

Fakulteit Ingenieurswese, Bou-omgewing & IT
Faculty of Engineering, Built Environment & IT

School of Engineering

Department of Materials Science and Metallurgical Engineering
Guidelines for writing for technical reports

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Date of last revision: 14 February 2013

The author would like to express his gratitude to the Department of Chemical Engineering for the document "Guidelines for writing technical reports and papers" in the compilation of this guide.



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1. Introduction

Engineers communicate their work in the form of technical reports. The structure of any report should be such that the reader (be it a fellow engineer or manager, etc.) can immediately identify the most important information relevant to their role in a project or investigation. For journal papers, the same principle is implied: if the paper is relevant to that of the reader, it should be apparent by simply reading the most important parts of the paper (abstract, conclusions and recommendations). Further detail on the relevant project or research problem will be studied only once the paper has been identified as important; this forms the body of a technical publication. Accuracy, brevity and clarity are the key to writing a good report, as mentioned by Bruckmann and Mandersloot (1998).

2. Format (Reports)

The basic layout for reports (e.g. on laboratory investigations) is as follows:

Editorial information (page numbers are in roman numerals, except for cover and table of contents):

Cover

Title page

Abstract and keywords (the title should be repeated)

Acknowledgements

Table of Contents

Nomenclature list

1. Introduction

2. Literature review

3. Experimental

3.1 Apparatus (if any) used

3.2 Experimental design (if any) or experimental planning

3.3 Methods

4. Results (or Results and Discussion)

5. Discussion

6. Conclusions (or Conclusions and Recommendations)

7. Recommendations

8. References

9. Appendices

Where appropriate (e.g. in large reports), it is good practice to start each section on a new page.

2.1 Font, spacing and margins

2.1.1 Font

Recommended fonts are Arial, Arial Narrow 12pt, Times New Roman 12pt, Palatino Linotype 12pt. Fonts should **never** be mixed in a report; nor should the size of different sections within the report. It is acceptable to reduce figure captions to 10pt – but this should be done for all the figures in the report.

2.1.2 Spacing

The spacing between two lines should either be 1 or 1.5; with double spacing used between paragraphs.

2.1.3 Margins

The top and bottom margin should be 1 to 1.5 cm, with the side margins 2 cm. Justify text.

2.2 Equations, numbers and units

2.2.1 Equations

Equations must be written using an equation editor, must be centered on a page with an equation number at the far right hand side. Greek letters, etc. must be used where appropriate. Where possible, use the same font for equations as for the rest of the text; or something close to it.

2.2.2 Numbers

Numbers should be written with a decimal point (i.e. 5.6) and not with a decimal comma (i.e. 5,6). Use scientific notation for big numbers, in the format: 1.23×10^{-8} and not 1.23×10^{-8} .

2.2.3 Units

A space must be placed between a number and a unit, e.g. 5.6 cm and not 5.6cm.

When writing units: rather write $5 \text{ Wm}^{-2}\text{K}^{-1}$ or $5 \text{ W}/(\text{m}^2\text{K})$ than $5 \text{ W}/\text{m}^{-2}\text{K}$ or $5 \text{ W}/\text{m}^2\text{K}$ or $5 \frac{\text{W}}{\text{m}^2\text{K}}$

The correct symbol for litre is ℓ and not l or L.

2.3 Figures and tables

Each figure and table should be provided with a number and title/legend. Descriptive figure captions are placed at the bottom of the figure, table captions / numbers at the top (of the table). Please refer to all figure and tables (by number) in the text of your report. Figures or tables that are not referred to or discussed in the text should be excluded, as these serve no purpose.

Axes of graphs should be clearly labelled, along the axes, outside the graph area. Curves should be fitted through data points to illustrate trends, rather than connecting all data points. Error analysis of the data should be indicated where possible (e.g. error bars, etc.). Paste figures as "pictures" rather than linked Excel (for example) documents. The legend for figures should be placed in an appropriate space on the figure.

Figures and tables should be formatted in such a way, that information can be clearly distinguished without a colour display. It is not recommended to use standard MS Word layouts for figures or tables. Figure 1 is an example of a figure in the correct format (a hypothetical descriptive caption has been added). Do not repeat information/data in both table and figure format, i.e. stick to the most appropriate format for the discussion. Should it be necessary to include raw data (e.g. for practical reports), this data can be added to the Appendix.

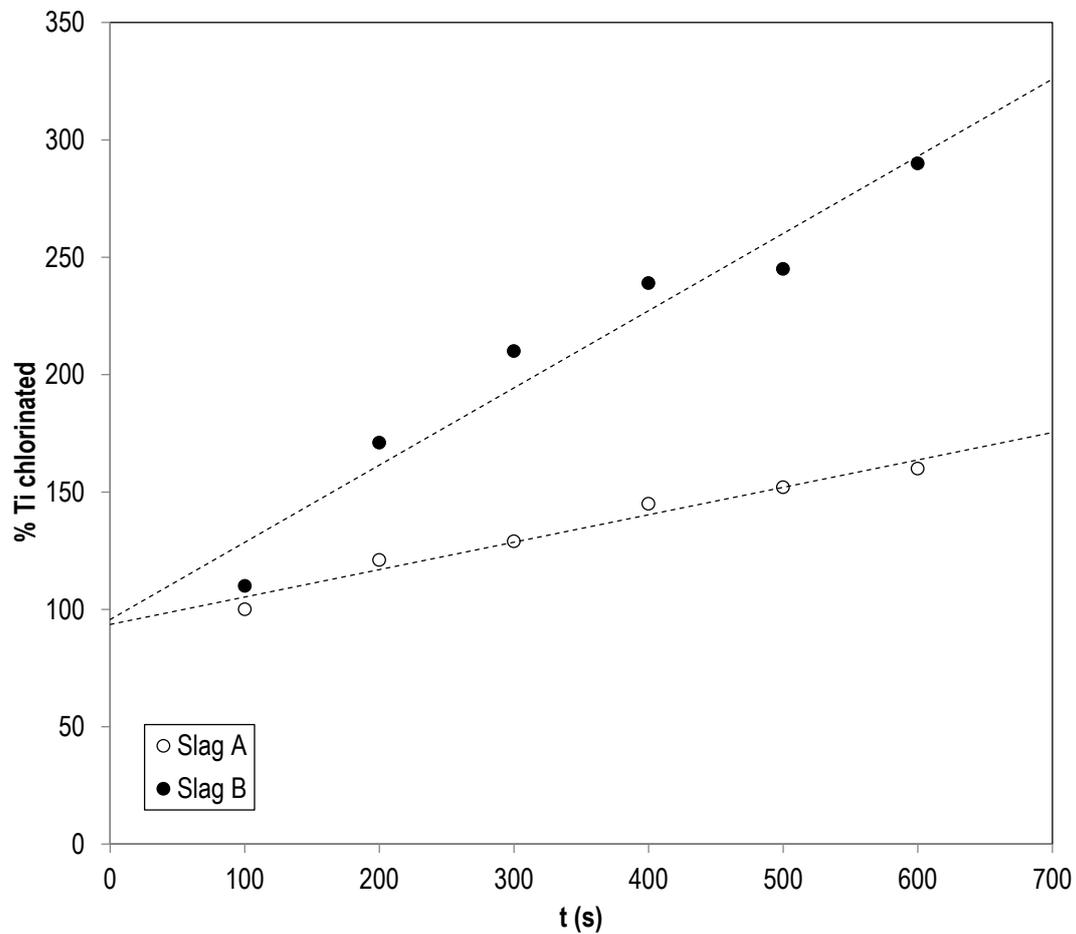


Figure 1: Amount of slag chlorinated in an atmosphere of chlorine and water vapour at 1000°C in a vertical tube furnace.

Table 1: Enrollment in local colleges, 2005 (Source, 2006)

College	New students	Graduating students	Change
	<i>Undergraduate</i>		
Cedar University	110	103	+7
Elm College	223	214	+9
Oak Institute	202	210	-8
	<i>Graduate</i>		
Cedar University	24	20	+4
Elm College	43	53	-10
Pine College	9	4	+5
Oak Institute	53	52	+1
Total	664	656	90

Note that the table has no vertical lines running through it, nor a border “boxing in” the data.

2.4 Abbreviations and bullets

Write all abbreviations without any spaces or periods (e.g. use UNISA rather than U.N.I.S.A.); avoid the use of bullets as far as possible.

3. Structure

3.1 Title

Keep titles brief, yet descriptive and informative. Avoid using non-specific words (e.g. “estimation” or “investigation”) and start with the most important aspect of the study.

3.2 Editorial information

When writing reports for this subject, as well as laboratory practical reports and final year projects, use the standard departmental template (www.up.ac.za/metal under Documents); be sure to include the module code, description, your student number, surname and initials and a relevant title. Also include the name of the module coordinator and date of submission.

The abstract follows the title page, followed by acknowledgements and the table of contents.

Note that the table of contents does not include an entry for itself, rather just the contents that follow in the body of the report.

3.3 Abstract and keywords

The main purpose of the abstract is to summarise the scope of the investigation, the main findings and recommendations. Important, project-specific information (e.g. a unique finding) should be reported as well; this ensures that the report is unique and unambiguous. An abstract is usually less than 200 words in length. Keywords follow the abstract and should be specific (i.e. not too general); limit the keywords to five or less.

3.4 Introduction

The introduction includes background information on the problem (why was it done?); the problem statement (what is the specific problem?; what was investigated?); the purpose of the investigation (which issues are addressed, and to what end?); the method used (very brief) as well the scope (also brief).

State here the relevant industrial and scientific background to your research topic. This section gives *brief* background to the problem (e.g. problem statement / purpose or goal of the investigation as well as a brief overview of the method). For final year research projects this section really eludes to where the investigation fits into the global context of the industry it is related to. In addition, the scientific background (i.e. what contribution is made / problem is solved) is also briefly mentioned. An introduction is usually around one page long.

3.5 Literature

Practical reports usually contain some background theory on the particular experiment that was done. Books and selected journal articles should be used as sources – class notes are not sufficient. A coherent, complete argumentative review should be given and related to the specifics of the practical. Merely regurgitating known

facts will result in very low marks. Special procedures (e.g. line intercept methods of point counting, background on the fundamentals of hardness testing, etc. is usually also included in this section).

For final year projects literature is *critically* reviewed – merely stating what other authors have said will result in a very low (possibly fail) mark. A final year project in the department is considered a mini-dissertation, not simply a project report.

Remember: write for the target audience!

This part of the report should be written principally in the present tense (for knowledge that has changed, the past tense is used).

3.6 Experimental

This section is always written in paragraph form and bullet points are to be avoided at all cost.

A description (not a list) of the equipment used must accompany each report; this section is followed by a detailed description of the experimental procedure (sampling, sample preparation, etc.). Calibration techniques are also included here (calibration curves, however, like other forms of data generated during calibration, are placed in the appendices of the report).

Include, in this section the experimental design – the choice of variables and what the measured responses was, etc. It is highly recommended that students consult texts on experimental design.

For final year projects, the same rules apply – do not assume that the reader is familiar with every part of the procedure – be descriptive, but also brief. Detail is critical in this section as the reader should be able to redo the experiments fully based on this section of the report. Do not, however, write a “step-by-step” account of the procedure.

The key to a good experimental section is to ensure another reader to repeat the experiments, but without writing an “operating procedure” for them.

3.7 Results

The quality of a publication significantly increases when results are presented first (in a sensible way), pointing out a few important points and then writing a full discussion on it. When necessary (i.e. where very few points are to be discussed), the discussion can be included in the same section (and the discussion section falls away). Avoid repeating results – i.e. do not draw a graph for data that is already in table form and vice versa. Statistical analysis is *essential* for all data.

3.8 Discussion

Critically discuss the results in relation to the literature that was reviewed and pay careful attention to avoid contradicting yourself. The discussion should include correlations and theories (existing and new) as well as mechanisms. Central to any discussion is validation with literature where possible and justifying new ideas with calculations etc. Ensure that there is a logical progression for every argument and that the text is cohesive.

All conclusions are drawn from the results – this proves insight into what is written.

NB: Be factual; support your arguments with facts!

3.9 Conclusions and recommendations

Conclude the main findings (as discussed in the discussion) of the study in this section, starting with the most important ones. Do not introduce any "new" information in this section. "Tie-up" findings with the objective(s) of the investigation. Recommendations can be added to this section, should there be few.

3.10 References

Justify each statement that is not your own; as well as your findings with supporting literature. Where possible, use general references (e.g. books) for general information and peer-reviewed literature (journal articles) for subject-specific information. Avoid using, for example, "class-notes" as a reference, etc.

All technical reports have a reference section. Write references in the form Habashi (1970) or Crundwell and Godorr (1997), or Mussatti et al. (1997), with an alphabetical list at the end of the report, as shown below. This is the recommended "Harvard" method of referencing. See also the guidelines which are available from the Academic Information Service, at <http://www.ais.up.ac.za/referencing/index.htm>

Examples of a reference list:

Journal paper: give authors, year, title of paper, name of journal, volume and pagination

Crundwell, F.K. and Godorr, S.A. 1997. A mathematical model of the leaching of gold in cyanide solutions. *Hydrometallurgy*, vol. 44, pp. 147-162.

Book: give authors, year, title, publisher, place of publication, pages cited

Turkdogan, E.T. 1983: *Physicochemical properties of molten slags and glasses*, The Metals Society, London, pp. 80-81.

Conference paper: give authors, year, title of paper, name of conference, editors, publisher, place of publication, pages cited

Sarma, B. and Fruehan, R.J: Fundamentals of bath smelting reactions, in S.Omebody (ed.), *5th International Conference on Molten Slags, Fluxes and Salts*, Iron and Steel Society, Warrendale, PA, 1996, pp. 357-374.

Internet sources: Use these sparingly, since the reliability of information on the Internet is extremely variable. Give the author of the page if known, otherwise the name of the company/body that hosts the page, the title of the page, its URL, and the date visited

Feldis, A: "My personal blog of sure-fire teaching mistakes." <http://www.myblog.co.za/feldis/mistakes.html>. Visited on 31 May 2006.

Notes: if the year is missing, use the abbreviation "sa"; e.g. (Smith, sa); sa = *sine anno* (no year).

Good software to use for referencing: RefWorks, EndNote and Mendeley.

4. Plagiarism

Each report or assignment within the Department of Materials Science and Metallurgical Engineering must be submitted with a declaration on plagiarism. Plagiarism is a serious offence (in this course it will be discussed at length in another document). Information on plagiarism: <http://www.ais.up.ac.za/plagiarism/index.htm>

5. References

Bruckmann, CG and Mandersloot, WGB 1998, *Structuring, Writing, Evaluating and Editing of Reports*, Delta Consultancy, Pretoria.

6. Appendix 1: Declaration on Plagiarism

DECLARATION ON PLAGIARISM

UNIVERSITY OF PRETORIA

Faculty of Engineering, the Built Environment and Information Technology

Department of Materials Science and Metallurgical Engineering

The University places great emphasis upon integrity and ethical conduct in the preparation of all written work submitted for academic evaluation.

While academic staff teach you about systems of referring and how to avoid plagiarism, you too have a responsibility in this regard. If you are at any stage uncertain as to what is required, you should speak to your lecturer before any written work is submitted.

You are guilty of plagiarism if you copy something from a book, article or website without acknowledging the source and pass it off as your own. In effect you are stealing something that belongs to someone else. This is not only the case when you copy work word-by-word (verbatim), but also when you submit someone else's work in a slightly altered form (paraphrase) or use a line of argument without acknowledging it. You are not allowed to use another student's past written work. You are also not allowed to let anybody copy your work with the intention of passing it off as his/her work.

Students who commit plagiarism will lose all credits obtained in the plagiarised work. The matter may also be referred to the Disciplinary Committee (Students) for a ruling. Plagiarism is regarded as a serious contravention of the University's rules and can lead to expulsion from the University.

The declaration which follows must be appended to all written work submitted within the department. No written work will be accepted unless the declaration has been completed and attached.

I (full names) _____

Student number _____

Topic of work _____

Declaration

1. I understand what plagiarism is and am aware of the University's policy in this regard.
2. I declare that this report is my own original work. Where other people's work has been used (from a printed source, internet or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.
3. I have not used another student's past written work to hand in as my own.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

Signature _____