SAN FRANCISCO STATE UNIVERSITY
DIVISION OF ENGINEERING

NOTES ON REPORT WRITING

In writing a technical report, it is wise to keep in mind the purposes that the report is to serve. The most common purposes are:

1. to communicate to others the results and conclusions drawn from the laboratory or field work.
2. to create a permanent record of laboratory or field work which may be used at a later time in connection with other work.

The laboratory reports for this course shall be either Formal or Informal reports as indicated by the instructor for each experiment. The Formal report consists of the following sections:

1. Title Page
2. Abstract
3. Table of Contents
4. Summary
5. Introduction
6. Apparatus and Test Procedure—
7. Results
8. Discussion
9. Conclusions and Recommendations
10. References
11. Appendices

The Informal report consists of sections 1, 2 or 4, 7, 8, 9, 10 and 11. An informal report is intended for a reader who is familiar with the basic test program but does not know the most recent test results.

Title Page

The title page should contain the test title, the date the test was performed, the date of the report, the name of the author of the report and the names of the laboratory partners. If there is room on the title page for the complete abstract, it may be placed there also.

Table of Contents

This is simply a list of the sections of the report and the page number where they can be located. A minor point can be noted here: in books, the title which appears at the top of the table of contents is most commonly "Contents", not "Table of Contents".
Abstract

The abstract contains only enough information about the work being reported to enable someone who is searching for information to quickly determine the applicability of the report to his problem. Try to think what information you would want if you were performing a library search. You wouldn't want it to be too long if it were not applicable to your problem yet you would want to know generally what was done if you thought it might be applicable. The abstract should normally not be longer than 100 to 150 words.

While the abstract should only refer to material described in the report, it should never directly reference material in the report. It should never say something such as: "is shown in Figure 15". The abstract should start with a statement of what was done or what the objective of the experiment was. In one sentence or so it should then describe how the results were obtained. Then, one or more key results should be stated. For example:

A performance test was performed on a Fuller model C-15, rotary air compressor. Instrumentation was provided to measure the air flowrate, inlet and outlet pressures and temperatures and shaft speed. The shaft power required was measured with an electric motoring dynamometer. The highest efficiency was observed to occur at a shaft speed of 600 rpm.

Summary

The abstract and the summary are quite similar in nature. The summary is normally longer and more complete and may, if necessary, include graphs and tables. While an abstract is normally used by the reader to determine whether or not he should read the report, the summary will normally be read by someone who is interested in the work described. If, however, the reader is not using the results directly, the summary may be the only portion of the report he reads. Such people might include your bosses, boss and persons in your organization not directly connected with the work. For this course, the summary will normally be one to two pages long.

Introduction

The purpose of the introduction is to prepare the reader for the body of the report by giving him a clear statement of the background and objectives of the report. The following items are often components of a good introduction:

1. The reader should be convinced of the value of the work and why it was performed.
2. A review of applicable literature should be included.
3. The limits of the work should be outlined here.
4. The outline of the presentation in the remainder of the report should be discussed if it is different from normal practice.
5. If the test was performed in order to verify an existing theory, then the theory should be discussed in the introduction. If a theory was developed on the basis of the test results, it is better presented in the discussion section of the report. Sometimes, the theory is presented as a separate section of the report placed right after the introduction.

Apparatus and Procedure

The apparatus should be described both in words and in sketches or pictures. If the experiment includes fluid flows, a flow diagram should be included. A sketch or flow diagram should always be included in the body of the report. Detailed drawings should be referenced here but included in an appendix. A list of the instrumentation should be included. This list should include the manufacturer and model number and in some cases the serial number. If the test procedure is simple, it can be included here. If the test procedure is lengthy, it should be referenced here and included in an appendix.

Results

The key results from the test should be included here in graphical and/or tabular form. A short text should be included to state what results are included and on which graph they are plotted (one half to one page.) Each table and each figure should be assigned a unique number. Tables are normally numbered with Roman numerals and Figures use arabic numbers. The number normally appears adjacent to the title. For example:

Figure '10 - Beam Stress vs. Time

Table IV - Summary of Results

For purposes of this course, all results which are presented and/or graphed should be presented in tabular form. The formulas which were used to compute results, including a calculation for a typical case; should be included in an appendix and referenced in the results text. In industry, this may not be the case. In fact, modern data acquisition systems may only provide results in graphical form. The text should also reference the original lab data sheets which should be placed in an appendix. Only include in the text results which are of direct interest to your reader. Intermediate calculations should be confined to an appendix.

The format of the graphical results is important. Figure 1 represents an acceptable graph. This graph was constructed by cutting the grid portion from a sheet of graph paper and attaching it to a sheet of 8 1/2 x 11 plain paper. The lettering was then drawn. The following notes apply to graphs:

1. With the exception of a page number nothing should be written within 1/2 inch of the top, bottom or right hand side of the graph or within 1 inch of the left hand side (the top and bottom being the 8 1/2 dimension.)
2. The graph should be placed in the report so that it can be read in the same direction as a written page or can be read by rotating the report 90 degrees clockwise from that orientation.

3. Discrete data points should be plotted as discrete points surrounded by a plot symbol such as a circle or a square.

4. Theoretical predictions should be presented as lines or curves and not plotted as points. If no theory is presented, it is permissible to draw a "best fit" curve through the data points.

5. All data points should be identified as on the example.

6. The graph should have a title. This can either be at the top or bottom of the page or on the grid portion of the graph.

7. All curves should be drawn with French curves.

The use of spreadsheet generated plots is encouraged. However, there are several points which should be noted. Spreadsheet programs normally provide an option to connect the data points with straight lines. Unless the points are rather close together, this produces a rather unattractive graph. It is best to suppress the lines option and draw in your own best fit curve using a French curve. Some spreadsheet programs can print the figure title in a very large font. Although the title may be in a slightly larger size than the other plot lettering, it should not be very large.
Discussion

This is a major part of the report and will vary in scope, length and complexity according to the nature of the investigation. Basically, the discussion evaluates the results, interprets them and investigates their significance. It is the bridge that leads the reader from the results to the conclusions. It is possible to integrate the discussion section of the report into the results section.

The discussion should include the following:

1. A statement about each result presented including its significance.

2. A discussion of any results that are unexpected.

3. Discussion of causes of experimental uncertainties.

4. Comparison of results to theories or preexisting experimental results.

5. Personal opinions to explain results.

6. If applicable, description and comparison to data of any new theories developed on the basis of the test data.

Conclusions and Recommendations

There should always be specific conclusions and recommendations that answer the objectives of the experiment or explain why the objectives were not met. No new results should be presented in this section of the report. This section can include a listing of the main results. Recommendations for methods to improve the experiment can be included in this section of the report.

References

A listing of documents mentioned in other portions of the report.

Appendices

The following must be included in the appendices

1. Original laboratory data sheets

2. Sample calculations (include graphs from the lab syllabus if used in reducing the data. See comments on Sample Calculations below.

The following may be included in the appendices:
1. Test procedure if not included in the body of the report

2. Detailed drawings of the test facility

3. Information of interest to some readers but not central to the report.

The format of the sample calculations is important. In experimental runs where the calculational formulas are identical except for the input numbers, sample calculations should be performed for a typical run. Each calculation should be labelled as to what is being calculated. The source for each number should be stated (unless it appears earlier in the sample calculations). These calculations be done by hand even if a spreadsheet program was used for the main calculations and serve as a check on the accuracy of the main calculations.
NOTES ON THE TECHNICAL MEMORANDUM

The technical memorandum, sometimes called a letter report, is a much less formal method of transmitting information than the formal report. It is also a very common method for transmitting information within an organization. It is frequently not a permanent record and the original may be destroyed within a few months or years of issuance. Some of the more common uses are:

1. Reporting intermediate results of a project
2. Reporting final results in a preliminary form prior to the issuance of a formal report.
3. Reporting the results of studies or evaluations for which a permanent record is not required.

The tech memo will normally have a header section like the following:

___________________________________________________________________________

DATE

TO:

FROM:

SUBJECT:

___________________________________________________________________________

Some care should be taken in terms of who the letter is addressed to. Frequently it will be your boss but it might be someone else in the organization. You should not send it to anyone other than your boss without permission. In most cases, some individuals other than the person to whom the letter is addressed will receive copies. The names of these individuals are normally contained on a list of carbon copies. Again, do not include people not under the control of your boss without permission. In this course, address the letter reports to the instructor.

The text of the letter will contain the information you are trying to transmit. The exact contents depend on the situation and may depend on other letters or reports previously transmitted. Generally the letter should contain at least the following:

1. The purpose of the letter
2. The results to be conveyed
3. The significance of the results.

In some cases, the first paragraph of the letter may be a brief summary of the results. If the results can be stated briefly, a summary should be included. If the results are lengthy, then a summary paragraph may be of less value.

In ENGR 302, the letter report becomes a small condensed report. It should include:

1. The purpose of the test
2. A brief description of the test apparatus (including appropriate sketches)
3. The results in tabular and graphical form
4. A discussion of the meaning of the results
5. Key conclusions.

In most cases, the text will be continuous, broken up only into paragraphs, without subheadings (although subheadings are useful in long letters). Tables and graphs will usually be labelled separate pages placed immediately after the letter text. With modern word processors, it may be convenient to place some figures and tables directly in the text. Materials which are not included in the text are called attachments. Attachments are normally sequenced as Attachment A, Attachment B etc. and are so referenced in the body of the letter. FOR ENGR 302, include an attachment with the lab data sheet and the sample calculations. The sample calculations should follow the same format as for formal reports.
Format of Laboratory Data Sheets

The exact format of the laboratory data sheets depends on the experiment. However, there are certain characteristics of all data sheets that are required in this course.

1. The first page of the data sheets should have a descriptive title.

2. The first page should have the date of the experiment.

3. The first page should list the names of each of the team members and each member should sign his/her name at the completion of the experiment.

4. There should be no writing within 1/2 inch of the sides and top and bottom of the page.

5. Each page of the data sheets should be numbered and presented as n/m, where n is the page number and m is the total number of pages.

6. Each run should have a unique run number so it can be identified throughout the report.

7. The units of each measurement should be clearly listed.

8. Even if some of the data sheets are generated by a computerized data acquisition system, the above rules apply and necessary information should be handwritten.

9. All data should be on 8-1/2 x 11 paper.