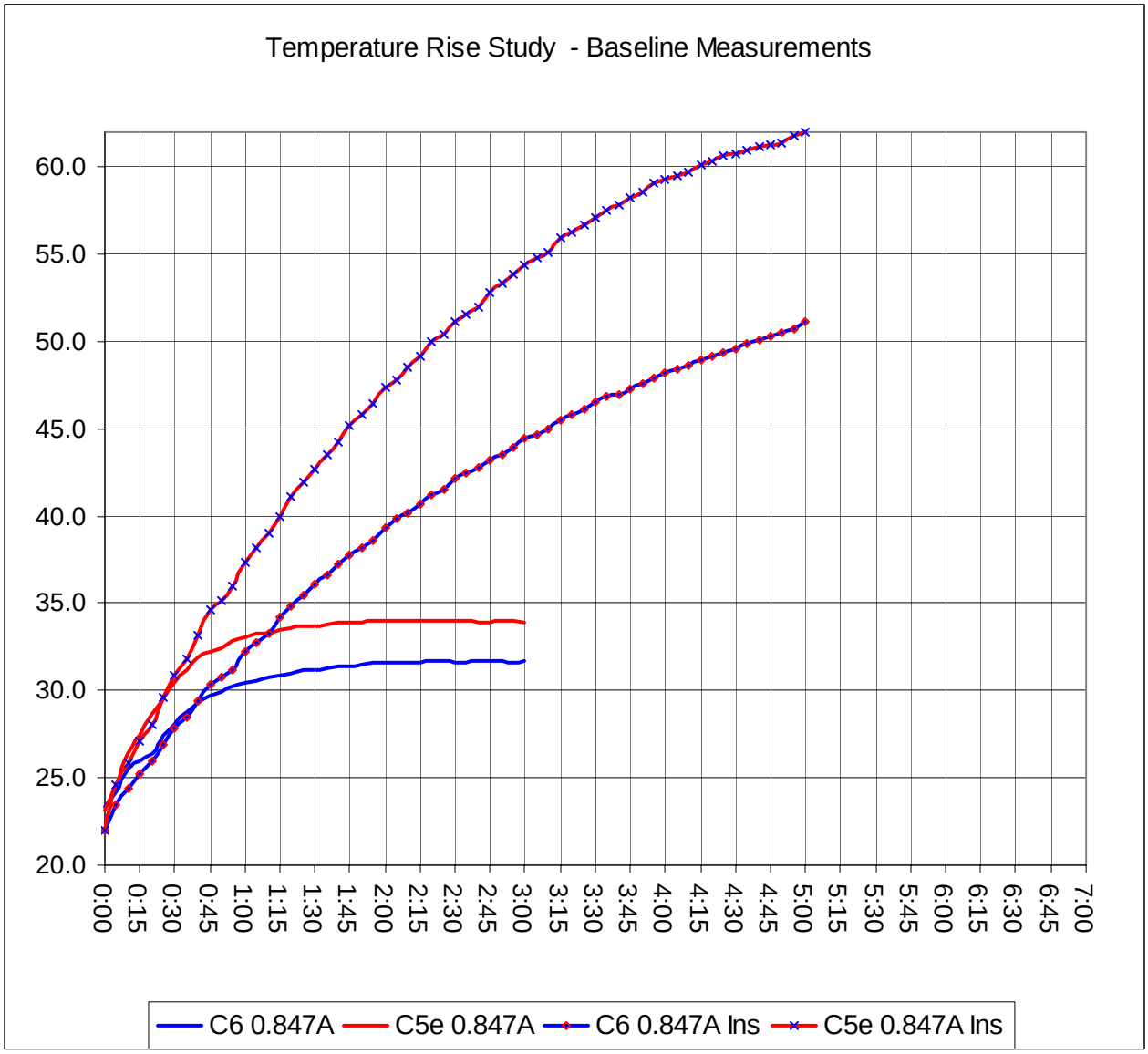
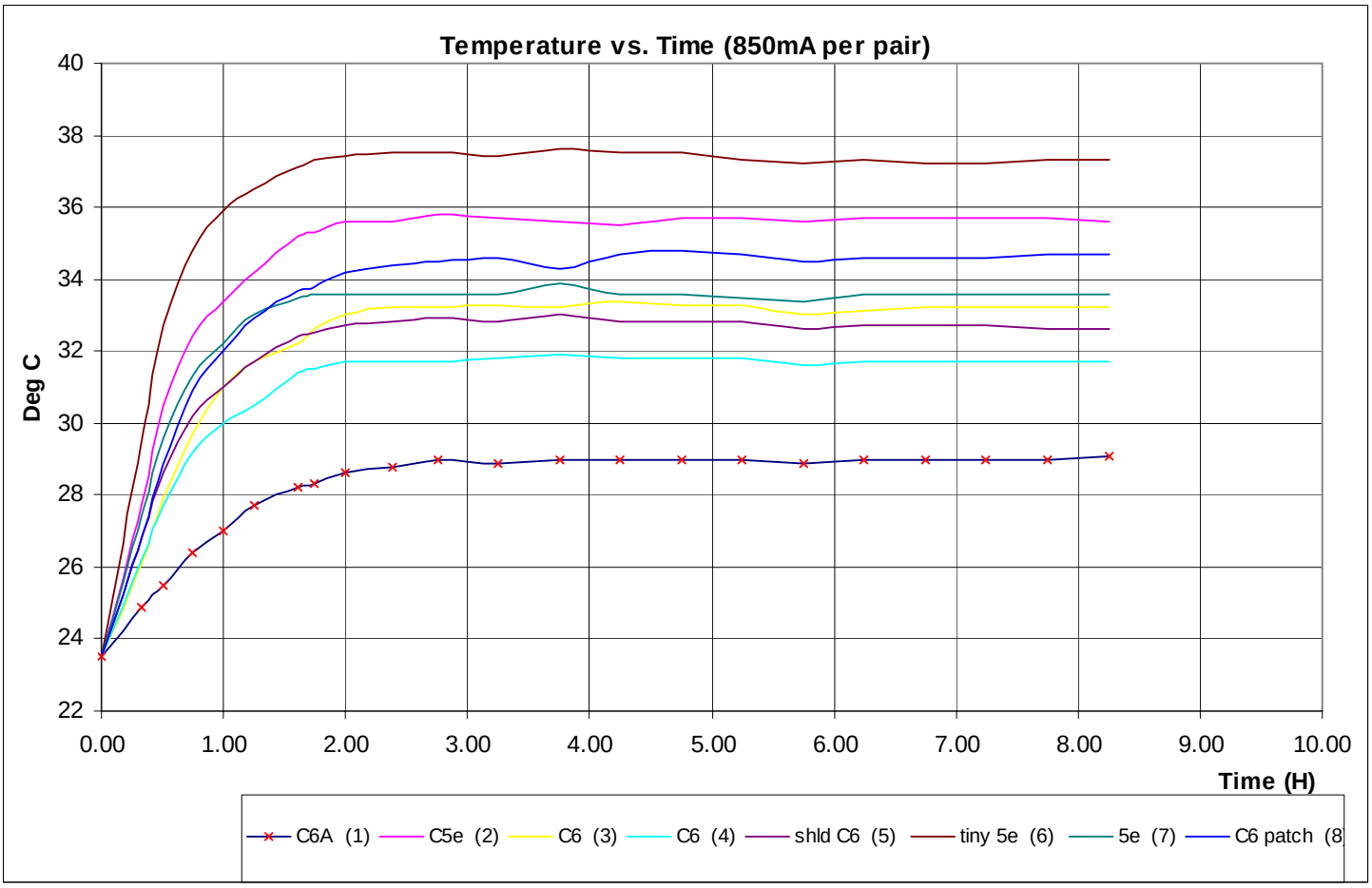
Results:

1. Worst Case Envelope Data & Preliminary Results: The first round of measurements were done on two cables at a current level of 850 mA per pair with and without insulation to establish a baseline and envelope for the rest of measurements.



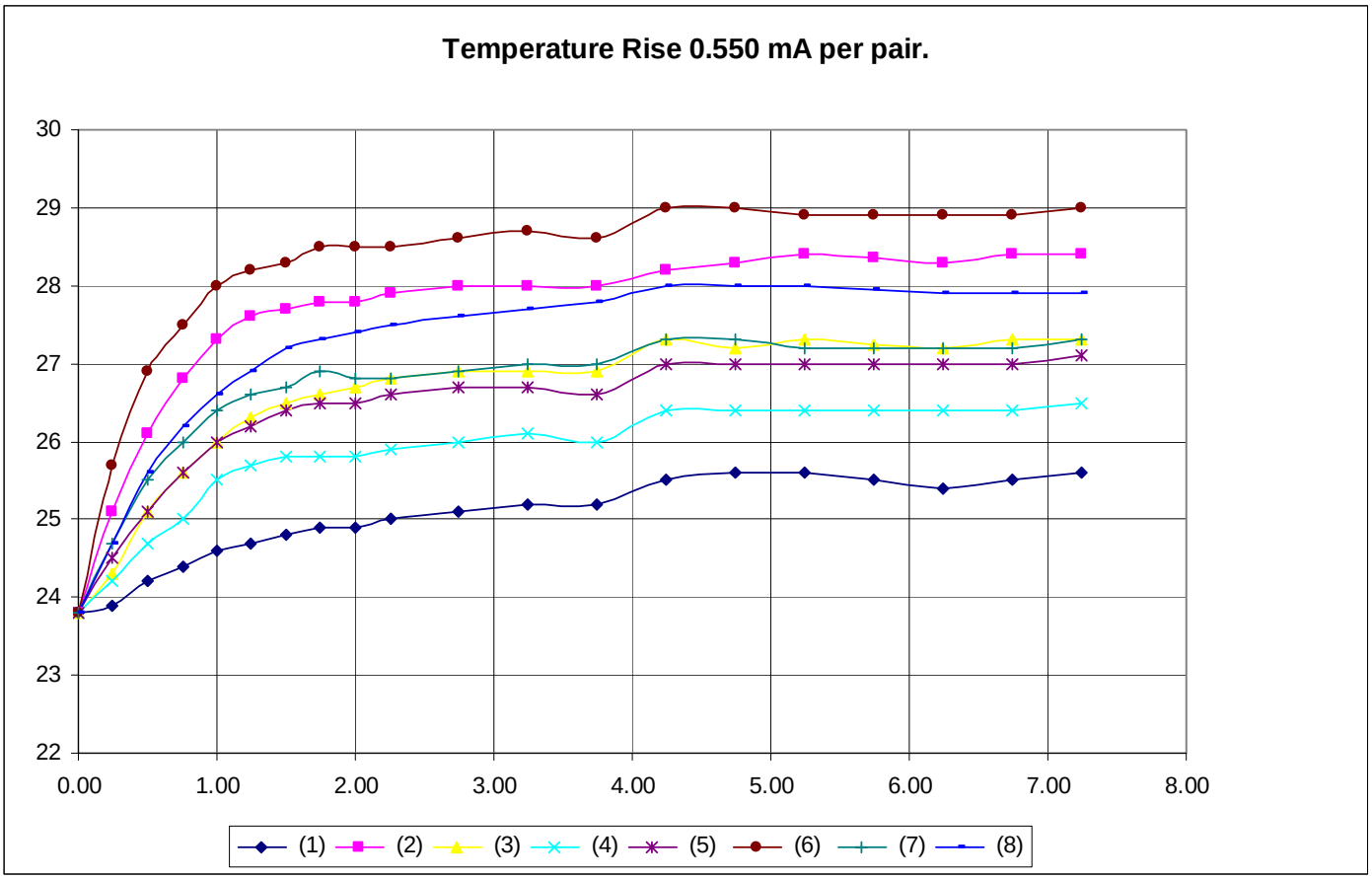
The main observation is that for these two of the cables tested, the steady state temperature rise in an ambient environment is in the order of 12 degrees C. This is good news, considering that a bundle of 150 cables, it is quite significant that there seems to be a steady state close to ambient temperature. On the other hand, neither cable reached steady state when insulated after 5 hours of operation, where the maximum temperature rise in the C5e cable was measured at an excess of 40 degrees. This is problematic as beyond 60 degrees C, the performance of most commercial cables is not specified. Additionally, the longevity of cables at a consistent elevated temperature is seriously compromized.

2. 850mA per pair (425 mA per conductor)



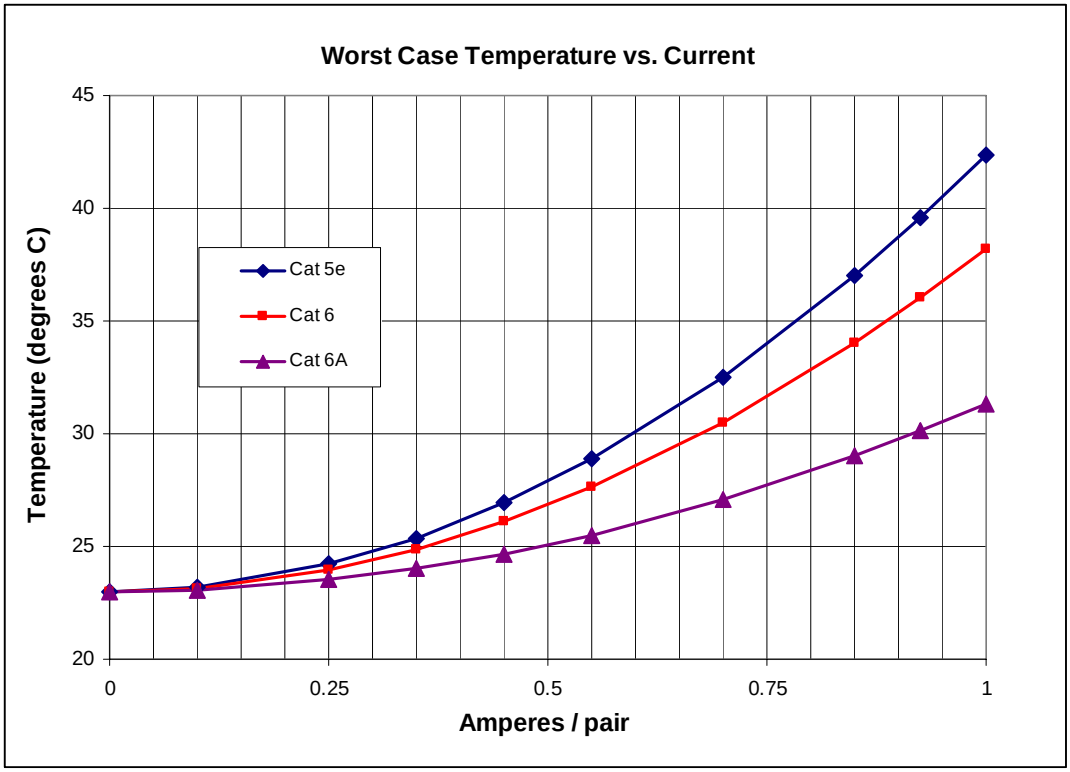
When tested in an ambient temperature ~23 degrees C, the maximum measured temperature rise was 15 degrees C for a current level of 850 mA per pair. Although the higher categories of cabling faired better (Maximum temperature rise for C6A was measured at 6 degrees C), overall, this level of current exceeded the guidance of 10 deg C maximum temperature rise for performance and longevity.

3. 550 mA per pair (275 mA per conductor)



With a maximum current of 550 mA per pair, the maximum measured temperature rise was less than 7 degrees on all categories of cabling. This temperature rise is acceptable both in terms of its effect on performance and its effect on longevity.

Discussion:
The following figure summarizes the temperature rise within the bundle vs. pair current for each category that was tested. The data is only shown for the un-insulated case.



Cabling standards specify the IL loss de-rating at 0.4% per degree C. The effect of temperature rise on IL is being studied.
Additionally, the measurement of temperature rise when only two pairs are used has not been done. First off, given current installs and user practices, it cannot be assumed that a cable will only have the current on two pairs. Furthermore, given the desire to deliver a minimum of 30 W to a load at the end of the cabling, the current level needed would result in a considerable loss in the cabling itself.

Conclusions:
Based on temperature rise considerations alone, a maximum current of 550 mA per pair is recommended.

Further Work Items:
- More detailed temperature profiles within the cable cross-section will be investigated.
- Further information on the effect of temperature rise on performance of the cable will be investigated.
- Power delivery vs. power loss depending on the cable resistance will also be evaluated in more detail.
- Temperature rise given a higher ambient temperature will also be considered.

			50				
	R	Current	Voltage	PSE Power	Loss	Max Delivered	Efficiency
C5/C5e	12.5	0.55	50	27.5	3.78	23.72	86%
C6	10	0.6	50	30	3.60	26.40	88%
C6A	7	0.8	50	40	4.48	35.52	89%

	Power Loss			Input Powe	Efficiency			Heating (BTU)		
I(A)	C5e	C6	C6A	50	C5e	C6	C6A	C5e	C6	C6A
0.35	1.5	1.2	0.9	17.5	91%	93%	95%	5.2	4.2	2.9
0.4	2.0	1.6	1.1	20	90%	92%	94%	6.8	5.5	3.8
0.45	2.5	2.0	1.4	22.5	89%	91%	94%	8.6	6.9	4.8
0.5	3.1	2.5	1.8	25	88%	90%	93%	10.7	8.5	6.0
0.55	3.8	3.0	2.1	27.5	86%	89%	92%	12.9	10.3	7.2
0.6	4.5	3.6	2.5	30	85%	88%	92%	15.3	12.3	8.6
0.65	5.3	4.2	3.0	32.5	84%	87%	91%	18.0	14.4	10.1
0.7	6.1	4.9	3.4	35	83%	86%	90%	20.9	16.7	11.7
0.75	7.0	5.6	3.9	37.5	81%	85%	90%	24.0	19.2	13.4
0.8	8.0	6.4	4.5	40	80%	84%	89%	27.3	21.8	15.3