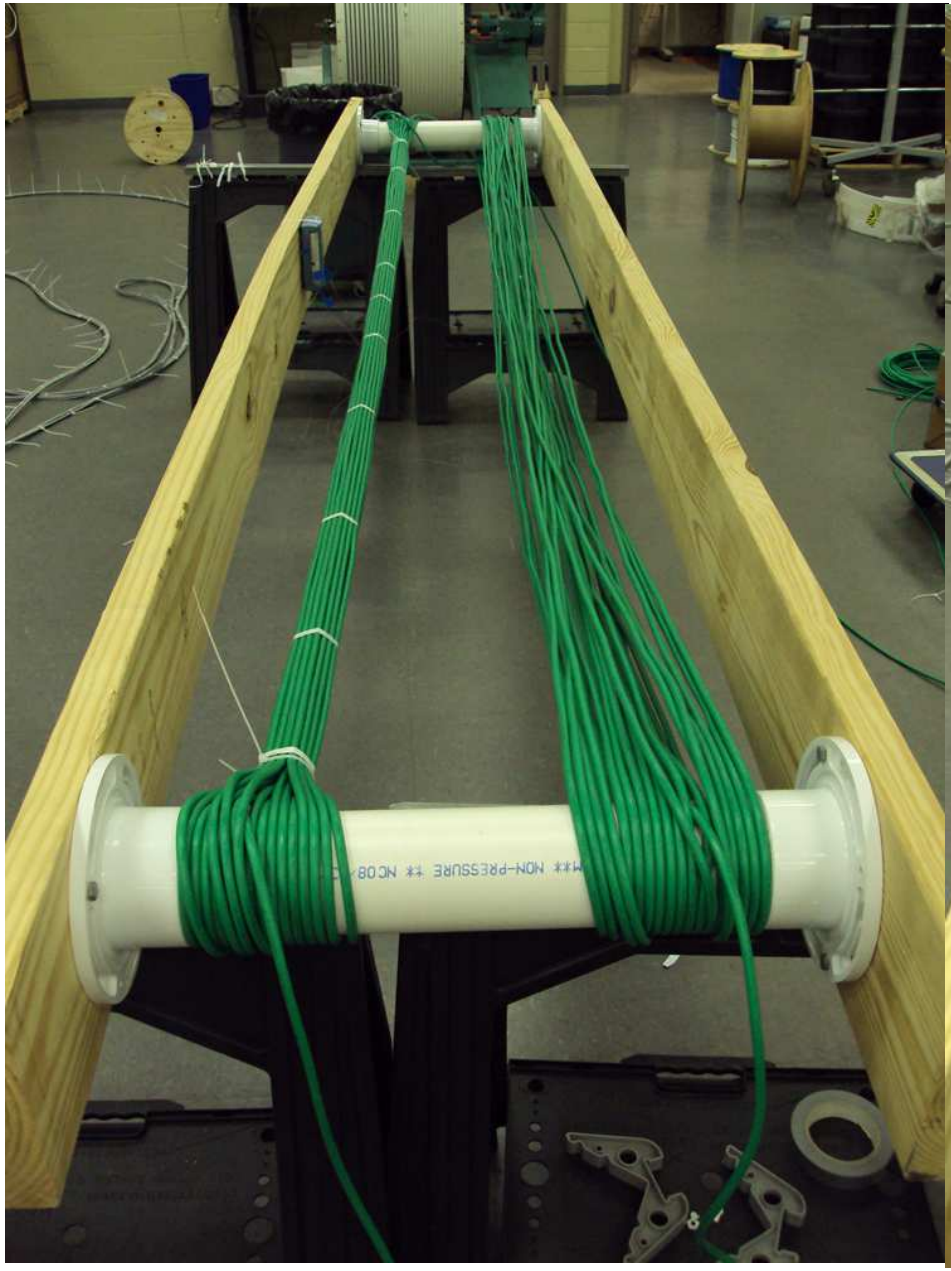
- Random bundling will trap air pockets within the cable bundle, which will act as insulation and increase cable heating, or
- Random bundling will create linked air pathways within the cable bundle, which will allow increased natural convection and reduce cable heating

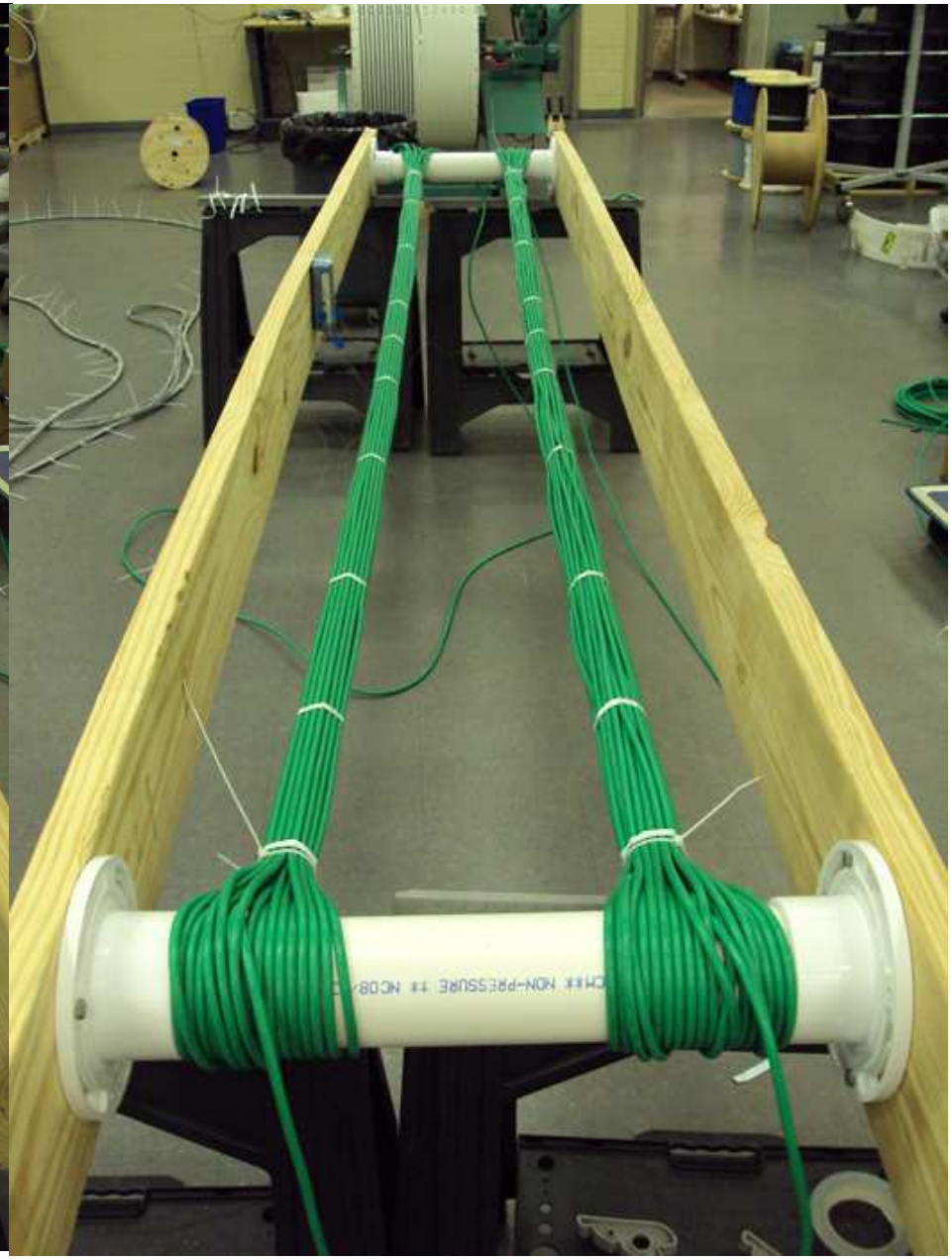
Experimental Procedure

- An organized bundle was created with three well-controlled cable layers around a central victim cable, resulting in a 37 cable bundle.
- A second victim cable was strung a short distance from the organized bundle.
- 18 round trip back-and-forth loops of the cable were placed near the second victim.
- The resulting group of 37 cables was clinched together into a bundle, with effort being made to keep the victim in the center, but no other efforts to keep the bundle organized.
- The two cable bundles were connected in series, so that the same current was present in both bundles at all times.
- Thermocouples had been placed at multiple locations on both victim cables. Other thermocouples were places nearby to monitor the ambient temperature.
- Over a period of two days, six different current levels were applied, to all pairs of both bundles. The current was kept constant long enough to reach steady state, and the temperature rise above ambient was observed.



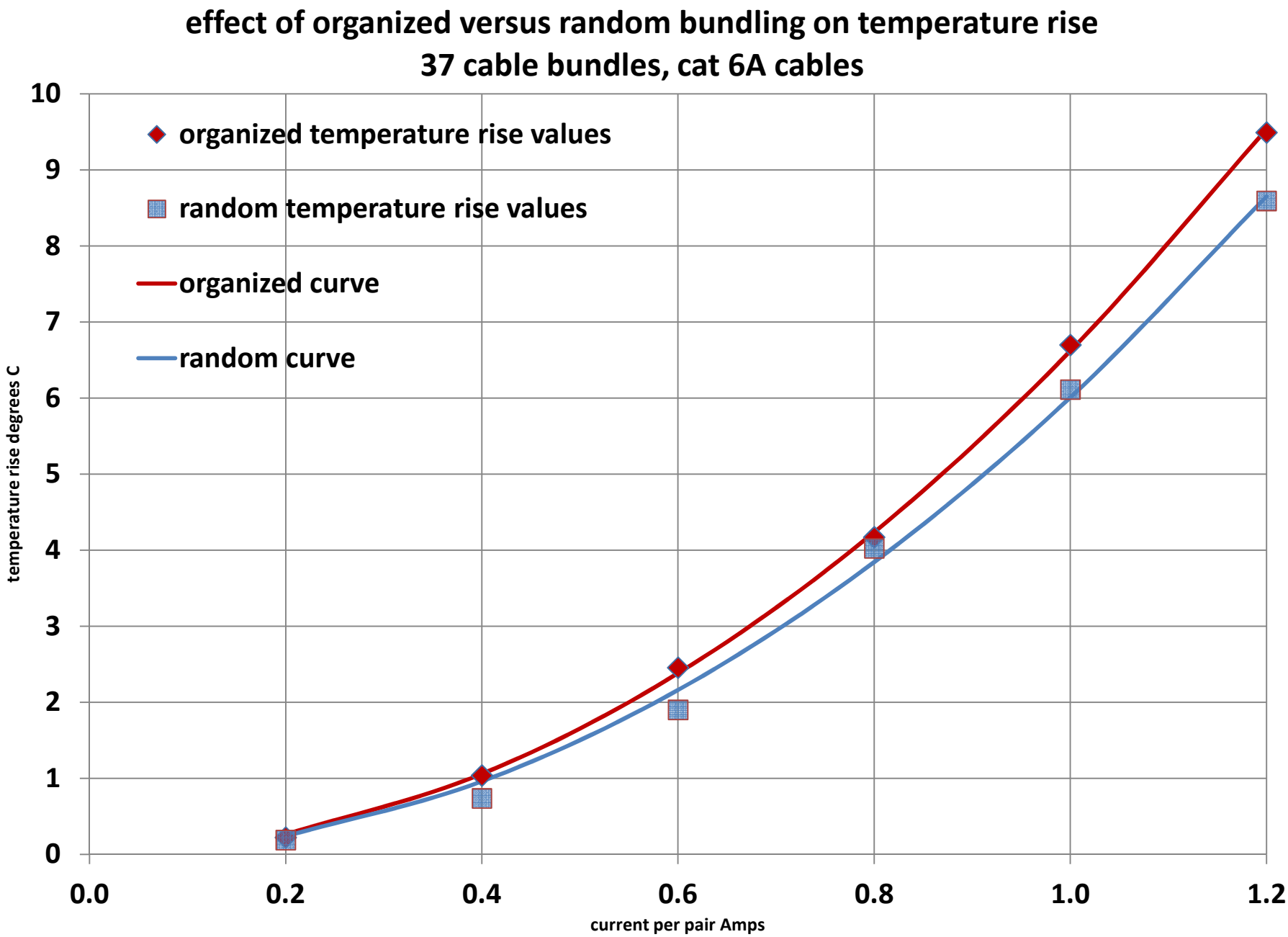

83





Outcome and Analysis

- The diameter of the organized bundle was 1.922 inches, the random 2.085 inches.
- The temperature rise of 6.7 degrees C in the organized bundle at 1 Amp/pair was similar to the prediction of 7 degrees C from jan14/larsen_01_0114.pdf.
- The six data points of temperature rise and current level for each bundle were curve fit to the form dT=K*I^2, assuming zero intercept and zero linear term (supported by jan14/larsen_01_0114.pdf).


effect of organized versus random bundling on temperature rise
37 cable bundles, cat 6A cables
organized temperature rise values
random temperature rise values
organized curve
random curve
temperature rise degrees C
current per pair Amps
0
1
2
3
4
5
6
7
8
9
10
0.0
0.2
0.4
0.6
0.8
1.0
1.2

Conclusions

- Random bundling does not trap air in pockets and increase cable heating.
- Organized bundling is slightly hotter than random bundling.
- There is no need to require random, or any other specific, bundling method:
  - Just assume organized bundling for thermal analysis, since that results in worst case heating.
  - Real life random bundling will result in a small safety margin.