Report Writing Guide for Engineers

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PREFACE

The *Report Writing Guide for Engineers* (*RWG*) is a reference source that will help undergraduate engineering students enhance their report-writing skills. The *RWG* was created after examining student assignments and realising there was a need for a set of clear standards in writing a report. The *RWG* will be a valuable resource for graduate engineers, especially in workplaces where report writing requirements may not be well defined. The *RWG* will also be useful when preparing team-based project reports.

Engineering education equips students with essential knowledge and skills needed in professional roles where technical report writing is a key communication skill.

Engineers solve problems based on scientific and technical principles within economic, health and safety, and environmental constraints. They aim to improve living standards and quality of life by optimising the use of resources such as energy, space, materials, time, and personnel.

Reports provide the means to communicate the benefits of proposed solutions, demonstrating how they will meet a client's needs and justify resource usage.

Unlike other forms of communication, reports are not limited by audience access, space, or time and allow for detailed, clear information backed by thorough analysis and thoughtful conclusions.

Technical report writing can vary across the different engineering disciplines and has differing stakeholder expectations, making a universal standard elusive. The *RWG* aims to harmonise these differences by detailing commonly accepted norms and standards for report writing.

Mastering the skill of technical report writing involves learning the standards and applying them effectively. A consistent standard not only enhances clarity and coherence but also supports students, especially in collaborative projects, by providing a unified framework for team-based reports.

Layout of *RWG*

Aside from the introduction, the *RWG* focuses on three main aspects of report writing with chapters on *structure*, *format*, and *writing style*. The final chapter deals with how to reference sources followed by appendices that provide additional support material.

New to the eleventh edition

This edition addresses the use and ethical considerations of artificial intelligence (AI) in writing, particularly in student assignments, emphasising the need to acknowledge and reference the assistance of AI when used to write a report.

The section on the formatting of numbers and the use of measurement symbols has been expanded. Additionally, the section on referencing has been updated in line with the latest edition of the *Australian Government Style Manual* (*Style Manual*) (APSC 2021).

The *RWG* continues to evolve to meet the needs of engineering students and professionals, aiming to enhance their ability to communicate effectively through well-crafted reports that meet industry and academic standards.

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001: Introduction

"As engineers, we were going to be in a position to change the world – not just study it."
– Henry Petroski
American engineer

The *Report Writing Guide for Engineers* (*RWG*) is designed to help undergraduate engineering students develop the skills required to write high-quality reports.

Quality in this context means meeting the presentation expectations of the report's readers, such as lecturers and workplace managers.

The *RWG* outlines the standards and expectations of report writing. It is not intended to limit the writer's creativity. Instead, it aims to ensure that the presentation of ideas and discussions is clear and effective, while adhering to established norms and conventions in report *structure*, *format*, and *writing style*.

Importance of early introduction

Introducing these expectations early in a student's education will more likely ensure they become second nature and help to foster proficiency in technical writing.

Some students mistakenly believe that engineering education focuses solely on scientific knowledge and engineering principles. While these are crucial, success in engineering also requires developing strong skills in communication, teamwork, leadership and networking.

Communication in engineering

Effective communication is essential for engineers who will often need to write reports, for example to persuade management, clients, or colleagues about the merits of a proposal; about the results of an analysis; or, the progress made in project delivery.

The success of a report depends as much on its presentation as the merits of the proposal.

Therefore, engineers need to ensure their reports are clear, accurate, and precise while avoiding confusion or ambiguity that can undermine a report's impact.

The role of reports

Reports are a primary means of written communication for engineers and scientists, that are widely used in various professional settings.

They are ideal for recording observations, conveying information, and gaining support from decision-makers.

Consequently, proficiency in report writing is often seen as a crucial graduate attribute in many engineering programs.

Team-based reports

Team-based projects are an essential component of engineering programs, designed to mirror the collaborative and interdisciplinary nature of real-world industry challenges. These projects require students from different disciplines to work together, bringing their unique skills and perspectives to solve complex problems. The culmination of such projects is often a team-based report, which is a comprehensive document detailing the problem, the methodology used to address it, the solutions proposed, and the results obtained.

To ensure that the report meets the required standards and that all team members contribute effectively, some form of guidance will often be provided.

The *RWG* serves as a framework that outlines the expectations for the structure, content, and format of the report. It helps to standardise the writing process, ensuring that all team members share a common understanding regarding their responsibilities and the report's overall organisation. This common platform reduces confusion and potential conflicts within the team, allowing for a more streamlined and cohesive report-writing process.

By following the *RWG*, students can focus more on the quality of their work and collaboration rather than concerns about report formatting or content expectations. This preparation is crucial for your future career, where there will be a need to produce clear, well-organised documents within a team setting.

Developing writing skills

Effective writing is a skill that requires practice and refinement. Students are advised to start to develop their report-writing skills early so they will meet professional expectations by the time they enter the workplace and be perceived as competent engineers with excellent communication skills.

Although report writing often appears challenging due to its seemingly rigid structure and impersonal style, students can become proficient writers with persistence and practice. Early knowledge of the norms and skills development will also prevent bad habits forming and more likely ensure the intended messages are effectively communicated.

Using the RWG

Students are encouraged to use the *RWG* as a aid in preparing a report. The *RWG* outlines the standards and conventions that will often form part of the assessment criteria.

Initially, frequent reference to the *RWG* may be necessary, but with sufficient practice there will be less emphasis on how to write the report and more on the report's intended message.

Recognising different stakeholders

Students should be aware that report writing requirements can vary between departments, organisations, and disciplines. For example, an employer may have specific reporting requirements for a student while on industry experience.

In the absence of any specific guidelines, the *RWG* will help the student to produce professional-looking reports.

Before commencing an assignment, the writer is advised to check with their supervisor whether there are any specific reporting requirements, such as the referencing method that should be followed.

Additional resources

The *RWG* includes in *Chapter 8 References* a list of reference material and guidelines on engineering and scientific writing.

Two such reference materials include the *Australian Government Style Manual (Style Manual)* (APSC 2021) and the *Chicago Manual of Style* (UChicago 2017). There can be other similar resources applicable to your locale.

While there are many similarities in these resources there are some differences such as in the details on how to reference sources.

The writer is advised to choose a resource that best aligns with their regional requirements but importantly be consistent in following the chosen resource's guidelines when preparing a report.

The *RWG* is based on the guidelines outlined in the *Style Manual* (APSC 2021) but has been adapted specifically to the task of technical report writing.

Navigating the RWG

For ease of navigation, the eBook version of the *RWG* contains two types of hyperlinks.

- First there are links coloured in dark blue linking in-text citations to the relevant sources in the references section, for example (APSC 2021).
- The second type of link coloured in orange is a cross-reference to the relevant section in the *RWG*, for example *Chapter 4 Structure*.

Impact of AI

With the rapid advancement of artificial intelligence (AI) applications to assist in writing, the section on *Writing assistance* in *Chapter 6* discusses how to navigate the important issues related to academic integrity, values and a university's student code of conduct.

Summary

In summary, the *RWG* is a resource aimed at helping engineering students develop essential report-writing skills that will lead to clear, precise, and professional communication, ultimately contributing to success in the workplace.

Team-based reports are an integral part of engineering education, bridging the gap between academic learning and industry practices. The *RWG* plays a crucial role in ensuring that these reports are prepared effectively, fostering collaboration, and enhancing the overall learning experience for students.

The next chapter discusses why reports are important and the role they play in the life of a professional engineer.

002:
The aims of report writing

"Almost all good writing begins with terrible first efforts. You need to start somewhere."
– Anne Lamott
American writer

What is a report – what are its aims and objectives?

A report is a form of written communication extensively used in science, engineering, research, business and industry. Its primary aims and objectives are to:

- *Present information*: Convey detailed and accurate information on a specific topic or activity;
- *Provide accounts*: Outline the methodology and procedures used in various activities or studies;
- *Record results*: Document the outcomes of studies or investigations;
- *Convey analysis*: Present results, analyse data, and draw conclusions;
- *Make recommendations*: Offer conclusions and suggest actions or recommendations based on an analysis; and
- *Influence decisions*: Discuss options or arguments intended to persuade or inform decision-makers.

Who reads a report and why?

During engineering studies, a student will complete many assignments that will require the submission of a report. The assignments might be related to a laboratory investigation; field study; engineering design; or, a design plan and economic evaluation. Such assignments are not only intended to aid in understanding scientific or engineering principles but also to assess the quality of a student's report writing.

Likewise, a graduate engineer will be required to prepare reports for their manager in the workplace. This might be to record information or an event; to outline the elements of a new design detailing the engineering and financial options; or to review a project.

A common mistake when writing a report is assuming the reader is familiar with all aspects of the topic, which can lead to communication shortcuts. This assumption can result in undesirable consequences, such as rejection of the report's findings or incorrect interpretations.

Hence, write for the 'average person,' who may only have general knowledge of the topic. This approach ensures that the report is accessible to a broader audience, including senior management who may not have a thorough technical understanding of the topic.

Sometimes a report's audience can extend beyond what was originally anticipated. While the report may have been requested by your direct line manager, the report could be passed up to senior management in the organisation who may not have the technical background to appreciate the finer details discussed in the report. In such circumstances, you may not get a second opportunity to explain or further elaborate on your ideas and discussion.

What is expected in a report?

Reports are useful as they can consolidate various types of information, including:

- design drawings;
- calculations, models and spreadsheets;
- graphs, charts, photographs and other illustrations;
- critical analysis and synthesis of information; and
- discussions and conclusions.

Despite the variety of information and objectives, readers expect a familiar structure and form of presentation.

Following the established norms, conventions and standards will increase the likelihood your ideas and recommendations will be accepted.

While reports should conform to the norms, there is still room for creativity and flexibility in presentation and discussion.

Success factors in report writing

Key aspects influencing the success of a report include:

- *Clarity and insight*: Ensure discussions are clear and insightful;
- *Logical development*: Develop concepts logically and coherently;
- *Supporting evidence*: Provide strong evidence to support your ideas; and
- *Sound conclusions*: Draw well-founded conclusions based on your analysis.

Many universities offer resources and support to students in report writing, such as face-to-face consultations and online services. An example of such support is *Report Writing Support* (UNSW 2024a). Utilizing these resources can enhance a student's report-writing skills and help attain academic and professional standards.

Summary

As with many tasks, report writing is an iterative process—especially if a high-quality report is desired.

Understanding and meeting the expectations of the audience is crucial to gaining acceptance of your designs, ideas and recommendations.

By practising and refining this skill, you will become more effective in communicating complex information and influence decision-makers in academic and professional settings.

The next chapter discusses the process steps and factors to consider when preparing a report.

003:
The report writing process

"To achieve great things, two things are needed; a plan, and not quite enough time."
– Leonard Bernstein
American conductor and composer

The steps in preparing a report include:

- *clarification* of the report's objective;
- undertaking the *investigation* or study;
- *planning* an appropriate structure for the report; and
- *drafting, editing and reviewing* the report.

Clarification

To write a good report, the writer must have a clear understanding of the report's objectives. This can be as simple as clarifying answers related to the who, what, when, where, how and why of a report.

- *Who* is the intended audience?
- *What* is the topic and the report's aims?
- *What* is the expected length of the report—several pages or several hundreds of pages?
- *When* is the report required?
- *Where* and *what* resources are available?
- *How* will the report be distributed?
- *Why* have you been asked to write the report?

Investigation

Once the objectives are clarified, the writer can begin the investigation. Depending on the type of report, the investigation can involve several different approaches.

The writer may need to visit a work site for example, or undertake discussions with a range of people, or observe some process. All the gathered information will need to be collated, filtered and analysed. Alternatively, the investigation may entail a series of experiments to collect data that tests a hypothesis.

In each case, the writer will need to consider the following:

- *What* questions need to be answered?
- *What* type of information must be collected?
- *Where* is the information located?
- *How* will the information be recorded?
- *How* will the data be modelled, analysed and presented?
- *What* resources are needed to do all this?

Planning

While investigating a topic, the writer should also be thinking about how the report's contents will be organised. A useful activity is to create a simple outline of the report.

An outline includes the headings and subheadings and the order in which they are sorted; are they sorted chronologically or by groupings of activities etc?

Whatever order, they should build a case that will support the report's conclusions and recommendations. This will be discussed further in *Chapter 4 Structure*.

Creating an outline will encourage the writer to consider what information should be included in the report and in what sequence. The outline will often evolve as work progresses to eventually result in the report's contents page.

Drafting and editing

In most instances, a report will usually require writing several drafts to produce a highly professional finished product that achieves the report's objectives. To this end, the writer will need to undertake the following.

Revisit the task often

Do this by *keeping the reader's needs and the report's objectives in mind*, not only as the information is collated and analysed but also as the report is being drafted.

Be selective

Do this by *keeping clear notes* on what information has been collated, by whom, from where and when. Also critically comment on the veracity and applicability of the information and its sources—do they meet the report's objectives? Review the project notes and draft copies of the report to decide what is essential and discard any non–essential information.

Create a structure

Do this by *organising the information* on several levels: into sections, paragraphs and sentences. Consider what sub-headings you might wish to have in each section. Include a summary or overview statement at the beginning of each major section as this will improve readability. A well-written paragraph will generally begin with a topic sentence and develop just a single idea to avoid confusion and ambiguity.

Bullet points are used in reports to good effect for clarity and emphasis; see the section on *Lists of information* in *Chapter 6*.

Tables of information and illustrations are often included in reports as they can effectively summarise information, aiding in communication and improving understanding and comprehension of interrelationships between variables.

Edit, review then edit again

The report should be systematically edited. This requires well-developed organisational skills. Some strategies that the writer may find useful are as follows.

- Give a draft version the *'bottom-draw treatment'* by putting it aside for at least 24 hours. The report will then be reviewed with a fresh pair of eyes where weaknesses in the discussion are more likely to become apparent.
- *Ask someone else for their comments* on the report, preferably someone familiar with the topic and from whom you can accept criticism.
- *Create a checklist* to summarise the requirements of a report. Checklists can be found in many good books on report writing. An example of a simple checklist is provided in Appendix 7.
- *Observe what other writers do well* and apply this to your writing.
- *Know your shortcomings and seek assistance* from student learning services. Develop an awareness of what you need to look for and what needs particular attention to improve your writing skills.

The time necessary to format, draft and edit a report is often greatly underestimated by students. Sufficient time has to be allowed for in the final editing which can take several days for large reports; leaving this to the night before is not good practice.

As well as leading to unnecessary stress, a last-minute rush will more likely result in a suboptimal quality report (and assessment). This can undo all the earlier effort that went into collecting information, modelling and analysis.

004:
Report structure

"I do not think that scheduling is uncreative I think that structure is required for creativity."
– Twyla Tharp
Choreographer

The structure of a report differs from other forms of writing such as an essay or novel. Whereas a novel is intended to be read sequentially from beginning to end, different people may only read certain sections of a report. For instance, management tends to focus on the summary, and sometimes on the conclusions and recommendations sections to quickly understand the main points made in the report. By contrast, a technical person might be more interested in the sections dealing with experimental design, results, and analysis.

Depending on its length and purpose, a report will generally be divided into several sections. This chapter outlines the sections most often found in a report.

An example of a report's structure is shown in *Appendix 3*, illustrating how the sections come together to tell a story, which in that case presents the results of a laboratory test programme. It also demonstrates elements of formatting and writing style within a report.

Writing in Engineering and Science (UNSW 2024b) is an example of a guide on technical report writing that includes a discussion on report structure.

Title page

The purpose of the title page is to indicate to the reader the nature of the subject matter that is covered in a report through an informative title. Details found on the title page can include:

- Title of the report;
- Report's author;
- Date of submission;
- Course code and department;
- Name of university or business organisation;
- Person to whom the report will be submitted for example your lecturer or your manager.

The design of the title page should be simple yet functional and appropriate to the audience and task. In addition to the formal title page, the course may require a separate assignment cover sheet.

*Statement of Originality

In the case of a student assignment, a statement or declaration affirming the originality of the report might be required. This declaration could be included in the assignment coversheet or incorporated into a report template. For a thesis, the declaration is normally placed immediately following the title page.

The statement is a formal declaration by the student that it is their original work and that all sources of information including data, illustrations and other material contained within the work have been properly acknowledged.

Summary

The Summary contains an *overview of the most important aspects of the material contained in the report.* While there are a variety of titles that can be used for this section such as an abstract, synopsis or executive summary, *the title most often used is Summary*.

The term *Executive Summary* is sometimes used in reports on a major project or investigation. This can include a project feasibility study or other similar comprehensive report that is several hundred pages in length. In which case, the discussion may extend over several pages.

Similarly, the term *Abstract* is generally reserved for a thesis, journal article, conference paper or other scientific publication.

The summary is the first section in a report. It is often the first section that is read and is usually read by everyone. Hence while brief it is an important section.

The summary is placed after the report's title page and before the table of contents. Ideally, the summary should be approximately one-half of a page in length but *no more than one page or 250 words*.

In essence, the summary has three parts, each often contained in separate paragraphs. It should succinctly state:

- the *objective of the study* or report;
- a *description of the process or method used* during the investigation, the major outcomes and results; and
- the *major conclusions and recommendations*.

Two examples of a summary section together with critical comments by a Lecturer are contained in Tables 1 and 2.

* **Note:** The section headings marked with an asterisk (*) are generally found in a thesis or other scientific publication such as a conference paper. These sections are not necessarily required in a technical report.

Table 1

A sample extract of a Summary section from a student's report with accompanying lecturer's comments.

SUMMARY	*Lecturer's Comments*
We have been assigned by the Directors of Base Metals Ltd to evaluate the options for primary access via shaft sinking or decline development to access the Southern Cross orebody in the North Parkes region of NSW. **In each case** a secondary return ventilation shaft or decline would be required. Some of the conclusions of this report are undoubtedly applicable for its evaluation, however, this has not been considered. This report clearly identifies the advantages of utilising a decline access for the purpose of employee access and ore recovery at this site. In reaching this conclusion the various technical and economic aspects of **the two alternatives** have been thoroughly considered. In particular the report highlights: • the economic advantage to decline access; • the reduced risk associated with decline access; and • the minimal environmental impact of a decline. In both cases, excavation by drill and blast was considered the best option for excavating through the surrounding country rock.	*The structure is good because there are clear stages evident in the writing including:* • *terms of reference;* • *report aim;* • *report solution; and* • *report scope.* *Expression could be improved in two areas:* • *wordiness; and* • *cohesion.* *Avoid the use of the first person (I, we etc) in technical writing but rather write in the third person.The underlined words are unnecessary.* *In the third sentence, it is unclear what is meant by 'its evaluation'.* *The words in **bold** are implicitly referring to the two access alternatives. It would be clearer to directly refer to 'the two alternatives' that are being discussed.*

Table 2
An example of a concise Summary section.

SUMMARY

Valley Copper Mines has secured a contract with a smelter to supply up to 0.7 Mtpa of copper concentrate. The results of this technical feasibility study has found that the best haulage option for the operation would be to use a truck haulage system. This would require a $10.69 million capital outlay at an average transport unit cost of $2.10 per tonne for an initial five year period and thereafter $1.97 per tonne for the remainder of the contract period.

Lecturer's Comments
This summary addresses the main elements in that it briefly provides the context for the study (a new contract), the objective (evaluate the best haulage option), final recommendation (a truck haulage system), with an estimated start-up cost ($10.69 million capital outlay) and forecast operating costs ($2.19 and $1.97 per tonne).

*Acknowledgments

An Acknowledgment section is normally only required in a thesis, conference paper or research report. In a thesis, it usually follows the abstract and in journal and conference papers it is generally placed before the references section.

Here the writer acknowledges the people and organisations that assisted and supported the project for example by providing resources or information. This can include the name of the organisation and any key people involved in the project. A few sentences or a short paragraph is usually all that is required.

Contents

The Contents section, or Table of Contents (TOC) as it is sometimes referred to, outlines for the reader's benefit the structure of the report.

It is a listing of the section headings and subheadings together with their respective page numbers. Table 3 shows an example of the content page in a report with the section headings.

Another purpose of the contents section is to assist the reader in quickly locating information of interest in a report. It is optional to use a section numbering system in small reports of say less than ten pages, but for larger reports section numbering systems are more often used.

If a numbering system is used, then it should be consistent and reflect the hierarchical nature of the section headings and sub-headings used in the report. A decimal number system is often used for this purpose; see the Contents section provided in the sample report in *Appendix 3*.

As indicated in an example of a contents page in Table 3, *the contents section is not included in the report's contents*.

The convention on page numbering in a report involves the use of:

- lower-case *Roman numerals* for the preface pages up to and including the Contents; and
- *Hindu-Arabic numerals* in the main body of the report commencing with the Introduction section—see the section on *Page numbering* in *Chapter 5*.

*List of figures and tables

In very lengthy reports containing many figures and tables, separate listings of figures and tables can be included immediately following the contents section.

Each list usually follows after the table of contents and should use a similar system of formatting. The list should include the figure or table number, short caption and page number.

List of symbols and definitions

If a report refers to special or unique names, terminology, symbols or abbreviations at different places in a report then it can be helpful

Table 3
An example of a Table of Contents.

CONTENTS

to the reader to include a glossary of terms. This is usually located at the start of the report following the table of contents. It should be sorted alphabetically and include the full and alternative forms of the name.

Introduction

This is the first section in the main body of a report. To emphasise this, the page number is reset to '1' using Hindu-Arabic numerals.

The introduction section is important as it sets out the context for the report. It should clearly define the objectives or purpose of preparing the report, any constraints or boundaries that limit the scope of the report and any other relevant background information.

At this stage of the report, there should be no discussion of the findings or recommendations.

The introduction can be as short as a single paragraph or as long as several pages in lengthy reports. An example of an introduction section is shown in Table 4.

Main sections and subsections

Following the introduction, the structure of a report will vary depending on its purpose. For example, a report for industry might detail *an investigation* such as a review of operations. Alternatively, a report might be prepared on the *findings of a laboratory study* such as alternate materials haulage systems. In other cases, it might be required to *report on observations and information* gathered during a field study to several sites detailing leading safety practices.

Each type of report will require a different structure. The following examples show the different structures that can be used in a report.

General report

Purpose: To provide a balanced account of a topic or an area of knowledge. The report is a record of the investigation and its outcomes.

A record of a project or study is necessary for several reasons, such as to capture best practices to improve project management in the future. Such a study would involve gathering information from different sources, analysing this information and making a conclusion.

The main body of this type of report could address:

- history and current understanding of the issues;
- investigation process or methodology used;
- models developed to aid analysis;
- verification of these models and an analysis;

Table 4

An example of an Introduction section in a report.

INTRODUCTION	*Lecturer's Comments*
CCMH Engineering Pty Ltd was approached by the Aluminium Company of Australia (ACA) to conduct an analysis of the bulk haulage options between ACA No.1 Bauxite Mine and the Coolenup Refinery. The direct distance between the sites was found to be [is] 15 km and approximately 30 km by haul road. The required capacity for the materials handling system was stated as 8 Mtpa. The design life of the system is [is set at] eight years with a possible extension to 12 years. CCMH Engineering was commissioned to investigate the economic, environmental and social cost of each of two haulage options, these being truck and conveyor haulage. The final decision on which bulk haulage option was to be recommended was based on: [The final recommendations took account of:] • economic viability, • environmental considerations, • safety considerations, and • social considerations This report aims to clearly set out the detailed analysis of both haulage options. In each case, a complete transport system has been designed, costed and analysed.	*In terms of content, this sets out the terms of reference and provides a brief background and the aim of the study.* *In terms of style, the second paragraph sets out the project constraints. Statements that refer to conditions (e.g. "is 15 km","is set at 8 years") are usually written in the present tense. Whereas statements about actions (e.g."was given as") are best written in the past tense.* *The main criteria to be used are presented. A brief description of methodology and report structure is included.* *Words written within square brackets are suggested alternates*

- future directions and/or solutions based on the findings of the report; and
- other impacts or aspects to consider.

Laboratory report

Purpose: To describe a series of experiments in sufficient detail that would allow the method, results and conclusions to be reviewed and, if necessary, modified and/or repeated.

It would be expected in such instances to draw conclusions based on the test results and to place these in the context of other related work. Typical section headings might include:

- theory & current knowledge to set the context;
- objectives;
- procedure and/or method;
- results; and
- analysis and discussion.

A report on a complex research program (for example a thesis) might entail several chapters, such as the procedures followed, the methods employed, a discussion on the results and analysis followed by a set of conclusions.

Field study report

Purpose: An account of activities, events and/or observations following a site visit. Typical sections might include:

- site description—what the organisation does and produces, plant layout, staff organisation;
- description of work/activities/systems/plant;
- description of other work/activities observed;
- general comments on building, layout, technical facilities and amenities; and
- outline of management, safety, environmental management and other systems.

Conclusion and Recommendations

Every report should include some concluding statement linking the objectives as outlined in the introduction section with the outcomes of the study. The conclusion addresses the *'so what'* type of questions – what was found and what impact this might have on the topic.

It could discuss the impact of the study, what was determined from an analysis of the test results, field trip or the organisation and, what was been learnt because of the study.

Table 5
An example of a Conclusion section.

CONCLUSION
This report has established on the basis of cost, geotechnical issues, environmental impact, exposure to risk and being fit for purpose, that a decline development is the better option for the primary access to the proposed mine at a production rate of 1 Mtpa of ore. Development of the mine below the 400m Level may require alternate access but this should be subject to a further evaluation before making a final decision.
Lecturer's Comments *The conclusions are short and to the point.* *They restate the major findings and recommend further work or decisions that may be needed if circumstances change.*

The conclusion section should synthesis information rather than simply provide a summary. It is an opportunity for the writer to demonstrate their insights on the topic. A sample of a conclusion is provided in Table 5.

The second part of this section is the recommendations. This part is optional and outlines what further work might be required, if any, to address any unresolved issues or alternate approaches considering what was found in the study.

References

This section contains a list of all the reference sources that were cited in the report.

Only *references cited in the report* should be included in the reference list. In the case of the author–date reference method, the **list is sorted alphabetically by author** and year of publication.

There are specific requirements as to the information that must be provided for each reference source including:

- author(s) of the article or reference source;
- year of publication;
- title of reference source if a report, journal article or conference paper;
- title of the publication such as a book, journal or conference proceeding; and

- publisher and place of publication.

When providing each reference source, a certain protocol must be followed. In the case of the author–date system this includes:

- information related to the source and order of its presentation for example first the family name and then the initials of each author followed by the year of publication;
- the words and abbreviations used with each reference for example 'in' denotes a conference proceedings while 'eds' are the names of publication editors; and
- the punctuation used for example when and where to use brackets, commas and full stops.

Together these distinguish the different types of reference sources such as a book, journal articles or conference papers. See *Chapter 7 Referencing* for further details on referencing.

An example of a reference list is shown in Table 6 with further examples shown in *Appendix 3* and *Appendix 4*.

Appendices

The Appendix section serves to provide additional or supporting information that, while not crucial to an understanding of the main facts and interpretation of results, the information may be required by the reader for verification or clarification of the data.

Information contained in the main body of the report should be directly related to the discussion. Information that indirectly supports the discussion is included in an appendix.

As with figures and tables, there should be a link between the main body of the report and each appendix. The reader should be directed in the main body of the report to the appropriate appendix, for example "…additional data are presented in Appendix A." See the section on *Section numbering* in *Chapter 5* for details on the numbering convention used in appendices.

Some examples of the different types of information that can be found in an appendix include:

- a list of raw or primary source data;
- a detailed description of equipment and/or drawings;
- configuration/settings of any models used;
- material safety data sheets (MSDS);
- sample copies of any survey documents; and
- product data sheet or equipment specifications.

Table 6
An example of a Reference list.

REFERENCES

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Note
1. The above list includes examples of the publication details respectively of a:
- *standards code;*
- *journal article;*
- *book;*
- *unpublished thesis;*
- *conference paper;*
- *document from a web page; and*
- *two different reference sources by the same author in the same year.*

2. The reference list is based on the author-date method consistent with the Style Manual (APSC 2021).

005:
Report format

"Information is a source of learning. But unless it is organized, processed, and available to the right people in a format for decision making, it is a burden, not a benefit."
– William Pollard
Writer

Layout and formatting

In general, while there are no strict constraints on the design of a report and some latitude allowed for personal preferences, there are some norms that need to be adhered to.

The overall guiding principle is that formatting should complement the communication process, making the report easy to read and pleasing to the eye—elements of formatting should not cause annoyance or a distraction to the reader.

Equally important, **formatting should be consistently applied** within a report. Table 7 shows some of the commonly used format settings in a report.

Typefaces and font styles

Traditionally text in a report is set in a serif family of typefaces such as Times New Roman as it is considered easy to read. Headings on the other hand are generally set in a sans serif typeface such as Arial and a larger font size than the text.

TABLE 7
Recommended layout for a report.

Layout option	*Setting*
Left margin	25 mm or 30 mm, the latter leaves room for binding and for comments by the reader
Right margin	25 mm recommended with a minimum of 20 mm
Top margin	25 mm
Bottom margin	25 mm recommended with a minimum of 20 mm
Line spacing	1.5 lines as this allows space for comments
Spacing between sentences	single space between sentences
Spacing between paragraph	6 (or 12) point
Justified text	paragraphs need not be justified in a report but it is usual in a thesis

An *italics* or **bold** font type is used whenever emphasis is desired for particular words.

A common trap for novices is to overuse the various font styles—it is recommended to use the font styles sparingly.

For example, the **italics** font can be used *to emphasize a phrase or an entire sentence*. It can also be used to denote a quotation or the title of a publication.

A **bold** font, being more striking to the eye, is used to give **stronger emphasis** but applied to just a few words. When emphasis is required on four or more words then it is suggested to use italics instead. A bold font is also often used to denote the major section headings in a report.

Another option to give emphasis is to use **CAPITALS**. Aside from section headings, this is particularly useful in circumstances requiring added emphasis where a reader might otherwise misread the meaning of a word or sentence such as "*water from outlets in this laboratory is not potable and must NOT be consumed.*" As reading capitalised words tends to slow the pace of reading, capitals should be used sparingly in a report.

With the development of desktop printing, underlining is *rarely used* having been replaced by bold and italic fonts. It can be used in those few instances when you might want to alert the reader where another font style may be less appropriate. Underlining, for example, can be particularly effective whenever part of a word needs to be emphasised, for example in a prefix such as 'unrepresentative.' As with capitals, underlining should rarely be used in reports.

A list of suggested format settings (font and spacing) for use in a report is shown in Table 8. On a final note, combining different font styles (that is italics, bold, underlining) should be avoided in a report.

Table 8
Recommended font settings in a report.

Format option	*Setting*	*Example*
Heading: Level 1	Start each section on a new page; Line spacing: 9 pt after; Hanging 1.4 cm; Typeface: Arial or Calibri; Font: 18 pt, All caps, bold	**1 HEADING L1**
Heading: Level 2	Line spacing: 12 pt before and 6 pt after; Hanging 1.4 cm; Typeface: Arial or Calibri (Light); Font:14 pt, Small caps, bold	**1.2 HEADING L2**
Heading: Level 3	Line spacing: 6 pt before and 3 pt after; Hanging 1.4 cm; Typeface: same as body text; Font: 12 pt, Sentence case, bold italic	***1.2.3 Heading level 3***
Heading: Level 4 (rarely required)	Line spacing: 6 pt before;Typeface: same as body text; Font: 12 pt, regular	1.2.3.4 Heading level 4
Body text in report	Paragraph spacing: 12 pt before; Line spacing: 1.5; Typeface: Times New Roman, Cambria or Palatino (Linotype); Font: 12 pt	…analysis of the options. Modelling the interaction…
Tables and Figures	Centred; Spacing from text above table caption/figure: 12 pt; Spacing to text below table/figure caption: 12 pt	
Captions for Tables and Figures	Centred; Table caption placed above table while figure caption placed below figure; Typeface: same as body text; Font: slightly smaller than body text e.g. 10 pt; Table caption: 3 pt above table; Figure caption: 3 pt below figure	
Table contents	Typeface: Arial or Calibri; Font: 9 or 10 pt; Text: right justified in left hand column, left justified/centred in other columns; Values: centred or tab aligned to decimal point	
Page numbers	Typeface: same as report; Font: 10 pt; Position: top right hand corner of page	
Header	Typeface: same as report; Font: 10 pt	
Footer	Typeface: same as report; Font: 10 pt	
Reference list	Align left; Indent second and consecutive lines; Typeface: same as report; Font: same as text	

Style sheets

Many word processing packages include style sheets. Once formatting has been configured in a style sheet, the task of formatting the different structural elements in a report is simplified and will ensure consistency throughout a report for example in the use of typeface; font type and size; and, line spacing for section headings, paragraphs, figure captions and the body text, etc.

Once the different format settings are setup as styles in a report, the file can be saved as a template for later use in all future reports.

Another advantage of style sheets is when a separate style is applied to different heading levels then the creation of a Table of Contents (TOC) in a report becomes just a simple task.

A listing of some styles used in a report is shown in *Appendix 3*.

Section numbering

A system of section numbering is often used for headings and subheadings in reports, especially reports exceeding ten pages and when there is a hierarchy of headings and sub-headings. Up to three levels of headings is usually sufficient for most reports, for example '8.4.3 Errors in data acquisition.' In very large documents such as a thesis, up to four levels of headings may be used. Too many levels may become confusing for the reader and also cumbersome for the writer to manage.

Use of the words 'section', 'chapter', 'appendix' etc when referring to the numbering in a report should be **treated as proper nouns**, hence the first letter of the word should always be capitalised for example "further information can be found in Section 8.2."

Like the main body of a report, an appendix can be divided into sections each containing disparate information. A different numbering convention is often used to distinguish the appendices from the main body of the report, two examples being:

- Appendix A, Appendix B, Appendix C etc; and
- Appendix 1, Appendix 2, Appendix 3 etc.

As with section numbering, the numbering system of tables and figures in an appendix is often different to that used in the main body of a report. The table or figure number can be prefaced by the number or letter of the appendix, for example "…see Figure A-1 in Appendix A." Alternatively a table or figure can be referred to in a particular appendix, for example "…as shown in Table 3 of Appendix 2 …"

Page numbering

Each page should be consecutively numbered in a report. To distinguish between the pages in the preliminary sections of a report from pages in the main body, two different numbering systems are used.

The page numbers for *the preliminary sections* up to and including the table of contents section are set in lowercase *Roman numerals,* that is i, ii, iii etc. In a report, the coversheet and title page are NOT paginated.

Page numbering recommences from *the start of the main body of the report* which usually begins with the Introduction section. Here *Hindu–Arabic numerals* are used for the remainder of the report, that is 1, 2, 3 etc.

The preferred position of the page number is within the page header portion in the right-hand corner at the top of the page.

Page headers and footers

In most technical reports only the page number should appear in the page header.

In reports for industry and governmental organisations, the footer may sometimes contain information necessary for document control such as the file name, date of publication and/or the name of the organisation.

Any elaborate design for a header or footer adds little value to most technical reports. The main issue is this adds unnecessary clutter and can distract the reader. If you wish to make use of headers and footers then you should ask how will the information aid in communication and is it essential. If used, its impact can be minimised by using a smaller font size.

Use of symbols in a report

Symbols for units of measurement

In general, metric units should be used for all units of measurement as per *Standards International (SI)* and laid out in the *International System of Units (SI)* (BIPM 2022).

When preparing a report, the writer should use SI units whenever possible but be mindful of the conventions in their industry and location.

For example, imperial units are still used in parts of industry in some countries when referring to engine power rating (hp *vs* kW), wheel rim size (in *vs* mm), air pressure (psi *vs* kPa) and mass of gold (oz t *vs* kg). The use of these non-SI units is discouraged and will likely diminish over time. If it is thought necessary to use these units in a report then the quantity should be stated in the SI unit followed by the equivalent quantity stated in the alternate non-SI unit placed within brackets.

In general, the preference in a report is to state a quantity as a numerical value rather than spelt out together with the symbol for the unit of measurement rather than the full unit's name, for example 10 m and 25 kg.

It is good practice to insert **a non-breaking fixed space between the numerical value and the symbol for the unit of measurement** so both the value and unit symbol will always appear on the same line; in some word processing software, the keyboard shortcut to insert a non-breaking space is *Ctrl-Shift-Space*.

There are several exceptions to this rule including the unit symbols for currency and plane angle where no space is inserted between the value and unit symbol for example $780 and 36°45'23".

If a quantity needs to be spelt out then the numerical value of the quantity should be followed by a space and then the appropriate unit of measurement spelt out, for example ten metres and twenty-five kilograms.

In most cases the symbol for a unit of measurement is set in a lowercase Roman font for example g (gram), m (metre) and kg (kilogram).

The main exception is **when a unit of measurement is named after a person** in which case the first letter of the symbol is set in an uppercase font consistent with it being a proper noun for example 'N' is the symbol for force named after Sir Isaac Newton; 'Pa' is the symbol for pressure named after Blaise Pascal; and, '°C' is the symbol for the Celsius temperature scale named after Anders Celsius—note the latter is a combination of the degree symbol and the abbreviated name.

In instances where a quantity and unit of measurement are spelt out, the unit is always written in a lowercase font (e.g. one newton and ten millipascals) except the unit for temperature which remains capitalised for example ten degrees Celsius.

The plural form is applied to the written name of a unit (e.g. ten newtons, two metres, twenty degrees Celsius) but NOT to the unit symbol (10 N, 2 m, 20 °C).

Abbreviations for unit symbols of measurement only require a full stop when ending a sentence.

When combining two or more units of measurement, they should each be either spelt out or the unit symbols used, never use a combination of written and symbol units.

- For the multiplication of units, insert either a centre dot (·) or a non-breaking space to indicate a combination of two separate unit symbols, for example in the case of torque 25 N m or 12 N·m is acceptable.
- For the division of units, insert a solidus ('⁄' Unicode 2044 in preference to the forward slash ' / ') with non-breaking fixed spaces inserted on both sides of the solidus, for example 250 t ⁄ h and 20 N ⁄ m^2.
  Alternatively, the negative exponent can be used, for example 35 N m^{-2} or 25 N·m^{-2}.

While a forward slash can be used to denote unit rate it should only be used with unit symbols, otherwise the term "per" should be used when the units are written for example two hundred kilolitres per second. One exception used in some industries, particularly when inserted in tables of data is the abbreviation 'pa' to report annualised

production rate. This is a non-SI unit meaning 'per annum' and its use is not encouraged.

A list of commonly used units and abbreviations can be found in *Appendix 6*.

Further details on numbers and units of measurement can be found in the section Numbers and Measurement in the *Style Manual* (APSC 2021) and *International System of Units (SI)* (BIPM 2022).

Symbols for a quantity

Symbols are used in science and engineering when referring to a material or physical property. Often these symbols are used to express a mathematical relation between different properties.

To distinguish between the symbol for a unit of measurement and the symbol for a property, the former is set in a Roman font while the latter is set in an italics or oblique font, for example *m* (mass), *E* (energy), *P* (power) and *T* (temperature).

The *International Standard for Quantities and Units* (ISO80000 2022) sets out a standard methodology when referring to the symbols for many properties or as it refers to 'quantities.' The Standard includes the symbol for a quantity as well as a definition and unit of measurement.

There are more than a dozen parts to ISO80000 covering for example mathematics; space and time; mechanics; thermodynamics; electromagnetism; and physical chemistry.

For example, *ISO 80000-4:2019 - Quantities and units — Part 4: Mechanics* sets out the symbols for Torque (T), pressure (p), strain (ε), stress (ρ) and normal stress (ρ_n) where in the last case the subscript 'n' indicates normal stress.

Notice the symbols use either a Latin or Greek letter set in either upper or lower case. A subscript can be attached to a symbol to denote a different application or value set in either a Roman or italics font. Each font type denotes a different meaning. The following are examples of different quantities depending on the font type used:

C: heat capacity

c: specific heat capacity, where $c = C / m$

c_p: specific heat capacity at constant pressure

c_E: specific heat capacity of substance E

The general rule regarding the use of the subscript in ISO80000 is that when the symbol represents a physical quantity or a mathematical variable then the subscript is set in an italics font for example 'c_p.' When the subscript represents a word or a fixed number it is set in a Roman font for example 'c_E.'

The meaning of all quantity symbols should be stated when used for the first time in a report.

Symbols for chemical elements

The symbol for a chemical element should always be set in Roman type where the first letter is capitalised and the second letter (if any) in a lower-case font for example H, He and Li (ISO80000 2022).

Examples of some commonly used units of measurement

Currency

When stating a currency quantity in a report, the local currency is usually implied and the appropriate local currency symbol should be used for example $2.63 million.

Note that 'million', 'billion' and 'trillion' are notations used in reference to a currency representing the scientific notations $x10^6$, $x10^9$ and $x10^{12}$ respectively. The terms are fully spelt out in the text with a non-breaking fixed space inserted between the numerical value and the notation. These terms should only be used when referring to multiples of currency quantities otherwise the standard SI notations should be used when stating a quantity.

The abbreviation for a million is the lowercase letter 'm'. Similarly, the abbreviation for a billion and trillion are 'b' and 't.'

In cases where space is limited such as in a table, the abbreviation for the notation can be used for example $4.3b. Note: No space is inserted between the value and the abbreviation for the notation. To ensure clarity and avoid possible confusion, the report should indicate the meaning and value of 'm' (million) and 'b' (billion) when used such as a footnote in a table.

If there could be confusion about the currency or whenever different currencies are used in the same report then a currency symbol can be added to distinguish between the more familiar currencies for example A$3.35 million, US$5.67 billion and €35,400. Explain in the report where a less familiar currency symbol is used the first time for example '¥543 million (Japanese yen)'.

Alternatively, the three letter *ISO4217 Currency Code* (ISO 2015) can be used to distinguish between the different currencies, for example AUD845.56, USD56.2 million, JPY3.1 billion, and EUR2400. Note: The *Style Manual* (APSC 2021) recommends no space between the currency code and its value whereas the *European Style Guide* (POEU 2022) recommends insertion of a hard space.

Computer file size, transfer rate and internet speed

Computer file size, data storage capacity and file transfer rate are usually expressed in units of a byte (B) for example 10 GB, 4 TB and 10 MBps.

When referring to network speed and internet bandwidth, the unit used is a bit (b) for example an internet speed of 10 Mbps, where eight bits is equivalent to a single byte. Note: When stating a unit rate, the industry convention is often to use the abbreviation 'p' (per) rather than the solidus ('/').

Time

The SI unit for time is the second (s). The use of some other non-SI units of time is acceptable including minute (min), hour (h), day (d) and month (mo).

There is no standard symbol for year but some symbols in common use include 'y', 'yr' and 'a'. Note: 'a' is also the abbreviation for 'are' a unit of area equal to 100 m^2. For this reason, it is recommended to state the meaning of a symbol when used for the first time in a report either in the text or footnote to a table.

Fractions of a second should be stated using the standard SI multiple factors for example 25 ms and 578 µs.

Volume

While the SI unit for length is the metre (m), litre is an accepted non-SI unit for volume, equivalent to 0.001 m^3. The recommended symbol for litre is the uppercase Roman letter 'L' to avoid possible confusion between the numeral '1' and the lower-case letter 'l', for example "the tank capacity is 2600 L of water."

Density

The density of a material is reported in SI units of kilograms per cubic metre for example 1.65 kg/m^3.

In an engineering context when referring to earth excavations, density of material is often stated in the non-SI unit of tonnes per cubic metre, for example 2.4 t/m^3.

When referring to soil and rock in its *in situ* or undisturbed state, the unit is tonnes per bank cubic metre, for example 3.2 t/bcm. Whereas for material that has been disturbed or excavated, the unit is tonnes per loose cubic metre, for example 2.65 t/lcm.

Force, stress and material strength

The SI unit for the force applied to a body is newtons (N), for example *"a force of 132 kN was applied."*

The units for stress applied to a material and the strength of a material are both stated in pascals (Pa), for example *"as a result of the force acting on the beam, the induced stress was calculated as 32.6 kPa"*; and *"the compressive strength of the material is 126 MPa."*

Material haulage

In engineering, the movement of overburden and other uneconomic material is usually reported in volumetric units, for example 1450 m^3.

In surface excavations, volume is often stated in terms of the *in situ* or undisturbed volume of material expressed in the non-SI unit of bank cubic metres as opposed to the loose or bulked volume, for example 2.8 x 10^6 bcm.

Mass and production output

The SI unit for mass is the kilogram (kg) while an acceptable non-SI unit is the metric tonne (t).

Production output is usually reported in units of mass, either in tonnes, kilo- or mega tonnes for example 2.45 t, 768 kt and 12.4 Mt.

For shipped product, a distinction is sometimes made to emphasise the dry mass of product ('d'), for example *"the monthly output was 12.4 dMt"*; and *"the amount of copper concentrate was 16.4 kt (db)"* where 'db' is an abbreviation meaning dry basis. This is to distinguish it from the wet or 'as measured' mass which does not account for moisture content in the product. Again state the meaning of any non-SI unit when used for the first time in a report.

Because of the differences in survey and measurement, material production rates of the product are usually reported on a time basis in units of mass of product, for example 67 t/h and 34.5 Mt/y. For other materials including overburden, output is often rather stated in volumetric units, for example 7200 bcm/shift.

Percentages

When dealing with percentages, use the '%' symbol when combined with a numeral, for example 6.4 %. Note: Consistent with use of other unit symbols a space is inserted between the value and unit symbol. When the quantity is spelt use the term 'per cent' for example *"ten per cent of …."*

Quantities and significant figures

There are several conventions when stating quantities in a report. These conventions are summarised in Table 9.

For a very large or very small quantity, use either scientific notation with the unit of measurement (e.g. 6.8 x 10^6) or an appropriate SI notation for example 'M' represents x10^6, 'k' for x10^3 and 'm' for x10^{-3} etc (BIPM 2022).

For values up to and including one thousandfold (i.e. x10^3), the SI notation is set in a lowercase Roman font for example 'm' for milli (x10^{-3}) as in mm and 'k' for kilo (x10^3) as in kg.

When SI notation is used for values in excess of one thousandfold (i.e. x10^6 or greater), the notation is capitalised, for example 'M' for mega as in megatonne (Mt) and 'G' for giga as in gigapascal (GPa). Note: A lowercase font is always used when the units are spelt out for example fifteen megapascals (15 MPa) and twenty-five gigalitres (25 GL).

Table 9

Conventions with the use of numbers, units of measurement and symbols.

Rule	*Example*
When stating a quantity without a unit, spell out whole integers from one to ten and use numerals for values of ten or greater excepting where a comparison is made involving a series of numbers	The design included three ball mills. The circuit contained 14 flotation cells, these being 6 lead cells and 8 zinc cells.
Use numerals when combined with units and when associated with abbreviations	4 km, 2 t, 6 %, 24 trucks The 2nd and 20th samples were…
Include a non-breaking space (*Ctrl-Shift-Space*) between a value and its unit except in the case of a currency and plane angle	22.5 Mt/y, 13.5 %, 36.4 x 10^6 bcm €45m, 36°45'23"
For values equal to or greater than 10 000, group numerals into sets of three from right to left. Insert a comma or space between each set*	11 400 kg (alternatively 11.4 t) 1 230 000 t (alternatively 1.23 Mt)
A comma or space is not required for values between 1000 and 9999	1100, 5430 t, 9990 m
Roundup numbers to reflect the level of accuracy, in most cases three significant figures will suffice	1 235 962 tonnes (as calculated) becomes 1 240 000 t or 1.24 M
For ordinal numbers, spell out first to ninth and then use numerals from 10th onwards	The second term concluded with... The 21th sample was found to…
Express quantities as an integer and decimal rather than as a fraction	2.5 s, 9.75 g, 15.3 t
Spell out all numbers placed at the beginning of a sentence	Twenty-five risk values are provided…

* The *Style Manual* (APSC 2021) recommends inserting a comma between sets of three numbers as some computer screen readers can announce spaced digits as separate numbers. The *International System of Units (SI)* (BIPM 2022) recommends, however, inserting a hard space. Similarly there are differences between regions in the use of a comma or full stop to denote the decimal point. The choice depends on local practice in your country.

Be aware of inadvertently changing between uppercase and lowercase fonts for the SI notation as the case denotes different values. For example 6.4 **M**Pa (6.4 x 10^6 Pa) is not the same value as 6.4 **m**Pa (6.4 x 10^{-3} Pa).

Unfortunately, some word processing software can alter the capitalisation of a unit symbol. This change will often occur unbeknown to the writer when typing a quantity into a report. It occurs when the first letter of an abbreviated unit immediately follows the SI notation.

For example, in the case of the unit for stress (Pa), while the quantity 250 M**P**a may have been typed by the writer, the software can change the capital 'P' to a lowercase 'p' resulting instead in the quantity 250 M**p**a. The latter quantity aside from being incorrect has no meaning. These inadvertent changes have to be manually corrected by the writer.

While the automatic change by software is unintended (and admittedly annoying), in the end *the onus is on the writer to check and ensure that all quantities in a report are correctly spelt and formatted* with the correct case applied (upper- or lower-case)— a quantity includes a numerical value, SI notation and unit of measurement.

Implied uncertainty

Particular attention must be given to the **number of significant figures** or digits when stating a quantity as the number of significant figures implies the level of uncertainty or magnitude of error assigned to that quantity.

In most instances, **three significant figures will normally suffice when stating a quantity** in a report, for example "*a stress of 2.75 GPa*" or "*a mass of 1.35 kt.*" In these two examples, the implied uncertainties are ±0.005 GPa and ±0.005 kt respectively. Unless otherwise stated, the uncertainty is equal to plus or minus half the last significant figure in the quantity.

If in the last example the quantity was reported as 1.350 kt, that is a quantity having four significant figures, the implied uncertainty would reduce to ±0.0005 kt or ±0.5 t. Stating this quantity to four significant figures can be misleading or incorrect.

A mistake sometimes made when using a spreadsheet for calculations is to 'cut and paste' a quantity calculated in the spreadsheet directly into the main body of a report without considering or adjusting the number of significant figures in the quantity.

For example, the results of computer modelling used to estimate ore reserves might determine the mass of ore to be 1 346 578.574 t. This value has ten significant figures, implying an uncertainty of ±0.5 kg which corresponds to a determination to within approximately 1 m^3. Considering the modelling data would normally be based on exploration drill hole spacing that is tens if not hundreds of metres apart, this quantity does not reflect the uncertainty in the modelling. While that quantity could be stated in the calculations contained in an appendix to the report, the more appropriate quantity when stated in the main body of the report would be 1.35 x 10^6 t or 1.35 Mt.

Equations and symbols for mathematical variables

Mathematical equations are generally indented or centred on a page, for example:

$$y = m\,x + b \qquad 1)$$

$$x = \lambda(h + f) \qquad 2)$$

An indent left tab can be used to align the left margin of equations and set in a style sheet.

When more than one equation is placed in a report, each equation should be consecutively numbered, with each number placed in brackets and aligned using a tab against the right-hand margin.

The numbered equation must be referred to in the text of the report, for example "*…as shown in Equation 1.*"

Visual information

Tables and figures or illustrations are used to supplement the textual information presented in a report. They can be used to:

- aid in the analysis, comparison and interpretation of data by more clearly highlighting a trend that might be evident in the data;

- reinforce a particular point or argument; and
- clarify a description given of an item of equipment, test setup or locality.

For example, a graph can be used to good effect to illustrate the relation between two or more quantity variables.

When designing visual information, it is important to ensure a clear and concise caption label is provided for each figure and table.

As a supplement to the text, they should be an integral part of a discussion and not used as a replacement for a discussion.

Hence, *each table and figure in a report must be referred to in the text of the report by the caption number of the table or figure.*

The text in the report should explicitly state what information is intended to be conveyed in each figure and table; that is what information does the figure or table highlight or is intended to clarify.

Every symbol or abbreviation used in a figure or table must be explained in the report either in the text or as a footnote to a table or figure. Units of measurement in tables are usually contained within brackets in the column or row headings. Explanatory notes can be added directly under the table, usually in a smaller size font.

Tables

Tables are a means of presenting data in a tabulated form with the data arranged in columns and rows.

The data can include interrelated quantities usually with different units of measurement and qualitative information, or a combination of both. They are used whenever a comparison of the data is important to the discussion or to highlight trends and/or anomalies in the data.

Table 10 illustrates the following points related to the layout and format of a table.

- The data in the table are arranged within cells that are divided into columns and rows.
- At the top of each column is a heading to signify the variable in that column together with an appropriate unit of measurement.

Table 10
An example layout of a table.

Mineral	*Formula*	*Hardness (Mohr scale)*	*Density (t/m^3)*
Argentite	Ag_2S	2 - 2.5	7.3
Galena	PbS	2.5	7.4 - 7.6
Sphalerite	ZnS	3.5 - 4	3.9 - 4.1

Source: Berkman and AusIMM (2011)

- The width of each column is adjusted to suit the content in the column.
- The content in some columns is either centred, left- or right-justified depending on the contents. When text is inserted in the far-left column of cells, the content can be right-justified.
- The table should be centred on the page.
- Lines are used to differentiate headings from data in the table. The use of shading and colour should be avoided.
- The caption is succinct and conveys the meaning of the association between the different data. Captions are usually descriptive to focus the reader's attention on a particular point evident in the table.
- If the table is from another source, a citation to the reference source should be listed underneath the table.

Whenever a table from another source is intended to be used in a report, it is preferable to re-type the information rather than simply copy and paste the table. This will ensure consistency with the formatting in the rest of the report.

Pasting a poor-quality reproduction into a report is not advised as it can be difficult to read, defeating the intent of having the table as well as detracting from the overall quality of your report.

Figures and illustrations

Figures in a report include a range of illustration types including graphs, technical drawings, plans, maps, sketches and photographs.

Every illustration should aid in communication and therefore be drawn to ensure the intended message is clear and unambiguous.

As in the case of tables, the quality of every illustration in a report is important. If the image

from a source is of poor quality then it should not be used as the message might be confused, misleading or ambiguous. If necessary, re-draft the illustration to better clarify and highlight the message intended to be conveyed while still citing the source.

The size of the figure in the report should be such that all the essential information is clearly legible to the reader.

Colour can often be used effectively to differentiate or highlight points in an illustration. But this only applies if the report will be made available in colour. Colour should be used judiciously as overuse can sometimes distract the reader.

The use of greyscale and different line types (thickness, solid/broken lines etc) can be applied to the same effect as colour when a report is printed in black and white.

Graphs

Graphs are a means of displaying measurable quantities and can be particularly useful as they create a visual representation of data. They aid in the recognition of an interrelationship between quantities.

Tufte (1983) stated that *"excellence in statistical graphics consists of complex ideas communicated with clarity, precision, and efficiency."* He further stated that graphical excellence provides the reader with *"…the greatest number of ideas in the shortest time with the least ink in the smallest space."*

The graph shown in Figure 1 illustrates the following points of preparing a graph for a report.

- The independent variable quantity is shown on the *x*-axis of the graph and the dependent variable is shown on the *y*-axis.
- Both axes are labelled with the units of measurement indicated.
- A sans serif typeface set in bold font has been used to give added emphasis to each of the axis labels. The font size is in proportion to the rest of the graph, neither too large nor too small.
- Numbers are included on both axes to indicate the scale. The upper and lower limits of the range for each axis have been selected to make full use of the graph area and to clearly show the nature of the relation between the independent and dependent variables. Again, a sans serif typeface is used for the numbers on the axes but not in a bold font and the font is slightly smaller than the axis label.
- A sufficient number of tick marks have been placed along each axis to indicate the scale without unduly cluttering the axes.
- A line of best fit has been added to show the nature of the underlying relation for each quantity rather than a line drawn from point to point where in this case a linear relation is indicated.
- Each of the two straight lines in the graph has a label indicating the name of each variable quantity, that is Cutting Force and Normal Force.
- As multiple measurements were made at each level of the independent variable, the average value of the dependent variable is shown together with the corresponding error, in this case indicating the magnitude of the standard deviation.
- The graph is centred on the page or column.

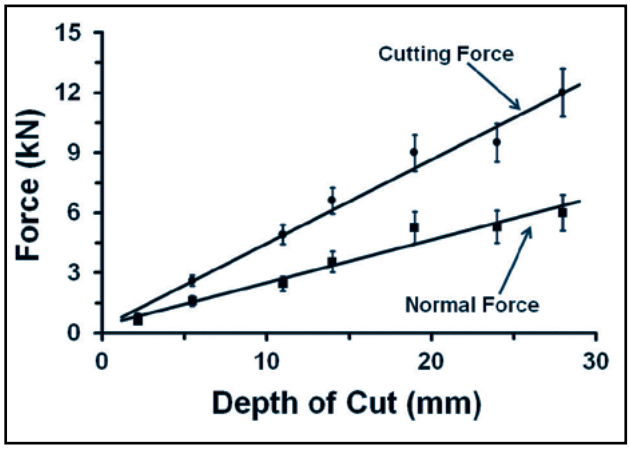

Figure 1. An example of the layout of a graph.

Plans and drawings

In the case of plans, maps, charts and technical drawings there is an additional required set of requirements. These types of illustrations should include a scale, a legend for the different symbols used in the illustration and where appropriate, an arrow indicating the direction of north.

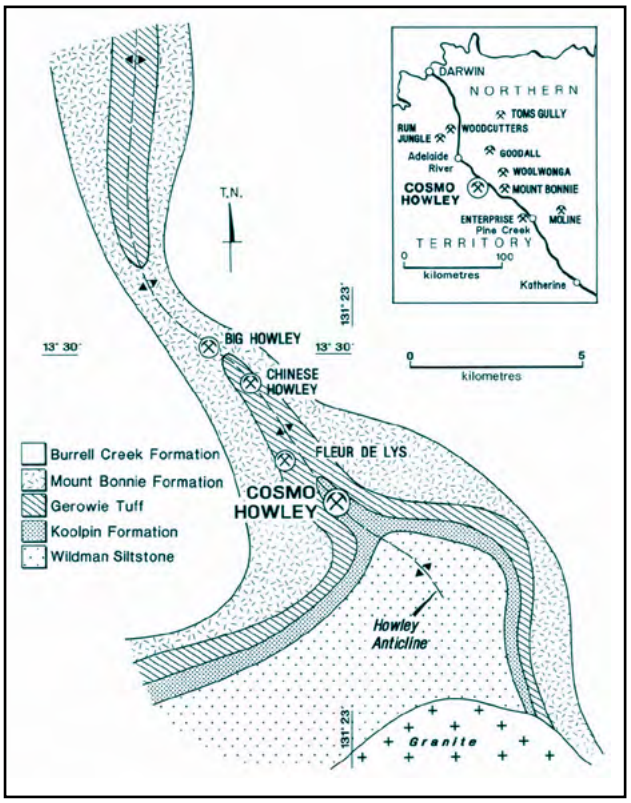

Figure 2. An example of a map or plan.
(Gloyne 1993)

It is often useful to enclose illustrations within a border that designates the limits of the illustration on the page.

The plan shown in Figure 2 includes information that identifies the location (in this case as an insert locality map); a scale; an arrow indicating the direction of true north; longitude and latitude; and a legend of the different stratigraphic formations indicated in the plan. The reference source of the plan has been added underneath the caption rather than directly under the illustration.

Figure 3 is an isometric perspective of the development and excavations surrounding an underground operation. Labels have been added to identify the different elements surrounding the stope.

Generally, technical drawings of equipment or their components also include the angle of projection, the date drawn or last modified and, the name of the person who drafted or authorised the drawing.

Large illustrations can be printed in landscape format on the page, in which case they should be placed so that the top of the illustration is aligned closest to the binding.

Even larger illustrations such as spreadsheets and plans can be printed on large format paper, for example A3 size then folded and placed in an appendix.

Captions for tables, figures & equations

Tables and figures should, as far as possible, be self-contained in highlighting a particular point for the reader's attention that supports a discussion in the text.

The caption plays an important part in this communication process. Hence **a caption must be attached to every figure and table in a report** stating what information it is meant to convey.

The caption for a table or figure has two parts: *a number,* and *a concise statement*. The caption for an equation consists solely of a caption number.

It is customary to consecutively number all figures, tables and equations separately in the order that they appear in the report for example

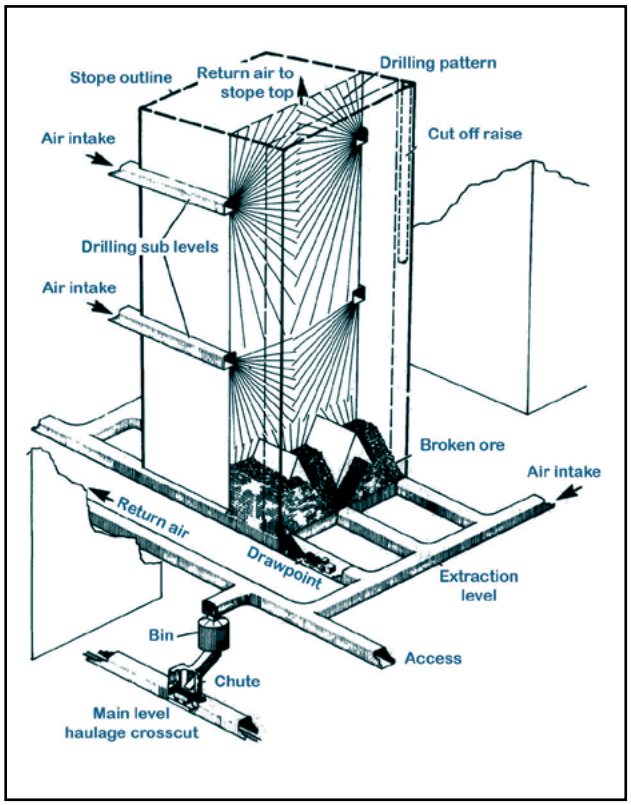

Figure 3. An example of a sketch or line drawing.
(after Hall 1993)

Table 1, Table 2; Figure 1, Figure 2; and, Equation 1, Equation 2 etc.

The caption statement should have sufficient detail to concisely explain what is contained in the figure or table. A fuller explanation should be provided where it is referenced in the text of the report.

Generally, captions for figures and tables are centred on the page whereby:

- **a table caption** is **placed above the table** as shown in Table 10;
- **a figure caption** is **placed below the figure** as shown in Figure 2 and Figure 3; and
- **an equation caption number** is placed in brackets aligned (using a tab) against the right-hand margin.

Every figure, table and equation in a report **must be referred to by its caption number** in the text of the report. The caption number provides an absolute reference point.

Avoid expressions that indicate a relative reference such as "*…refer to the figure above*"; "*…as the following figure shows…*"; or, "*see Figure 1 shown below.*" One reason to avoid a relative reference is that while editing, the position of the figure or table may alter relative to the reference point in the text so that in terms of the last example, Figure 1 could be repositioned onto the following page.

It is always desirable to place the figure or table close to and preferably immediately following the paragraph where the caption number is mentioned in the text of the report.

As with section headings, when referring to a particular figure, table or equation caption number, the label should be considered a proper noun. Hence the first letter of the figure, table and equation should be capitalised, for example "*…as shown in Figure 1*"; "*…the data in Table 4*"; and "*…the calculated value of Equation 6*."

In some publications, the editor may require an abbreviated form of the caption number to be used, however, in a report the full word should be used.

As with values and units, it is good practice to **insert a non-breaking fixed space** (*Ctrl-Shift-Space*) between the label (Table, Figure or Equation) and the caption number.

If for some reason a table, figure or equation must be copied from another publication, **do NOT include the original caption.** The original caption is unlikely to be compatible with the numbering system and formatting used in the report. Instead type in a new caption for the table, figure or equation with the format consistent with the rest of the report.

Acknowledgment of sources

As with the case for quotations and paraphrased statements in a report, the source of every table and figure must be acknowledged. This is required no matter whether it is a direct copy, modified copy or redrawn version of an illustration, table or other material.

The following conventions are used when citing a reference source.

- *Table:* the citation is placed directly under the table using an expression such as "Source: Smith (1994)." The citation is often written in a slightly smaller font say 8 or 9 points as shown in Table 10.
- *Figure:* in the case where the illustration is a copy without any changes then the reference follows immediately after the figure caption placed within brackets in the form as is shown in Figure 2, that is "(Gloyne 1993)." If changes were made to the illustration or it is redrawn then add the word 'after' before the citation for the original illustration, for example "(after Hall 1993)" as is shown in Figure 3.

When citing a reference source, it is preferable to always cite the original or primary source of an illustration especially if it has not been altered rather than a secondary source such as material appearing in a course learning guide.

006: Writing style

"The secret of being boring is to say everything."
– Voltaire
French writer, philosopher

Scientific and technical writing differs from other literary forms in several respects. Primarily, technical writing aims to inform the reader, who has some knowledge of the subject area, rather than to entertain. Hence the writing style tends to be simple, concise and objective.

Whenever possible, writing should be in the present tense. However, there are times when the use of other tense is appropriate such as:

- *past tense*: when discussing what was done and the results of a study;
- *present tense*: when describing the constraints of a project;
- *present tense*: when detailing the general conclusions or learnings of a study; and
- *future tense*: when outlining the recommended further actions.

Objectivity — aim to be impartial

Since the primary aim of the report is to inform, emotive language should be avoided.

The student is advised to convey information as objectively as possible. For example, a literary sentence might be written as:

> *"The wind was blowing fiercely, and the outside air was becoming colder."*

Whereas a more scientific or technical writing style would be:

> *"The wind velocity was 45 kph which reduced the air temperature to 15 °C."*

Be concise

Being concise refers to both word selection and sentence structure.

Conciseness in word selection

Use words and expressions economically. If you can use one word instead of two or three, then choose the one word. Often the single word is more precise and more suited to a written context, and a two-word phrase is usually an idiom and open to multiple interpretations. For example, use 'avoid' in preference to 'get around' and 'investigate' in preference to 'look into.'

Further, while the writing style of a report tends to be formal, this does not mean overly extravagant language should be used which is a common trap for new writers.

The intent of writing a report could be, for example, to convey to the reader the writer's knowledge of a subject area, or to demonstrate their ability to analyse and synthesise information; that is the emphasis should be on the content with the report being a means to convey this understanding.

Construct succinct sentences

Most importantly, avoid long sentences and long paragraphs.

Sentences with four or more clauses (or parts) can often confuse the reader. The more clauses, the less clarity is likely about the message.

Your text will *often read better if you write two shorter sentences rather than one long sentence.* If you need to include some qualification or an example, then a longer sentence might be acceptable.

An example of a long sentence is:

> *"After consulting three manufacturers: Brown and Co, Green Ltd, and White Industries Pty Ltd, we found two types of vibration suppression devices for the driver's seat in a haul truck and both are simple in design but have inherent shortcomings."*

A more concise statement might read as:

> *"Three manufacturers were consulted: Brown and Co, Green Ltd, and White Industries Pty Ltd. Two vibration suppression devices were identified for the driver's seat in a haul truck. Though each design is simple both have inherent shortcomings."*

Similarly, long paragraphs should be avoided, especially paragraphs containing a single long sentence.

A simple but effective rule is that *each paragraph should address a single theme.* The theme should be introduced in the opening sentence, developed in the body of the paragraph with a concluding remark made in the final sentence.

Avoid colloquialisms

In most instances, report writing requires a formal style of writing. This differs from everyday conversation in the choice of words and patterns of speech that are chosen. It includes avoiding expressions otherwise known as colloquialisms such as *"…it can be clearly seen that…"* and *"…it is generally understood that…"*

Do not discriminate

Discriminatory and sexist language must be avoided when talking generally about people. Non-discriminatory use of language helps to avoid stereotyping, patronising and demeaning people based on their gender, status or ethnicity. Some examples of discriminatory language and the more acceptable neutral terms are provided in Table 11.

First person or third person?

The *strong preference is to use the third person active voice* whenever writing a technical report to create a formal and objective tone in a report.

This means that whenever possible, avoid speaking directly to the reader and avoid the use of personal pronouns such as I, me, we, us and our. This is probably the most difficult aspect of report writing to master and for many people will take much practice to perfect.

Using a formal voice and an objective tone in a report achieves several things.

Table 11

A list of some discriminatory terms that should be avoided and the preferred alternatives.

Instead of…	*Use in preference…*
workman	operator/employee
(to) man	staff/operate/use/work/direct
man hours	operating hours/working hours
man power	staff/workforce/personnel
men on machine	person on machine/operator on…
tradesman	maintainer/tradesperson/carpenter…
workmanship	work skill/skill/quality of output
chairman	chairperson
foreman	supervisor/superintendent
businessman	business executive/business person

First and perhaps most important, this writing style creates a sense that *the writer is separated from the subject matter* and that the writer has objectively analysed the data or information. This will lessen any perception of bias or ownership that might otherwise be seen as having influenced the conclusions presented in a report.

It also reinforces the impression that an objective analysis of the information has been undertaken and consequently, any reasonable person would draw similar conclusions.

Secondly, this writing style separates the writer from the reader by avoiding the use of emotive language that might otherwise unduly influence the reader.

Unlike what can sometimes occur in other forms of writing, *a report should focus on conveying information* rather than expressing personal opinion. The information should be backed up by data, analysis, modelling and reference to other supporting information.

An often-used expression that is apt in this context is *"the facts should speak for themselves."* Be aware though that different conclusions might be reached depending on what combination of facts are presented to the reader and how they are presented. To avoid the report from being seen as biased requires all known facts to be presented unless the reasons for being selective are clearly stated.

Sometimes an awkward sentence structure can arise when writing about actions and events without referring directly to who or what was involved. In such cases choose a sentence structure that provides the greatest clarity and conciseness. For example, consider the following three sentences:

"It was observed that the deviation was large."
(passive, person unknown)

"A large deviation was observed."
(passive, person unknown)

"The engineer observed a large deviation."
(active, person known)

The first sentence is ambiguous and wordy. While the second sentence is concise, the question arises to who observed the deviation? In the third sentence, it is clear who did what.

If it is important for the reader to know that you, or some member of the project team, performed some tasks or holds a particular opinion, then use the first person in an active clause such as provided earlier in the third example.

These aspects of writing style are illustrated in Tables 12 and 13.

Be clear

Avoid being ambiguous or unclear. This can happen when you do not specify what you are writing about and can even depend on how you use words such as 'it', 'this', 'thing', 'way', 'someone' etc as illustrated in the following sentence.

"Day (1983) suggested a new way to make a clear TiO_2 solution."

The word 'way' is vague and could be improved by substitution with a more specific term such as 'method', 'procedure' or 'technique'.

Be correct

Check that your spelling, punctuation and grammar are correct. If using a spell checker, be careful which word *you* select. Many inconsistent and easily corrected errors will affect the report's overall presentation.

Proofreading a report is essential. Often errors and ambiguities become more apparent if the draft report is left for a few days and then read. This is called 'the bottom-draw treatment' referred to earlier in *Chapter 3*.

Table 12
An example of a 'wordy' piece of writing.

OPERATION

It was considered pertinent to consider the broader issues regarding the extraction method before investigating the access alternatives. Indeed it would have been remiss not to do so. Without going into extensive detail, it is considered that extraction could be performed utilising 4 levels, long hole drilling from above and below and open stoping (nominally 15 m by 15 m stopes) between levels…

Lecturer's Comments
Some wordy statements and phrases (shown underlined) can be eliminated. Also, the first two sentences sound too formal. This is due to the use of wordy third person passive structures.

Many universities have a department that assists students improve their communication skills and which provides useful resources. This may include for example online resources on topics such as punctuation, grammar and spelling that can be used to improve written expression.

Check for jargon

Jargon comprises technical language, terms and acronyms that are related to a particular discipline, field of study or activity. It can be used effectively when communicating with others who work within that discipline. However, problems arise in communication when jargon is used in a report that will be read by a more general audience.

Jargon can also include technical words. This can lead to confusion as some words will have a different meaning depending on the context.

Different disciplines can place an entirely different meaning on the same term. For example, in medicine the word 'fast' means 'resistent to.' In geotechnical engineering it means *"a hard stratum under poorly constructed ground."* While in painting it means that *"colours are not affected by light, heat or damp."*

To an engineer, stress and strain relate to the internal mechanics of a material subjected to an externally applied force whereas it has an entirely different meaning for a person with a medical background and to a botanist.

Always endeavour to write for your intended audience. If the report is for your supervisor or professional colleague, then the use of jargon might be both appropriate and expected. If, however, you are writing a report for a more general audience that includes people with a non-technical background, jargon should be avoided and instead use simple, clear descriptions.

Engage the reader

You may have noticed that the style of writing used in this document conflicts with the earlier statements on writing style.

In this document, the writing style has been deliberately altered in some sections. Often the style chosen is more personal with the intention of engaging the reader.

To illustrate how the same message can be written in different styles, consider the following three passages related to the same subject. Even though the message may be the same, there is

Table 13
An example of a 'clear' piece of writing.

Lecturer's Comments	**RISK MANAGEMENT PLAN**
This section of text is easy to read. *Each point is expressed simply and clearly.* *Other strengths in the text include:* • *the points follow the Parallel Rule;* • *the points are logically sequenced; and* • *the sentences are clear and concise.*	The specific objectives of the plan are as follows. a) To provide a framework for management to address major risks associated with both options as determined by previous risk reviews. The Risk Management Plan will therefore include: • the key areas to be addressed; • the actions to address the key risk areas; • the roles and responsibilities within relevant organisations; and • the means for monitoring and review of the actions. b) To provide a document that has practical value to persons involved in its implementation and is suitable as an introduction to the extraction. c) To provide the initial basis for The Risk Management Plan, for which detailed content can be updated to accommodate any future requirements arising from changing circumstances or improved knowledge. In other words, the document is intended to be 'live' and reflect changes when needed.

a distinct difference in the level of warmth and engagement between the three versions.

Current report writing style:

"This document has been prepared to help you, the student, to write better reports. It is not intended to constrain your creative talents but to outline the accepted norms and standards of structure, format and style used in technical report writing."

A technical report style:

"This document has been prepared to help students write better reports. It is not intended to constrain the student's creative talents but to outline the accepted norms and standards of structure, format and style used in technical report writing."

An alternate technical report style:

"This document is intended to improve the quality of report writing by students; in so doing it is not intended to constrain creative talent. The document outlines the structure, format and style used in technical writing."

Listing information

Reports frequently use lists to clarify and/or to emphasise information. They are also used to succinctly summarise information. There are several ways to form a list in a report; three of the more common forms are featured.

The *first form is a continuous sentence*. In this case, each item in the list begins with a lower case letter and ends with appropriate punctuation as shown in the following example.

A Ross chain feeder was chosen because
- previous experience was satisfactory,
- evacuating costs were less, and
- an over-type feeder required less maintenance.

The *second form of list is a collection of individual sentences.* The opening sentence ends with a colon and each subsequent line finishes with a semi-colon as shown in the following example.

The trucks had three distinct features, these being:
- the tipping wheels are projected;
- the doors are rigidly attached to the suspension arms; and
- the suspension arms are anchored to the chassis.

The *third form of list is an inventory*. Here each item in the list begins on a new line with a lowercase letter and with no punctuation until the end.

The equipment required for efficient operation is listed below.
- wide throat 200 mm idler blocks
- a 12 V sealed beam light
- screens to protect the operator.

There should be a logical order to the sequence of items in each list. It could be moving from the general to the specific, or from most important to least important, from largest to smallest component, and so on. A numbered list is useful if a sequence or series of steps applies to the points in the list.

Parallel rule

To ensure lists and bullet points score well on a readability index then consider applying the *Parallel Rule.*

The Parallel Rule involves using a similar grammatical pattern when making a list. The writer begins each new item in the list in a similar manner. In Table 13, points a), b) and c) each begin with *"To provide …"* The bullet points under point a) also share a similar grammatical pattern each beginning with a definite noun '*the* key, *the* actions, *the* roles and *the* means'.

Spelling of technical terms

As with many professions, a range of specialist terminology has evolved over time. For example, the terms used to describe the different means of accessing an underground operation include an adit, shaft, drift and decline while a layperson might just simply use the term tunnel.

Unfortunately for new entrants to an industry use of some terms can differ between different sectors in an industry. For example, the overhead surface in an underground excavation is termed 'roof' in one sector of mining whereas 'backs' is used in another sector.

Aside from different sectors, terms can vary geographically for example to undertake mineral exploratory activities in New South Wales, an Exploration Lease is required whereas in Queensland, an Exploration Permit is needed. Again, it is important to select the correct terminology appropriate to the context, location and audience.

The internet can provide links to many technical dictionaries, glossaries and other resources that can explain many of these terms.

Shortened words and phrases – abbreviations and acronyms

In general, abbreviated forms of words and phrases such as WA and NPV are often used in formal report writing. However, use of grammatical contractions such as don't, can't and it's are discouraged in reports as these are 'spoken forms' of expression.

In formal writing at university and in many workplaces, non-abbreviated forms of expression should be used instead, for example does not, cannot and it is.

Abbreviations consist of the first few letters of a word but without the use of the last letter in the word. While abbreviations are usually terminated by a full stop/period, modern convention tends to favour using minimal punctuation for example Co (Company), min (minimum) and Vic (Victoria). Note: when the abbreviation ends the sentence then a single full stop is applied.

Contractions like abbreviations, are a shortened form of a word but consist of the first and final letters of a word and do not require a full stop for example Ltd (Limited), Rd (Road), Qld (Queensland).

Phrases that are referred to more than once in a report can also be shortened. One method of shortening, called an **acronym**, consists of the first letter of each word formed so that *the shortening is pronounced as a word* such as JORC (Joint Ore Reserves Committee) and CSIRO (Commonwealth Scientific and Industrial Research Organisation, pronounced si'ro).

An alternate form of shortening of a word or phrase is called an **initialism.** Unlike an acronym, *each letter is pronounced separately.* Ordinarily, each letter in an initialism is capitalised such as EIS (environmental impact statement), IRR (internal rate of return) and NPV (net present value).

The convention is that whenever an acronym or initialism is used for the first time in a report then *the word or phrase is written in full followed immediately by the shortened form enclosed within brackets*. Subsequently, only the abbreviated form is used in the report.

An example of an initialism in a report is illustrated in the following sentence.

> The underground operation uses load haul dump (LHD) equipment for materials haulage…The haulage fleet consists of ten LHDs.

Symbols are another category of the shortened form of words and concepts that include for example '&' (and) and '@' (at). Except for units of measurement, their use is discouraged in the text of a report, however, they can be used where space is limited such as in a table. See the section *Symbols for units of measurement* in *Chapter 5* for further details on symbols and measurement.

There are other shortened forms of a word or phrase that do not follow any of the usual conventions but are in common use in certain industry sectors. For example, the term 'ytd' is similar to an initialism but it is not always capitalised. This term is pronounced as year-to-date rather than each letter read out separately as would be the case of an initialism. These terms should be treated as symbols and not used in the running text of a report but restricted to use in tables.

Another category includes the shortened form of Latin words and phrases. This includes for example:

- c. (*circa* – about or approximately);
- cf. (*confer* – compare);
- e.g. (*exempli gratia* – for example);
- etc. (*et ceteria* – and so forth, and so on);
- i.e. (*id est* – that is);

- v. or vs (*versus* – against); and
- viz. (*videlicet* – namely).

The use of this category of the shortened form is again discouraged in the running text of a formal report. But as with symbols, they are acceptable where space is limited as in tables or when enclosed within brackets.

For further detailed discussion on capitalisation, plural and possessive forms, punctuation and other categories of the shortened form such as time and geographical features, see the *Style Manual* (APSC 2021). *Appendix 6* contains a list of some commonly used abbreviations in industry.

Punctuation

Minimal use of punctuation is often preferred and has become the norm in report writing. Understanding when and how to use punctuation helps in expressing ideas clearly. Some examples of the correct use of punctuation are provided in Table 14.

Writing Assistance

The context

Report writing serves as a form of communication with two key attributes: reports are "time-stamped" and it is a one-way form of communication.

- *Time-stamped*: Reports contain discussions and ideas that are fixed at the time of release. They are not dynamic, meaning the writer cannot update the report on the fly, and making corrections is rarely possible.
- *One-way communication*: Information flows one-way, from writer to reader, unlike conversations that allow for a back-and-forth exchange of ideas.

Given these attributes, expressing ideas clearly and precisely is essential, particularly in scientific and engineering reports.

Tools to assist in writing

Various tools are available to help writers achieve clear and precise communication. Students are encouraged to use some of these tools like

Table 14
Punctuation conventions.

Name	Symbol	Function	Examples
Full stop	.	To mark the end of a sentence.	The overburden is comprised of soft shale with a strength of 25 MPa.
Colon and semi-colon	:	To introduce a list. Begin the list on a new line with a bullet point for each item in the list and place a semi-colon at the end of each line.	Work site inductions are important for three reasons: • in an emergency …; • a fire would…; and • newly 'inducted' workers.
Comma	,	Separates information into readable units. Such uses include • after introductory phrases • around relative clauses giving extra information • between separate items listed in a sentence.	The Eocene deposition, which formed in an extensional structural setting under a transgressive depositional environment, are characterised by higher levels of ash and sulphur, and by generally thin or intermediate seam thickness, typically four to six metres in the economic deposits. (Friederich, Langford and Moore 1999)
Apostrophe	'	Used to indicate ownership (whose) with nouns.	• the worker's hat can be found… • ABC Ltd's safety officer has…
Quotation marks	"…"	Indicates that the words enclosed in the quotations are from another source and are written exactly as in the original source.	Brake and Bates (1999) believe that these seams *"may have resulted from the domed typography."*
Hyphen	-	Joins two words to create a single idea. Used when the spelling of two joined words would be awkward or obscure the meaning. Use only when necessary.	• free-settling particle • liquid-solid separation • sink-float system

spelling and grammar checkers, though the level of assistance these tools provide can vary.

Educational institutions and academic assessors have concerns about the extent of assistance that some tools provide.

Writer's own work

A fundamental principle is that any document, including a report, must be the writer's own work (UNSW 2024c). This is particularly important when a student submits a report for assessment.

Using artificial intelligence (AI) to assist in creating or developing ideas, or in their expression, is considered *plagiarism* unless properly acknowledged in the report.

Spelling and grammar checkers

Tools advising on correct spelling, grammar, and referencing are considered writing aids. They typically do not influence or assist in creating or expressing ideas. They are often regarded as standard editing tools and are generally accepted in educational settings.[1] Their use in assignments is often recommended, with examples including *Microsoft Office* built-in tools or extensions like *Grammarly Basic* and *EndNote*.

Generative artificial intelligence

Generative AI tools actively assist in creating and expressing ideas, which conflicts with the principle that a report is the writer's own work.

The *National AI in Schools Taskforce* defines generative AI as:

> "*Generative AI can generate new content such as text, images, audio, and video that resembles what humans can produce. It is effective at recognizing patterns (in video, audio, text, or images) and emulating them when tasked with producing something.*" (Department of Education, 2023)

Examples of generative AI tools include *Grammarly Premium, ChatGPT, CoPilot, CodePilot, Elicit,* and *Consensus*. These tools are increasingly integrated into existing software packages.

While these tools have a place in education, their use in student assignments including report writing is either prohibited or, even when explicitly permitted, must be properly cited. Even when allowed, the *report must substantially remain the student's own work* (UNSW 2024c).

Some institutions caution against using generative AI in assignments. For example, the document *Guide for Referencing and Acknowledging the Use of Artificial Intelligence Tools* (*The Guide*) (UNSW 2024d) states:

> *"Generative AI tools **are not high-quality sources**. Relying on information provided by an AI tool could reflect poorly on the quality of your academic work. For this reason, we suggest avoiding using a generative AI tool like ChatGPT as a primary source for factual information."* (UNSW 2024d)

Additionally, the document states:

> *"You should never rely on generative AI outputs as a source for high-quality information. In fact, **you should assume all AI outputs are incorrect** until proven otherwise."* (UNSW 2024d)

Regarding the authenticity of information produced by AI, the document notes:

> *"AI tools may also, unknowingly, plagiarize other sources, meaning it may not have correctly cited or attributed original author(s). In addition, these tools might suggest **sources that look and sound legitimate, but are in fact fake**. These are known as an 'hallucination.'"* (UNSW 2024d)

Limitations of AI in report writing

The three quotations listed in the previous section are particularly relevant regarding student learning and writing:

- *AI contains secondary sources of information*. AI-generated content is not original; it is derived from existing work by others. This makes AI output a secondary source of information, not a primary source. For writers and researchers it is important to appreciate the distinction between primary and

1 Acceptance is not universal as some educational institutions caution against the use of grammar checkers in writing "*as they too easily replace student writing and student voice with AI content and style...causing the assignment to be identified as AI-generated and a violation of academic integrity*" (DeVry 2024)

secondary sources—refer to the discussion in *Chapter 7* on *Primary and secondary sources*.

- *Scope of AI information databases*. AI databases contain a finite range of information and they do not create new knowledge. AI can only access and re-state information already available within a limited part of the public domain. Similar to internet search engines, AI has limited access to sources and does not include for example all scientific and engineering journal articles or research reports. Students and researchers have access to a broader range of information through university library search engines, which AI does not have.
- *Reliability of AI sources*. The sources of AI-generated information are often unknown, raising concerns about the credibility of the output. Hence the earlier recommendation to "*assume all AI outputs are incorrect until proven otherwise.*"
- *Obligation to verify AI output*. Given these limitations, before AI output is used in a report, the writer is morally and ethically bound to independently verify the information against reliable primary sources—see the section *What are good quality sources* in *Chapter 7*.

Ensuring academic integrity

Educational institutions use tools to ensure compliance with academic integrity requirements. These include plagiarism-checking tools that scan documents to ensure material is properly cited and referenced. Tools like *Turnitin* and *Grammarly* can also detect when generative AI has been used in a document.

If plagiarism or the unauthorised use of generative AI is detected, academic misconduct proceedings may be initiated.

Best practice for student reports

1. *Collate information from good quality sources*:
   - Learn to gather information from good quality sources.
   - Focus on information from credible and reliable sources including primary research papers and articles—5-Star and 4-Star rated sources, see *A reference rating scheme* in *Chapter 7*.
   - Use university library search engines and databases such as *Scopus* and *Science Citation Index*.
2. *Develop Your Own Voice*:
   - Learn to develop your own voice by summarising the gathered information in your own words.

This guidance emphasises the importance of maintaining academic integrity while leveraging available tools to enhance writing quality.

Summary

The *RWG* emphasises the importance of clear, and precise writing, and the ethical use of writing assistance tools. While standard editing tools are encouraged, *it is recommended to avoid generative AI in student assignments*.

Key points include:

- Before undertaking an assignment confirm which AI tools, if any, are permitted.
- If permitted and AI is used then cross-check the output (i.e. material provided by the AI tool) against other non-AI sources to ensure accuracy and that it is correct. Confirm the material aligns with the quality of your ideas. **Ultimately, the writer is responsible for the ideas and material contained in a report** and submitted for assessment (UNSW 2024d).
- Declare which AI tools were used and how they were used, and reference this in the report—see *Using AI generated material* in *Chapter 7*.
- When an AI tool was used solely to change, or suggest changes, to a report, an *acknowledgement statement* should be added to the report.

007: Referencing

"Google can bring you back 100,000 answers, a librarian can bring you back the right one."
– Neil Gaiman
English author

When must material be referenced?

Whenever material is used in a report that you did not create, then the source of that material must be acknowledged in the report. This includes your own material that was used in any previous report or publication.

Such material includes *all types of information, ideas, concepts, and theories* that are either a direct quotation, paraphrased or written in summary form; *illustrations* including a sketch, plan, graph and chart; and, *numerical data* including tables.

Reference sources include traditional publications such as books, journals, conference papers, newspapers, magazine articles, and reports and digitally sourced information such as web pages, electronic broadcasts, podcasts, and blogs.

When identifying the source, sufficient detail must be provided for someone to locate and confirm the authenticity of the material.

Why must it be referenced?

Referencing is the term applied to the process of disclosing the source of material. It should be done consistently and systematically to acknowledge the original creator of the material.

Citing references in a report is good practice. It can add weight to a writer's argument and support the ideas, discussion, plans, designs and concepts presented in the report. The weighting though is dependent on the quality of the reference sources that are cited.

Importantly, *referencing provides a means of demonstrating that the writer has researched a particular topic* which is often one objective in writing a report. The greater the number of quality reference sources, the stronger the evidence that research has been undertaken.

If a report does not acknowledge sources, then there is an implication that the material in the report is the writer's own work.

A lack of referencing can be counter-productive as there is no external corroboration to the material presented in the report. Consequently, it detracts from the potential impact of a report.

The situation of not acknowledging the source of material is termed **plagiarism**.

Plagiarism, aside from being unethical, is a serious form of academic and professional misconduct and it can also be *a breach of copyright*.

Both plagiarism and breach of copyright can have serious and undesirable consequences.

For a student, it could lead to failure in an assignment and in severe cases even suspension or expulsion from a program of study. As a professional person in industry, it can lead to dismissal from an organisation, tarnishing their reputation and future employment prospects.

What is plagiarism?

Simply put, plagiarism can be defined as

> *"…using the words or ideas of others and passing them off as your own...it is a type of intellectual theft."* (UNSW 2024e).

Some examples of plagiarism include copying, inappropriate paraphrasing and citation, collusion and self-plagiarism (UNSW 2024f). Plagiarism extends to non-disclosure of material obtained using AI tools—see *Writing assistance* in *Chapter 6*.

Acknowledging the work of others is a practice that you are expected to follow during your studies and in your professional career.

Referencing is the means to acknowledge the work of others to avoid plagiarism. It is also required when AI has been used to assist in writing a report (see *Writing assistance* in *Chapter 6*). Finally, referencing is part of good ethical behaviour in respecting the moral and intellectual property ownership rights of others.

Student code of conduct

Every educational institution will have a policy statement setting out the expectations of student behaviour. For example, at UNSW this behaviour is defined in the *UNSW Code of Conduct and Values* (UNSW 2024g). Many organisations will also have similar policies defining expected behaviour in the workplace.

Sometimes there can be an additional policy specifically on plagiarism. As an example, the document titled the *Ethical Use of Scholarly Material* (UNSW 2024h) states:

> *"Students must observe academic conventions in the ethical use of the materials of others. Maintaining standards in scholarship requires a commitment to scholarly values. Among such values is the adherence to ethical behaviour.*
>
> *Many aspects of ethical behaviour come together in the process of research and, in particular, in the use of scholarly materials. In the interests of maintaining high standards in scholarship and research, the University reminds students that when they are completing assignments, conducting research and writing theses, they are ethically bound to:*
>
> - ***Cite the published source**, to acknowledge the originator of substantial ideas upon which they are building their work, and to acknowledge quotations by the use of quotation marks*
> - ***Refer to, or use unpublished scholarly materials only** with the appropriate consent, and to acknowledge the source of the materials if that consent is given*
> - ***Refrain from plagiarism** with its multiple facets as defined in Student Misconduct Procedures...*
> - *Ensure that their **use of scholarly materials does not result in obstructing access by others**, in particular, where such materials are held within the University by a library or research centre*
> - ***Faithfully represent the views of authors cited** and not to misrepresent authors' views either by partial or censored quotation, or by quotation out of context, or by misleading commentary*
> - ***Seek access only to scholarly materials to which they know they are entitled** or authorised, and not to attempt to access such material to which they know they are*

not entitled or authorised (for example, by computer hacking)

- ***Respect the rights of other authors*** *and to refrain from tampering with digital records (whether in text, image, sound, or other format) over which the originator has copyright and/or has asserted the moral rights of ownership*
- ***Refrain from manipulating digital records*** *(whether in text, image, sound, or other format), whether in their original context or in a different context, so as to mislead their audience."*

Similar codes of conduct are often accessible on university and organisation's websites.

What are good quality sources?

While students are encouraged to seek out information from various reference sources, not all sources necessarily provide reliable nor independently verified information.

The report writer has to be discerning in the choice of sources used in a report. Avoid selecting the first or most easily accessible source such as material identified by an internet search engine.

Identifying sources is only part of the process of information gathering, the reliability of the source material must also be assessed.

Unreliable sources may not only mislead but can reflect poorly on the overall quality of a report, on its conclusions and recommendations, and adversely on the report's authors.

It is in the best interest of the report writer to develop the skills necessary to *seek out and identify the most reliable reference sources*, much of which comes with experience. Reliable sources will usually have some process of independent verification by appropriately qualified people.

A reference rating scheme

To assist in selecting the best sources, a five-star rating scheme is presented.

The scheme ranges from **5 Star** sources which are likely to contain *the most reliable information* to **1 Star** being the *least reliable reference sources*.

Underpinning each category in the rating scheme are criteria with examples provided. Some caution in using the scheme is advised as generalisations have been made which might not always apply in every circumstance.

What is important is that there are *differences in the reliability of reference sources* and in the end some judgement must be made to assess which are the most appropriate sources to obtain reference material for use in a report.

Five star rating

The top rated category is reserved for those sources of information that are usually the most reliable. These reference sources will have well-developed systems in place to evaluate an article before its publication. Characteristics of these systems include:

- all submitted articles are reviewed by trusted experts in the field;
- the methodology described in the article is soundly based;
- the results are transparent and can be independently audited;
- the conclusions and outcomes in an article can be justified based on sound underlying data and an appropriate analysis of the results has been made; and,
- there is a lack of any undue influence in preparing the article.

This category includes scholarly journals that have an established independent peer review process to critically review material before its publication; independent here meaning independent of the author.

Such journals should have a statement that all articles have been refereed or peer-reviewed. Some examples of these types of journals include *Nature*, journals from major publishing houses such as *Elsevier*, *John Wiley & Sons* and *Springer*, and journals from various engineering and other learned societies.

The same level of reliability can often be attributed to books distributed by commercial publishers.

These too will generally have well-established review and editorial processes in place before publication.

This category includes the most reliable sources of information for use as reference material in reports and assignments. Because of this the information is generally regarded as being authoritative and the publications are termed *refereed journals and books*.

Four star rating

The next level down on the reliability rating is information provided in refereed conference proceedings organised by engineering and other learned societies.

These conferences will have a panel of independent reviewers who are specialists in their field and review each article before it is published in the proceedings. Hence the term *refereed conference proceeding* is often applied.

To ensure transparency, the names of the reviewers are listed in the proceedings.

Also included in this category are articles published by universities, research and similar organisations.

Often the information from these organisations is published in journals, conference proceedings and/or books but the information can also be made available directly by the organisation in the form of reports of investigations or project reports.

Usually, these organisations will have established internal review processes involving relevant professionals to review the material before it is released. This material is often available to the public and can be found in major libraries.

Here the onus is on the organisation to ensure the published information is reliable and credible as it reflects on the reputation of the organisation.

An example of this reference source are the reports published by the CSIRO, as well as governmental departments, authorities and institutions. This category can also include university theses (Honours, Masters and PhD) though the results will often be published separately in a journal or as a conference paper.

Three star rating

This category is reserved for material that either has not been independently reviewed or lacks transparency about the veracity of the information.

These factors could be due to commercial, strategic or marketing considerations.

But again, this is balanced by the potential negative impact on the organisation's reputation. As well, the information released into the public domain can be subject in some instances to scrutiny by regulatory bodies. Hence for the most part the information can be reliable and used as reference material, but care should be exercised when using it.

This category includes trade journals and magazines which can include advertising material. These may only be reviewed by the editor who may not be an expert on all the topic areas published in the journal or magazine.

The category also includes publications from companies, non-refereed journals and online journals. Examples include company annual reports and internal reports. While often useful, *the information needs to be cross-checked and preferably should be cited with other higher-ranked information sources.*

Two star rating

This category includes sources containing what appears to be technical writing including articles and reports but where there is no apparent system of independent review of the information. The implication is that some or all of the information may or may not be correct.

Typically, this will include sources on the internet belonging to an individual or unincorporated organisation. It also includes unpublished articles and reports as well as papers from conferences that have not been peer reviewed.

Since there can be a question as to whether the information has been independently verified, its reliability for use in reports is questionable.

These sources are generally not recommended to be used as principal source material. If such source material must be cited then **the information should not be used in isolation** but be supported by citing in combination with other more authoritative, higher-ranked reference sources.

One star rating

The final rating category includes open or collaborative sources of information prevalent on the internet such as Wikipedia and social media. More often than not the processes of verification are not stringently applied, if they exist at all. Hence the information can be unreliable and even misleading. *While these sources might be useful in providing background information they should not be cited in a report*.

This category *includes sources that cannot be attributed to either an individual, group or organisation and where no details are provided about where or how the information was obtained*. An example of this might be a web page such as Wikipedia which has no affiliation to a company/organisation and/or no contacts and/or contains links to advertising material. In the case of Wikipedia, material can be added to an article by anyone and there is not always any independent verification of material. Hence there is a question as to the reliability of the information.

As the information may be incorrect, plagiarised and/or poorly written, these are the least reliable sources, and **it is advised against using these as reference sources** in a report.

Implications for students

Before the advent of the internet, the range of reliable reference sources was usually limited to books, journals and conference proceedings making the process of filtering information straightforward even though getting access to the information could be time-consuming.

Now as sources of information are more readily accessible through the internet and search engines can quickly point to material, the process of gathering information has been greatly simplified. In fact, it could be said the pendulum has swung so far in the other direction that perhaps there is now a state of information overload with a huge variety of potential reference sources available some often being a restatement of the same information but which may also incorporate less reliable and conflicting information.

So considerable time is now required to filter out unreliable sources and distil the relevant elements for inclusion in a report.

In summary, when preparing a report you must:

- *be discerning* in your choice of reference sources and recognise that not all sources are equally reliable; and
- *selectively use* only highly ranked and verifiable reference sources in your report.

How do I reference material in a report?

Several methods have been developed to reference material, two of the more common methods in science and engineering are:

- the author–date method[1] (or name–year); and
- the documentary–note method.

The author–date method entails naming the author and year of publication next to where the material has been used in the report. This is cross-linked to the full publication or bibliographic details listed in the reference section at the end of the report. Examples of this method include the *Chicago Manual of Style* (UChicago 2017), the MLA style, and the (American Psychological Association) *APA Style* (APA 2020).

The documentary–note method uses either symbols or a series of consecutive numbers placed within square brackets in the body of a report adjacent to the sourced material. The full publication details are listed either as a footnote or in the references section at the end of the report. Examples of this method include the (Institute of Electrical and Electronics Engineers)

1 The 'Harvard style' is a misnomer that is often incorrectly associated with the author-date method. "*The name 'Harvard' in this style is misleading. There is no official institutional connection between Harvard University and this citation style…another name for the author/date citation system*" (cited in Lim 2022). The author-date method is the preferred generic term encompassing several officially-supported referencing styles.

IEEE Style (IEEE 2018) and the footnote–bibliography system.

Of these methods, the author–date and the IEEE Style are the two most used in science and engineering. The latter is used in technical fields such as electrical, electronic and computer systems engineering.

Which method should I use in referencing?

Choosing the method for referencing sources can be challenging given the variety of styles available.

Underlying all methods is the provision of sufficient detail to enable someone to obtain later and verify that material. The methods essentially vary in the order that details are presented (author, year, title etc) and punctuation.

The best approach is to seek clarification and guidance specific to the context of your report.

The following outlines a structured approach to help determine which method to follow for an assignment or publication:

1. *Ask the assignment setter*: Your first step should always be to check with the academic, manager, or editor who set the assignment to ascertain the required method referencing. They will likely have a preferred method and/or specific guidelines.
2. *Check organisational preferences*: If the assigner has no preference, the next step is to check if your department, school, faculty, or organisation has a preferred method. Academic institutions often have guidelines available on their website or in student handbooks.
3. *Refer to disciplinary standards*: If there is no specific method mandated by your department or organisation, look at what is standard in your field. Different disciplines and learned societies will often have a preferred method.
4. *Use a major style guide*: If all else fails, default to a major style guide. Some of the most widely accepted guides include:
   - *Style Manual* (APSC 2021)
   - *Chicago Manual of Style* (UChicago 2017)
   - *APA Style* (APA 2020)
   - *IEEE Style* (IEEE 2018)

Key points to remember

- *Consistency*: Ensure that whatever method you choose, apply it consistently throughout your work.
- *Detail and clarity*: Provide sufficient bibliographic details that will enable others to locate and verify the sources used.
- *Punctuation and order*: Pay attention to the specific order and punctuation required by the style guide.
- *Adaptability*: Be prepared to adapt to different methods as required by various assignment and professional contexts.

By following this approach, you will be able to effectively manage and apply the appropriate referencing method for your work, ensuring that your references are properly formatted and provide the necessary details for verification.

What information must be provided when referencing?

As mentioned there are many variants of the author–date method and some are subject to periodic updates. The following discussion provides a guide to the use of one variant as set out in the *Style Manual* (APSC 2021). Be sure to check the particular details of the style prescribed by your academic.

As with most referencing systems, there are two parts to the method.

The first part is the in-text citation to the material's reference source in the body of the report. The author–date citation method includes the name of the author and year of publication inserted immediately following where the material has been used. In other methods a number or symbol is used.

The citation provides a link to the second part which includes the full bibliographic details of the reference source.

Cite all sources in the text

The in-text citation consists of the family name of the author or authors without initials and the year the reference source or article was published.

The citation is placed immediately following where the material is used in the report for example following a quotation or in the caption of an illustration.

The name of the author may or may not be enclosed within round brackets depending on the structure of the sentence, while the year is always placed within round brackets.

Some examples of citing material that has been paraphrased in a report using the author-date method are as follows.

- A single author cited within a sentence:

  "Following analysis of the test results, Roxborough (1988) found a correlation between..."

- A single author cited at the end of sentence:

  "…a reasonable prediction as to the performance of a roadheader machine (Roxborough 1988)."
  Note: Consistent with the *Style Manual* (APSC 2021) there is no punctuation between the author and year though some variants may prescribe use of a comma.

- A reference that has *up to three authors*:

  "…Rogers, Jones and Hart (1978) confirmed an inverse relation between…"
  Note: the names of all authors are included in the citation and listed in the order they appear in the publication. The word 'and' is used in preference to the ampersand ('&') symbol.

- Reference with *more than three authors:*

  "…when making measurements with the Schmidt Hammer (Golder et al. 1982)."
  Note: only the name of the first author is stated in the citation followed by the term et al. in the citation. See the later section on *Multiple Authors* for further details.

- When information is *corroborated from multiple sources*:

  "…the forces vary with penetration (Roxborough and Phillips 1974; Bilgen 2003; Hood 2003)."
  Note: the citations are first sorted by year and then by name with each source separated by a semicolon.

- Including page numbers in a citation:

  "Following analysis of the results of the core cuttability test work, Roxborough (1988:24) reported…"
  "…in recording measurements using the Schmidt Hammer (Golder et al. 1982:45–47)."
  Note: this form of citation is used when needing to reference a quotation or when necessary to highlight a particular section in the source.

Provide full publication details in the reference list

The second part of the referencing method is to provide the full bibliographic or publication details of the reference sources. These details are contained within a section headed 'References' located at the end of a report.

By convention, **the list of reference sources is sorted alphabetically by author and year of publication**; see the section on *References* in *Chapter 4*.

Using as an example some of the citations stated in the previous section, the corresponding full bibliographic details as they would appear in the references section of a report would be:

Golder AB, Outter S, Edwards R, Williams B and Foulter D (1972) *Rock Properties and Their Characterisation*, 684 p (Pelican Books: London).

Rogers F, Jones KL and Hart SM (1978) A study of factors impacting on rockbolt anchorage, *Int. J. Rock Mech. Min. Sci. and Geomech. Abstr.* 16(3):21–27.

Roxborough FF (1988) The cuttability of rock in the Sydney Region, in *Proceedings Tunnelling Australia*, pp 34–42 (The Australasian Institute of Mining and Metallurgy: Melbourne).

The above three reference sources are examples of a book, journal article and conference paper respectively, the latter usually published in the proceedings of a conference. Note: Consistent with the *Style Manual* (APSC 2021), the year of publication is placed in round brackets and there is minimal use of punctuation between the various parts of the bibliographic details and with the authors names.

Hyperlinks to the bibliographic details can be included in the references section when the report is published online but not if a report will be distributed in print form only. Hyperlinks are usually evident by some of the details being underlined or appear in a different colour font. Note: To remove a hyperlink from a reference list in some word processor software, first highlight the hyperlink then right-click and select *Remove Hyperlink* from the list of available options.

What is the difference between a reference list and a bibliography?

What is included in a reference list?

The references list contains details of **all the reference sources that have been cited in a report**. If there is no citation to a reference source in the report, then it is not a reference and should not be included in the reference list.

The bibliographic details in the reference list must include the names of all the authors of the reference source. Hence while the abbreviation 'et al.' is used in a citation when there are more than three authors, the abbreviation **should never appear in the bibliographic details of a reference list**.

What is included in a bibliography?

Occasionally there might be a requirement to list all the readings and other information sources that may have been referred to in preparing a report but not cited in a report. In such instances, the publication details would appear in a separate section headed 'Bibliography', 'More Readings' or 'More Information'.

A bibliography list is not a substitute for a reference list. It is not normally found in technical reports and only included when specifically required.

What are primary and secondary reference sources?

A primary source is the original or earliest dated source in which the information was first published. It is **preferable to always cite the primary reference source**.

In some instances, the information may have been republished in a later work by the same or different author, this is called a secondary source.

While it is preferable to find and confirm information from the primary source, it might not always be possible. This might be necessary when the original publication is out of print or no longer publicly available or, where the information is written in another language.

One reason for the emphasis on identifying the primary source of information is that there can sometimes be changes introduced in the material by the secondary authors such as in the data, analysis, interpretation and/or conclusions.

Citing a secondary reference source

The following are two examples when it is necessary to cite a secondary source in a report.

> "…acoustic emissions are generated in a material when it is subjected to stress (Kaiser cited in Hardy 1981)…"
>
> "Kaiser (cited in Hardy 1981) stated that acoustic emissions are generated in a material when subjected to stress…"

The corresponding bibliographic details in the references section would contain details of the secondary author, for example:

Hardy HR Jr (1981) Application of acoustic emission techniques to rock and rock structures: a state-of-the-art review in Acoustic Emissions, *Geotechnical Practice*, STP 750:4–92 (ASTM).

Some examples of referencing

Two examples of citing references are provided in Table 14. The paragraph that includes a reference to the work of Brake and Bates published in 1999 is an example of citing a *direct quotation* with words from the referenced material enclosed within quotation marks. While the paragraph referring to work on Eocene material is an example of citing material that has been *paraphrased.*

It is more common to paraphrase information in a report rather than to include direct quotes; quotations should be used sparingly in reports.

A direct quote is usually reserved for important concise statements or when it is important to

ensure there is no misinterpretation of important information, as for example the quotation on the Ethical Use of Scholarly Material stated in the earlier section in this chapter on *Student code of conduct.*

Even when ideas or concepts are summarised from another source in your own words (that is paraphrasing) the reference source of the original material must be sited. Two examples of how to reference paraphrased information are:

> "Keilblock et al. (1998) simulated an ERS door being opened 30 times…"

> "The oldest known sediments with reliable dates are of middle Eocene age (Hutchison 1996)."

The following sections provide examples of citing different types of reference sources in a report.

There are rules related to the order of references, the formatting of letters and words, and the use of punctuation in the bibliographic details. Formatting rules include using different font styles and punctuation marks, for example the name of the publication is usually set in an italics font. The rules must be followed precisely.

There are further examples of referencing provided in *Appendix 1* as well as in the references section of the sample report shown in *Appendix 3* and the conference paper shown in *Appendix 4*.

An extensive discussion of the author-date method together with numerous examples for different media can be found in the *Style Manual* (APSC 2021).

Citing a source with multiple authors

If a reference source has **fewer than four authors** (that is no more than three authors) then the names of **ALL authors must be stated** in the citation. An example of a citation having three authors is:

> "Lawrence, Smith and Jones (1988) found the major parameters…"

In instances when there are **FOUR or more authors** then the term 'et al.' is used in the citation in the body of a report. This is an abbreviation of the Latin phrase meaning 'and others.'

The term 'et al.' is used immediately following the name of the reference's first author. The *Style Manual* (APSC 2021) recommends placing the term in Roman type not italics and include a full stop after 'al'. Two examples of a citation having four or more authors are:

> "Dilution can vary significantly between systems (Gordon et al. 1995)."

> "In the paper, James et al. (1995) noted…"

The term 'et al.' should not appear in the references section of a report. Instead, the names of all authors must be provided with the bibliographic details.

In instances where two or more authors of the same family name are cited in a report then the author's initials are included, for example:

> "The oldest known sediments in the Sydney Basin with reliable dates are of middle Eocene age (Hutchison KR, 1996)."

Citing multiple reference sources

In some instances, it might be required to note more than one reference source to support an argument, concept, issue etc. This is especially the case when using lower-ranked sources.

Citing multiple reference sources is particularly useful if an issue might be contentious and/or references having a low star rating.

In such cases, all the references should be enclosed within one set of round brackets, each separated by a semicolon, for example:

> "…analysis of water samples indicated high levels of dissolved metals (Joghson 1990; Neval and Smith, 1996; Williams et al. 2001)."

Citing multiple publications by an author in the same year

Whenever two or more references are attributable to the same author published in the same year then to distinguish each citation, a lowercase letter is added following the year of publication, with each year separated by a comma, for example:

> "Haas (1981a, 1981b) has shown…"

The order of the letters is determined by the alphabetical order of the titles in the reference listing.

Details in the references section would be:

Haas CJ (1981a) Analysis of rockbolting to prevent shear movement, in *Symposium on Rock Bolting*, Brisbane, pp 156-162 (The Institute of Engineers).

Hass CJ (1981b) Shear resistance of rockbolts, *Engineering Transactions*, 260:32-41.

Citing a long name author

Sometimes the name of an author is an organisation rather than an individual. In such cases, an abbreviation can be used in the citation using the convention outlined in *Chapter 6 Writing Style*, for example:

> "One of the high-priority research areas identified by the Australian Research Council in 2022 was… (ARC 2022)."

The abbreviated form as used in the citation should be stated at the start of bibliographic details in the reference list followed by the full name of the organisation included in round brackets.

When there are sources by the same author in the reference list then the author's name can be substituted by two long dashes ('em' dashes), for example:

ARC (Australian Research Council) (2022) *Research priorities*, www.arc.com.au, accessed: 24 March 2024.

——(2023a) *Research priorities*, www.arc.com.au, accessed: 24 March 2024.

——(2023b) *Results of funding outcomes*, www.arc.com.au, accessed: 24 March 2024.

Further examples are shown in *Chapter 8 References*.

Citing a lecture, seminar or workshop

When referencing information provided in a lecture or presentation, state the name of the person who gave the lecture and the year in the usual manner in the citation. The listing in the references section would include the name of the lecture, the venue where the lecture was delivered and the date of the lecture. Two examples of this type of information source are:

Laurence D (23 October 2008) Challenges and opportunities for sustainable mining practices in the Asia-Pacific Region. 11th Kenneth Finlay Memorial Lecture delivered at Law Library, UNSW Sydney.

Kerr C (12 August 2006) Approaches to mine planning. Presentation to UNSW students at Perilya Broken Hill.

When quoting information, tables or figures from a transcript of a lecture then reference the source material in the usual manner. Note: some variants include the date at the end of the bibliographic details.

Citing a discussion or interview—personal communication

Sometimes the only source of information might be a form of verbal communication such as an interview, meeting or telephone call.

It is preferable not to use this as a reference source as the information can prove difficult to corroborate.

Whenever there are no other sources available then it may be necessary to cite this type of source, for example when it is a unique observation. This type of source is termed Personal Communication.

Before being cited in a report, permission must have been sought from the person to be used as a reference source in a report. This is not only good ethical practice, but it also ensures the source is agreeable to confirm the information if corroboration is sought by others in the future. To this end, it is also good practice to diarise and/or keep a written copy or email that permission has been granted.

Two examples of citing personal communication in a report include:

> "Discussion with G Andrews (18 October 2016, personal communication) confirmed …"

> "...failure would often extend up to a sandstone parting (S Smith, 4 June 2017, personal communication)."

In these instances, the person's title and initials are included in the citation together with the actual date communication took place. This type of

reference source is normally NOT included in the reference list. Note: some variants of the author-date method permit personal communications to be included in the reference list.

Citing information from a website

When information is obtained from the internet then the bibliographic details must include the name of the document, the address of the website and the date when the information was accessed.

Generally, only the *Uniform Resource Locator* (URL) for the site home page of the reference source need be included. Do not include the URL provided by an internet search engine as it is not the actual address of the reference source (and the search address can often be quite long).

When the report will be available in print format only and the URL is reasonably short being no more than one line then it is provided with the bibliographic details. If, however, the report will be available in electronic form then the URL can be hyperlinked to the title of the article. This is illustrated in the following two examples.

Report available in print only:

Brown ET (2012) Progress and challenges in some areas of deep mining, Australian Centre for Geomechanics website, accessed 15 May 2024. https://papers.acg.uwa.edu.au/p/1201_01_brown/

Report available electronically or online:

Brown ET (2012) Progress and challenges in some areas of deep mining, Australian Centre for Geomechanics website, accessed 15 May 2024.

The hyperlink should point to the website that hosts the document rather than a link to the PDF site as the latter website address can and often does change.

See Appendix 1 for further examples of referencing information from electronic sources.

Printed versus on-line material

In circumstances when published information is accessible on the internet such as a journal article or conference paper then the reference details should combine both the original publication details with the internet address where the article can be accessed.

Stating only the internet address of the journal article is not acceptable especially if the internet site is only available through a restricted service provider as this can hinder general access to the article.

Usual method for a journal article:

Alehossein H and Hood M (1999) An application of linearised dimensional analysis to rock cutting, *Int. J. Rock Mech. Min. Sci. and Geomech. Abstr.* 36(5):701-709.

Suggested method when article is accessible on-line:

Alehossein H and Hood M (1999) An application of linearised dimensional analysis to rock cutting, *Int. J. Rock Mech. Min. Sci. and Geomech. Abstr.* 36(5):701-709, accessed 14 May 2011. www.sciencedirect.com/science

Not acceptable:

Alehossein H and Hood M (1999) An application of linearised dimensional analysis to rock cutting, accessed 14 May 2011. http://sirius.library.unsw.edu.au:9003/sfx_local?sid=metalib:SCIDI4&id=doi:&genre=&isbn=&issn=13651609&date=1999&volume=36&issue=5&spage=701&epage=709&aulast=Alehossein&aufirst=H&auinit

Citing information on data storage media

When information is obtained from a document sourced from some form of electronic media such as a USB flash drive or CD/DVD-ROM rather than as a hardcopy publication then it is listed like a conference proceeding, for example:

Kerr P (2002) Decline haulage at Kanowna Belle Gold Mines, in *Proceedings 8th AusIMM Underground Operators' Conference* [CD-ROM], pp 285-292.

Citing legislation

The convention when referring to an Act of Parliament or legislation in a report for the first time is to use the short title of the legislation together with the year stated in italics. The name of the legislation is then followed by the jurisdiction and abbreviated form of the

legislation in brackets. Any subsequent citation to the legislation uses the abbreviated form without the year, for example:

"…requirements regarding general safety regulations are detailed in the *Work Health and Safety Act 2011* (NSW) (WHS Act). The WHS Act requires…"

Legislation is usually structured within a hierarchical order. When reference needs to be made to a specific section in legislation then the citation will follow a certain sequencing. The following example is a reference to legislation in section 53 ('s. 53'), subsection 1 ('(1)'), paragraph a ('(a)').

"…the use of stop orders by the responsible Minister is outlined in the WHS Act s. 53(1)(a)."

When referring to legislation in a foreign jurisdiction, it is written in Roman font followed by the abbreviation of the country in round brackets, for example:

"…overseas investment in the industry is covered by the Foreign Investment Act 2018 (PNG)."

"PNG's Foreign Investment Act 2018 outlines the requirements for…"

Details of legislation in the reference list of a report are set in Roman font.

NSW Department of Industry (2015) Work Health and Safety (Mines and Petroleum Sites) Act 2013 No 54.

Dealing with incomplete source information

Citing an unpublished article

If a reference source is unpublished then use the year the article was written in the citation but in the reference section include a comment the work is unpublished and include the organisation name, for example.

"Johnson (1997) further developed the principles..." or

"..based on developed principles (Johnson 1997)"

Johnson G (1997) Derived mechanisms for better understanding of rock failures, [unpublished article], WhitePeaks Consultancy, Geneva.

Missing or unknown date

When the publication date cannot be determined then the expression n.d. (no date) is used in place of the year for both the citation and the reference list as illustrated respectively.

"Johnson (n.d.) further developed the principles..."

Johnson L (n.d.) *The Principles of Mine Ventilation*, 228 p (World Books: New York).

If a reference source has been accepted for publication but the date of publication is unknown at the time of writing a report then the following forms can be used for both the citation and the reference list.

"Johnson (in press) further developed the principles..." or

"..based on developed principles (Johnson, in press)"

Johnson G (in press) Derived mechanisms for better understanding of rock failures.

Missing or unknown author

An author can be an individual, grouping of individuals, company, organisation, department, or institution.

In the case when the author is not a real person but for example a company, then use the name of the company in place of the author in the citation and reference list. Two examples of this include:

Perilya Ltd (2010a) Increase in Broken Hill mineral resources and ore reserves, www.perilya.com.au, accessed 3 April, 2011.

Perilya Ltd (2010b) Perilya Limited investor and analysis presentation, www.perilya.com.au, accessed: 3 April, 2011.

If the author cannot be identified then treat the source with extreme caution. This is particularly the case when information is obtained from a website that has no identified author or organisation as the information may have been created to attract advertising or for other purposes and, consequently the information may not be correct nor accurate.

As discussed earlier in this chapter, the objective when undertaking research for use in a report is to find and use information obtained from credible sources that can be verified. The report's author must decide whether the information is credible, valid and/or relevant before using it as a reference source in a report. If you have cross-checked the information and verified that the source is credible but there is no obvious author then use the title of the document or web page in place of the author followed by the year and other publication details.

Using AI generated material in report writing

As discussed in the section on *Writing assistance* in *Chapter 6,* a variety of AI tools can assist in report writing. Depending on the AI tool used and its application, different referencing requirements apply:

- *Spelling, grammar, and referencing assistance*: When an AI tool is used solely for spelling and grammar checking or for assisting in referencing, it generally does not need to be referenced in a report. This is conditional on the tool not making any substantial changes or suggesting any alterations to the meaning, wording, or ideas in the report—see *Writer's own work* in *Chapter 6.*
- *Substantial contributions or changes*: If an AI tool contributes significantly or makes substantial changes, such as *quoting, paraphrasing, or summarizing material*, it must be referenced with an in-text citation—see the following section *Citing use of AI in the text*.
- Editorial changes and idea formulation: When an AI tool suggests editorial changes or help in formulating ideas and concepts, or in identifying relevant resources, an acknowledgment statement must be included in the report—see the section *Acknowledging use of Generative AI*.

Citing use of AI in the text

When material produced by an AI tool is included in a report, it must be referenced with an in-text citation. *The Guide* (UNSW 2024d) recommends citing AI tools as software rather than personal communication, with the company as the author and the software as the product name.

Example of in-text citation:

"..was the most likely dominant species based on analysis of the test specimen (OpenAI 2024)"

Example of the entry in the references section:

OpenAI (2024) ChatGPT (Large language model), accessed 18 July 2024. https://chat.opai.com/chat.

Note: Not all reference methods require information to be included in the reference section unless there is a publicly available link to the source, for example the *Chicago Manual of Style* (UChicago 2017). This is because AI tools provide a unique link to a user that cannot be accessed by anyone else, that is the link is not publicly accessible. Hence it is argued the reference details would be incomplete.

Acknowledging use of generative AI

When AI tools make substantial contributions, this use must be disclosed. The steps include:

1. Confirming permission from the academic assessor regarding which AI tools can be used in writing a report.
2. Ensuring that any AI-suggested changes are correct and accurately reflect the writer's ideas.
3. By submitting, the writer is declaring all ideas in the report are their own—see *Chapter 6 Writer's own work* and *Chapter 7 What is plagiarism*.
4. Adding an acknowledgement statement following the reference list.

Some examples of an acknowledgment statement include:

Acknowledgement:
I would like to acknowledge the assistance provided by [Name of AI tool] (access month and year) which offered editorial suggestions. Some examples of prompts I used include [list prompts here].

Acknowledgement:
I would like to acknowledge the use of [Name of AI tool] (accessed month and year) which

assisted with suggested changes in the writing of this report.
Some examples of prompts I used include [list prompts here].

Acknowledgement:
This report includes material and ideas generated with the assistance of [Name of AI tool] (accessed month and year).

Managing references

Software tools like EndNote, RefWorks, and Zotero help track, insert, and manage in-text citations and reference lists. While these tools ease the process, the report's author must ensure all reference details are accurate and consistent.

Summary

All sources of information and material used in preparing a report must be acknowledged, whether direct quotations or paraphrased material. This also includes non-text information such as tables, illustrations, and other materials created by others.

An assessment must be made of the reliability of reference sources and preferably only highly reliable sources should be used in a report. References must be accurately and consistently presented.

Within engineering, there are several methods used to acknowledge reference sources, two being the author–date and the IEEE methods. Common to most variants of the author-date methods, referencing is in two parts, these being:

1. In-text citation: The family name of the author(s) and the year of publication are cited near the material used.
2. Reference section: Full bibliographic details are provided at the end of the report, sorted alphabetically by author and year of publication.

008: References

APA (American Psychological Association) (2020) *Publication manual of the American Psychological Association*, 7th ed., accessed 16 July 2024. https://apastyle.apa.org/

APSC (Australian Public Service Commission) (2021) *Australian Government style manual*, (*Style Manual*) stylemanual.gov.au, accessed 19 May 2024. https://www.stylemanual.gov.au/

AusIMM (Australasian Institute of Mining and Metallurgy) (2020) *Guide to Authors*, accessed 27 June 2024. http://www.ausimm.com.au.

Berkman DA and AusIMM (2011). *Field Geologist's Manual*, AusIMM.

BIPM (International Bureau of Weights and Measures) (2022), *The International System of Units (SI)*, vol. 2, accessed 3 June 2024. https://www.bipm.org/en/measurement-units.

COPE (Committee on Publication Ethics) (2023) *Authorship and AI tools*, accessed 17 July 2024. https://publicationethics.org/cope-position-statements/ai-author.

Department of Education (2023) *Australian framework for generative intelligence in schools*, Commonwealth of Australia, accessed 23 June 2024.

DeVry University (2024) *Guidelines on using generative AI tools*, accessed 17 July 2024. https://libguides.devry.edu/studentAI

Gloyne M (1993) Gold ore mining by Dominion Mining Limited at Cosmo Howley, NT, in *Mining and Metallurgical Practices in Australasia* (ed: J T Woodcock), AusIMM.

Hall BE (1993) Copper ore mining at Mount Isa Mines Limited, Mount Isa, Qld, in *Mining and Metallurgical Practices in Australasia* (ed: J T Woodcock), AusIMM.

IEEE (Institute of Electrical and Electronics Engineers) (2018) *IEEE Editorial Style Manual for Editors*, accessed 17 July 2024. https://ieeeauthorcenter.ieee.org/wp-content/uploads/IEEE-Editorial-Style-Manual.pdf.

ISO (International Standards Organisation) (2015) *ISO 4217-2015 – Codes for the representation of currencies*, accessed 20 May 2024. https://www.iso.org/iso-4217-currency-codes.html

——(2022) *ISO 80000-1:2022 – Quantities and units. Part 1: General*, accessed 20 May 2024. https://www.iso.org/standard/76921.html

Lim M (2022) *Harvard referencing does not exist*, accessed 16 July 2024. Institute of Professional Editors. https://www.iped-editors.org/

POEU (Publications Office of the European Union) (2022) *Interinstitutional style guide*, accessed 4 June 2024. https://style-guide.europa.eu/en/

Tufte ER (1983) *The Visual Display of Quantitative Information*, Graphic Press: Chesire, Connecticut.

UChicago (University of Chicago) (2017) *Chicago Manual of Style*, 17th edn, University of Chicago Press, Chicago, accessed 16 July 2024. https://www.chicagomanualofstyle.org/home.html

UNSW (University of New South Wales) (2024a) *Report writing support*, accessed 3 June 2024. https://www.student.unsw.edu.au/report-writing-support

——(2024b) *Writing in engineering and science*, accessed 3 June 2024. https://www.student.unsw.edu.au/writing-engineering-science

——(2024c) *Use of AI for assessments*, accessed 23 June 2024. https://www.student.unsw.edu.au/assessment/ai

——(2024d) *Guide for referencing and acknowledging the use of artificial intelligence tools (The Guide)*, accessed 17 July 2024. https://www.student.unsw.edu.au/ai-referencing

——(2024e) *What is plagiarism?* accessed 19 May 2024. https://www.student.unsw.edu.au/what-plagiarism

——(2024f) *Common forms of plagiarism*, accessed 19 May 2024. https://www.student.unsw.edu.au/common-forms-plagiarism

——(2024g) *UNSW Code of Conduct & Values*, accessed 19 May 2024. https://www.student.unsw.edu.au/plagiarism/integrity

——(2024h) *Ethical use of scholarly materials*, accessed 19 May 2024. https://my.unsw.edu.au/student/atoz/Ethical.html

Winckel A and Hart B (1996) *Report Writing Style Guide for Engineering Students*, Faculty of Engineering: University of South Australia.

Other useful references

Berry R (2000) *The Research Project: How to Write It*, Routledge: London.

Evans D and Gruba P (2002) *How to Write a Better Thesis*, Melbourne University Press.

Lannon J (2003) *Technical Communication*, Longman: New York.

Laura JG and Lannon JM (2004) *A Concise Guide to Technical Communication*, Pearson Longman.

Oxford University Press (2016) *New Oxford style manual*, Oxford University Press, Oxford.

Pentz M and Shott M (1994) *Handling Experimental Data*, Open University Press.

Swales J and Freak C (2000) *English in Today's Research World*, (University of Michigan Press).

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Appendix 1:
Examples of referencing

This appendix contains examples of referencing the bibliographic details for various types of information sources.

The examples are based on the author–date method as defined in the *Style Manual* (APSC 2021), which is one of countless variants of the author–date method.

In most variants, the required publication details (e.g. author, year, title etc) and order of presenting those details are almost identical with differences in use of punctuation and placement of brackets.

Referencing management software such as EndNote includes databases hosting many of these variants as well as other referencing styles including the IEEE method.

Listing of reference types

Information obtained from printed sources

A1 Article in a journal
A2 Paper in a conference proceedings
A3 Paper presented at conference but not published
A4 Book
A5 Chapter or paper by an author in a book edited or compiled by others
A6 Author with two publications in the same year
A7 Thesis
A8 Map or plan
A9 Article in a magazine, newspaper or other periodical
A10 Public lecture, seminar or workshop
A11 Printed material with a restricted or intermittent circulation
A12 Patent and patent application
A13 Material accepted for publication but not yet published
A14 Manuscript in preparation

Information obtained from electronic media sources

E1 Paper available in an on-line journal
E2 Document available from a website
E3 Information from a website
E4 Paper presented at a conference or workshop but not published
E5 Document stored on data storage media – a CD/DVD, USB flash drive
E6 Electronic book
E7 Online press release
E8 Film, video, television or radio program
E9 Online video
E10 Podcast
E11 Online illustration
E12 Artificial Intelligence (AI)

Quality of sources

The **five star rating scheme** referred to in *Chapter 7* has been included in the following list where appropriate as a guide to the quality of a source for that type of material.

Caution should be exercised as the rating scheme applies to the generalised case of sources and may not be applicable in all circumstances.

Use of capitals

In the list of information sources, reference is made to TCC and SCC which refer to differences in the capitalisation of words whereby:

- **TCC**–*Title Case Capitalisation*: applies to the *title of a book, journal and conference proceeding* where the first letter of most words of the title are capitalised and is usually set in italic font.
- **SCC**–*Sentence Case Capitalisation*: applies to the *name of a journal article, conference paper or other document* where only the first letter of the first word in the title is capitalised.

In the case of SCC, the usual convention for capitalisation should be followed such as to capitalise proper nouns.

Digital object identifiers (DOIs)

A DOI is an internationally standardised identifier for a document which is unique and does not change (unlike a URL which can change). Many journals articles and other material are now assigned a DOI.

One purpose of the DOI is to make document retrieval a much simpler process.

Include the DOI at the end of the bibliographic details preceded by the term 'doi:'.

Information obtained from printed sources

A1. Article in a journal

refereed ☆☆☆☆☆
non-refereed ☆☆☆

Reference syntax:

1 2 (3) 4, *5,* 6(7):8.

1. Family name of all author(s);
2. Initials of author(s);
3. Year the article was published;
4. Name of the article (**SCC**);
5. Title of journal (**TCC,** *in italics*);
6. Volume or issue number;
7. Sequence number within the volume (number is enclosed in brackets);
8. Page numbers of the article in the journal.
9. 'doi:' DOI if available.

Examples:

Barton N, Lien R and Lunde J (1974) Engineering classification of rock masses for the design of tunnel support, *Rock Mechanics*, 6(4):183-236.

George P (1954) The oxidation of ferrous perchlorate by molecular oxygen, *Journal of the Chemical Society*,1954:4349-4359.

Wang CY, Liu T, Yang XG, Ge S, Stanley NV, Rountree ES, Leng Y and McCarthy BD (2022) Fast charging of energy-dense lithium-ion batteries, *Nature,* 611:485–490 (2022). doi: 0.1038/s41586-022-05281-0.

A2. Paper in a conference proceedings

refereed ☆☆☆☆
non-refereed ☆☆☆

Reference syntax:

1 2 (3) 4, *5,* 6 (7: 8 9) 10 (11:12).

1. Family name of all author(s);
2. Initials of the author(s);
3. Year that the conference was held;
4. Name of paper (**SCC**);
5. "in *Proceedings of*" followed by the title of the conference proceedings (**TCC**, *in italics*);
6. City and country in which the conference was held;
7. "ed:";
8. Initials of the editor(s);
9. Names of the editor(s);
10. Pages of the paper in the proceedings (pp x-y);
11. Publisher of the proceedings;
12. City where the publisher is based.

Examples:

Bjurstrom S (1974) Shear strength of hard rock joints reinforced by grouted bolts, in *Proceedings of the Third International Congress on Rock Mechanics*, Denver, Colorado, pp 98-105 (National Academy of Science: Washington).

Readett D J, Quast K B, Newell R, Hill S F and Ketteridge I B (1987) Modelling the leaching of NaCI from Bowmans, in *Proceedings Research and Development in Extractive Metallurgy 1987*, pp 273-277 (The Australasian Institute of Mining and Metallurgy: Melbourne).

Stanford J and Carter P (2009) An assessment of the impact of stylus metallurgy, in *Proceedings 9th Underground Operators' Conference*, University of Wollongong, 12-13 Feb, (eds: N Aziz and J Nemcik) pp 348-356 (Australasian Institute of Mining and Metallurgy: Illawarra Branch).

A3. Paper presented at conference but not published ☆☆

Reference syntax:

1 2 (3) 4, 5 *6,* 7, 8.

1. Family name of all author(s);
2. Initials of the author(s);
3. Year that the conference was held;
4. Name of paper (**SCC**);
5. "paper presented to";
6. Title of the conference (**TCC**, NOT in italics);
7. City and country in which the conference was held;
8. date of conference.

Example:

Suzuki R (1982) Workers' attitudes toward computer innovation and organisation culture: the case in Japan, paper presented to 10th World Congress of Sociology, Mexico City, 16-21 August.

A4. Book ☆☆☆☆☆

Reference syntax:

1 2 (3) *4,* 5 (6: 7).

1. Family name of all author(s);
2. Initials of the author(s);
3. Year the book was published;
4. Title of the book *(***TCC***, in italics);*
5. Number of pages in book (x p) or, pages in the book where the information came from (pp x-y);

6. Publisher of the book;
7. City where the publisher is based.
8. 'doi:' DOI if available.

Examples:

Boldt J R (1967) *The Winning of Nickel*, pp 27-32 (Van Nostrand: New York).

Angalaeswari S, Deepa T and Kumar LA (eds.) (2023) *AI Techniques for Renewable Source Integration and Battery Charging Methods in Electric Vehicle Applications* (IGI Global). doi: 10.4018/978-1-6684-8816-4

A5. Chapter or paper by an author in a book edited or compiled by others

☆☆☆☆☆

Reference syntax:

1 2 (3) 4, 5 *6* (7: 8 9), 10 (11: 12).

1. Family name of the chapter or paper author(s);
2. Initials of the author(s);
3. Year that the compilation was published;
4. Name of the chapter or paper (**SCC**);
5. "in"
6. Title of the book or compilation (**TCC**, *in italics*);
7. "ed:";
8. Initials of the book or compilation editor;
9. Family name of the book or compilation editor;
10. Pages in the book or compilation where the information came from;
11. Publisher of the book or publication;
12. City where the publisher is based.
13. 'doi:' DOI if available.

Examples:

Naveen Kumar KA and Vigneshwaran A (2023) Renewable Energy Resources and Their Types, in *AI Techniques for Renewable Source Integration and Battery Charging Methods in Electric Vehicle Applications* (ed: S Angalaeswari, T Deepa and L Kumar) (pp. 116-135) (IGI Global). doi: 10.4018/978-1-6684-8816-4.ch005.

Paterson M S (1978) Experimental rock deformation, in *The Brittle Field, Minerals and Rocks 13*, pp 42-50 (Springer-Verlag: Berlin).

A6. An author with two publications in the same year

The precise form is dependent on the type of source however a suffix is added to the year of publication consisting of a lower case letter to differentiate between publications. The corresponding suffix is used in the in-text citation.

Examples:

Withnall I W (1976a) Summary of mineral exploration in the Georgetown area, *Qld Govt Min J*, 77:583-589.

Withnall I W (1976b) Mines and mineral deposits in the Forsayth 1:100 000 sheet area, Queensland, Geol Sury Qld Rpt 91.

A7. Thesis

☆☆☆☆

Reference syntax:

1 2 (3) 4 [5] 6, 7.

1. Family name of the author;
2. Initials of the author;
3. Year that thesis was completed;
4. Title of thesis (**SCC**);
5. [Published or unpublished and Type of thesis: Honours, Masters or PhD];
6. Name of the awarding institution;
7. City of the educational institution.

Example:

Lees M J (1973) *Experimental and computer studies of a grinding circuit* [unpublished PhD thesis], University of Queensland, Brisbane.

A8. Map or plan

☆☆☆☆

Reference syntax:

1 2 (3) *4,* 5 – 6 7, 8.

1. Family name of author(s);
2. Initials of the author(s);
3. Date map was drafted;
4. Region of the map (in italics) (**TCC**);
5. State/province the region is located;
6. Scale of the map;
7. What the map is showing;
8. Publisher of the map.

Example:

Pirajno F and Occhipinti S (1996) *Btyah, WA — 1:250 000 Geological Series,* Western Australian Geological Survey.

A9. Article in a magazine, newspaper or other periodical ☆☆☆

Reference syntax:

1 2 (3) 4, *5,* 6(7):8.

1. Family name of the author(s);
2. Initials of the author(s);
3. Year the article was published;
4. Name of article (**SCC**);
5. Title of journal, magazine, newspaper or other periodical (**TCC**, in italics);
6. Volume or issue number/date of publication. This could be the month for a monthly publication or the year for an annual publication;
7. Sequence number within the particular volume (enclosed in brackets);
8. Page numbers of the article in publication.

Examples:

Leadbetter C (2002) Why globalisation is a good thing, *The Times*, 26 June, p 6.

Tasker S-J (2011) Industry fears skills crisis, *The Australian*, 12 May, p 22.

A10. Public lecture, seminar or workshop ☆☆

Reference syntax:

1 2 (3) 4, 5 6, 7, 8, 9.

1. Family name of the presenter;
2. Initials of the presenter;
3. Year that the presentation was given;
4. Title of the lecture (**SCC**);
5. Subject or reason for the lecture;
6. "delivered at";
7. Venue where the lecture was delivered;
8. Name of the institution;
9. Date of the presentation.

Example:

Laurence D (2008) Challenges and opportunities for sustainable mining practices in the Asia-Pacific Region. 11th Annual Kenneth Finlay Memorial Lecture, delivered at Law Library, UNSW Sydney, 23 October.

A11. Printed material with a restricted or intermittent circulation

Generally the same reference syntax is used whatever the source but it does not contain any italicised component and whenever possible it contains the document number at the end of the reference.

Examples:

AS (Australian Standard) (2005) AS 2193 – Calibration and classification of force measuring systems.

AMIC (Australia Mining Industry Council) (1988) Mining and the return of the living environment, 36 p.

BSI (British Standards Institute) (1989) BS 8081 – British standard code of practice for ground anchorages.

Brunther D and White S (2004) Anchorage and failure mechanisms of fully encapsulated rockbolts – Stage 2, AMIC report C10022.

BHP Billiton (2007) Sustainability Report, Summary Report 2007, 24 p.

Came J E (1911) The tin mining industry and the distribution of tin ores in New South Wales, NSW Department of Mines, Sydney, Mineral Resources Rpt No 14.

Department of Resources, Energy and Tourism, (2009) Airborne contaminants, noise and vibration. Leading Practice Sustainable Development Program for the Mining Industry, October, 97 p (Commonwealth of Australia).

HI (Hamersley Iron) (1996) Resources technology operations, 51 p (Hamersley Iron Pty Ltd).

Newcrest Mining Ltd (n.d) Cadia Valley Operations.

Panek L (1956) Principles of reinforcing bedded mine roof with bolts, USBM RI 5156

A12. Patent or Patent application ☆☆☆

Reference syntax:

1 2 (3) (4) 5, 6 7.

1. Family name of the author;
2. Initials of the author;
3. Company that will own the patent;
4. Date that the patent was lodged;
5. Name of the patented work *(***SCC***);*
6. Name of the panel providing the patent (**TCC,** *in italics*);
7. Patent number.

Examples:

Canterford J H (M K Canterford) (2004) Recovery of nickel, *International Patent Application* 04/00123.

Marsden J 0 and Brewer R E (Phelps Dodge Corp) (2004) Pressure leaching of copper concentrates, *Australian Patent Application* 02/12651.

A13. Material accepted for publication but not as yet published ☆☆

Use similar syntax as for a published reference source except substitute the expression "in press" in place of the year of publication.

Example:

Warren I H (in press) The generation of sulfuric acid from pyrite by pressure leaching, *Australian Journal of Science*.

A14. Manuscript in preparation ☆☆

Reference syntax:

1, 2 (3). 4. 5. 6.

1. Family name of manuscript author(s);
2. Initials of the author(s);
3. "in prep";
4. Title of the manuscript (**SCC**);
5. Name of the supporting institution;
6. City in which this institution is located.

Example:

Niclaus S (in prep). Applying chaos theory to long-distance delivery services. Horizon Research Station. North Pole.

Information obtained from electronic media sources

E1. Paper available from an on-line journal

refereed ☆☆☆☆☆
non-refereed ☆☆☆

Reference syntax:

1 2 (3) 4, 5, 6, 7, 8, 9. 10.

1. Family name of author/editor(s);
2. Initials of author/editor(s);
3. Year website information last updated;
4. Name of article or paper (**SCC**);
5. Title of the journal (**TCC**, in italics);
6. Volume, number and page number;
7. Place of publication;
8. Publisher;
9. Date website was accessed;
10. URL of website - homepage or, full address if of an appropriate length, or DOI (preferable) if available.

Examples:

Feit G N, Malinnikova O N, Zykov V S and Rudakov V A (2002) Prediction of rockburst and sudden outburst hazard, *Journal of Mining Science*, 38(1):61-63, accessed: 27 October 2004. www.kluweronline.com.

E2. Document available on a website ☆

Reference syntax:

1 2 (3) 4, 5. 6.

1. Author(s) of website/organisation name;
2. Initials of author/editor(s);
3. Year website information last updated;
4. Name of document (**SCC**);
5. Date website was accessed;
6. URL of website - homepage or, full address if of an appropriate length.

Example:

EPA (United States Environmental Protection Agency) (2003) Applicability of the toxicity characteristic leaching procedure to mineral processing waste, accessed: 26 October 2004. www.epa.gov.

E3. Information from a website ☆

Reference syntax:

1 2 (3) 4, 5. 6.

1. Author(s) of website/organisation name
2. Initials of author/editor(s);
3. Year website information last updated;
4. Name of page viewed (**SCC**);
5. Date website was accessed;

6. URL of website - homepage or, full address if of an appropriate length.

Examples:

Geoscience Australia (2006) Department of Industry, Tourism and Resources, Canberra [online], accessed: 12 December 2006. www.australianminesatlas.gov.au.

INCB (International Narcotics Control Board) (1999) United Nations, Vienna [online], accessed: 1 October 2009. www.incb.org

E4. Paper presented at a conference or workshop but not published

☆☆

Reference syntax:

1 2 (3) 4, 5, 6, 7, 8.

1. Family name of the presenter of the paper;
2. Initials of presenter of the paper;
3. Year presentation was given;
4. Name of the paper (**SCC**);
5. "paper presented to"
6. Title of the conference;
7. City where the conference was held;
8. Date(s) of the conference.

Example:

Suzuki R (1982) Workers' attitudes toward computer innovation and organization culture: the case in Japan, paper presented to 10th World Congress of Sociology, Mexico City, 16 - 21 August [online], accessed: 1 October 2009. www.incb.org.

E5. Document on data storage media including CD/DVD ROM, USB flash drive

This will follow the syntax for the corresponding hardcopy source except the term "[CD ROM]," "[DVD ROM]" or "[USB]" is inserted after the title.

Example:

Brathwaite R L, and Faure K (2004) The Sams Creek peralkaline granite hosted gold deposit, Northwest Nelson, New Zealand, in Proceedings PACRIM 2004 [CD ROM], pp 127-133 (The Australasian Institute of Mining and Metallurgy: Melbourne).

E6. Electronic book

☆☆☆

Reference syntax:

1 2 (3) 4, 5, (6: 7), 8. 9.

1. Family name of the author/editor(s);
2. Initials of the author/editor(s);
3. Date book published;
4. Title of the book (**TCC**, in italics);
5. Pages cited in book;
6. Publisher of book;
7. City where publisher is located;
8. Date book was viewed on-line;
9. URL where the book was made available.

Example:

Hagan P and Mort P (2024) *Report Writing Guide for Engineers*, p. 106. (UNSW Engineering, Sydney), accessed: 12 August 2024. doi: 10.5281/zenodo.12738835.

Lloyd C B (ed.) (2005) *Growing up Global: The Changing Transitions to Adulthood in Developing Countries*, 262 p (The National Academic Press: Washington), accessed: 5 May 2007. www.nap.edu/books.

E7. Online press release

☆

Reference syntax:

1 2 (3) *4*, [5] 6. 7.

1. Family name of author/speaker/organisation;
2. Initials of author/speaker;
3. Date of the press release;
4. Title of the press release (**SCC**, in italics);
5. "media release";
6. Date press release was accessed;
7. URL where the press release was publicised.

Example:

Howard J W (2007) *Welfare payments reform*, media release [media release], accessed: 25 July 2007. www.pm.gov.au/media/Release/2007/Media_Release24432.cfm.

E8. Film, video, television or radio program

☆☆

Reference syntax:

1 (2) 3 [4] 5, 6, 7.

1. Name of the program or film;
2. Year recorded/broadcast/released;
3. Title of the story (**TCC**, in italics);
4. Type/format of media;
5. Name of media organisation/distributor;
6. City or country where organisation is based;
7. Date of recording.

Examples:

Four Corners (2001) *Going Backwards,* television program, Australian Broadcasting Corporation, Sydney, 9 July.

My Brilliant Career (1979) Motion picture, New South Wales Film Corporation, distributed by Australian Video, Australia.

E9. Online video ☆

Reference syntax:

1 (2) 3 4, [5] 6. [7: 8].

1. Name of the host show/program/film;
2. Year video made;
3. Title of the video (**SCC**, in italics);
4. [online video];
5. Date video was viewed on-line;
6. URL where the video is hosted.

Examples:

The Overlander (2007) *Overlander.tv: Aboriginal tent embassy, Canberra* [online video] accessed: 31 July 2007.www.youtube.com/watch?v=abMIHjO2nh4.

The Cabinet of Dr. Caligari (1991) *The Cabinet of Dr. Caligari* [online video] accessed: 20 June 2007. http://video.google.com.au/videoplay?docid=-411719693227284081.

E10. Podcast ☆

Reference syntax:

1 (2) *3*, 4, 5 [6] 7. 8.

1. Organisation;
2. Year produced/made;
3. Name of podcast (**SCC**, in italics);
4. Publisher;
5. Date of podcast;
6. "podcast";
7. Date podcast was accessed'
8. URL where the podcast is available.

Examples:

Late Night Live (2013) *Traditional societies and what we can learn from them.* ABC Radio National, 23 March [podcast] accessed: 19 February 2013. www.abc.net.au/radionational/programs/latenightlive.

CSIRO (2010) *Gold mining without a mine*, 1 Febuary [podcast] accessed: 11 July 2010. www.csiro.au/multimedia/Gold-mining-without-a-mine.html.

E11. Online illustration

Reference syntax:

1 2 (3) 4, 5, 6, 7. 8.

1. Family name of author;
2. Initials of Author;
3. Year image was produced;
4. Name of image or a description (**SCC**, in italics);
5. Format and any details;
6. Name and place of sponsor;
7. Date image was viewed;
8. URL where the image is hosted.

Example:

Firth J (1968) *From the rich man's table,* political cartoon by John Firth, Old Parliament House, Canberra, accessed: 11 May 2007. www.oph.gov.au/frith/theherald-01.html.

Khafre pyramid from Khufu's quarry (2007) *Khafre pyramid from Khufu's quarry*, digital photograph, Ancient Egypt Research Associates, accessed: 2 August 2007. www.aeraweb.org/khufu_quarry.asp.

Map of the Parish of Maroota (n.d.) *Map of the Parish of Maroota, Country of Cumberland, District of Windsor 1840-1849*, digital image of cartographic material, National Library of Australia, accessed: 13 April 2007. http://nla.gov.au/nla.map-f829.

E12. Artificial Intelligence (AI) ☆

Reference syntax:

1 (2) 3, 4, 5.

1. Company;
2. Year accessed;
3. Product name;;
4. Date image was viewed;
5. URL where product is hosted.

Example:

OpenAI (2024) ChatGPT (Large language model), accessed 18 July 2024. https://chat.opai.com/chat.

Notes

- An author of a website includes an individual, group of individuals, company, organisation, department and institution etc.
- If a website does not state when it was created nor last updated then the abbreviation n.d. (no date) can be substituted for the year of publication.
- If you have cross-checked and verified the source is reliable but there is no obvious author then use the title of the document or webpage in place of the author followed by the year and other publication details as per the required syntax.
- Generally only the Uniform Resource Locator (URL) for the site home page of the reference source needs to be included or the doi. If the page URL of the information being cited is reasonably short, that is less than one line, then the full URL may be included.

Appendix 2:

A quick guide to referencing

QUICK GUIDE TO REFERENCING

All sources of information and material used in a report that is not your own original work must be acknowledged in the report. This includes text whether it is a direct quotation or paraphrased and whether it is used in whole or part as well as any other material such as a table of information or some form of illustration. The referencing system has two parts with the author(s) and year of publication cited in the body of the report next to where the material is used. The in-text citation links to the full publication details contained in the References section of the report.

The type of information that needs to be provided for a hardcopy reference source includes:

- Editor's surname
- Author surname
- Author initials
- Year published
- Conference title
- Journal title
- Title
- The pages used
- The Publisher
- City of Publisher
- Published or not
- Title of contact

The type of information that needs to be provided for an electronic media reference source includes:

- Page URL
- Author surname
- Author initials
- Year last updated
- Conference title
- Journal title
- Company name
- Name of page
- Date accessed
- The pages used
- Online book info
- Source type

Examples of referencing popular information sources

Book

Boldt JR (1967) *The Winning of Nickel,* pp 27-32 (Van Nostrand: New York).

Hagan PC and Mort P (2018) *Report Writing Guide for Engineers*.

Information from a website

Geoscience Australia (2006) Department of Industry, Tourism and Resources, Canberra [online], accessed: 12 June 2010. www.australianminesatlas.gov.au.

Article or paper on a website

Feit GN, Malinnikova ON, Zykov VS and Rudakov VA (2002) Prediction of rockburst and sudden outburst hazard on the basis of estimate of rock-mass energy [online]. *Journal of Mining Science*, 38(1):61-63, accessed: 27 October 2010. www.kluweronline.com/issn/1062-7391.

Personal communication

Clark I (2011) Personal communication, 10 November. Superintendent - Technical Services, ABC Mine, Bluevale Mining Ltd.

Thesis

Lees MJ (1973) Experimental and computer studies of a grinding circuit, (unpublished PhD thesis), University of Queensland, Brisbane.

Online image used as a figure

Firth J (1968) *From the rich man's table*, political cartoon by John Firth, Old Parliament House, Canberra, accessed 11 May 2007. www.oph.gov.au/frith/theherald-01.html.

Electronic book

Lloyd CB (ed.) (2005) *Growing up global: the changing transitions to adulthood in developing countries*, 262 p (The National Academic Press: Washington) [online], Accessed 5 May 2011. www.nap.edu/books/11174/html/index.html.

A paper in a conference proceeding

Readett DJ, Quast KB, Newell R, Hill SF and Ketteridge IB (1987) Modelling the leaching of NaCl from Bowmans lignite, in *Proceedings Research and Development in Extractive Metallurgy 1987,* Melbourne, pp 273-277 (The Australasian Institute of Mining and Metallurgy: Melbourne).

Examples of referencing popular information sources

Article in a journal, newspaper or other periodical
Carswell JT and Schofield NA (1993) Estimation of high grade copper stope grades, Cobar Mines, Cobar, NSW, *The AuslMM Proceedings,* 298(2):19-32.

Lecture/presentation note
Laurence D (2008) Challenges and opportunities for sustainable mining practices in the Asia-Pacific Region. 11th Kenneth Finlay Memorial Lecture delivered at Law Library, UNSW Sydney, 23 October.

Printed material with restricted circulation
Amos BJ and de Keyser F (1964) Mosman, Queensland – 1:250 000 geological series, Bureau of Mineral Resources Geology and Geophysics Explanatory Notes, SE55-1.19

An article in a book compiled by others
Anderson LE (1980) Copper ore concentration at Kanmantoo, SA, in *Mining and Metallurgical Practices in Australasia* (ed: J T Woodcock), pp 314-315 (The Australasian Institute of Mining and Metallurgy: Melbourne).

Online video
ABC Radio National (2010) *Lingua Franca*, 24 Feb [podcast], Accessed 25 May 2011. abc.net.au/rn/podcast/feeds/lin.xml.

Notes on a film, video, television or radio program
Four Corners (2001) *Going Backwards*, television program, Australian Broadcasting Corporation, Sydney, 9 July.

Multiple authors
Nickson S, Sprott D, Bawden WF and Coulson A (1997) A geomechanical study for a shaft wall rehabilitation program, in *Proceedings 99th CIM Annual General Meeting 1997,* p 20 (Canadian Institute of Mining: Vancouver).

Online newspaper article
Corey P (2007) Costello hints at green safety net. *Sydney Morning Herald*, 10 May [online] accessed: 27 March 2011. www.smh.com.au/news/business.

An author with two publications in the same year
Withnall IW (1976a) Summary of mineral exploration in the Georgetown area, *Qld Govt Min J*, 77:583-589.

Withnall IW (1976b) Mines and mineral deposits in the Forsayth area, Queensland, Geol Surv Qld Rpt 91.

JORC Code
JORC (2004) Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (The JORC Code) [online]. (The Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia). www.jorc.org.

For more information on referencing refer to Chapter 7 in the *Report Writing Guide for Mining Engineers*

Notes:

1. Generally, only the Uniform Resource Locator (URL) for the site home page of the reference source needs to be included. If the page URL of the information being cited is reasonably short, that is less than one line, then the full URL may be included.
2. An author of a website can include an individual, a group of individuals, a company, an organisation, a department, an institution etc.
3. If a website does not state when it was created or last updated then the abbreviation n.d. (no date) can be substituted for the year of publication.
4. If there is no obvious author for the reference source then use the title of the document or webpage in place of the author followed by the year and other publication details as per the standard syntax.

Prepared by James Tibbett, Pam Mort and Paul Hagan, UNSW. Updated to conform with *Style Guide* (APSC 2021)

December 2017 / Updated June 2024

Appendix 3:

An example of a technical paper

This appendix contains an example of a technical report that reflects the standards outlined in the *Report Writing Guide*.

The report has been amended with extracts included to illustrate the various elements of *structure*, *format* and *writing style* in a report.

In all pages before the Introduction section use *roman* numerals are used in page numbering
[see *RWG* §5 – *Page Numbering*]

The first part of the Summary states the context of the project, *the why*,
[see *RWG* §4 – *Summary*]
Note: the symbol, §, is used in these notes to denote section number in *RWG*

SUMMARY

The results and conclusions of this research project are based on experiments undertaken using a laboratory-scale, single-shear rock re-enforcement test facility that was designed, constructed and commissioned at the University of New South Wales (UNSW Sydney).

Note: the first time a term is used in a report it is first written in full followed by its abbreviation enclosed within brackets. From then on only the abbreviation is used
[*RWG* §6 – *Abbreviations & Acronyms*]

prove understanding of the behaviour of rock
o shear and enable the development of improved
ese elements in underground environments. To this end, the project examined the effect of several parameters on the performance of reinforcement elements.

The test results indicate the rock environment behaves as a system as the interaction between the various reinforcement elements was markedly different to the observed behaviour of individual elements when tested in isolation.

…the second paragraph states *the aims and scope* of the project or study

…and finally, a summary of *the key results, findings and recommendations* are presented

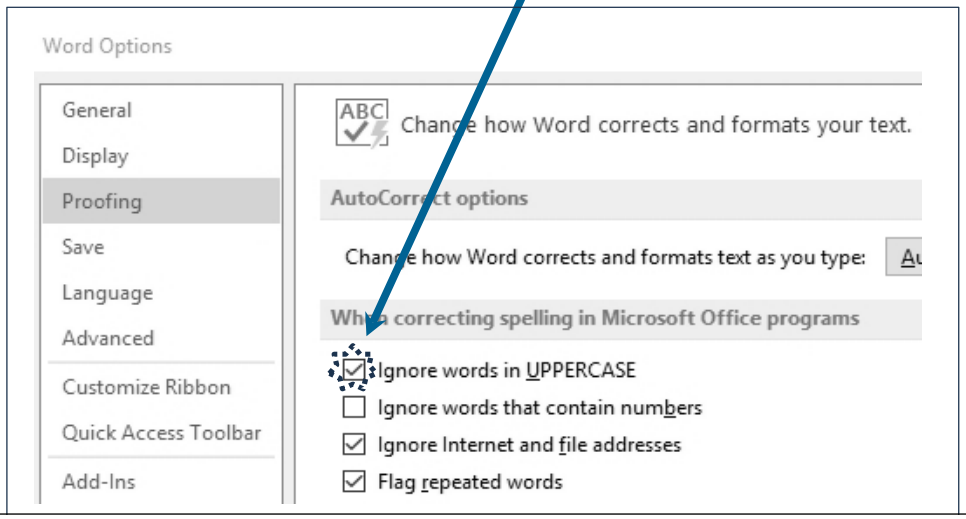
ii

CONTENTS

Summary and Content pages are written in Roman numerals. Page numbering is re-started at the Introduction section using Hindu-Arabic numerals.
[*RWG* §5 – *Page Numbering*]

A typical layout for a Contents page illustrating the structure and hierarchy used in a report. Note the use of different fonts and capitalisation together with indenting to differentiate the different heading levels.
[*RWG* §4 – *Contents*]

Be aware that the default setting for spell checking in some word processing software is set to *"Ignore words in UPPERCASE"*.
It is advised to **deselect this in the Options**.
This can be particularly embarrassing when the spell checker does not detect an error in the title on the cover sheet and, as in this case, in the Table of Contents. Spelling errors reflect poorly on the quality of a report.



The Introduction section briefly outlines the context for the study/project [*RWG* §4 – *Introduction*]

Page numbering re-commences at the start of main body of report in the Introduction section using *Hindu-Arabic* numerals [*RWG* §5 – *Page Numbering*]

1

1 INTRODUCTION

The design of rock support systems has evolved within the underground construction industry, particularly with rockbolts as the primary means to support the rockmass (Gardner 1998a). New applications and innovations in rock reinforcement have continued to appear on the market and are regularly trialled and used in Australia and the rest of the world. Within Australian underground mines, rockbolts are often roof support.

Note the form of citation for single and multiple authors. [*RWG* §7 – *Referencing;* and *RWG Appendix 1 Examples of referencing*]

Gerdeen et al. (1977) have estimated that an Australian underground mine typically uses between 4000 and 6000 rockbolts per month, which equates to a total cost of approximately A$150 000 per month for rockbolts, plates, resin and accessories.

A research project based on experiments using a laboratory-scale, single-shear rock reinforcement test facility was undertaken at UNSW.

Note the positioning of spaces in values, scaling and *SI* units [*RWG* §5 – *Numbers and use of significant figures*; *RWG* §5 – *Symbols for units of measurement* and *RWG* Table 9]

1.1 RESEARCH OBJECTIVES

The objectives of the research project were to:

- define the current understanding of reinforcement elements when subjected to shear;
- design and develop an appropriate test facility; and
- conduct a series of controlled laboratory experiments to study the effects of:
  - the geomechanical properties of rock;
  - element pre-tensioning; and
  - applied loading rate

on the performance of reinforcement elements in both direct shear resistance and indirect shear resistance w

Clear and succinct statement of project objectives

Note the link to Figure 1 is embedded in the sentence – it is not added as an afterthought at the end of the sentence nor enclosed in brackets [*RWG* §5 – *Captions for figures and tables]*

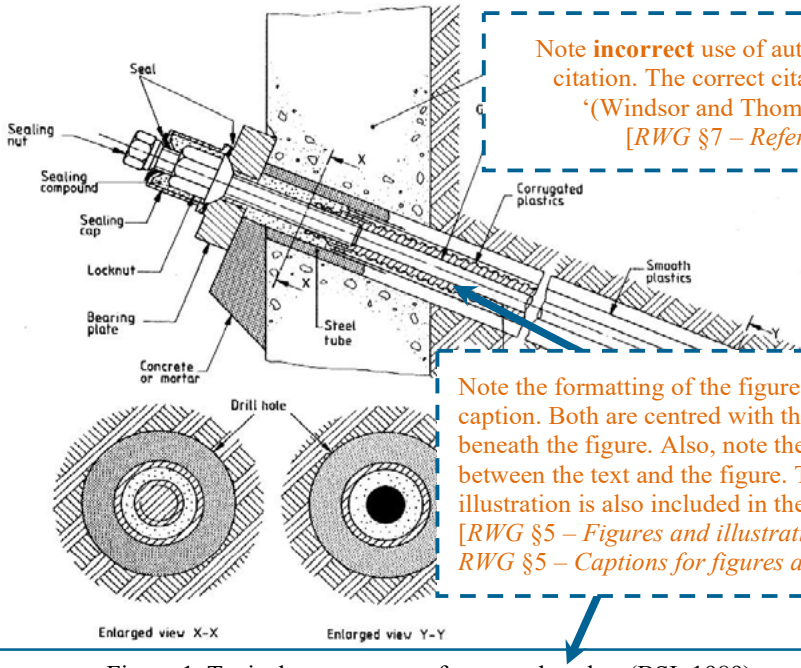
1.1.1 Ground anchors

Ground anchors are often used in civil engineering. They are used to transmit a tensile load to a load-bearing stratum. A ground anchor such as that shown in Figure 1 is generally 15 m or more in length and consists of three components these being an anchor head, free anchor length and fixed anchor. They tend to have a large cross-sectional area that provides sufficient load

2

can be grouped into two broad categories based on their primary modes of action either being high axial capacity elements or high shear capacity elements (C Windsor & R Thompson 1999).

Note **incorrect** use of author-date style of citation. The correct citation should be '(Windsor and Thompson 1999)' [*RWG* §7 – *Referencing*]



Note the formatting of the figure and the figure caption. Both are centred with the caption placed beneath the figure. Also, note the link made between the text and the figure. The source of the illustration is also included in the figure caption [*RWG* §5 – *Figures and illustrations;* and, *RWG* §5 – *Captions for figures and tables*]

Figure 1. Typical components of a ground anchor (BSI, 1989).

High axial capacity elements are in the majority with around 90% of all ground anchors. They include an array of long individual elements that are orientated for a stable reinforcing element and discretely coupled over a long anchorage length at the far end (bond length). At the collar of this reinforcing element, the ground anchor is secured to the rock mass face using an external mechanical fixture (free length). The free length is….

Note the source of all materials including illustrations as well as text, must be referenced

While the section on ground anchors (§1.1.1) provides important background information on what a ground anchor is, how it functions and where it is used, the introduction should also present a problem statement, so the objectives of the report are justified.
What is the problem with ground anchors that leads to the need for further research?
It is also a good idea to end the introduction with an outline of the report. Usually this can be just a few sentences explaining how the report is organised.

This section justifies the choice of sample type, describes sample preparation, and outlines the general conditions of the experiments.

2 CONCRETE CASTING

An example of a concise introduction to a new section. This section outlines the methods or 'what the researchers

2.1 INTRODUCTION

The importance of the surrounding rockmass is critical in analysing the performance of a reinforcing element under a shear load. The test program used concrete to simulate the surrounding rockmass having similar levels of strength, static modulus of elasticity and Poisson's ratio but equally important it is a homogeneous material, and an unlimited number of samples can be provided.

2.2 CONCRETE

The ability for cement to flow when mixed with aggregate and water makes it ideal for casting before hardening to form a stone-like material.

The test procedure used only fully cured concrete to ensure consistency in the material properties, these included measurement of compressive strength, static modulus of elasticity and Poisson's ratio.

During the casting of the concrete into the steel formwork, we prepared concrete test cylindrical specimens having dimensions of 100 mm diameter by 200 mm high as shown in Figure 2 to determine the properties of the concrete.

Avoid using 'we' or other personal pronouns as this diminishes a desired sense of objectivity. Also, this sentence is a bit wordy.
An alternate could be…
"Concrete was cast into cylindrical steel formwork with dimensions of..."

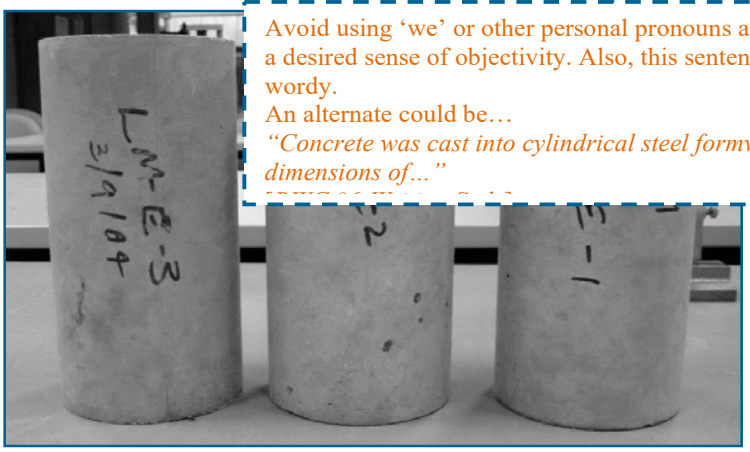


Figure 2. Concrete cylindrical specimens before testing.

In this section, the analysis and testing of the sample is documented. Important equations that were used are provided, results are summarized in tables and brief statements of key results are presented.

3 PROPERTIES OF TEST MATERIALS

The Static Modulus of Elasticity (E) and Poisson's Ratio (ν) were determined following ATSM C469. The Standard specifies Young's Modulus and Poisson's Ratio of Portland cement concrete should be determined under longitudinal loading conditions using the chord modulus to define elasticity. Typically for normal-weight concrete, E ranges between 14 and 41 GPa.

The Static Modulus of Elasticity can be calculated using Equation 1.

$$E = \frac{\sigma_2 - \sigma_1}{\epsilon_2 - 0.00005} \quad 1)$$

Note the format for an equation and the equation caption number aligned with the right margin [*RWG §5 – Equations*]

where:

E: chord modulus of elasticity (MPa)

σ_1: stress corresponding to a longitudinal stra

σ_2: stress corresponding to 40% of the estima

ε_2: longitudinal strain corresponding to the σ_2

Note the format for data contained in the table and the link between the text and table. The caption is placed above the table [*RWG §5 – Tables;* and *RWG §5 – Captions for figures and tables captions*]

The results of the concrete cylinder compression test are summarised in Table 1.

Table 1
Results of concrete cylinder compression test.

Sample No.	*P_1*	*P_2*	*P_3*	*P_4*	*mean*
Core diameter (mm)	100.2	100.2	100.3	100.1	100.2
Maximum load (Kn)	514.9	561.6	495.7	489.9	518.7
Strength (Mpa)	65.3	71.2	62.8	62.3	65.9

The strength of the concrete specimens exceeded 60 MPa with a mean strength of 65.9 MPa…

Exercise caution when typing units and ensure upper- and lower-case are used correctly.
Be particularly careful as the case can be inadvertently "corrected/altered" by word processing software to the wrong case as in this instance.
Here, the correct units should be **kN** and **MPa**.
[*RWG §5 – Symbols for units of measure*]

4 TEST RESULTS

Figure 3 shows the variation in stress with ram displacement of sample P_1 during testing using a Schenk Test Machine. The graph indicates a constant stiffness up to the point of failure and significant residual strength in the post-failure region

While tables present values, graphs help to show trends in data.
[*RWG §5 – Figures and illustrations;* and,
RWG §5 – Captions for figure and tables]

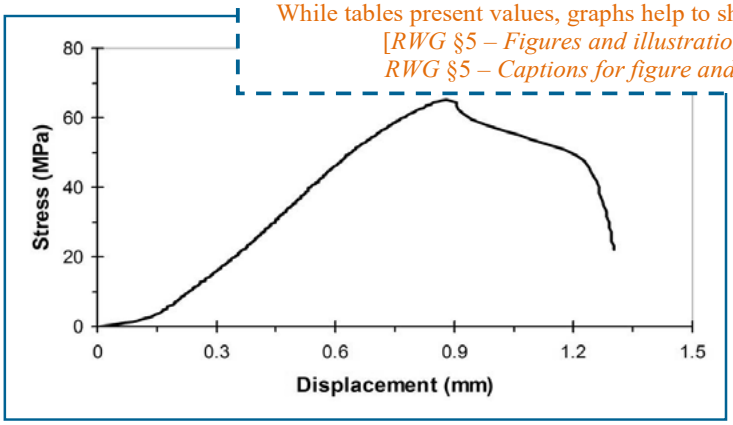


Figure 3. Loading characteristic for test sample P_1.

A hydraulic load cell was placed between two steel plates located between the concrete surface (borehole collar) and the dome plate as shown in Figure 4.

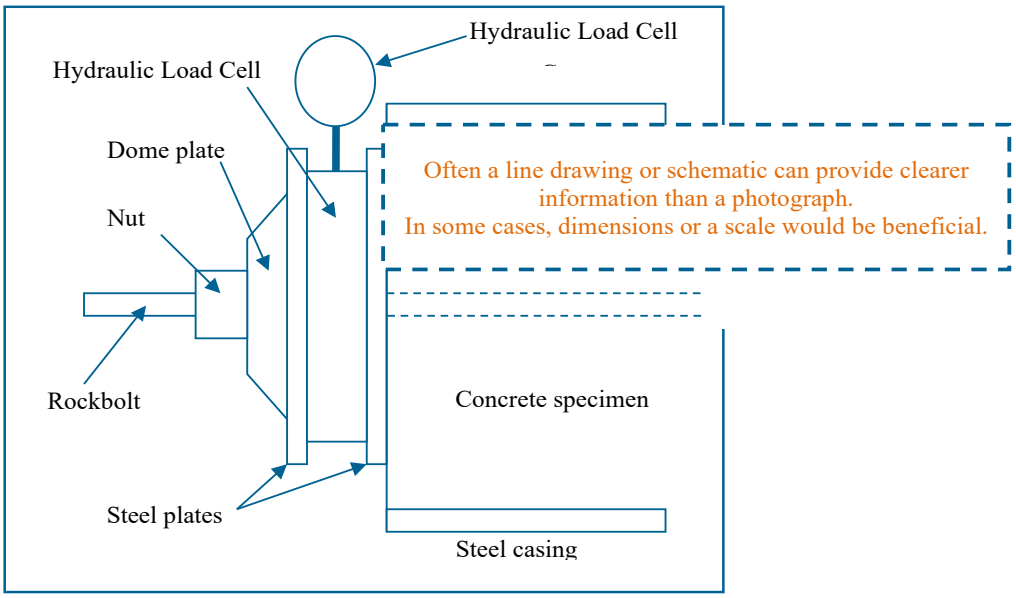


Figure 4. Schematic of load cell arrangement used to determine the level of pre-tension in a rockbolt.

Some issues arose during the installation of Samples 4 and 6. These issues are summarised in Table 2.

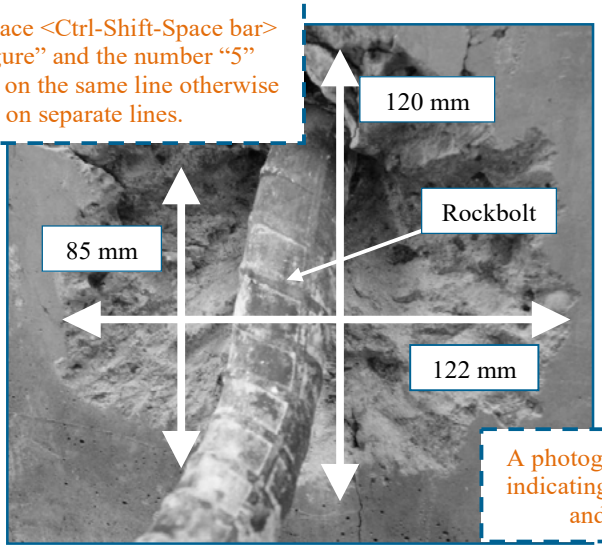
Table 2.
Summary of the issues in setting test samples.

Sample No.	Hole Length	Installation	Comments
4	1125 mm	Spin time: 20 s Hold: 60 s Pre-tension required: 40 kN	The borehole was too long after the steel plates and load cells were introduced to the system. The length of the hole was too long to allow the rockbolt to secure itself to the fast-set resin capsule.
6	1060 mm	Spin time: 20 s Hold: 60 s Pre-ter require Pre-ter attaine	Two fast-set resin capsules were inserted into the borehole to gain an

It is not a sign of weakness to discuss problems or failures. Rather it is an opportunity to show what has been learnt from these setbacks and it can help justify your final choices or decisions. Including 'what not to do' or 'what does not work' also serves to inform your peers, so they can avoid similar problems in the future.

The rockbolt was subjected to a combination of both shear and axial loading that led to the formation of two plastic hinges coinciding with the points of maximum bending stress. Due to the strength of the concrete, the rockbolt crushed the concrete around the borehole wall as shown in Figure 5.

Inserting an unbroken space <Ctrl-Shift-Space bar> between the word "Figure" and the number "5" ensures these two appear on the same line otherwise they can appear on separate lines.



A photograph with an overlay indicating various dimensions and main features

Figure 5. The image shows the extent of bending in the tendon and associated crushing of material around the borehole.

A restatement the aims and/or objectives of the project

7

5 CONCLUSION AND RECOMMENDATIONS

The objective of this project was to investigate the behaviour of rockbolts when subjected to shear. A full-scale laboratory shear testing facility was designed, constructed and commissioned to model the action of shear force on a rock reinforcing element as occurs in an underground environment.

Present the key findings and conclusions

As a result of the test program, the following conclusions can be made.

- The shear resistance of a rockbolt when installed in concrete was found to be more than double the shear strength and greater than the ultimate tensile strength of a rockbolt. The enhanced performance is thought to be due to a combination of the friction induced between the shear surfaces and the confinement offered by the borehole.
- There were two distinct loading regimes observed between the applied shear load and shear displacement. Initially, the system exhibited a large degree of stiffness, but this reduced with continued loading until there was excessive yielding before the eventual failure of the rockbolt.
- The level of stiffness was found to vary with loading rate…

Based on the results of this study it is recommended that further investigation be undertaken concerning:

- borehole and element geometry;
- element orientation relative to discontinuity; and
- element and encapsulation material properties.

Note: The minimal use of punctuation. The list is sorted first by author and then by year.
[*RWG* §7 – *Referencing* and

8

6 REFERENCES

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Note: While 'Personal Communication' is cited in the body of a report, some referencing methods do not require it to be listed in the List of References.
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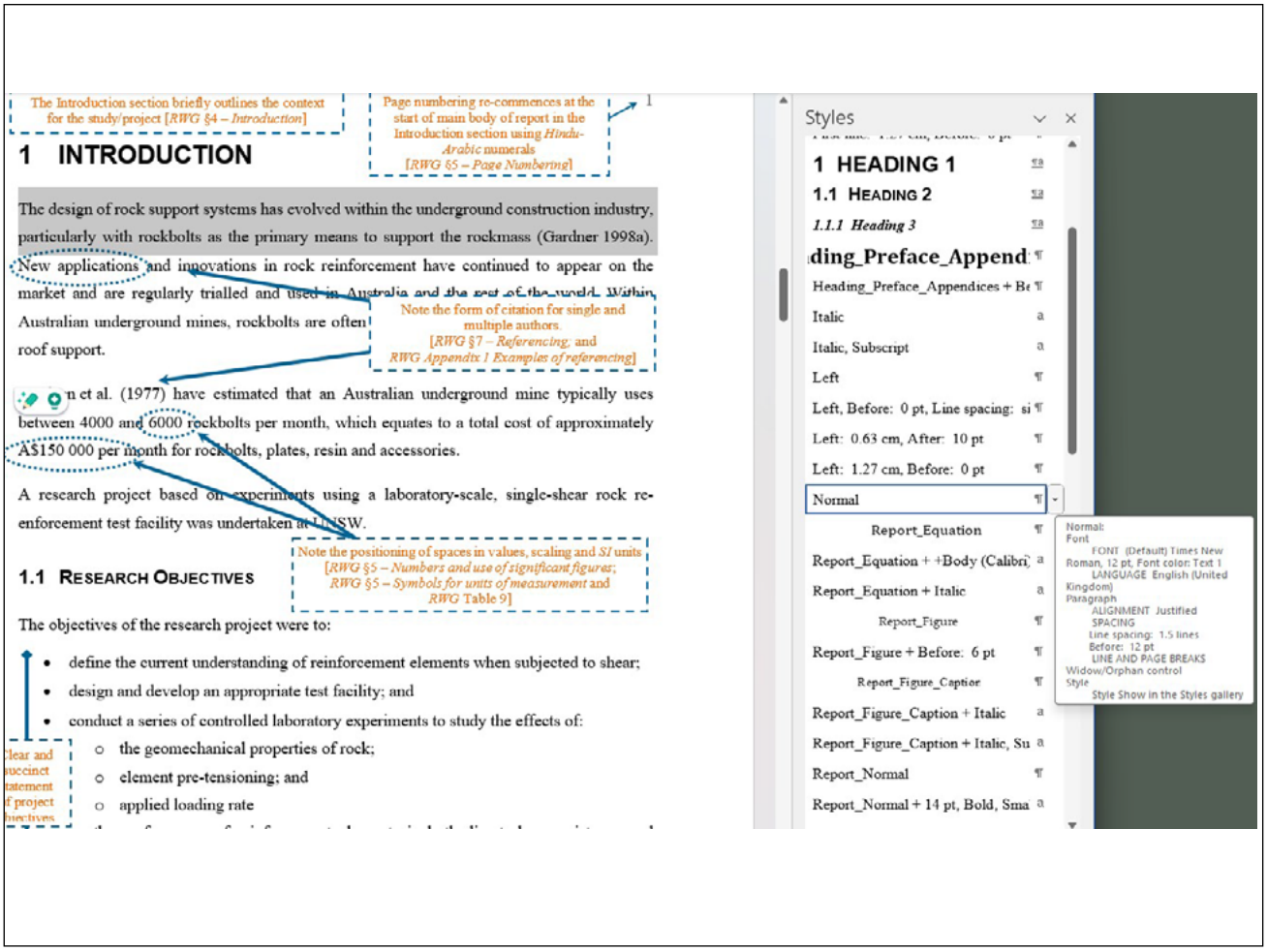

The image above contains on the left an extract from the Introduction section in the report and on the right a listing of the various styles in the document's Style Sheet.

The opening sentence highlighted in grey on the left is formatted using the "Normal" style which is highlighted in a rectangular box on the right which in turn indicates in the break-out box the various formatting elements for the Normal style, for example font type, font size, paragraph line spacing etc.

Appendix 4:

An example of a conference paper

This appendix contains an extract of a conference paper first published in *Technology Roadmap for Rock Mechanics, Proceedings 10th Congress of the International Society for Rock Mechanics*, 2003.

The effect of resin annulus on anchorage performance of fully encapsulated rockbolts

Author and affiliation

Patrick Hanrahan
University of New South Wales (UNSW Sydney)

Abstract

{*Insert paragraph space*}

A diverse selection of rockbolt designs and resin anchors are available for use in underground construction. Research at UNSW involved the construction of a rockbolt pull-testing facility. This facility has recently been upgraded and commissioned. Initial work verified the pull-test process.

A program has been completed to understand the load transfer mechanism and improve [illegible]rformance of rockbolts. This paper describes the results of this research.

Set alignment to Justified in Format/Paragraph

INTRODUCTION

Rockbolts are increasingly relied on as a key component in the primary support mechanism of many underground mines. In the Australian mining industry, for example, over 5 million rockbolts are installed each year at a cost of over A$35 million. Previous research by UNSW, Strata Control Technology Pty Ltd (SC[illegible] found that over 30% of [illegible] optimum performance i[illegible] (Galvin et al. 2001).

"Spacing before" set to 6pt in Format/Paragraph

A research initiative has been launched combining the skills and experience of industry and research expertise in the university to develop an understanding of fully encapsulated rockbolts. The broad objective is to improve the performance of rockbolt systems and improve overall safety in mines. This initiative resulted in the establishment of a test facility at UNSW that operates within a controlled laboratory environment.

TEST FACILITY

Design objectives

The attributes of a rockbolt test facility include:

- the facility should be capable of examining a wide range of parameters associated with the installation of rockbolts and of replicating a wide range of conditions;
- tests should be carried out under controlled conditions to better ensure the repeatability of results; and
- the facility should be available for use by industry (both suppliers of rockbolt systems and industry end-users) to independently assess the performance of new products or changes in the method of installation.

Use bullet points to summarise

The design of the new test facility incorporates a hydraulic actuator like that used in most rockbolt pull-out tests. The ram can apply various load conditions to a rockbolt. A bi-axial cell is used to hold the test specimen containing a fully encapsulated rockbolt. The test specimen can either be a sample of rock replicating the conditions at a particular mine or, a man-made material. An advantage of the latter is it mitigates potential problems that can arise due to the variability in material properties between rock samples.

Facility features

The test facility at UNSW uses a modified workshop lathe as the test platform. The main components of the facility include:

- a bi-axial cell with an internal diameter of 145 mm, length of 200 mm and rated maximum confinement pressure of 30 MPa mounted to the bed of the lathe;
- servo-control hydraulic system used for precise control of the loading rate of a 300 kN capacity hollow core ram during a pull-out test;

Note the correct use of upper- and lower-case in the unit abbreviations: "MPa" and "kN"

Insert *Ctrl-Shift-Spacebar* in quantity between the value and unit abbreviation

TEST SAMPLE PREPARATION

Test samples

Type

A cementitious grout (Celtite MG75S) was selected in place of cored rock samples in the test program. The grout strength was

Preparation

To ensure uniform of over 100 test s plastic moulds. Ea and a length of 200

Rockbolt anchora

A Celtite 24 mm ey used in the test pro diameter of 21.7 m 22.8 mm and a rib spacing of 10 mm. The rockbolt has an ultimate tensile strength of 344 kN.

A mix-and-pour resin was subsequently used in the tes injected into the was rammed. Th ck while the res The resin was the rockbolt and sample standing vertically.

EXPERIMENTAL PROGRAM

Procedure

In summary, the test procedure involved a load being applied between the rockbolt and the end surface of the test sample as illustrated in Figure 1. This tensile load is intended to simulate the induced load on a rockbolt when separation occurs between partings in rock strata.

During each test, the outer surface of the test sample was subjected to a confinement of 10 MPa within the bi-axial cell. Before a pullout test began, a valve was closed to stop the flow of hydraulic fluid to the cell. The level of confinement simulates *in situ* field conditions, but it was also the minimum level necessary to support the sample in the cell during drilling and pullout test. A transducer monitored changes in the bi-axial cell pressure during each test.

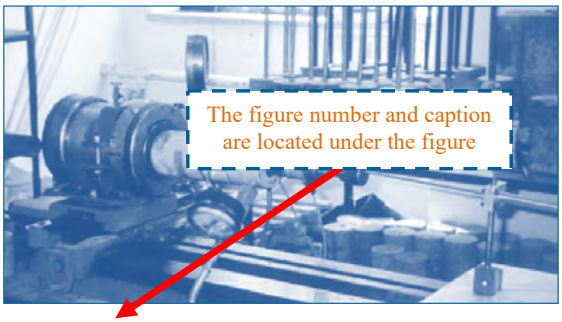

Figure 1. Test set-up showing the arrangement of the bi-axial cell, hydraulic ram, pressure transducer and LVDT.

Observations

Reasonable repeatability was observed at each level of resin annulus as illustrated in Figure 2. This figure shows the load/displacement curve for the 3 mm annulus test.

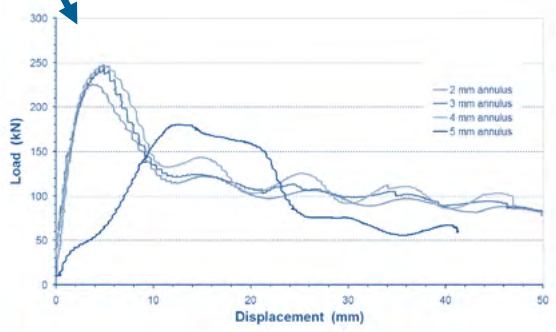

Figure 2. Load/displacement curve for an anchorage system with a 3 mm annulus (after Hagan and Weckert, 2002).

The results from the test p Table 1. There was little m in the pressure of the bi-axi experimental noise tended might have otherwise occurred.

Table 1
Summary of results.

	Annulus thickness (mm)			
	2	*3*	*4*	*5*
Limit of elastic behaviour – load (kN)	180	180	190	60
Stiffness within the elastic region (kN/mm)	99.4	85.0	100	40.0
Maximum Pullout Load (MPL) (kN)	225	245	240	185
Residual load at 50 mm displacement (kN)	60	70	90	45

In the graph, note there is no descriptor at the top of the graph, only in the caption underneath with the figure number. Also, for each axis note:
- the difference in font size between the axis labels and units;
- spacing between major tic marks and the minor tic marks so each axis does not appear too busy;
- units are included in axis labels; and,
- a legend is included where more than one set of results are plotted.

The figure number and caption are located under the figure

Note: when referring to a specific Figure, Table or Equation the label should be treated as a proper noun; hence it should begin with a capital letter.

The caption has the table number first with the descriptor on the following line

Unfortunately, the current monitoring arrangement tended to even out any transient changes in stress that might occur along the length of the test sample. Alternate arrangements to monitor any induced stress changes are being considered for future tests.

Analysis

Little difference was observed in the curves for resin annulus thicknesses of 2, 3 and 4 mm as indicated in the summary graph in Figure 5. The performance of the anchorage systems in these instances exhibited a relatively high as well as consistent level of stiffness up to the point of maximum pullout load (MPL); the latter being the maximum load-bearing capacity of the anchorage system.

This initial elastic behaviour reflected the material properties of the rockbolt component in the anchor system as well as the cohesiveness between the rockbolt, resin and rock. As the MPL is less than the UTS of the rockbolt, the MPL is likely to indicate failure of either the resin/rock or resin/rockbolt interface or both.

Beyond the MPL, the resistance to the externally applied load fell away with further displacement of the rockbolt until a residual resistance level was reached for the anchorage system. It is interesting to note that this residual resistance still represented a reasonably high value equivalent to about 70% of the MPL.

Consequently, even after the failure of the resin interface, a fully encapsulated rockbolt can still provide an appreciable level of resistance against the separation of rock strata.

It should be cautioned, however, that the level of this residual resistance might be dependent on the nature of the material properties of the surrounding rock mass and further testing would be required to confirm this.

CONCLUSION

The test program indicated that there was an optimum range of resin annulus thickness within which there was little change in the performance of a fully encapsulated rockbolt anchorage system.

On either side of this optimum range, there was a reduction in the MPL as well as other properties of the anchorage system. For example, it was found that for the case of a 21.7 mm rockbolt used in the test program when resin annulus reached 5 mm in a 32 mm diameter hole, there was a reduction of nearly 25% in MPL from that achieved within the optimum annulus range. This can significantly degrade the capability of the rockbolt to bind together rock strata. It is yet to be

Font types used in this document are:
- Headings: Arial (i.e. sans serif), 10 pt
- Text: Times New Roman (or any serif font, e.g. Palatino), 10 pt
- Figure and Table captions: Times New Roman.

Paragraph. Single spacing, 6pt spacing before paragraph. Left and right margins are 15 mm and column spacing is 10 mm.

To use a *'Style'*, select the text then go to Format/Styles and Formatting and pick the relevant style name from the list, e.g. Paper_Text

The findings reinforce the importance of matching the correct hole size for a given rockbolt diameter.

ACKNOWLEDGEMENTS

The author acknowledges support from the Australian Research Council (ARC) for funding the research project. The project was also assisted by Celtite Pty Ltd which provided test materials. The author wishes to thank Dr M Smith for supervising the project and for the contributions made by John Steel and Daniel Lin to the project.

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Note the indent in the second and subsequent lines of the references

Adapted from the paper:
Hagan PC (2003) The effect of resin annulus on anchorage performance of fully encapsulated rockbolts. *Proceedings of 10th International Conference on Rock Mechanics*, September, South African Institute of Mining and Metallurgy: Johannesburg

Appendix 5:

Examples of spelling & hyphenation

Examples of spelling and hyphenation of some technical terms.

ball mill
blasthole
bypass
cost-effective
cross-cut
cross-section
cut-off
drill core
drill hole
et al
flocculent
fly-in, fly-out
hanging wall
headframe
impeller
in situ
in-depth
interlevel
iron ore deposit
jackhammer
jaw crusher
lead-zinc ore
liquid-solid separation
long-term
low-grade
mine site
multilevel
non-metallic
off-line
offshore
off-site
one-half
one-twentieth
ongoing
on-site
open cut
ore dressing
ore shoot
orebody
orepass
outcrop
overall
overflocculated
per cent
pre-existing
program
reagent
recleaning
recognise
regrind
rock-crushing plant
screen sizing test
self-actuated
short-term
sink-float system
solid-liquid interface
start-up
sublevel
sulfide
sulfur (also related terms)
test work
time frame
trialled
two-thirds
world-class
worldwide

adapted from Appendix 1 in AusIMM (2020)

Appendix 6:

Some abbreviations used in report writing

°	degree (angle)
°C	degree (Celcius)
A	ampere
A$	Australian dollar
AC	alternating current
ACF	Australian Conservation Foundation
AGC	Australian Geoscience Council
APSC	Australian Public Service Commission
AGSO	Australian Government Survey Organisation (formerly BMR)
Ah	ampere hour
AIG	Australian Institute of Geoscientists
AIME	American Institute of Mining, Metallurgical and Petroleum Engineers
alk	alkaline
am	antemeridian (before noon)
AMEC	Australian Mining Exploration Companies
AMF	Australian Mineral Foundation
AMIRA	Australian Mineral Industry Research Association International
AMPLA	Australian Mining Petroleum Law Association
and	not abbreviated (do not use “&”)
aq	aqueous
AR	Analytical standard of purity
AS	Australian Standard (usually with number and date, eg AS373S-I990)
at	atomic
at wt	atomic weight
atm	atmosphere/atmospheric
ATS	Australian Tunnelling Society
ATSE	Australian Academy of Technological Sciences and Engineering
av	average
bbl	US petroleum barrel
BHN	Brinell hardness number
BS	British Standard
BSS	British Standard specification
cal	calorie
calc	calculated
cf	compare
CIM	Canadian Institute of Mining Metallurgy and Petroleum
cm	centimetre
cm/s	centimetre per second
cm^2	square centimetre
cm^3	cubic centimetre
cm^3/s	cubic centimetre per second
CMMI	Council of Mining and Metallurgical Institutions
coeff	coefficient
const	constant
cos	cosine
cot	contangent
crit	critical
cryst	crystallised
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CV	calorific value
d	day
db	decible
ρ	density
DC	direct current
Dept	department
dia	diameter
dil	dilute
E	east
ed(s)	editor(s)
edn	edition
η	efficiency
eg	for example
EPA	Environment Protection Agency
eqn	equation
equiv	equivalent
equiv wt	equivalent weight
ESD	ecologically sustainable development
etc	etcetera
eV	electron volt
€	Euro

expt	experiment(-al)
ft	foot/feet
g	gram
g mol	gram molecule
G	Newtonian constant of gravitation
g/L	grams per litre
galv	galvanised
GBP	British pound
GSA	Geological Society of Australia
h	hour
ha	hectare
horiz	horizontal
ht	height
Hz	Hertz = frequency
ibid	in the same reference
ie	that is to say
IMA	Indonesian Mining Association
IMMA	Institute of Metals and Materials Australia
in	inch(es)
IoM^3	The Institution of Mining, Metallurgy and Materials
ISO	International Organisation for Standardisation
J	joule
K	degree absolute (Kelvin)
kg	kilogram
kJ	kilojoule
km	kilometre(s)
km/h	kilometre per hour
km/s	kilometre per second
km^2	square kilometre
kPa	kilopascal
kV	kilovolt
kVA	kilovolt ampere
kW	kilowatt
kWh	kilowatt hour
L	litre
L/s	litre per second
lat	latitude
liq	liquid
long	longitude
m	metre
MW	megohm
m/s	metre per second
m^2	square metre
m^3	cubic metre
m^3/h	cubic metre per hour
m^3/min	cubic metre per minute
max	maximum
MCA	Minerals Council of Australia
mg	milligram
MHz	megahertz
MICA	Minerals Industry Consultants Association
min	minimum, minute
ml	millilitre
mm	millimetre
mm^2	square millimetre
mm^3	cubic millimetre
MMIJ	The Mining and Material Processing Institute of Japan
mol wt	molecular weight
mol	mole (amount of substance)
mol	molecule/molecular
mol/L	molecules per litre
μg	microgram
μ	micron
μm	micrometre
M	million
ms	millisecond
Mt/a	million tonnes per annum
mV	millivolt
MW	megawatt
N	Newton, north
nb	note well
Nm^3/h	normal cubic metre per hour
NNW	north north west
No(s)	number(s)
NPV	net present value
Ω	Ohm
op cit	in the same place previously cited
p/pp	page/pages
Pa	pascal
Pat	patent
%	per cent abbrev. used in tables

per cent	per cent written in text
pers comm	personal communication
PESA	Petroleum Exploration Society of Australia
pH	measure of acidity or alkalinity
pm	postmeridian (after noon)
ppb	parts per billion
ppm	parts per million
qual	qualitative
quan	quantitative
rad	radian/radius
rev	revolution
rev/min	revolutions per minute
s	second (time)
S	south
SAIMM	Southern African Institute of Mining and Metallurgy
SD	standard deviation
SE	south east
ser	series
SI	International System Units
sic	incorrectly written in the original
sin	sine
SME	Society of Mining, Metallurgy and Exploration Inc
soln	solution
sq	square
SSW	south south west
t	tonne
t/a	tonne per annum
t/d	tonne per day
t/h	tonne per hour
t/m	tonne per month
tan	tangent
temp	temperature
TMS	The Minerals, Metals and Materials Society
US$	US dollars
V	volt
var	variety
vel	velocity
η	viscosity
vol(s)	volumes(s)
vs	versus
W	Watt, west
w/v	weight for volume
w/w	weight for weight
Wh	watt hour
wk	week
WNW	west north west
wt per cent	weight per cent
wt	weight
yr	year
¥	yen

Thermodynamics

a	activity
c	speed of light in a vacuum
Cp	molar heat capacity at constant pressure
F	Faraday constant
G	Gibbs free energy
H	enthalpy
L	latent heat of transformation or phase change
N	Avogadro's number, molar concentration
R	molar gas constant
S	entrophy
T	absolute temperature

adapted from Appendix 2 in AusIMM (2020)

Appendix 7:

A checklist for report writing

		RWG
FORMAT		
heading and subheadings	laid out logically and consistently at each level (size and style of headings)	pp 7-12
decimal and numbering system of sections	used accurately and consistently; in most cases no more than three levels of heading is necessary in most reports	9, 15
page numbers	place in top right hand corner	15
headers and footers	it most instances they are unnecessary so avoid using	15
physical presentation, legibility, layout	include title page; stapling suitable for short reports but for longer use more heavy duty forms such as comb binding or perfect binding do not use place separate pages in individual plastic sleeves	
TABLES AND FIGURES		
key tables/figures	placed in main body of report: each table and figure must be labelled and referred to in the text of report	21-24
significant figures	round values to appropriate number of significant figures to reflect accuracy of value - generally three figures will suffice; use scaling factors for units and/or scientific notation	19-20
captions for tables and figures	concise but self-explanatory; captions for tables placed above the table; captions for figures below the figure	23
caption information	concise summary that complements the information stated in the text	23
data in tables and figures	consistent (cross-checks) with the data in text	21
symbols, labels and signs	explained clearly	17-18
notation/asterisks	explanatory notes provide further information immediately below table/figure	
reference citation	if table or figure not your own then cite source	24
STRUCTURE		
names/titles of people etc	spelt correctly and appropriately acknowledged	
summary	written to highlight and summarise significant information; usually less than 250 words and address three dimensions - what is the objective of study/purpose of report, what you did and, what you found/conclude/recommend	8
table of contents	clear and simple structure on page; matches exactly the headings in the report; include section numbers cross referenced to page number in report	9
page numbering	on preliminary pages use Roman numerals up to and including contents pages; restart page numbering using Arabic numerals from the introduction section	15
definitions of new terms	expressed accurately and clearly	9
abbreviations and acronyms	written out fully when first used with abbreviations in round brackets	30
report self-contained	includes all relevant information	
appendices	each appendix referred to in main body of report; contains information to support findings; only contains relevant information; do not use to “bulk-up” report	9, 12

CONTENT		RWG
information content	depth and appropriateness; uses sufficient referenced material; author's opinions/key findings clearly stated; assumptions clearly stated especially if not all information was not known or accessible; information by other authors to support argument is clearly referenced	p 33
quality of discussions and conclusions	answers the question/problem/objective posed in the introduction – states how the objective of the study was fulfilled.	
REFERENCING		
acknowledgement of all sources of information (other than your own) in figure captions, tables and whenever paraphrased or quoted in text	cite all reference sources using author/year system in main body of report	33, 37, 38, 42
reference list	full bibliographical details provided for all reference sources; all references cited in report must be included in list; only references cite in report to be included in list; list of references sorted by author and year	33, 38-39
reference components	all elements of reference provided (author, year, title of publication and publisher) and laid out in the preferred style	37, 38, 42 App 1
punctuation	follow exactly the standardised punctuation; be consistent; use of capitals and italics as required	Table 14
TECHNICAL		
wordiness	ensure report has been adequately proofread and proofread; check spelling conforms to Australian/Local standards; omit redundant or unnecessary words and phrases and, avoid obfuscation!; use plain and simple english; avoid "old world words and phrases such as appertaining to, herewith	8, 25
avoid colloquialisms	avoid everyday informal language; for the message to appear impartial, to engage the reader and ensure wide acceptance of report findings it is better to adopt a formal writing style	26, 28
sentences	complete, tight and varied in length; avoids long sentences	26
passive voice	used appropriately to emphasise the object of action rather than the agent; avoid first person, use third person appropriately.	26-27
parallel construction	applied accurately for lists of information	29
agreement	subjects and verbs are related in number and person, e.g. she does, they do, it does	
other expression	gender inclusive language, grammar, punctuation, tenses, fluency, correct word choice, conciseness, avoids clichés	26-28

adapted from Winckel and Hart (1996)

INDEX

NOTES

NOTES

Report Writing Guide

for Engineers ❯