1 INTRODUCTION

This guide is intended for postgraduates who are preparing project reports, dissertations or theses. The intention is to provide a concise guide covering all aspects of research documents. It does not, however, aim to provide comprehensive information on detailed stylistic features. There are in addition, usages that are specific to a given branch of engineering. Candidates should therefore consult their supervisors about the specific requirement of their topic and discipline.

It should be noted that in the Faculty of Engineering and the Built Environment, the terms thesis, dissertation and research report have specific meanings: a thesis is the document submitted for the degree of Doctor of Philosophy; a dissertation that for the degree of Master of Science in Engineering by research only; and a research report that for the degree of Master of Science in Engineering by advanced coursework and research.

In the Built Environment, the terms thesis and dissertation apply to doctoral degrees and research masters respectively. However, the term discourse is used in certain of the masters degrees by advanced coursework and research.

The word thesis is used in this document for simplicity, but the information applies to theses, dissertations, research reports and discourses.
2 THE STRUCTURE AND FORM OF THESES

This chapter does not aim to provide comprehensive information on all matters relating to form and structure in thesis writing. For a detailed guide on presentation, the candidate is advised to consult a standard text on the subject.

2.1 Preliminaries

The essential elements of a thesis are presented below in the order in which they should normally appear.

- Title and title page
- Candidate’s declaration
- Abstract
- Dedication
- Acknowledgements
- Contents
- List of figures
- List of tables
- List of symbols
- Nomenclature / list of acronyms
- Introductory chapter
- Central chapters
- Concluding chapter
- References
- Bibliography
- Appendices

2.1.1 Title and title page

A specimen title page is shown in Appendix A. The following information is given on the title page.

Title

The title should indicate the contents and scope of the thesis in as few words as possible. Phrases such as “a report on investigations into…” and “observations on some aspects of…” add nothing significant to the title and
should be avoided. While the title should be as brief as possible, it should be accurate, descriptive and comprehensive, clearly indicating the subject of the investigation. It is most important that the title be an accurate description of the contents of the work.

**Author’s name**
The full forenames (given names) followed by the surname (family name) are given under the title. They should be typed with the first letter of each name in capitals and the remainder in lower case.

**Thesis statement**
The following are examples of the correct wording:

**Doctor of Philosophy:**
A thesis submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Doctor of Philosophy.

**Master of Science in Engineering by research only:**
A dissertation submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science in Engineering.

**Master of Science in Engineering by advanced coursework and research:**
A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Engineering.

**Year in which thesis was completed**
This is given on the lowest line of the title page, no more than 25mm from the foot of the page. It must include the place and date of completion, for example “Johannesburg 2009”.

**2.1.2 Contents**
The table of contents should be given on separate pages and follow the structure and form of the thesis (Section 2.1 above), including the heading format. The contents should contain only the first three levels of headings and must reflect the correct page numbers for each heading.
2.1.3 Candidate’s declaration
University Regulation G.28 requires the following:

Together with the thesis, dissertation or other work, the candidate shall submit a formal declaration stating –

a) Whether it is unaided work, or what assistance has been received;

b) Whether the substance or any part of it has been submitted in the past or is being submitted for a degree to any other university;

c) Whether any information used in the thesis, dissertation or other work has been obtained while employed by, or working under the aegis of, any person or organisation other than the University.

An example of the conventional form of declaration is as follows:

DECLARATION

I declare that this thesis* is my own unaided work. It is being submitted to the Degree of Doctor of Philosophy** to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

.......................................................... ..........................................................

(Signature of Candidate)

......... day of .............., ...........

(day) (month) (year)

* dissertation or research report, as applicable

** or Master of Science, as applicable

This declaration should appear on a separate page, with each copy of the thesis signed individually by the candidate.

2.1.4 Abstract

The abstract is a brief, informative summary of not more than 150 words for a master’s dissertation or research report, and not more than 350 words for a doctoral thesis. It outlines the purpose of the work, the research methods and procedures employed, as well as the major results and conclusions. The abstract should always start with a statement of the major theme of the thesis.
The abstract is extremely important. It should give the significant facts as concisely as possible, especially as relates to new findings or innovative methods, as well as the conclusions and recommendations. The reader can then decide whether or not to read further. The format for the abstract is the normal style used in the rest of the thesis (see Section 8.2 below for the University requirements for abstracts).

2.1.5 Dedication

This is a brief, optional statement paying tribute to the writer’s spouse, partner, family or other associated persons. It is typed centrally on a separate page, starting on the chapter line. It does not require a heading, for example:

In memory of my mother
Ruby Johnson

2.1.6 Acknowledgements

Assistance received in carrying out the work of preparing the thesis should be acknowledged, although it is not usual to acknowledge routine checking, minor assistance or general advice. It is, however, usual to acknowledge the assistance of a supervisor, financial assistance, permission to publish, as well as special facilities provided by a company, university or research institution.

2.1.7 List of figures

A list of figures follows the Contents on a new page, and precedes a list of tables. A specimen list of figures is shown in Appendix C below.

2.1.8 List of tables

A list of tables follows the list of figures on a new page. A specimen list of tables is shown in Appendix D.

2.1.9 List of symbols

Each thesis should provide a list of the symbols and SI units for physical quantities on a separate page following the list of tables. Symbols vary from discipline to discipline, so candidates should consult their supervisors with
regard to the correct symbols for their field of research. A specimen list of symbols appears in Appendix E.

2.1.10 Nomenclature

Authors should avoid jargon, abbreviations and acronyms which are not in common use in their field or which have not been defined. If there are acronyms or unusual technical terms, each should be defined when it first occurs in the text, and also included in a list of nomenclature (or list of acronyms) on a separate page following the list of symbols.

2.2 Body of the thesis

In most theses the chapters may be readily divided into three sections: the introductory chapter or chapters; the central chapters comprising the major report of the study, divided into logical chapter divisions; and the concluding chapter or chapters that contain the findings, conclusions and recommendations of the thesis.

2.2.1 Introductory chapter

The first chapter, or chapters, should contain the following:

- A clear and complete statement of the problem investigated, the hypothesis tested, or the purpose of the study;
- A validation or justification, which, by a discussion of discriminatively selected reasons, establishes the importance of the problem. It is often appropriate to indicate the limits of the research and to define words unique to the study or used in a restricted or unusual manner in reporting the investigation;
- A preview of the organisation of the remainder of the thesis. This should make it easy for the reader to understand the relationship between the various parts of the work;
- A resume of the history and present status of the problem by means of a literature survey comprising a brief critical review of previous investigations of this and closely related problems. The contribution of each of these to the topic should be made clear, together with
discussion on how the present research addresses inadequacies of earlier studies or extends on them;

- A statement of the sources of data, the method of procedure (experimental techniques) and the treatment of the findings. In a thesis of an experimental nature, a separate chapter is usually devoted to these topics.

2.2.2 Central chapters

It is impossible to give specific directions for organising the findings of all studies because of the wide variety of topics investigated, techniques employed and kinds of data accumulated. The chapters of this portion of the thesis are the thesis – they make the candidate’s contribution to knowledge. All other portions of the manuscript are subordinate to what has actually been discovered and is now being made known. The candidate should take great pains to present the material in a clear and well ordered form, in terms that can be readily understood.

The organisation and distribution of content should be such that each chapter represents an important division of the subject material. Each chapter, other than the introductory and final chapters, should open with a paragraph or two containing:

- A statement of the portion of the problem covered in the chapter;
- A description of the materials and methods used in connection with this part of the investigation; and
- An enumeration of the points to be covered.

The concluding paragraph(s) of each chapter consist of a summary of the chapter that indicates the contribution to the whole study.

2.2.3 Concluding chapter

The concluding chapter or chapters should be a summary that restates the developments of previous chapters, showing succinctly the more important findings and conclusions of the whole study. The author may list unanswered questions that have emerged, but which require research beyond the limits of the present undertaking.
2.3 References and Bibliography

When students do assignments and reports, they use sources such as books and journals. Because of ethical requirements and the laws of copyright, researchers must identify the sources that they quote from, paraphrase or otherwise make use of, for example using ideas or facts found in these works. References, also called ‘source citations’, are required when students use complete thoughts and unique phrases from any sources.

Students are guilty of plagiarism if they try to pass off the work of another author as their own. Plagiarism is a serious offence. An example of plagiarism is when a student copies part of a book, article or material from an internet site in an assignment. It is also illegal to copy sentences, paragraphs or any other specific information, including tables and figures, without acknowledging the source or providing a reference. Students may not write assignments by merely combining quotations, even if source citations are provided. Assignments and research reports must be the students’ own work, written in their own words and providing considered interpretation of the sources. This is particularly important in a thesis, dissertation or other postgraduate work, as there must be an original contribution to knowledge.

A reference consists of two parts. In the body of the text, the sources are cited in parentheses giving the author(s), date of publication and preferably page numbers. These short author-date citations refer to the list of references at the end of the document, where full bibliographical information is given. All sources cited in the text must be included in the list of references.

A summary of the author-date system of referencing is given in Section 2.3.1 below. For more detailed information, students should consult the sources provided in this part of the Style Guide.

In brief, references should be chosen and cited to:
   - Indicate the source of the writer’s statements;
   - Acknowledge another person’s work;
Provide a source of additional information.
The relevance of any reference should be carefully considered and the number of references kept to a necessary minimum, and not used to pad the list of references. The citations must be given in sufficient detail for easy retrieval of the information.

When students use direct quotations or paraphrase a passage, the author, date and page number must appear in the text. The quotation is given in quotation marks (inverted commas) followed by the reference in parentheses (brackets). An example of a direct quotation is: “A stairway cut in the cliffs led up to the end of the headland…” (Lewcock, 1976:89). For paraphrasing, the reference is as follows: Lewcock (1976:89) indicates that access from the town was gained by a stair cut into the cliff.

2.3.1 Referencing systems

There are a number of recognised referencing systems. The two most commonly used in scientific literature are the Harvard system and the Numerical system. Candidates should consult their supervisors on this matter.

Styles for citations vary from discipline to discipline, for example, the Built Environment disciplines require the use of the Harvard system, explained in: Smith, M “Style Guide for the writing of theses and dissertations.” Johannesburg: University of the Witwatersrand Library.

Harvard / Author-date system

The references are referred to in the text by the author’s surname followed by the year of publication in brackets. Where the sense of the text requires, the author’s name is also included in brackets, for example:

1. In *The Construction Industry in Developing Countries*, Wells (1986) argues for a more direct role for government…

2. This “freezing of technological progress” is exacerbated through competitive tendering, as there is little chance for “the contractor’s experience of production on one project to be used to obtain a better performance on the next,” (Wells, 1986:74).

Each work is listed in alphabetical order of authors in the list of references. If several works by the same author are cited, they are listed in chronological
order by publication date, and where there is more than one work published in
the same year, these are designated (Block, 2007a:287); (Block, 2007b:23);
etc, with the same designation in the list of references to distinguish them. If
there are three or more authors, only the first author’s name is given in the
text, followed by ‘et al’. The full list of authors for the work is given in the list of
references.

Specimen text using the Harvard system
A succinct account of the basics of interactive television programming
has been given (Bolton, 1981). Robertson (1979) has reviewed some
of the technical aspects. Nyhan and Johansen (1980) have
summarised the economic implications. Veith (1981a; 1981b) has
provided the best all-round accounts of teletext and videotext.

Specimen reference list using the Harvard system

Numerical system
The references are numbered in ascending order in the text and are listed in
the same order in the list of references. In the text itself, the numbers are
typed in superscript.

Specimen text using the numerical system
Bolton has given a succinct account of the basis of interactive
television programming. Robertson has reviewed some of the technical
aspects. Nyhan and Johansen have summarized the economic implications.
Veith has provided the best all-round accounts of teletext and videotext.

Specimen reference list using the numerical system


2.3.2 Citations

The order in which information in the list of references is given is as follows:

For books

- Authors’ surname and initials
- Year of publication
- Title (underlined) and edition number
- Place of publication
- Name of publisher

For chapters in books

- Authors’ surname and initials of the chapter
- Year of publication
- Title of chapter (in italics or inverted commas)
- Surname and initials of editing author
- Title of book (underlined) and edition number
- Place of publication
- Name of publisher

For journal articles and conference proceedings

- Authors’ surname and initials
- Year of reference
- Title of paper (in italics or inverted commas)
- Name of journal or title of conference (underlined) with volume, issue number and month
- Place of publication (if known)
- Publisher (if known)
2.3.3 Punctuation for citations

A comma follows the author’s surname; a full stop follows the author’s initials. Journal names are given in full unless the abbreviation is accepted practice in the relevant discipline. Titles of books, reports, theses and journals are given in ‘title case’; titles of articles, conference papers and chapters in books have only the first word and proper nouns capitalized.

2.3.4 Bibliography

Any supplementary literature not directly referred to in the text, but considered to be relevant to the research topic, may be put in a separate Bibliography after the list of references.

2.3.5 Referencing internet and other digital formats

Internet articles


Cited 31 January 1996.

The date in brackets indicates when the article was written, often given as a copyright date. The date at the end is when the student accessed the internet site.

CD-ROM


2.3.6 Referencing Illustrations

When an illustration of a building is used in theses, dissertations or reports, a caption must be written below it to indicate the name of the architect (where applicable), the name of the building, its location and the year of completion. The source of the illustration must be given after the caption.

Where a photograph or drawing is given in its original format (scanned, digitally copied or photocopied), the caption and source citation are given as follows:

If the picture is traced or redrawn, the source is acknowledged by using the word “after”:


If students make their own drawings by interpreting information from a source, they need to indicate where the information comes from. This is done by using the phrase “derived from” in the reference:


2.4 Appendices

Appendices are convenient places for recording complicated mathematical or other formulae, descriptions of experiments or apparatus, or any other specialized or lengthy material such as tabulated experimental observations, computer programme listings, copies of instrumental outputs or other material that would detract from the readability of the text. The reader should be able to study or refer to this material later. Appendices must be numbered or lettered consecutively in large print at the top right-hand corner of the page to facilitate their location in the text. Each appendix must start on a new page. The appendices should be placed immediately after the list of references (or bibliography).

**BIBLIOGRAPHY**

Chicago: University of Chicago Press.

Johannesburg: University of the Witwatersrand Library.


3 HEADINGS AND NUMBERING

The arrangement of headings of various levels (hierarchical positions) reflects the organisation of the contents of the thesis, dissertation or report. The levels of headings may be indicated by typeface and format alone. For example, the
heading ‘TWO PHASE FLOW’ is recognisably higher than ‘Onset of flow instability’.

The decimal numbering of headings further clarifies the sequence of importance and the interrelation of the portions of text under each heading. Thus the headings ‘3 TWO PHASE FLOW’ and ‘3.3.1 Onset of flow instability’ are even more informative than the corresponding unnumbered headings. Numbering also facilitates cross-referencing within the text.

3.1 Rules of Numbering

- Arabic numerals should be used throughout for headings.
- First level headings (chapter headings) are numbered continuously beginning with 1.
- Each main division of text (chapter) may be divided into any reasonable number of subdivisions (second level headings) that are also continuously numbered. This method of subdivision and numbering can be continued, in principle, to any level but tends to become clumsy and confusing beyond the third level.
- Numbering should be confined to the first three levels. Additional levels are unnumbered but identified by typeface and format as shown in Section 3.3 below.
- Numbers designating headings of different levels are separated by full stops. No full stop appears after the last number, including where there is only a single number (first level heading).

3.2 Typeface and Format

The typeface and format of all headings should reflect their levels, independently of numbering. The typographical details of the system of headings may be dictated by the printing system used for the final production of the document. Whatever the typography, it is essential that the system be logical and that it is applied consistently. Headings should be left-aligned, not centred, and there should not be a full stop at the end of a heading.
3.3 Examples of Systems of Headings

1 FIRST LEVEL HEADING

1.1 Second Level Heading

1.1.1 Third level heading

Fourth level heading

Fifth level heading. This leads directly into the text on the same line.

The last two levels can be in italics for greater clarity.

4 STYLE AND PUNCTUATION

4.1 Text Structure

A good thesis is comprehensive and precise. To be concise at the same time, the writer must watch the presentation carefully. The draft should be read through critically and unnecessary material eliminated. Where the writer’s first language is not English, it is most important to seek help in the reading and correction of the draft.

The following techniques may help:

- Break down complex statements into shorter sentences or lists;
- Avoid pompous words or jargon where a simpler word will be as effective;
- Avoid empty phrases such as “it is interesting to note…”;
- Avoid unnecessary words: “the precipitate was found to be in a wet condition” can be better phrased as “the precipitate was wet”.

4.1.1 Word choice

Use of the personal pronoun

The argument against the use of the personal pronoun is that the subject matter is the important thing, not the author. This is basically sound as long as it does not lead to vagueness (“it is considered…” or ponderous writing (“the author is of the opinion that…”)). In these instances it is better to use the personal pronoun, for example “I think…” or “I consider…”.

Technical language and jargon

Technical language is a necessary part of scientific writing. However, the writer must be certain that the reader will understand the language used.
Where there is doubt, terms should be defined, either in the text or in a glossary.

For example, “The hydrostatic loss appears to be responsible for dumping (or weeping) from sieve places…” is acceptable in a thesis intended for those familiar with distillation terms and concepts, but the statement becomes jargon when the potential readers may not be experts in the field.

Jargon is often created by introducing strange and unnecessary new words. For example, while ‘colonise’, ‘oxidise’ and ‘analyse’ have become acceptable through general usage, ‘blendorise’, ‘insolubilised’ and ‘solubilisation’ are not. However frequently they may be used in a chemical laboratory, they are unknown outside of one.

4.1.2 Tenses
The following points should be observed to avoid common errors:

- Reports of work done are usually written in the past tense;
- Statements of universal truths, such as a natural law, are made in the present tense;
- Do not change tenses in one sentence unless there is good reason.

For example, if we say that “The balloon rose because the hydrogen inside it was lighter than air”, this could be understood to mean either that this might apply only under the observed conditions, or that the gas is always lighter than air. To make the meaning clear, we must mix tenses in the sentence: “The balloon rose because hydrogen is less dense than air.” This example tends to be the exception: complications and bad style arise when tenses are changed without specific intention, such as to eliminate ambiguity.

4.1.3 Sentence structure

Active and passive voice
Traditionally technical writers have regarded the passive voice as the only acceptable form of presentation. In modern writing, however, the active voice
is used more often. A phrase such as “Economy justifies the procedure” is preferred to “The procedure may be justified in the interests of the economy”.

**Sentence length**

Long sentences with several dependent clauses are difficult to follow, particularly if the subject itself is complex. Reading tests have shown that sentences with more than 25 words are generally difficult to comprehend. Therefore, unless you are a master of the English language, avoid long sentences.

4.1.4 **Paragraphing**

Paragraphs are meant to help the reader by breaking up the text into manageable sections. The following guidelines will assist in organising paragraphs:

- A paragraph should consist of a central statement, supported by a group of details or subsidiary sentences;
- In technical writing, the main statement is usually at or near the beginning of the paragraph. For argument or persuasion, the central statement is often placed at the end of the paragraph as a climax to the supporting propositions;
- The transition between paragraphs should be smooth, with some connecting link in the text or a logical structuring of ideas;
- Long, unbroken sections of text are discouraging to the reader, so paragraphs should not be unduly long. If your text has many paragraphs exceeding 100 words, you should examine it critically.

4.2 **Conventions**

4.2.1 **Capitals**

There is much confusion about the use of capitals, with authorities differing considerably. The trend is to use capitals sparingly, following these general guidelines:

- The first word in a sentence and in a direct quotation that starts at the beginning of the sentence in the original are capitalised;
• Proper nouns and common nouns that are part of a name, for example ‘river’ in the River Amazon take capitals;
• Common nouns are capitalised when they are used with a number or letter to designate a specific thing, for example ‘Laboratory D’.

4.2.2 Acronyms
An acronym is a word formed from the initial letters of a name (NASA), by combining parts of a series of words (Soweto, derived from South Western Township), or from a combination of initials and parts of words (Radio Detecting And Ranging – radar). Certain acronyms have become dictionary words, but all others should be used sparingly and written in full the first time they appear in the text. If the acronym is not found in the dictionary, it should be in capitals, for example ‘ESKOM’. Students should be aware that acronyms that are familiar in this country may not be known by a broader readership, eg COSATU.

4.2.3 Spelling
In a language as complex as English, there is no simple set of rules. When in doubt, consult the Shorter Oxford Dictionary for the accepted Standard English spelling which is preferred to American. In addition to guidance on spelling, the Oxford Dictionary for Writers and Editors gives useful information on punctuation. The spelling check on most computer programmes is useful, although not infallible, and should be set to UK or South African English.

4.2.4 Abbreviations
Only generally accepted abbreviations and symbols should be used.

4.2.5 Punctuation
There are some 36 chief punctuation marks, however many of these are used only in specialised linguistic contexts. For a concise guide on the use of the more common punctuation marks, see Houp and Pearsall (1985).

4.2.6 Pagination
Pagination should run consecutively through the thesis, with all pages, numbered, including those that contain only figures or tables. The pages
containing the preliminaries are generally numbered with lower-case Roman numerals, while the body of the text, list of references and appendices are in Arabic numerals. Students are advised to check cross-references to specific page numbers and page numbers in the table of contents after each phase of editing.

5 EXTRA-LINGUISTIC MATERIAL

The customary medium of communication is language. However, in the sciences and engineering extra-linguistic material such as numbers, symbols, equations, tables, graphs and illustrations of various kinds are frequently used. The principle for such material is that it should be used only when it is the most effective means of communication and understandable to the target readership.

5.1 Numerals

The rules for the correct use of numbers are simple, based on common sense:

- In the text, use words rather than numerals for integers of ten or below. The exception is when integers are associated with unit symbols. For numbers above ten, use whatever gives greatest clarity and good appearance.
- Where it is necessary to have decimal fractions, these should be expressed in numerals, eg “The original design required 2.7 times as many components…”
- Do not use numerals for numbers that are approximations.
- Do not begin a sentence with a numeral as it can lead to confusion and is displeasing to the eye.
- Ordinals from ‘first’ to ‘tenth’ should be written out, but for higher ordinals the author should use discretion.
- Avoid very large or small numbers by using exponential notation (0.253 x 10^{-6} or 2.53 x 10^{6}). Where this is not appropriate, numbers should be separated by a space into groups of three counting from the decimal marker, eg 5 241.2 or 0.524 65. The groups must not be separated by
a comma, point or any other means. Where a number is less than unity, a zero must precede the decimal marker (0.325 not .325).

- When listing numbers, as in a table, always align them on the decimal marker.

### 5.2 Mathematics

Mathematics included in the text should form an integral part of the argument and should be intelligible to the intended reader. Detailed derivations and mathematics beyond the interest of the majority of readers should be put in an appendix. Mathematics must be carefully presented using printed symbols, with consistent use of units and symbols that follow international practice.

The form of presentation of a mathematical expression should:

- Bring out the structure of the expression clearly;
- Be as simple as possible;
- Introduce the minimum disturbance in the appearance of the printed page.

To comply with these last two points, algebraic fractions in the text should make use of a *solidus* or slash, not a horizontal bar:

\[
\frac{ax + b}{cx + d} \quad \text{and not} \quad \frac{ax + b}{cx + d}
\]

Note that careless use of the slash can lead to ambiguities:

\[
a + b/y \quad \text{means} \quad a + \frac{b}{y} \quad \text{and not} \quad \frac{a + b}{y}
\]

The correct form of the latter is \((a + b) / y\). Ambiguities can generally be overcome by the use of brackets, as in \(\log (a/b); (\sqrt[3]{3}) x\). Be sure that all brackets occur in pairs. Exponential expressions should have the format \(e^{2\pi x/y}\) or \(\exp(2\pi x/y)\).

However, with more complicated expressions, the foregoing rules may violate the conditions above. It may be necessary to simplify the expression or set it on a separate line, as in:

\[
q = \frac{L(t_0 - t_3)}{2\pi r_1 h_1} + \frac{1}{2\pi k} \ln \frac{r_2}{r_1} + \frac{1}{2\pi r_2 h_2}
\]
that can be expressed as:
\[ q = L(t_0 - t_3) / \Sigma R_t \]

where
\[ \Sigma R_t = (1/2\pi r_1 h_1) + (1/2\pi k) \ln(r_2 / r_1) + (1/2\pi r_2 h_2) \]

Left justification of all equations is favoured rather than vertical alignment of ‘equal’ signs, as shown in the above examples. Where the equation is too long to fit on one line, a break should be made before an operational sign or at some other logical place, but preferably not within a bracketed statement. The section of the equation on the new line should be placed just to the right of the ‘equal’ sign, as shown below:
\[ \Delta \omega = \frac{1}{y} \left[ \int f(v_1 A_1) \phi_1 \phi_2 dV + \int f(v_2 A_2) \phi_1 \phi_2 dV + \int f(v_1 A_1) \phi_2 dV + \int f(v_2 A_2) \phi_2 dV \right] \]

Note on superscripts and subscripts, p26.

Standard symbols should be used wherever possible, for which the student should consult the authoritative literature in the particular field.

5.3 Tables

Tables are best used when sets of numerical values are to be compared or contrasted. They should be used only where data cannot be clearly presented in graphical form. For example, discrete data sets can frequently be compared more effectively by using a bar chart than a table. Tables should be kept simple and clear, with only the relevant information included. There is no need to put in all the intermediate steps or results as they cloud the main issue.

Tables can be in either portrait or landscape format. In portrait orientation, the table is read with the page in the normal position, making it more convenient. Where possible, the table should be arranged to fit on a single page of the document. Where the size or content prevents this, landscape orientation may be used, but the student should ensure that the page is bound with the top of the page on the left.
Each table must have a heading and be numbered with Arabic numerals using a similar system to that described in Section 3.1 above. Thus, the first table in Chapter 2 is Table 2.1, the second is Table 2.2, etc. The same principle holds for lettered appendices, but with the full stop omitted, for example the third table in Appendix E is Table E3. Tables should be referred to in the text by their table number.

The columns in a table should be arranged for easy comparison, with related information in adjacent columns. Each column should have a brief heading that includes the appropriate units. The same symbols and units should be used in the text. In column headings, avoid expressions such as ‘x $10^3$’ as it is ambiguous whether the figures in the column have already been multiplied by the factor or whether the reader must do this. It is better to use the recognised metric unit, but where this is not possible, the heading must be completely clear, for example ‘Capital cost (R millions)’ is clearer than ‘x $10^6 =$ Capital cost in R’.

**Table 5.1 Calibration of rotameter**

<table>
<thead>
<tr>
<th>Position of Float (mm)</th>
<th>Flow rate (m$^3$/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TL = 17 °C</td>
</tr>
<tr>
<td></td>
<td>Flow rate (m$^3$/h)</td>
</tr>
<tr>
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5.4 Illustrations

All illustrations (graphs, photographs, drawings and diagrams) are referred to as figures. Each has a number and descriptive title, which should be placed below the illustration. (See 2.3.6 for referencing drawings.) Numbering follows the same principles as those for tables (see 5.3). Thus, the first figure in Chapter 2 is Figure 2.1, the second is Figure 2.2, etc. The third figure in Appendix E is Figure E3.
5.5  **Graphs**

Graphs can take a number of different forms: bar charts; pie charts (divided circles); pictographs; line graphs. The appearance of a graph is its major attribute, so it is up to the writer to decide on the impression required when choosing the format. As line graphs are the most frequently used in scientific work, attention will be directed primarily to this type. Line graphs are used to show the relationship between a continuously varying independent variable and one or more of its dependent variables. In preparing graphs for inclusion in a thesis, the following should be kept in mind:

- The graph should clearly illustrate the point that the writer is making;
- The scale should be chosen so that only the relevant parts of the curve are presented;
- If the zero needs to be suppressed, this should be clearly indicated;
- The choice of grid size should be dictated by the accuracy required;
- The scale should be easy to read and be restricted to multiples of 10;
- Units should be clearly stated;
- The caption should be brief but self-explanatory, positioned under the graph;
- Any notes or supporting information should be placed below the caption;
- Graphs should not be cluttered with detail.

**Graph example**

5.4.2 **Drawings, diagrams and photographs**

Line drawings and diagrams must, as far as possible, be kept simple and uncluttered with detail. Working drawings are usually not acceptable. Unless they serve to clarify the verbal content of the text, or express an idea more vividly than words can, drawings or diagrams serve no purpose. Only generally accepted graphic symbols should be used.

The inclusion of photographs may occasionally be useful and sometimes necessary. As a rule, photographs should not be used unless they show
something unusual or include features that cannot easily be expressed in words or with line drawings. If they are used, photographs should be taken with care, avoiding cluttered backgrounds such as views of unrelated equipment. There should be adequate contrast, with important details clearly visible (not in shadow or glare). Some sort of scale should be included so that the size of the object can be verified.

Any illustrative material that cannot be effectively reduced to A4 format may be included in a pocket inside the back cover of the document.

6 PRODUCTION OF THE THESIS

6.1 Word Processing

6.1.1 Paper

A good quality white bond paper of A4 size must be used, with printing on one side only.

6.1.2 Type layout

The main body of the text should be set in 1.5 or double spacing with generous margins. Text should be aligned at a consistent distance from the top and bottom of the page, although the top margin of the first page of a chapter may be slightly lower. A specimen page layout is given in Appendix E below.

The following are suggested dimensions of margins:

- Top, bottom and right – 30mm
- Left – 40mm to allow for binding

All work should be justified to the left margin without indented paragraphs. Paragraph breaks are designated with a triple line spacing where the text is in double spacing and a 1.5 line break where 1.5 line spacing is used. Full justification (both left and right margins) should be avoided as it reduces the readability of the text.
6.1.3 Setting the copy (font type)

Use a clear type such as Arial, Times New Roman, Helvetica or Courier with 12 point font size. Italics should be used only for emphasis, for references, or to designate words in a foreign language.

6.2 Illustrations

Whatever the method of reproduction, tables and illustrations must be neat, concise, legible and, above all, comprehensible. Originals of photographs should be avoided in favour of a high-resolution scanned copy.

6.3 Number of Copies

For all masters' dissertations and discourses, two bound and two unbound copies should be submitted for examination.

For the degree of PhD, three bound and two unbound copies of the thesis are required.

In all cases, a CD-ROM containing the thesis, dissertation or discourse must be submitted in pdf format, created through the print menu of word processing programmes.

6.4 Binding

Leather or other expensive binding is not required, but the method of binding should be robust and appropriate to the size of the document. Ring or spiral binding is generally acceptable. The cover of the bound document should be simple, with the title, the name of the author below the title, the degree for which the document has been submitted, and the year, eg:

BIOGAS-FUELLING OF SMALL ENGINE-ALTERNATOR SET FOR RURAL APPLICATIONS

Robert William Bluff
PhD
2006
7 EDITING AND REVISING

7.1 Checking, rectifying and polishing

It is the author’s responsibility to edit the first draft to:

- Determine the accuracy of the information;
- Clarify ambiguities;
- Emphasise important issues;
- Check spelling, grammar and punctuation.

The editing process is essentially one of critical evaluation of the manuscript against the requirements set by the objectives of the research. The main requirements are those of content, but accuracy, brevity, clarity and consistency must not be neglected. The author should evaluate each chapter of the work to ensure that it:

- Has the required content;
- Is free from inaccuracies, ambiguities and bias;
- Emphasises important issues and is free from verbosity, irrelevance and unnecessary detail;
- Can be readily understood;
- Is appropriate for its purpose.

Before starting the process of checking, the writer should ideally leave the draft for a few weeks to be able to switch to the role of a critical reader. The editing consists of three operations, each of which should be done separately. These are:

- The integrity edit;
- The logical progression edit;
- The text and language edit.

7.1.1 Integrity edit

The table of contents should be examined for the following points:

- Are the headings and subheadings clear descriptions of the material covered in each section?
- Do they form a recognisably logical pattern with a numbering system that reflects this pattern?
Next, the text should be checked page by page for the following:
- Are the headings and numbers identical to those used in the table of contents?
- Are the tables and figures correctly numbered and in sequence, with informative headings and captions?
- Are tables, figures and references all correctly referenced in the text?

### 7.1.2 Logical progression edit

Each chapter should be examined to:
- Check that the objective of each chapter is clearly stated and that the concluding section shows whether or not the objective was achieved;
- Check that the logical thread is apparent. Any jumps or gaps in the progression are usually an indication of faulty organisation, so these should be marked but not corrected at this stage;
- Check whether sections contain anything that does not belong there;
- Check that the conclusions flow from the discussion.

All structural defects must be corrected before the text and language edit.

### 7.1.3 Text and language edit

Only when the student is satisfied with the basic format of the report should he or she concentrate on the structure of the text and use of language. The non-verbal components (graphs, tables and illustrations) should be evaluated as part of the text editing.

The criteria for evaluating functional writing, as mentioned above, are:

#### Content criteria
- Accuracy – sufficient for the needs of the reader;
- Brevity – covering the essentials adequately and eliminating irrelevancies;
- Clarity – avoiding vagueness and ambiguity;
- Emphasis – drawing attention to significant information.

#### Tone
- Appropriate to the situation;
• Consideration for the needs and capacity of the reader;
• Professional treatment of the subject matter;
• Authoritative, without arrogance.

The specific aspects of language usage discussed in Section 4 should be consulted.

7.2 Graphic Material

Essentially the same criteria used in the language edit should be applied to graphic communication, namely accuracy, brevity, clarity and emphasis. One of the main reasons for using graphics is their ability to give an overall view and show relationships. Any graphic material that fails in these important areas probably does not justify its inclusion.

7.3 Time and Location Limitations

Most theses are prepared within a short time. However, once accepted, a thesis becomes part of the body of scientific literature. The writer should therefore draw attention to information that is valid only for a short time. The writer should clarify that points that are valid locally (e.g. under Highveld conditions at an altitude of 1 500m) are not necessarily valid generally. For instance, the recommendation to install solar panels on north-facing roofs does not make sense in the northern hemisphere. Cost data, monetary exchange rates and similar data are also subject to variation in place and time, so the precise information and limitations must be made clear.

7.4 The External Viewpoint

While the writer may consider himself to be objective with regard to the research material and its presentation, often the level of objectivity is not sufficient or consistent enough for a thesis. Therefore, an external reader’s viewpoint is needed, generally that of the supervisor or colleague who does not have to be an expert in the research subject, but who can simulate the position of the intended readership. This external reader should be skilled in recognising the kinds of errors described in this document, should annotate the manuscript accordingly, and suggest ways of improving it. The best
manuscripts have been produced through a co-operative interaction of author, supervisor and independent proof-reader/editor.

7.4 **Rewriting**

Of all tasks, rewriting a text is the least popular, yet it is essential for a clear and professional style. Editing tends to focus on the correction of errors rather than the elegance of expression. Rewriting substantial parts of the text is often essential to produce an elegant, well-balanced piece of writing.

8 **LAWS AND REGULATIONS**

8.1 **Copyright Laws**

Direct quotations from another work are permitted to a reasonable extent for the purposes of research, provided that the source and name of the author are acknowledged. Subsequent publication of the thesis as a book would necessitate the explicit approval of the copyright holder. In this connection, thesis writers should be aware of University Regulation G.29 as outlined below.

8.2 **University Regulations**

The following University Regulations reprinted from the University Calendar, pertain to theses and dissertations:

**G.26 Abstract and style of thesis or dissertation**

The thesis, dissertation or other work prescribed by the rules shall –

a) Include an abstract of not more than 350 words for a doctoral thesis and not more than 150 words for a master’s dissertation

and

b) Conform as far as possible to the style and format recommended in the authorised ‘Style guide for theses and dissertations’ obtainable from faculty offices.

**G.27 Copies of thesis or dissertation**

1) Subject to any additional or contrary provisions in the rules for any individual degree of master or doctor, a candidate shall submit to the Registrar three bound copies (or four or two if so prescribed by the rules or
determined by the Senate), and two further copies unbound, of his/her thesis, dissertation or other work. The bound copies shall be in a form that, in the opinion of the Senate, is suitable for submission to the examiners.

2) A candidate for a higher degree shall not be entitled to the return of the copies of the thesis, dissertation or other work, which he/she has submitted for the degree.

G.28 Formal declaration
Together with his/her thesis, dissertation or other work the candidate shall submit a formal declaration stating –

a) whether it is his/her own unaided work, or if he/she has been assisted, what assistance he/she has received;
b) whether the substance or any part of it has been submitted in the past or is to be submitted for a degree in any other university;
c) whether any information used in the thesis, dissertation or other work has been obtained by him/her while employed by, or working under the aegis of, any person or organisation other than the University.

G.29 Copyright
While copyright in his/her thesis, dissertation or other work remains vested in the candidate, the University shall have the right to make a reproduction of it or parts of it for a person or institution requiring it for study and research: Provided that not more than one copy is supplied to that person or institution; and to distribute abstracts or summaries of it for publication in indexing and bibliographic periodicals considered by the University to be appropriate.

G.30 Acknowledgement of award of degree if the material published subsequently
A candidate upon whom a higher degree has been conferred by the University and who subsequently publishes or republishes his/her thesis, dissertation or other work, in whole or in part, shall indicate on the title page or in the preface or, if this is not appropriate, in a footnote that such thesis, dissertation or other work has been approved for that degree by the University.
BIOGAS-FUELLING OF SMALL ENGINE-ALTERNATOR SET FOR RURAL APPLICATIONS

Robert William Bluff

A dissertation submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in fulfilment of the requirements for the degree of Master of Science in Engineering.

Johannesburg, 2006
# APPENDIX B: SPECIMEN CONTENTS PAGES

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LIST OF SYMBOLS

Avogardo constant $L$
Boltzmann constant $k$
elementary charge (charge on proton) $e$
Faraday constant $F$
gravitational constant $g$
mass of electron $m$
molar gas constant $R$
Plank constant $h$
APPENDIX F: SPECIMEN PAGE LAYOUT

Outer line represents edge of paper, inner line is text area.

30mm

First line on full text page

CHAPTER LINE
First line under chapter heading