

**To:** ENGR 199 Students

**From:** S. Scott Moor

**cc:** Engineering Faculty

**Date:** March 1, 2006

**Subject:** Format Conventions for Technical Reports and Memos

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Preparing a technical memo requires consistent and clear formatting of text, figures, tables, equations and numbers. This memo outlines the format expectations for these items. It is a follow up to my pervious memo of August 27, 2004, *Writing Memos – Structure and Content*.

### Summary

The memos you prepare must be professional in appearance and clear in content. Tables, figures and equations are particularly important to achieving this goal. In a technical memo these items are a part of your communication and must be crafted with the same care as your other writing. To integrate these items into the entire memo it is essential to refer explicitly to any included figure, table or equation in your narrative discussion.

Report all numerical results in a table or graph so your reader may easily find and compare your results. When preparing a figure or table, design the format so that it clearly communicates the main point you want your reader to understand. It is redundant to include both a table and a figure of the same data unless there is a unique point being made by each which cannot be made by the other.

In general graphs are the preferred way to present your data. However, there are a few key places where you table are used: (1) when presenting very limited data where a graph would be overkill, (2) when precise comparison of the data is required or (3) when you have a very large or complex data set. The larger tables required for this last case should be included as an attachment or appendix so they do not interrupt the main flow of your discussion.

Use an equation editor to clearly and professionally format your equations. This will allow you to produce equations similar to those in a text book. All variables must be defined on their first use in a document including a definition of their appropriate units. Use a reasonable number of significant figures in all reported numbers. Include units with all numerical values. When reporting a number with an absolute value less than one always include a leading zero before the decimal point.

### Acknowledgement

The material presented in this memo is adapted from directions prepared by Dr. Don Mueller. I am indebted to him for his work.

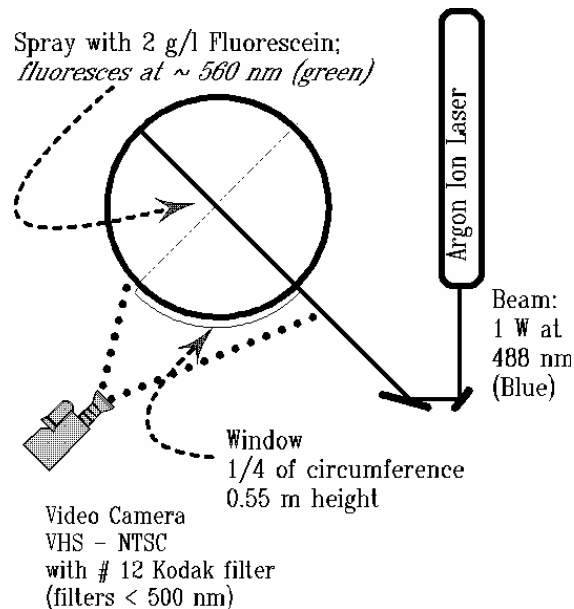
## Text

Memos should be prepared in a plain readable font (e.g. Times Roman) of 12 point pitch. Margins on all sides should be one inch. Section titles should be used to subdivide the memo. The overall format of the memo must look consistent. In most cases text should be single spaced with double spacing between paragraphs.

## Figures

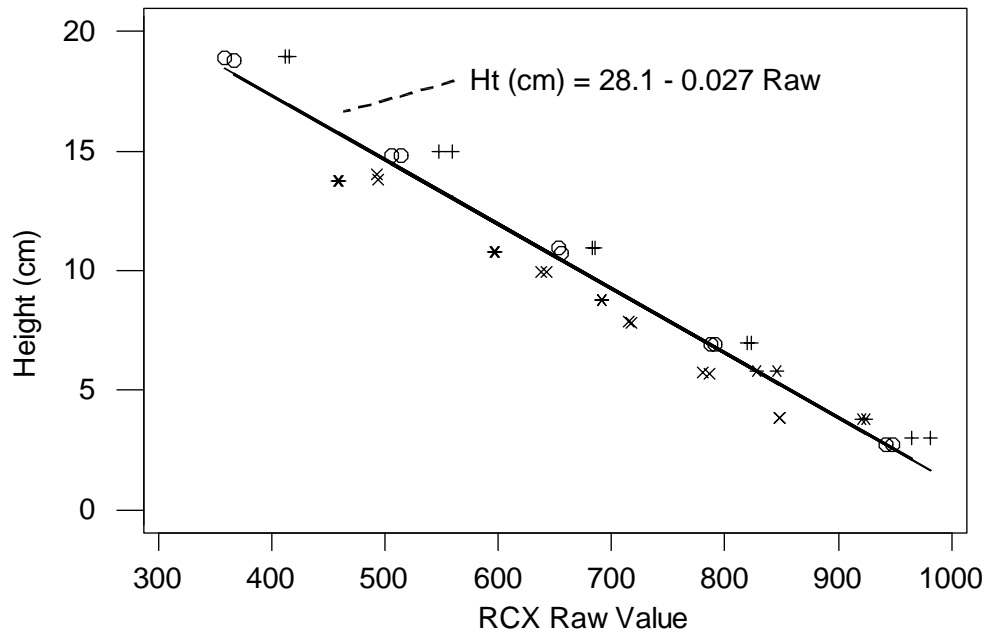
Properly constructed figures are essential to the clarity and appearance of your technical memos. However, if improperly constructed, figures can be a confusing distraction to the reader.

Figure 1 below is an example of a schematic figure. The figure should be of reasonable size and aspect ratio. Most figures do not need to take up the entire page. Center your figures on the page. Identify them with the word "Figure", a number, and a brief descriptive caption centered below the figure. Use the same font in the figure caption as in the rest of the report. The word "Figure" and the figure number may be bolded for clarity.



**Figure 1:** This diagram shows the top view of the laser-induced-fluorescence flow-visualization setup. The laser beam is expanded in the vertical direction by two cylindrical lenses.

Figure 2 is an example of a graph in a technical report. Axes labels are descriptive and include units. The text on the graph should be readable and contained within border. If the figure must take up the entire page, rotate the figure into landscape orientation. The figure should be readable by turning the document 90 degrees clockwise. For example, in landscape orientation Figure 2 would be rotated 90 degrees counter-clockwise.



**Figure 2:** Calibration curve for level sensor. The different symbols represent four separate calibration experiments conducted by four different student groups. The linear least squares fit is shown with the solid line.

The figure should have a dark border and clearly visible lines. Design your memo to be photocopied. Therefore, avoid the use of color. Instead, use line styles or symbols to differentiate data sets. Identify each curve with a label or in a legend. Labels are preferred when curves are separate enough to be clearly identified. If the curves are close together or cross many times, a legend should be used. A descriptive note on the graph can also be quite useful.

Represent data from experiments or other discrete sources as points. This clearly shows that between the points we have no information directly from the experiment. Equations are continuous and therefore are represented by lines over their applicable range.

### Tables

Tables can also be very useful in technical memos. However, tables in the text of the report should be included with caution. Typically, tables in the text are used to summarize large amounts of data, report limited numerical values or when precise comparison of the number is required. Detailed original data is best included in an attachment or appendix.

Table 1 below shows a typical table from a technical report. Center a table on the page and identified it with the word “Table”, number, and brief caption. Place the caption above and flush left with the table. Use the same font in the caption as in the rest of the report. The word “Table” and the figure number may be bolded for clarity. Include units in the column headings.

**Table 1:** Effective Length and average values of  $\bar{h}$  for each of the fins.

$F_{in}$	$L_{eff} (m)$	$\dot{Q}_{loss} (W)$	$\bar{h} (W / m^2 K)$		
			Experimental	Numerical	
			Eq. (25)	Eq. (30)	Eq. (31)
1	0.39	0.90	15.0	12.5	15.2
2	0.57	2.38	12.6	10.2	12.2
3	0.75	3.77	11.4	8.9	10.7

Vertical lines dividing columns are usually not necessary, and should be avoided. This might allow the tabular data to be scanned. Carefully consider the number of digits reported in tables. Remember that more digits imply greater precision. Include only a reasonable number of significant digits in tabulated data.

Be sure that tables are not broken by a page break. In the rare occasion where a table is too large to fit on a single page, repeat the table row and the column headings on each page. Put such large tables in an attachment or appendix.

### Equations

Neatly format all equations using an equation editor. An example of an equation from a technical report is as follows:

$$f_1 = \frac{(kL)_1^2}{2\pi L^2} \sqrt{\frac{EI}{\rho A}} \quad (1)$$

where:

$(kL)_1=4.73$  (dimensionless)

L = length of the rod

E = Young's Modulus (Modulus of Elasticity)

$\rho$  = density of the material

A = cross sectional area

I = area moment of inertia

Number equation numbers so that they may be referred to elsewhere in the text. Appropriate variables should be chosen, and each variable must be explicitly defined in the text on first use.

### Numbers

If numerical values in decimal format with units are to be reported in the text, use the following style: 0.123 kJ/(kg K). Notice that the leading zero is included, and a space is present between the number and the units.