



**SOUTH DAKOTA MINES**

An engineering, science and technology university

**Thesis and Dissertation Writing Manual  
Academic Year 2020-2021**

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*Graduate School of the South Dakota School of Mines and Technology*

**Instructions for the preparation of theses and dissertations at the  
South Dakota School of Mines and Technology**

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## 1 Introduction

These preparation instructions are effective for all theses and dissertations completed September 1, 2018, or later.

Master's and professional theses and doctoral dissertations are placed in the Devereaux Library collection at the South Dakota School of Mines and Technology (SD Mines). This manual contains the requirements and regulations of the Office of Graduate Education and the Faculty for uniform style and format of these documents.

The Graduate Office encourages the preparation of documents to be consistent with the specialized requirements of primary publications in individual fields, so that eventual publication of the work is facilitated. Thus the standards in this manual are somewhat flexible to accommodate different disciplines. If the manual does not address an issue, then normally it is up to the author's graduate committee to specify the appropriate format or content. **However, requirements in the manual that specify “must” are not negotiable and must be adhered to.** “Should” indicates a typical practice that is preferred by the Graduate Office but may be modified to accommodate discipline-specific standards.

### 1.1 Division of responsibilities for preparing a thesis or dissertation

Faculty regulations pertaining to procedures for the supervision, approval, and defense of theses and dissertations are described in Graduate Education Policy Section GEP VI, found in the university academic catalog. Both student and advisor are responsible for following these procedures.

The division of responsibilities for preparing, reviewing, and submitting a thesis or dissertation is:

- The student is responsible for preparing a thesis or dissertation that ***“is an acceptable manuscript in terms of the technical quality, completeness, and proper expression and usage in American Standard English”*** (Graduate Education Policy GEP VI.6). The student is also responsible for producing a manuscript that follows the formatting guidelines in this manual.
- The student's graduate committee has the responsibility to ensure that the document is an “acceptable manuscript” as defined above and in particular must ensure that the work is presented in accordance with discipline-specific standards and practices.
- The Office of Graduate Education has responsibility for monitoring the physical format of theses and dissertations to make certain that the format conforms to

university guidelines and that the quality of the master copy of the manuscript will allow satisfactory reproduction.

## 1.2 Writing and defense procedures

The overall steps to completing a thesis or dissertation include:

1. The complete version of the document is finished, with all required components (see Section 2.1).
2. The major professor reviews the document and grants permission for it to be submitted to the committee and to the Graduate Office for a formatting pre-check.
3. The committee reviews the document. If it is determined to be defensible, the student formally schedules the defense using the Graduate Office form.
4. The student defends. The committee, before and/or during the defense, will provide feedback on required revisions.
5. The student completes the required revisions and obtains committee approval of the document in the form of the committee's signatures on the title page.
6. The document is submitted to the Graduate Office for a final proofreading and abstract review.
7. The student makes final corrections and submits a single final copy, printed on archival paper, to the Graduate Office for signature by the dean.
8. The student delivers the final signed document to the library for printing and binding.

A detailed checklist of steps covering the writing, submission, and defense of a thesis or dissertation is provided in the [Thesis-Dissertation Completion Instructions](#) available on the Graduate Education forms web site. Please be sure to use the current version available for the semester in which you are completing and defending the thesis/dissertation.

A checklist-style summary of the formatting requirements for thesis/dissertation submissions is provided in the [Thesis and Dissertation Checklist](#) available on the Graduate Education forms web site.

All forms listed in this document may be found at:

<http://www.sdsmt.edu/Academics/Graduate-Education/Grad-Ed-Forms/>

## 2 Organization of the Thesis/Dissertation

### 2.1 Required components

The required components of an M.S. thesis or Ph.D. dissertation include, **in this specific order:**

- title page,
- copyright notice (optional but recommended),
- abstract,
- acknowledgements,
- table of contents,
- list of all tables,
- list of all figures,
- list of all equations (optional),
- list of all acronyms (optional),
- body,
- bibliography,
- appendices (optional),
- vita.

Formatting requirements for each component are detailed in Section 7 of this document. All components must be present at the time the document is submitted to the major professor for the initial review to begin the defense process. Under no circumstances can the defense proceed with an incomplete manuscript.

### 2.2 Conventional or Journal style options

The **body** of the thesis or dissertation may be in one of two formats: a **Conventional style** composed of chapters organized as a standard scientific outline, or a **Journal style** containing one or more manuscripts intended for journal submission. Each style is described in detail in the following sections.

#### 2.2.1 Conventional style

In the Conventional style, the body of the thesis or dissertation must be organized according to the classical scientific/technical outline in the form of five numbered chapters:

1. Introduction
2. Theory and/or Literature Search
3. Methods
4. Results
5. Conclusions

Variations of this basic outline to follow discipline-specific conventions are permitted, including variations on the chapter titles, additional chapters, or other modifications, as long as the basic structure and components of the classical outline are still discernible to a reader who is technically literate but not a subject matter expert. Students should consult with their graduate advisory committee on developing the final structure of the work.

### **2.2.2 Journal style**

The Journal style is designed to accommodate and encourage the submission of journal articles for publication in lieu of a classical thesis or dissertation. The articles may have been already published, or they may be manuscripts intended for future submission, or anywhere in between. M.S. theses in this style typically have 1-2 journal articles, and Ph.D. dissertations in this format typically have 3-4 journal articles. It is up to the discretion of the graduate committee as to the number, quality and length of journal articles that are acceptable. Each article is presented as a numbered chapter in the final thesis/dissertation.

However, the Journal style is more than some journal articles bound together. They must be uniformly formatted following the guidelines of the Graduate School rather than the guidelines of each individual journal, and must fully meet the formatting expectations detailed in Section 6 of this document. In addition, an introductory chapter and a conclusions chapter are required to tie the articles into a complete, coherent thesis/dissertation.

The introductory chapter provides an introduction to the body of work represented by the journal article(s), including the comprehensive literature review done by the student during the course of the research (since the literature review is often sharply curtailed in a journal article due to space limitations).

The conclusion chapter summarizes the conclusions from all the journal articles and expands upon the implications of the entire thesis/dissertation as a whole, including an assessment of future work.

The overall chapter outline of the Journal style, using a three-article dissertation as an example, is:

1. Introduction
2. Journal Article 1
3. Journal Article 2
4. Journal Article 3
5. Conclusions

As with the Conventional style, this outline may be adjusted to accommodate discipline-specific customs, such as dividing the Introduction into two chapters consisting of an introduction and a review of literature/theory, so long as the basic structure remains discernible.

These additional considerations must be followed to ensure the consistency and coherency of the work as a whole.

- Each journal article chapter must, under the chapter title, include a complete reference to the published article or a statement that identifies the journal to which submission of the article is planned or in progress.
- The lists of tables, figures, equations, and acronyms should include all items in the entire thesis/dissertation.
- Figures and tables should be numbered sequentially throughout the entire thesis/dissertation, or should be given a Chapter-Figure number format, as in Fig. 1-1 for the first figure of Chapter 1, Fig. 3.4 for the fourth figure of Chapter 3, and so on.
- Each journal article should have its own self-contained bibliography or references section.
- The bibliography for the entire thesis/dissertation should only cite references from chapters that are not journal articles, and should contain this disclaimer: “This bibliography is limited to the non-journal article chapters of this thesis/dissertation. All journal articles in this thesis/dissertation have a self-contained bibliography.”
- If the articles have been previously published, an appendix must be provided to document that permission to reproduce the articles has been obtained from the copyright holder (see Section 3).



## **3 Guidelines on Use of Multi-author and Copyrighted Content**

### **3.1 Multi-author content**

In some cases, students may have contributed to a body of research from which multi-author articles were published or are intended to be published. In order to prevent the appearance of plagiarism or theft, the student should take care to clearly identify his or her own contributions to the greater whole.

**If the student is preparing a Conventional style thesis/dissertation, the document must be written such that it only or primarily describes the student's contribution.**

Where mention of the contributions of others is needed, it should be limited as far as possible and take the form of references to publications, manuscripts, or personal communications as is the common practice. Inclusion of large sections of information from team manuscripts or publications is strongly discouraged; if present, these sections must be clearly identified as the work others using footnotes, references, notations within the text, or other means.

If the student is preparing a journal-style thesis/dissertation that includes one or more articles with multiple authors, consult the guidelines in Section 3.2 for unpublished manuscripts and in Section 3.3 for published articles.

### **3.2 Works anticipated for publication**

If the author is using the Journal style with intent to submit the article manuscript to a publisher, but the paper has not yet been accepted, the author may copyright the thesis as described in Section 4. Upon acceptance of the manuscript for publication by a journal, the author will normally transfer the copyright to the publication company.

If the article manuscript has multiple authors, then the portion of the work done by the student must be described as indicated in Section 3.1.

### **3.3 Use of works previously published by others**

The use of material copyrighted by others, from a single figure to an entire manuscript, must be properly acknowledged and, unless it falls within the doctrine of fair use, may be used only with written permission of the copyright owner. A copy of the owner's written permission must accompany the final document in an Appendix.

### **3.4 Entire works previously published by the thesis/dissertation author**

If the journal article format of the thesis/dissertation is being used (see Section 2.2), and the journal articles have already been published, or have been accepted for publication, the thesis/dissertation author must obtain written permission from the publisher to reprint the material within the thesis/dissertation. **This step may take weeks, so the process must be started well before the defense.** The thesis/dissertation must include an appendix that contains a copy of the document granting the permission.

In the journal article format, each previously published article should carry this statement directly below the chapter/article title: Included by permission of \*\*\* (Appendix \*).

### **3.5 Works previously published by the thesis/dissertation author as co-author**

A statement must be made (in footnote or in text) indicating the portions of previous work done by the author. Permission from the publisher to include the work into the thesis/dissertation must also be obtained and documented as described in Section 3.3.

## **4 Copyrighting Theses or Dissertations**

### **4.1 Ownership**

The ownership rights to theses and dissertations created by students are governed by [SD BOR Policy 4:34](#) and the [SD Mines policy IX-2](#).

Students with questions regarding intellectual property, patents, and inventions are advised to review these policies and contact the SD Mines Office of Research Affairs with questions.

### **4.2 Copyrighting**

The United States Copyright Act of 1976 adopts the principle of automatic copyright. Works created after 1 January 1978 are copyrighted under federal statute upon creation. Although registration with the United States Copyright Office and use of a copyright notice are not conditions for securing initial copyright for these works, registration and notice are still important to ensure full protection of rights under the law. Students are encouraged to place a copyright notice in every thesis or dissertation as indicated in Section 7.2.

Federal registration of the copyright of theses or dissertations is optional and is the responsibility of the student, if registration is desired.

### **4.3 Further Information on United States Copyright Law**

Inquiries regarding federal copyright law, institutional copyright policy, and copyright matters in general may be directed to the Office of Research Affairs.

## **5 Master Copy Preparation**

At the end of the defense process, a single final master copy of the thesis/dissertation is printed on archival paper and delivered to the Devereaux Library for reproduction and binding. To determine the number of additional copies to be made, the [Thesis-Dissertation Library Order Form](#) must be completed by the student and signed by the major professor and the department.

Theses and dissertations must be electronically printed and error-free, since the master copy is kept as a permanent record of research and academic achievement by the student and is used for reproduction.

### **5.1 Paper**

The paper used to print the master copy must meet institutional standards for reproduction and archival quality. The SD Mines bookstore carries paper meeting the requirements. Paper purchases should be made well in advance because last-minute requests may find the bookstore out of stock, which could potentially delay graduation. If purchasing paper from another supplier, please contact the Devereaux Library for paper specifications: [library@sdsmt.edu](mailto:library@sdsmt.edu)

### **5.2 Electronic copies**

In addition to the printed master copy, an electronic PDF version of the entire document must be provided to the Library on a clearly labeled CD or DVD disc.

### **5.3 Figures**

All copies deposited in the Devereaux Library must be fully illustrated. Images and charts reproduced using digital printers should be printed directly on the proper paper using archival-quality inks/dyes/toner.

The library will make the necessary reproductions of all figures on pages that are no larger than 11 x 17 inches.

For figures larger than 11 x 17 inches, the appropriate number of copies must be supplied. Large tables, charts, maps, etc., must be folded no larger than 7 x 10 inches with plate number and/or title in bottom right corner, to allow trimming of the bound volume without damaging the material. PDF files of large figures may also be provided on a CD or DVD disc for inclusion in the back pocket.

The library charges more for color pages when copying your thesis/dissertation, which adds to your cost, and many journals also charge more for color pages than for black and white. Besides, many readers who request access to your work through interlibrary loan may be provided with a copied version of the original, in which color figures may suffer from poor legibility. For these reasons, black and white figures should be used except when color is absolutely necessary. Graphs, for example, should be created using different black line styles, thicknesses, dashes, and so on, instead of the default multi-color plots produced by some graphing programs.

## **5.4 Data**

Normally data associated with the research is printed within the document to provide the most permanent and accessible record of the information.

Extensive tables, computer code, or lists of data should be placed in an appendix. Data sets too large to be printed may be provided as documents, images, maps, or other items on a CD or DVD disc to be placed in the pocket of the bound document. The student is responsible for providing the requisite number of disc copies to the library.

The printed data may also be provided in electronic format on the disc copies if the author wishes to facilitate electronic access of the data to the scientific community.

## **6 Global Formatting Requirements**

All pages, in either the Conventional or journal-style format, must follow the guidelines in Section 6, except where specifically indicated otherwise in Section 7.

### **6.1 Page layout**

Pages must be standard letter size (8.5 x 11 inches) and oriented in the same manner as the pages of this instruction manual, often called “portrait.” Landscape orientation is

permitted for large tables or figures (see Section 6.5 and 6.6 for details). A small number of double-size (11 x 17 inch) pages may be included to accommodate large tables or figures.

The document must be printed on one side of the paper only; no duplex or double-sided printing is allowed.

The main text sections (the body text) is to be double-spaced except for specific items or sections described in Section 7. A clearly recognizable indentation should be used to start each paragraph.

Layout Checklist:

- Pages are standard letter size (8.5 by 11 inches) in portrait orientation.
- All pages are one-sided
- The body text is double-spaced
- Paragraphs are indented

## **6.2 Margins**

Margins on all pages are to be 1½ inches on the left side (to allow for binding) and 1 inch on the other three sides. The same margins apply to portrait letter-size, landscape letter-size, and double-size pages. Margins are to be blank—without punched holes, writing, or other marks.

The margins set in many word processing packages may not measure the same on the printed page. Measure the margins on printed test pages and adjust the software settings accordingly to meet the requirements.

Margins checklist:

- 1.5-inch margin on the left, including the title page
- 1-inch margins on the top, bottom, and right
- Landscape and double-size pages have the same margins as portrait pages

## **6.3 Font requirements**

Fonts used should be clean, easily readable, and professional. A serif font should be used for the body text. Times New Roman is the recommended font, but other common serif fonts may also be acceptable. Unusual or proprietary fonts should not be used because they may not reproduce correctly under all conditions.

The same body text font must be used throughout the work, although other fonts and styles may be employed for small sections or specific objectives.

Headings may be in a serif or sans serif font. Times New Roman, Calibri, or Helvetica are recommended. The styles, weights, and sizes of the fonts used must clearly indicate the hierarchy of the headings. Heading numbers, such as those used in this manual, may be used if desired.

The body text font must be 12 pt. in size, and all text in the document must be at least 10 pt. in size. Figure and table captions must be distinctive in size or style from the body text but cannot be smaller than 10 pt.

Font Checklist:

- Body text font is in 12-pt. Times New Roman or similar serif font
- The same body text font is consistently used throughout
- No text is smaller than 10 pt.
- Figure/table captions are distinctive from the body text but at least 10 pt.
- Headings should clearly indicate the hierarchy

## **6.4 Page numbers**

All pages in the bound document should be numbered, with the exception of the title page and the optional copyright notice page. Numbering requirements may be thought of as comprising three sections in the document.

Section 1 is unnumbered and includes the title page and optional copyright notice.

Section 2 is called the front matter and includes the abstract, acknowledgements, table of contents, list of tables, and list of figures, list of equations, and list of acronyms. This section is numbered sequentially using lowercase Roman numerals (i, ii, iii, iv, etc.). The abstract will be the first numbered page in the document (i).

Section 3 includes the main body of the document and the back matter (bibliography, appendices if present, and vita). This section is numbered sequentially using Arabic numerals (1, 2, 3, 4, etc.). The first page of the first chapter will be numbered 1. If the Journal style is used, continue numbering consecutively throughout. Do NOT restart at 1 for each article.

Page numbers must be placed in the upper right-hand corner,  $\frac{3}{4}$  inch down from the top, and  $\frac{3}{4}$  inch from the right-hand side (Fig. 1). Landscape or double (11 x 17 inch) foldout pages must also have page numbers in this location, with the ‘upper right’ determined with the bound document in reading position and the binding on the left.

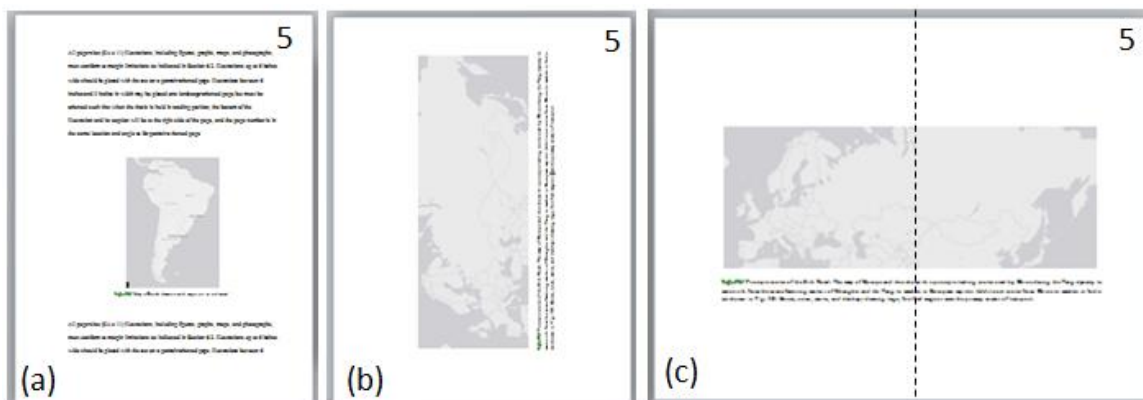


Fig. 1. Placement of page numbers. Page numbers must be placed on all bound pages except the title and copyright notice, right-side up in the upper right corner  $\frac{3}{4}$ " from the upper and right edges when the bound document is held in reading position with the binding on the left: (a) letter-size portrait page; (b) letter-size landscape page; and (c) portrait or landscape double-size (11 x 17") fold-out page. Number size and location are not to scale.

#### Numbering Checklist:

- Numbers appear in the upper right corner,  $\frac{3}{4}$ " from the top and right side.
- The title page and copyright page are not numbered
- The front matter is numbered using lower-case Roman numerals (i, ii, iii, etc.)
  - abstract (number i)
  - acknowledgements
  - table of contents
  - list of tables
  - list of figures
  - list of equations (if present)
  - list of acronyms (if present)
- The main body and back matter are numbered with Arabic numerals (1, 2, 3, etc.)
  - body of thesis (starts at number 1)

- bibliography
- appendices
- vita

## **6.5 Figures**

Figures include graphs, maps, flowcharts, photographs, or other graphic designs. This section covers page-size figures that fit on a letter-size 8.5 x 11 inch or double-size 11 x 17 inch page. See Section 5.3 regarding figures larger than page-size.

### **6.5.1 Layout of figures**

Page-size figures should be inserted in the main body of the document close to where they are first referenced. They should be centered on the page. It is strongly recommended to place them inline (body text above and below but not wrapped around) in order to minimize paging disruptions during editing.

All page-size figures must conform to margin limitations specified in Section 6.2. Figures up to 6 inches wide should be placed with the text on an 8.5 x 11 portrait-oriented page. Figures between 6 inches and 9 inches in width may be placed on a 8.5 x 11 landscape-oriented page, but must be oriented such that when the thesis is held in reading position, the bottom of the illustration and its caption will be at the right side of the page, and the page number is in the same location and angle as for portrait-oriented pages (Fig. 2).

Figures must be numbered sequentially throughout the document, regardless of whether it is Conventional style or Journal style. However, a chapter-figure number format may be used, e.g. Fig. 3-1 or Fig. 3.1 (first figure of Chapter 3).

If the work includes double-size 11 x 17 inch pages for large figures or tables, then these pages will be bound into the document as fold-out pages and should contain page numbers in sequence with the letter-size pages (See Section 6.4 for page number location and orientation). If the work includes many double-size pages, then they will usually be folded and placed in a back pocket of the bound volume and should not be numbered.



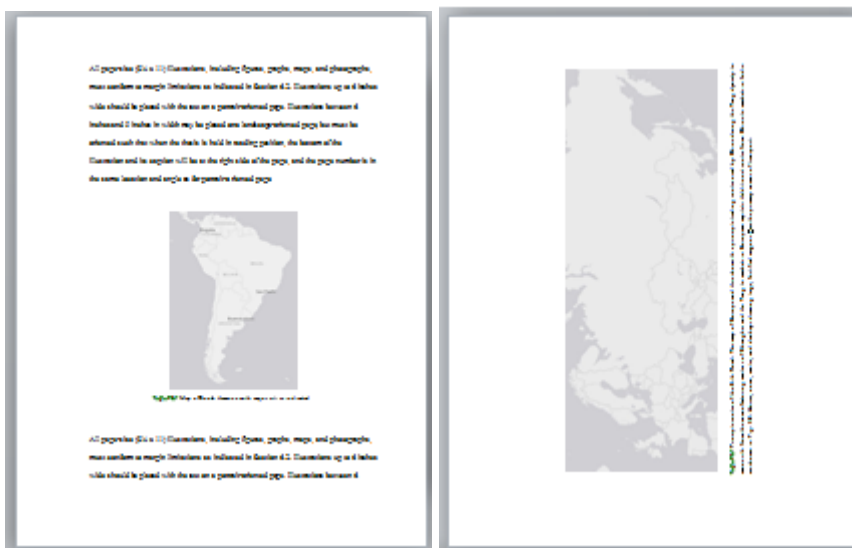


Fig. 2. Example of portrait layout and landscape layout for figures and captions

## 6.5.2 Captions

Captions for all figures, maps, graphs and figures must comply with margin and font specifications in Section 6.1 and 6.3. Figure captions must be distinctive in size or style from the body text, but cannot be smaller than 10 pt. All figure captions must be placed beneath the illustration on a portrait-oriented page, or on the right-hand side of the page for a landscape-oriented illustration.

Single-line captions should be centered under the illustration as in the example of Figure 2. Long multi-line captions should be single-spaced, must include a short title that can be used for the list of figures (See Section 7.7), and must be right-left justified rather than centered. They may be flush with the margins or mirror-indented, as in these examples:

Fig. 1-3. Map of the study area and sample localities. Triangles indicate winter samples, circles indicate spring samples, squares indicate summer samples, and diamonds indicate fall samples. Sites marked with an X were visited but no appropriate samples were found for collection.

Fig. 1-3. Map of the study area and sample localities. Triangles indicate winter samples, circles indicate spring samples, squares indicate summer samples, and diamonds indicate fall samples. Sites marked with an X were visited but no appropriate samples were found for collection.

Only the first word of each sentence should be capitalized. Add 1 or 2 empty lines after captions to enable readers to readily differentiate captions from the narrative text.

Figures checklist:

- Figures are centered on portrait pages with caption immediately below
- Wide figures on a landscape page appear bottom-right with the caption below the illustration (to the right of the page), but numbered as for portrait pages
- All figures conform to the required page margins
- Figure numbers increase sequentially throughout document or use chapter-number style
- Captions are distinctive in size or style from the body text but at least 10 pt.
- Single line captions are center-aligned; multiline captions are right-left justified
- Sufficient space below the caption clearly distinguishes it from the body text
- Captions use standard capitalization, not title capitalization

### **6.5.3 Preparation of hand-drawn figures**

Figures, maps, graphs, and figures are, in most cases, produced electronically. If not, the following instructions apply.

To prepare a good original by hand:

1. Draw on high quality reproducible paper or film.
2. Draw with black, waterproof (non-transferring) India ink. Do not use felt tip pens.
3. All lines should be dark, crisp and clear.
4. Drawing should be clean of any film.
5. When shading, use dark, clear patterns.
6. Do not use blue line. Not all blue lines can be reproduced.
7. When creating thesis drawings larger than 8 1/2" x 11" (i.e. – such as geologic maps) they must be folded down to a 7" x 10" format. Place identifying information (plate, title, preparer's name) in the bottom or bottom right corner so it can be easily displayed when folded.

## **6.6 Tables**

Tables may be organized, typed, and structured in accordance with format of journals in the candidate's particular discipline, but must still conform to font and margin specifications listed in Section 6.2 and 6.3.

Tables must be numbered sequentially throughout the document, regardless of whether it is Conventional style or Journal style. However, a chapter-table number format may be used, e.g. Table 3-1 or Table 3.1 (first table of Chapter 3).

Tables exceeding one page (letter- or double-size) should normally be placed in an appendix rather than in the main body of the thesis.

The page layout guidelines for tables are the same as for figures EXCEPT that table captions must go ABOVE the table instead of below the illustration. Review Section 6.5 for details.

## 6.7 Use of Acronyms

At the first usage of an acronym spell out entire name/phrase for which an acronym is to be used and follow with the acronym in parentheses. Avoid off-color or otherwise inappropriate acronyms.

The author may provide a list of all acronyms in the document in an optional section, List of Acronyms, as described in Section 7.9.

## 7 Formatting Each Component

This section describes specific formatting requirements for each component of the thesis or dissertation, in the order in which they must appear in the document.

### 7.1 Title Page

The title page has very specific and detailed guidelines. Please be careful to use the current version from this manual and not rely on previously completed works. **Triple-check the title page for accuracy BEFORE you defend** to avoid obtaining signatures multiple times. Errors on an already-signed page will still have to be fixed, even if it involves overnight mailing of a new page to absent faculty members at your expense.

#### 7.1.1 Thesis and Dissertation Titles

Theses and dissertations can be valuable reference works when they can be easily located. Titles must be informative, meaningful, and descriptive—rather than just indicative of the content of the material. For example, it would be well to avoid such phrases as:

“Factors affecting...”

“Some causes and effects of...”

“An experiment on...”

NOTE: The method, process, instrument, device, etc., developed or used should be identified in the title if it's a significant part of the research.

Authors of master's theses and doctoral dissertations must substitute, in the title, appropriate words for formulas, symbols, superscripts, Greek letters, etc. For example, the term “Fission-Fragment Synthesis of  $K Mn(CN)$ ” is to be written as “Fission-Fragment Synthesis of Potassium Manganicyanide.” This facilitates readability when the work is included bibliographies, literature indexes, and literature search engines.

### **7.1.2 Title page formatting**

The title page must match the template provided in this instruction manual for the year you are completing your degree, and must contain the title, degree program, author, whether the document is a master's thesis or a doctoral dissertation, its purpose, name of the college, date defended, and signature approvals of the Graduate Advisory Committee, the head of the major department or program coordinator of a multi-disciplinary program, and the Dean of Graduate Education. Names should be printed below signatures.

The title should be in 14-pt. boldface body text font. However, if you are having trouble fitting the signatures on one page, you may reduce the title to 12 pt. bold.

Text other than the title should match the body text font (12-pt. regular serif). However, if you are unable to fit your committee signatures onto one page, you may reduce the font size of the affiliations to 10 pt. You may also slightly reduce the blank spaces between lines of text.

For the signature lines of SD Mines faculty committee members, there are some cases where the faculty member's departmental affiliation does not fully express their close affiliation with an interdisciplinary graduate program. Thus it is acceptable to list either the faculty member's home department or interdisciplinary affiliation (but not both). SD Mines has four interdisciplinary graduate programs: Materials Engineering and Science, Biomedical Engineering, Atmospheric and Environmental Sciences and Nanoscience and Nanoengineering.

For the signature lines of external committee members, their institutional affiliation (if any) should be listed. In all cases the committee member's highest degree should be listed.

Spell out acronyms of affiliations, e.g. South Dakota Game, Fish, and Parks instead of SDGF&P.

The examples below provide additional guidance for signature lines that fall into special categories or cases.

***The student has co-major professors:*** List both co-major professors above the Graduate Division Representative

Co-Major Professor – Kofi R. Bean, Ph.D., Department of Chemistry and Applied Biological Sciences	Date
--	------

Co-Major Professor – Berr E. Muffin, Ph.D., Department of Geology and Geological Engineering	Date
---	------

***The degree is an interdisciplinary program:*** The Program Director will sign instead of the Department Head. If the program director is also a committee member, he or she will be listed twice, and on the committee line, the department affiliation is used.

Committee Member – Earl T. Gray, Ph.D., Department of Materials and Metallurgical Engineering	Date
--	------

Director of the Materials Engineering and Science Program – Earl T. Gray, Ph.D.,	Date
---	------

***An emeritus professor committee member:***

Committee Member – Hazel R. Nut, Ph.D., Professor Emeritus, Atmospheric and Environmental Sciences	Date
---	------

***A committee member from another university:*** Include the both the department and the university.

Committee Member – Amir E. Kano, Ph.D., Department of Geology, Arizona State University	Date
--	------

***A committee member from a company or agency:***

Committee Member – Carmel M. Roll, P.E., National Institute for Occupational Safety and Health	Date
---	------

***A committee member from a multi-institutional grant:*** Use this format if the member has no other formal affiliation; if Dr. Brew’s primary position was at a university, the school would normally be listed as the affiliation

Committee Member – Colder B. Brew, Ph.D., Director of the United States Department of Agriculture Midwest Climate Hub	Date
--	------

***An affiliation that is too long to fit comfortably on the line:*** It is permissible to allow the affiliation to extend under the ‘Date’ as shown above for Dr. Brew above. It is also permissible to move part of the affiliation to the line above:

Committee Member – Colder B. Brew, Ph.D., Director of the United States Department of Agriculture Midwest Climate Hub	Date
--	------

**Title Page checklist:**

- Title is in 14-pt bold font
- Page conforms to margin and font requirements
- Each required item and signature line is included
- Names, titles, affiliations, and degrees have been triple-checked for accuracy
- Degree abbreviations use periods (Ph.D., M.S., etc.)
- Affiliations are spelled out, not acronyms

A sample title page is provided for an M.S. and a Ph.D. on the next two pages. Please use the exact formatting shown.

## The Metaphysics and Mythology of Coffee

by  
Joseph Highly Caffeinated

A thesis submitted to the Graduate Division  
in partial fulfillment of the requirements for the degree of

Master of Science in Chemical Engineering

South Dakota School of Mines and Technology  
Rapid City, South Dakota

Date Defended: April 1, 2017

Approved by:

_____ Major Professor – Kofi R. Bean, Ph.D., Department of Chemistry and Applied Biological Sciences	_____ Date
_____ Graduate Division Representative – Kaldi T. Goatherd, Ph.D., Department of Humanities	_____ Date
_____ Committee Member – Skin E. Latte, Ph.D., Department of Civil and Environmental Engineering	_____ Date
_____ Head of the Department of Chemical and Biological Engineering – Dee Caff, Ph.D.	_____ Date
_____ Dean of Graduate Education – Maribeth H. Price, Ph.D.	_____ Date

## The Metaphysics and Mythology of Coffee

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Joseph Highly Caffeinated

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Doctor of Philosophy in Chemical & Biological Engineering

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Approved by:

Major Professor – Kofi R. Bean, Ph.D., Department of Chemistry and Applied Biological Sciences	Date
Graduate Division Representative – Kaldi T. Goatherd, Ph.D., Department of Humanities	Date
Committee Member – Skin E. Latte, Ph.D., Department of Chemical and Biological Engineering	Date
Committee Member – Van L. Mocha, Ph.D., Department of Chemistry and Applied Biological Sciences	Date
Committee Member – Chai T. Drink, Ph.D., Department of Mechanical Engineering	Date
Head of the Department of Chemical and Biological Engineering – Dee Caff, Ph.D.	Date
Dean of Graduate Education – Maribeth H. Price, Ph.D.	Date



## 7.2 Copyright notice

Students are encouraged to place a copyright notice in every thesis or dissertation as shown below. The notice should be placed on a page by itself, immediately following the title page, with the notice near the center of the page. The copyright notice page should NOT have a page number.

Copyright © 2017 by Koffee R. Bean  
All Rights Reserved

## 7.3 Abstract

### 7.3.1 Abstract format

The abstract must be placed on a single separate page by itself, with the title ‘Abstract’ on the top of the page. It must fit on one page and adhere to the margin requirements. Unlike the main body text, the abstract must be single spaced. A single paragraph is preferred, but multiple paragraphs are allowed. If used, new paragraphs should be denoted with first-line indentation or an extra space between paragraphs.

Abstract checklist

- Addresses objectives, methods, results, conclusions
- On a single, separate page with correct margins, numbered i.
- Single-spaced**, with indentation or extra space to denote paragraphs

### 7.3.2 Tips on writing a good abstract

An abstract should be informative. It should not state: “this is discussed,” “that was investigated,” or “conclusions are given.” Be as specific on each point as space allows. Avoid stating what the material is about. Concentrate instead on what work has been done. For example, do not write: “the gravity anomalies in the area are discussed.” Rather, state that: “A gravity high of 25 milligals suggests that . . . .”

The most common convention is to report your information impersonally. This, however, is a convention and students should consult with their major professor and graduate committee on possible exceptions. Typically, the restriction on the use of the word “I” and “we” makes it easy to ensure passive voice that is common in abstracts.

Example: “On 30 June a sunspot almost 20 times the size of the planet Earth was observed on the east limb of the sun.”

The abstract must summarize the following four major elements of the full document:

- Objectives of the research
- Methods used in the research
- Results of the research
- Conclusions and recommendations

The preparation of a good abstract is an art to be acquired through care, thought, and practice. It should convey a maximum amount of information with a minimum number of words, and this section requires more writing and re-writing than does almost any other part of the work.

An example abstract is provided on the following page.

## Abstract

$^{67}\text{Cu}$  is a high-priority medical research radioisotope because, unlike other medical radioisotopes, it simultaneously emits a beta particle that is useful for cancer therapy and a gamma ray that is useful for diagnostic medical imaging. These dual emissions enable, in principle, real-time imaging of the effectiveness of cancer treatment. Initial research with the use of  $^{67}\text{Cu}$  shows great promise in the treatment of non-Hodgkins Lymphoma, Ovarian, Bladder and Colorectal cancers. However,  $^{67}\text{Cu}$  has not been regularly supplied to medical researchers for several reasons. First,  $^{67}\text{Cu}$  is difficult and expensive to produce with conventional proton accelerators. Second, the purity of the  $^{67}\text{Cu}$  that has been produced has been unreliable.

To assess an alternative production technique, we investigated the production of  $^{67}\text{Cu}$  using bremsstrahlung gamma rays (photons) from conventional, copper-clad electron linear accelerators (linacs). These gamma rays, in turn, induce the nuclear reaction  $^{68}\text{Zn} + \gamma \rightarrow ^{67}\text{Cu} + \text{p}$ . The threshold energy for this photo-nuclear reaction requires photons of at least 9 MeV but, for high yields, a substantial portion of the photons should have energy greater than 20 MeV. Experimental measurements and theoretical calculations were completed to assess the production rate of this photo-nuclear process with bremsstrahlung from fixed-power 1 kW electron beams, with electron beam-energy ranging from 20 to 50 MeV.

Our results showed that copious quantities of  $^{67}\text{Cu}$  can be produced with conventional copper-clad electron linacs, and that the cost of photo-nuclear production is less than that of production with proton accelerators. In addition, we found good agreement between our theoretical calculations and experimental measurements. These results also showed that the photo-nuclear production of  $^{67}\text{Cu}$  increases monotonically with fixed-power electron beam energy. The incremental gain in photo-production, for fixed beam power, however, decreases as electron beam energy increases and the photo-nuclear production rate appears to approach a plateau of approximately 25  $\mu\text{Ci/g-kW}$ .

We conclude that photo-nuclear production of  $^{67}\text{Cu}$  via the  $^{68}\text{Zn} + \gamma \rightarrow ^{67}\text{Cu} + \text{p}$  reaction is potentially a viable alternative to current technique with proton accelerators. Further research is needed, however, to assess more realistic conditions associated with the tradeoffs between beam power and beam energy in copper-clad conventional electron linacs. Furthermore, research is needed to investigate the  $^{67}\text{Cu}$  purity issues associated with the separation of minute quantities of copper ( $\approx 1 \mu\text{g}$ ) from much larger samples of zinc ( $\approx 100\text{g}$ ).

## 7.4 Acknowledgements

Note that externally funded projects generally require, by contract, an acknowledgement of the financial support. These items must be placed in the acknowledgements and should include at minimum the agency and the project number. Consult with your major professor or the agency for the preferred form of the citation.

You may also use this section for personal acknowledgements to your major professor, committee, family, friends, or other people. If included, use a professional rather than personal writing style to match the rest of the document. Here is an example (indented for clarity only; use regular margins for your acknowledgements).

I would like to thank my major professor, Koff E. Bean, and my committee members Skinner Latte and Berr E. Muffin, for their guidance and advice on the research and the writing of this thesis. The Department of Defense donated the gas chromatograph used for characterizing the samples. The University of Maryland provided the use of its EDS Microprobe and SEM laboratory at no cost. Fellow students Chai Tee and Capp A. Chino provided invaluable assistance in the laboratory experiments and company on many late nights of work. My friends Nitro Brew, Pop Tart, Koffi Kake, and Lem N. Barr gave me much encouragement and inspiration to complete the work. Most of all, I thank my husband Josh and my daughters Tofi and Brittney for their unfailing love, patience, and support during this whole process.

This research was supported by National Science Foundation Grant (NSF-123456) and the Society of Creative Anachronism (SCA-7654).

Acknowledgements checklist

- External funding acknowledged with appropriate citation
- Personal acknowledgements written professionally in good taste

## 7.5 Table of Contents

The Table of Contents must identify all of the main components of the work listed in Section 2.1, with the correct page number for each. Proper use of headings in Word or in LaTeX makes it much easier to create and update the Table. If using manual methods, be sure that the final page numbers are correct after all edits have been completed.

Unlike the body text, the Table of Contents must be single spaced. However, a blank line should be placed between each main component as listed in Section 2.1, as well as between each chapter.

The section titles must be on the left side (with appropriate indentation to indicate the hierarchy) and the page numbers must be right-justified with a dotted leader line.

Heading numbers (as in this manual) are encouraged but are not required.

Chapter titles may be written in upper/lower case or in ALL CAPS at the author's discretion, but upper/lower case is usually easier to read.

Use the Table of Contents at the beginning of this document as an example of the correct format. The list of tables and list of figures should also follow this format.

Table of Contents checklist

- Lists all sections including Abstract, Acknowledgements, List of Tables, etc.
- Adheres to document guidelines for margins and fonts
- Single spaced, with a blank line between each chapter
- Indented to show section hierarchy
- Numbers right-justified with dotted leader lines

## **7.6 List of Tables**

The List of Tables section is required if the document contains any tables. It must include all tables in the document, numbered sequentially, regardless of whether the Conventional or Journal style is being used.

The List of Tables must start on a new page and may cross multiple pages if needed. It must be single-spaced, but no blank line is needed between the tables in one chapter and another.

Page numbers must be right-justified with dotted leader lines.

Do not place long, multi-line, explanatory captions in the List of Tables. If necessary, give each table a brief caption title in addition to any long explanations. See Section 6.5 for more information. If the even the short versions of the captions are longer than a single line, the caption must be single-spaced, although a small amount (3 to 6 pt.) of additional space between each caption is permissible and may help readability.

Example of the List of Tables:

Table 1. List of samples collected.....	6
Table 2. Summary statistics generated for the spring, summer, fall and winter sample collections .....	8
Table 3. Accuracy assessment of the fall-winter image classification .....	11

List of Tables Checklist (also applies to Lists of Figures and Equations)

- Starts on new page numbered with Roman numerals
- Adheres to document guidelines for margins and fonts
- Single spaced; small additional space between tables/figures/equations OK
- Page numbers right-justified with dotted leader lines
- Uses reasonably short titles, not extended multi-line captions
- Table/figure/equation numbers and page numbers checked for accuracy

## 7.7 List of Figures

The List of Figures section is required if the document contains any figures. It must include all figures in the document, numbered sequentially, regardless of whether the Conventional or Journal style is being used.

Formatting requirements for the List of Figures are the same as for the List of Tables.

## 7.8 List of Equations

The List of Equations section is optional. If included, it should follow the same formatting requirements as for the List of Tables.

## 7.9 List of Acronyms and Abbreviations

The List of Acronyms and Abbreviations section is optional. If included, it must start on a new page and follow the same guidelines for margins and fonts as the rest of the document. It typically consists of two columns with the acronyms listed on the left and the full terms on the right. No page numbers are indicated for the terms. The list may be double spaced or single spaced, but should fit on one page if possible.

Example:

USDA	United States Department of Agriculture
USGS	United States Geological Survey
ASPRS	American Society of Photogrammetry and Remote Sensing

## 7.10 Body of thesis/dissertation

The body of the thesis or dissertation must contain the chapters specified in Section 2.2 for either the Conventional style or the Journal style. The thesis/dissertation must follow one style or the other; no intermediate styles are allowed.

Follow the global formatting requirements detailed in Section 6.

Each chapter must start on a new page.

### Body checklist

- Double-spaced and conforms to margin and font specifications
- Conventional style is organized with these or similar chapters: Introduction, Theory/Literature, Methods, Results, Conclusion.
- Journal style includes Introduction and Conclusions chapters to tie the articles together
- Starts on page 1 (Arabic numerals) and is numbered consecutively throughout

## 7.11 Bibliography and References

The author may use either footnotes or references to a bibliography at the end of the thesis or dissertation. The Office of Graduate Education encourages preparation of theses/dissertations in a format suitable for submission for publication.

Bibliographic style (footnotes, references, citations, etc.) and type (mathematical notation, symbols, etc.) differ widely. The student should adopt the guidelines established by the candidate's department or professional society. The choice of style is determined by consultation with the candidate's major professor and committee. Ideally, the candidate should follow a format required by the publication to which he/she plans to submit the work.

However, if there is no specific format in a given field, and the candidate's department has no specific guidelines, use of the American Psychological Association (APA) style is encouraged. See <http://www.apastyle.org/> Appendix A contains a list of leading bibliographies and influential journals that may also be consulted when choosing a style.

In a Conventional style thesis/dissertation, all of the references are placed in the bibliography at the end of the document, and the citation method in the text must be consistent throughout.

If the author is using the Journal style, then each article has its own references in addition to the non-article bibliography section. It is preferred that the same bibliographic style be used throughout the thesis or dissertation, even if each article is intended for a different journal with different bibliographic styles. (Reformatting the bibliography in different styles is fairly easy using one of a number of bibliography programs.) However, if the author does not use such a program, it is not expected that the references be manually re-formatted, and each article may have a different style.

#### Bibliography checklist

- Conforms to margin and font specifications
- Chosen bibliographic style (Conventional) or styles (Journal) is/are consistently applied in each section
- In Journal style, Bibliography contains only the references in the Introductory and Conclusions chapters.

## 7.12 Appendices

Appendices are optional, but are recommended whenever the author wishes to include large data tables, computer code, numerous graphs, or other large compilations of information that would otherwise interfere with the smooth flow of discussion in the main text. If there is only one appendix, the title of the section should be Appendix, not Appendices.

Appendix pages must conform to the margin and font specifications for the entire document. The pages may be portrait or landscape but must follow the guidelines set in Section 6.5 and 6.6 for figures and tables.

Each Appendix should be identified with a letter (Appendix A, Appendix B, etc.), and each one should start on a new page. The page numbers must continue from the previous section and must be numbered sequentially throughout the entire set of appendices.

#### Appendix Checklist

- Journal style requires at least one appendix containing permission to reprint published articles (if applicable)
- Each appendix labeled with a capital letter (A, B, etc.) and starts on new page



- Consecutively numbered continuing from previous section

### **7.13 Vita**

A vita page must be included as the last page of all theses and dissertations deposited in the Devereaux Library. It is suggested that it be limited to one page. The vita is to be written in the third person using professional style and could contain the following information (although A and B may be omitted if the author is concerned about identity theft):

- A. Place and date of birth.
- B. Place and date of high school graduation.
- C. Place and date of college graduation—with degree and major.
- D. Place and date of receipt of master's degree—with major.
- E. Vocational and professional experience (not summer jobs)—including dates, nature of position, and school or organization.
- F. Military experience, with indication of professional relevance—if any.
- G. Scholarly publications, exhibits of creative work, membership in professional organizations and honorary societies.

#### Vita Checklist

- Written in professional style
- Arabic page numbers continued from previous section

## Appendices

### Appendix A. Some sources for bibliographic styles

The style of the principal abstracting journal or other major journals of the candidate's discipline is also a good guide for choosing a bibliographic style for a thesis or dissertation. Whenever possible, periodical titles should be abbreviated according to the standards outlined by the American National Standards Institute.

Some specific journals and bibliographies in various disciplines are listed below. It is not required to select a style from this list.

American National Standards Institute, Inc., American National Standard for the Abbreviation of Titles of Periodicals. 1970. (Z39.5-1969—which is a revision of Z39.5-1963).

Atmospheric Sciences: J. of the Atmospheric Sciences; Meteorological and Geostrophysical Abstracts

Chemical Engineering: Chemical Abstracts; Engineering Index.

Chemistry: Chemical Abstracts; Analytical Abstracts.

Civil Engineering: ASCE Publications Abstracts; Engineering Index.

Electrical Engineering: Electrical and Electronic Abstracts; Engineering Index.

Electronics and Communications Abstracts Journal.

Geology and Geological Engineering: Annotated Bibliography of Economic Geology; Bibliography and Index of Geology; Bibliography of North American Geology; Geological Society of America, Bulletin; Geophysical Abstracts.

Mathematics: American Mathematical Monthly; American Mathematical Society Proceedings; Mathematical Reviews.

Mechanical Engineering: American Society of Mechanical Engineers, Transactions. Series A to J; Engineering Index; Mechanical Engineering.

Metallurgical Engineering: American Institute of Mining, Metallurgical and Petroleum Engineers, Transactions. American Society of Metals, Transactions; Engineering Index; Metals Abstracts; Chemical Abstracts.

Mining Engineering: Geological Society of America, Bulletin; Mining

Engineering: Engineering Index, IMM Abstracts, Energy Research Abstracts.

Paleontology: Camp, Charles Lewis, Bibliography of Fossil Vertebrates, 1954-1958, Geological Society of America (New York), 1964. (Z6033/.P2/C342); Bibliography and Index of Geology.

Physics: Nuclear Science Abstracts; Solid State Abstracts Journal; Physics Abstracts; Physical Review A-D.

## Appendix B. Grammar assistance and helpful web sites

Helpful website addresses for research and writing tips:

- <http://www.wsu.edu/~brians/errors/errors.html>
  - For help on grammar mechanics
- <http://word.tips.net/>
  - Helpful tips on Microsoft Word
- <http://owl.english.purdue.edu/owl/>
  - Website includes an online writing lab and tips for ESL writers
- <http://www.sdsmt.edu/Campus-Life/Ivanhoe-International-Center/Current-International-Students/>
  - Contains a list of ESL web resources on the SD Mines Ivanhoe International Center's website
- <http://library.sdsmt.edu/quicklink.html>
  - As a member of the South Dakota Library Network [SDLN], holdings of the Devereaux Library as well as those of most South Dakota libraries are available online via the network. Search for specific journals in the library collection, or search holdings of more than 55,000 libraries worldwide.
  - EndNote is a commercial reference management software package, used to manage bibliographies and references when writing essays and articles. Normally EndNote costs hundreds of dollars per user; however, EndNote software is available at no charge to our students, faculty and staff through a state contract. Please contact the library if you are interested in this software.
- [www.latex-project.org](http://www.latex-project.org)
  - LaTeX is a document preparation system for high-quality typesetting. It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing.

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 PROOFREADERS' MARKS
 

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Symbol	Meaning	Example
☞ or ☞ or ☞	delete	take <del>it</del> out
⊂	close up	print as <u>one</u> word
☞	delete and close up	<del>close</del> up
^ or > or ˆ	caret	insert here <i>(something)</i>
#	insert a space	put one <sup>^</sup> here
eg#	space evenly	space evenly ^ where indicated
stet	let stand	let marked <del>text</del> stand as set
tr	transpose	change <u>order</u> the
/	used to separate two or more marks and often as a concluding stroke at the end of an insertion	
[	set farther to the left	<u>too</u> far to the right
]	set farther to the right	too <u>far</u> to the left
~	set as ligature (such as )	encyclo <u>p</u> ædia
=	align horizontally	<u>align</u> ment
	align vertically	align with surrounding text
x	broken character	im <u>per</u> fect
□	indent or insert em quad space	
¶	begin a new paragraph	
Ⓟ	spell out	set <u>5 lbs.</u> as five pounds
cap	set in CAPITALS	set <u>nato</u> as NATO
sm cap or s.c.	set in SMALL CAPITALS	set <u>signal</u> as SIGNAL

<i>lc</i>	set in lowercase	set <del>S</del> outh as south
<i>ital</i>	set in <i>italic</i>	set <u>oeuvre</u> as <i>oeuvre</i>
<i>rom</i>	set in roman	set <u>mensc</u> as mensch
<i>bf</i>	set in <b>boldface</b>	set important as <b>important</b>
= or -/ or $\hat{=}$ or /M/	hyphen	multi-colored
$\frac{1}{N}$ or <u>en</u> or /N/	en dash	1965–72
$\frac{1}{M}$ or <u>em</u> or /M/	em (or long) dash	Now—at last!—we know.
∨	superscript or superior	$\overset{2}{\pi}$ as in $\pi r^2$
∧	subscript or inferior	$\underset{2}{\text{H}}$ as in $\text{H}_2\text{O}$
∧ or ∨	centered	∧ for a centered dot in $p \cdot q$
↵	comma	
↵	apostrophe	
⊙	period	
⋮ or ⋮/	semicolon	
⋮ or ⋮	colon	
«» or «»	quotation marks	
(/)	parentheses	
[/]	brackets	
OK/?	query to author: has this been set as intended?	
↓ or ↓ <sup>1</sup>	push down a work-up	an unintended <del>mark</del>
⊙ <sup>1</sup>	turn over an inverted letter	inve <del>t</del> ed
wf <sup>1</sup>	wrong font	wrong si <del>z</del> e or styl <del>e</del>