

Technical Memorandum (TM)

TO: MEEN 363 Students
FROM: Class instructor
Subject: Writing Technical Memos
Date: September 1, 2011

SUMMARY OF THIS MEMO

This memorandum explains (and demonstrates) how to write a technical memorandum (*TM*). *Webster's* defines a memorandum as a “usually brief communication written for interoffice circulation . . . a communication that contains directive, advisory, or informative matter”. Adding the adjective “technical” implies a certain degree of structure both in format and content. A *TM* is a concise and well written communication approximately three to six pages long¹ that:

- defines a task,
- specifies the objectives of the task,
- identifies and outlines a solution method and/or an experimental procedure,
- reports and discusses the results of implementing the solution and/or the recorded performance from field or laboratory measurements, and
- provides conclusions and recommendations.

It is often necessary to include appendices containing data, sample calculations, etc. to support statements made in the main body of the Memo. A description of the various parts of a *TM* follows.

HEADING

The heading should follow the format of this memo. The tech memo must be dated. (All correspondence, analysis, etc. should be dated.) The heading of a memo contains parts for “TO”, “FROM”, and “SUBJECT”. The TO part identifies the recipient of the memo by name and title, i.e., a manager or a superior or a customer. The FROM part identifies you by name and position; e.g., Joe Studious, Shop Manager. The SUBJECT part is equivalent to a title and tells what the memo is about as completely and concisely as possible.

EXECUTIVE SUMMARY

Concisely define the task in terms of the objectives of the work and specify any restrictions or constraints. Summarize the major findings, conclusions and difficulties found. Sound engineering practice demands a precise usage of technical terms and short sentence structure. This is not an introduction; do not give a lot of background and motivation. The recipient of the *TM*(may be) is knowledgeable about your work and you do not need to explain to him/her why you are doing it. You must explain exactly what you are going to do, but you do not need to give the motivation for the project. (The total length of this section should not exceed 200 words).

METHOD

Describe the method used to solve the problem (theoretical, experimental, or both) including any major assumptions, derivation of important equations, and/or experimental procedures. Describe the physics of the problem, show assumptions for the physical model and the governing equations of motion, including boundary and initial conditions. Provide a concise nomenclature to follow.

This section almost always requires some sketches or drawings, i.e. figures. The main text should always refer to the figures before they appear. The writer needs to explain the items depicted with attention to trends

¹ Type font should be maximum 12 points, 1 or 1 ½ spaces and with 1 inch margins in 8 ½ by 11 inch pages.

and important characteristics. Figures are listed in ascending number and accompanied by meaningful and explanatory captions. Figures with multiple curves should have clear symbols (and keywords) differentiating them. Equations are also numbered in ascending order.

PROCEDURE

Here you must describe in a logical manner the procedures for analysis, exact or numerical, for example. Provide statements on the validity of the solution procedure highlighting advantages or shortcomings. For numerical solutions, you must provide statements on the accuracy, convergence and stability of the results. For experimental results provide the uncertainty and repeatability of the experimental results.

RESULTS and DISCUSSION

All results are presented in the units of actual measurement or calculation, either English or SI, with final values in alternative units given in parenthesis.

Present the calculated results in a form best suited to help the reader understand their significance in light of the stated objectives. This will usually means graphs or curves, supplemented by tables highlighting identified (measured) or calculated values (predictions). Present all of the significant findings of the study and explain any important observations, trends, or limitations. Discuss how these observations (results) will lead to your final and important conclusions. Avoid typing too many significant digits in tables and figures. One can readily distinguish the work of a neophyte from that of a seasoned communicator (experienced engineer) by simple checking the numbers typed. In a nutshell, never lists more significant digits that are smaller than the uncertainty.

CONCLUSIONS

Always state your conclusions. Conclusion must address the purpose of the work (assignment or project). Some students (and even professional engineers) do not want to risk making erroneous conclusions so they waffle on stating conclusions. For example, they may list several possible conclusions, but leave it up to the reader to choose one. You are educated and qualified to *analyze* the data (results) and draw conclusions from it. As a future engineer, your boss will think enough of your qualifications to pay you a good salary, and he/she expects conclusions and sound recommendations. The only exception is the case in which the data does not support a conclusion; and in this exceptional case, the method used is inadequate for the purpose and you should so state.

REFERENCES

List all references in your main text according to the ASME format, see:
http://www.asme.org/Publications/ConfProceedings/Author/References_2.cfm

In general, a references lists the authors' names (last name and first initial), year of publication, title, journal or periodical name, volume and page numbers. Always acknowledge (reference) any material taken from URL sites, including any pictures, tables and graphs.

OTHER recommendations

The Elements of Style, by W. Strunk and E.B. White:

BUY IT!

"Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should not have unnecessary lines and a machine no unnecessary parts. This requires NOT that the writer makes all his sentences short, or that he avoids all detail and treats his subjects only in outline, but that every word tells."

From *The Real Thing*, by Tom Stoppard

Words are innocent, neutral, precise, standing for this, describing that, meaning the other, so if you look after them you can build bridges across incomprehension and chaos. But when they get their corners knocked off, they are no good anymore.

I don't think writers are sacred, but words are. They deserve respect. If you get the right ones in the right order, you can nudge the world a little or make a poem which children will speak for you when you're dead.

Use consistent text fonts and size throughout the document. Keep the same paragraph indentation and number of points before and after each paragraph.

Avoid inserting or attaching support material that is not properly documented. This includes computer programs (MATLAB) without any comments and definitions of variables and processes, (EXCEL) worksheets w/o clearly labeled cells and equations used, charts or figures without content, etc.

Figures and Tables APPEAR always AFTER the text citing them. Figures and Tables must contain COMPLETE captions, i.e. descriptive titles (full sentences). Labels in Figures (X,Y axes) must display appropriate physical units, for example, X: distance [meter], Y: acceleration [meter/s²].

Most technical papers and reports are written in the third person, i.e. they are impersonal. Sentences such as ... were done were performed..... was reported.....have been had been demonstrate POOR ENGLISH.

Use short concise sentences with the basic (and most familiar) structure: **SUBJECT + VERB + PREDICATE + COMPLEMENT**. Please remember that the complement qualifies the predicate NOT the subject.

When reporting about work completed DO NOT USE future tense. Use simple past tense or even better (my choice) use PRESENT tense when discussing others' work or results; i.e., for example

AWFUL

Gas seal coefficients were reported by Author ()

The loads were shown to decrease with increasing rotor speeds.....

The results are shown in Figure X

To improve the accuracy, San Andres () introduced a 3 control-volume to calculate seal force coefficients.

SHOULD BE

Author () report(ed) force coefficients for gas seals

The experimental results show the loads to decrease as the rotor speed increases

Figure X depicts the results

San Andres () introduced a three control-volume bulk-flow analysis to predict more accurately the seal force coefficients

DO NOT mix tenses in a sentence. DO NOT mix tenses in a paragraph

DO NOT play with language. Keep it simple and easy to read. **Never assume the reader has the same level of knowledge (about your stuff!) as you do.** Provide sufficient details. A person with average technical level should be able to understand and learn from your work.