This list is intended to assist those who prepare technical manuscripts, but who are not yet fully versed in the nuances that make such writing different from general writing style.

Engineers, on average, spend about 50% of our work-hours writing! Most of us ain’t good, natural writers; please join me in a continuous effort to improve our technical writing.

Employers of engineers routinely list “communication skills” as their #1 desired attribute in applicants. Effective writing is a major portion of these communication skills.

The purpose of technical writing is to successfully communicate our methods, ideas, designs, other results, and conclusions to our clients and other readers. Our writings are often preserved for posterity, whether we want them to be or not.

Due to the economic pressures of our age, publishers often do little or no editing of accepted manuscripts, except for formatting. So it is up to you, and worth your while, to make your writings of professional quality. For substantial writings, the publisher should send you a “proof” just before printing; you must review it very carefully, and return your as brief as possible comments swiftly so as not to delay or cancel publication.

Learning the conventions and rules of technical writing can be tedious, but once familiar with them technical writing becomes much easier.

If writing for a specific publication such as for a journal or magazine, a master’s thesis or Ph.D. dissertation, a competition, or a book or web publisher, before you start writing obtain and follow precisely the publisher’s rules and style conventions. These rules are often posted on their website, or printed within a journal itself, for example. Study several highest quality examples of what they have published recently to observe, and possibly mimic, successful writing styles.
Publishers’ and successful authors’ style preferences vary, but the ultimate guide to general publishing style is The Chicago Manual of Style (CMS) [The University of Chicago 2010]. Standard technical writing style does vary from general style, though.

Spoken American-English is different from that written. American-English varies somewhat from British-English, so be careful of spelling and terminology differences.

Assume a general technical audience for your writings. Your audience might or will be international, so be aware of I-P vs. SI units, dialect and cultural differences, etc. For example, there are different dollar currencies used worldwide, so “US$” or “USD” is clearer than just using the “$” symbol.

Technical writing is formal writing, so don’t use jargon, informal phrases, etc. And don’t use “etc.” – list all the items. And don’t start sentences with “And.”

Avoid commercialism. When wanting to mention a specific product use an equivalent generic term for it instead, and only cite the commercial source if absolutely necessary via your Reference list. E.g., use “gypsum wallboard” instead of “Sheetrock®.” But if a tradename cannot be avoided, e.g., in discussing the history of something specific, include the registered trademark (®) symbol with the first use of that term.

Use generous margins, normally one inch on each of the four sides of the page. However, if to be directly-reproduced and bound, make the lefthand margin wider, e.g., 1.25 or even 1.5 inches.

Use double line spacing for theses and dissertations, but 1.5 spacing for most other manuscripts. Use a single column of text per page. The publisher, in the final formatting, may do otherwise, e.g., use two columns and single spacing as is typical for academic journals.

Unless instructed to do otherwise, use a 12 point serif font such as Times-Roman for your text, and a bolded sans-serif font like Arial or Universal for figures’ and tables’ captions. Use bold for the manuscript’s title and its sections’ headings and subheadings.

Full-justification is usually preferred for the text portions of your technical writings. Hyphenate words, at their proper syllable-breaks, at the end of lines sparingly if at all.

All text, including captions and labels within figures, must read from the bottom or right side of the document and never from the left or top. Very wide figures or tables may be rotated 90 degrees counterclockwise, along with their captions, if placed on separate pages; no general text is to appear on such pages.

Don’t be hesitant to include extra blank spaces; e.g., vertically before and after lists, indented quotes, equations, or figures; or about showing figures or tables on separate pages, or making things larger if doing so will improve the readability of your manuscript. Again, the primary purpose is to convey your ideas successfully to the reader, not to save paper or bandwidth.
Indent the beginning of new paragraphs, or put a vertical space between paragraphs without the indents, but do not do both. The latter is done in this white-paper.

Avoid using one sentence paragraphs unless absolutely needed for very strong emphasis.

Avoid “widows and orphans” when your paragraphs extend from one page to another. Wordprocessing software often has “widow and orphan protection” available as an option.

Basic technical manuscripts include a Title, Abstract, Introduction, other main body sections, Results and Discussion, Conclusions and Recommendations, and References.

For long manuscripts, such as for books, theses, dissertations, or reports, include a separate title page and a Table of Contents. If there are many figures or tables, consider also including a Table of Figures or Table of Tables. For long writings, its chapters and other major sections, such as the Abstract, each begin on a new page. If a very long manuscript, such as for a book, create and include an Index; remember to update the Index’s page numbers so they are accurate for the as-printed version – do not assume that the publisher will make this last-second update.

Use present tense for the Abstract and future tense for the Recommendations, but past tense for almost everything else.

Be sure to provide transitions, usually via short paragraphs, between the main body’s sections to help guide the reader from one topic to the next.

The Abstract will often be the last major section of your draft that you write. Its purpose is to pique readers’ interest so that they will read the remainder of your paper, etc. So wet their appetites in the Abstract, but don’t give away the ending.

The main body of your manuscript will likely begin with the Introduction section or chapter. The first or maybe second paragraph of the Introduction should be your problem statement. In just a few sentences describe the big issues, but then funnel down quickly to the specific ones that your manuscript will address. The next portion of your Introduction is typically the literature review – use search tools such as Ei’s Compendex® and Google Search® to find relevant literature. For a very long manuscript the literature review is often in a separate chapter or section that follows the Introduction, and is commonly named Background.

After writing sections that describe your method, data, experiments or case studies, etc., the Results and Discussion section will present your findings. This portion of your manuscript is often data-intensive; consider using graphs instead of large tables for your results, for example, to assist the readers. Avoid small print in tables and figures that may be unreadable in the final product.
The main body of your technical manuscript will end with a Conclusions and Recommendations section or chapter. Note it is not the “Conclusion” (singular); the Conclusions (plural) portion of this section restates the conclusions that you drew and reported previously in your manuscript. No new concepts appear for the first time in Conclusions. The Recommendations portion of this section is your opportunity to suggest future work. After finishing the Abstract, Introduction, and Conclusions portions of your manuscript, you’ll likely notice that each of these discuss similar concepts, but in at least slightly different ways.

Include a short Acknowledgments section when the work was supported by others, or to recognize the assistance of other people who were not coauthors. For book and other very long manuscripts intended for wide distribution, including an About the Author(s) page is helpful for readers.

Always give credit where credit is due. Never put yourself in the position of being accused of plagiarism or other theft of intellectual property. This includes borrowed data for tables as well as equations and figures. Give complete references. Unless otherwise instructed by the publisher, use the author-year format in the text, e.g., [Rock 2013], and list all citations alphabetically by the first author’s last name in your References section, e.g.,


When there are two authors, show both last names and the year, e.g., [Smith and Brown 1998] in the text’s citation. If three or more, use the first author’s last name and “et al.” in the text, for example [Jones et al. 2005], but list all the authors’ names in your References entry.

Consider including a Bibliography section too, after the References, for any of your general readings that you didn’t specifically cite but may have influenced your work.

Appendices must be referred to in the main body, or not be included. If there is more than one appendix, label them Appendix A, Appendix B, etc., and put them in the order first mentioned. If there is only one appendix, it is the Appendix, and not Appendix A. Use appendices for bulky content that distracts from the flow of the main text. Footnotes are generally discouraged in technical writings, so use footnotes sparingly if at all.

Number the pages. In very formal publications, the first page of each new section is often not numbered, but all pages are counted even if a page number does not appear. Use lower-case Roman numerals, starting with “i”, for the cover pages, and Arabic numerals, starting with “1”, for the main body of the manuscript through the appendices, if any.
Use passive construction. And third-person only, so no I’s, me’s, we’s, they’s, our’s, one’s, etc. are used.

At the first use of an abbreviation, acronym, or initialism, spell it out fully then follow immediately with the abbreviation in parentheses. E.g., “The indoor air quality (IAQ) was of concern in the room.”

Symbols for variables that appear in the text are italicized and defined at first use. E.g., “The mass \( m \) of the Earth is slowly increasing due to meteor strikes.” If variables were not defined previously, include a list just after each equation with brief definitions and the units. Provide a Nomenclature or Symbols list too if many variables are used in the manuscript. For a very long manuscript a Terminology section may be beneficial too.

In the text use Arabic numerals for integers greater than about twelve, so use 13 instead of thirteen, and nine instead of 9. But if a number starts a sentence, always spell it out or rearrange the sentence.

For “camera ready” manuscripts; such as for theses, dissertations, and some books; their figures, tables, and equations must appear directly after first mention. For figures and tables, the best location is at the top of the next page rather than at the bottom of the current. For very formal writing that will be formatted by the publisher, do not imbed figures or tables within the text, and definitely do not wrap text around them in your manuscript. For such unformatted manuscripts, tables and then figures appear at the end of the manuscript, with only one per page. A separate page that provides all the table and figure captions may be required by the publisher.

For scholarly works that will be printed, avoid using color figures. Such are expensive and may be unreadable if published in only black and white. But for glossy magazines, web publications, sales literature, and presentations, color is very beneficial.

All figures and tables are numbered; traditionally figures are numbered with Arabic numerals, and tables are numbered with capital Roman numerals. Figures, tables, and equations must be mentioned in the text, or not be included. And, again, they appear directly after first mention in preformatted, fully-edited manuscripts intended for direct publication.

Instead of using “(see Figure 4)”, make such part of the sentence. E.g., “Figure 4 depicts the relationship between the costs and the years to payback for the available options.” Capitalize the “F” in figure and “T” in table when mentioning specific ones in your text.

Figures and tables must have captions, and they are usually in bold. Figures’ captions go below the figures, tables’ captions go above. A good caption is short but is descriptive enough so that the figure or table and its caption could be understood if separated from the text. A caption does not necessarily require a complete sentence; if not a complete sentence do not put a period at its end.
Equations are in bold and centered, and are labeled using right-justified numbers in parentheses, e.g.,

\[ E = mc^2 \]  \hspace{1cm} (1)

where:

\begin{align*}
E &= \text{energy, BTU or J} \\
m &= \text{mass, lbm or kg, and} \\
c &= \text{speed of light, ft/s or m/s}
\end{align*}

Note, as shown in the example above, that equations are usually presented as part of sentences, so punctuate accordingly. Also note that the full colon, “:”, is considered the terminator of a sentence. For the above if the colon did not appear after “where” then a period would be used after “m/s”.

For figures, tables, equations, quotations, etc. by others, provide citations in both the text as well as in the figures’ or tables’ captions; an exception is for things that are known to all. So Einstein’s 1905 paper could have been cited for Eqn. 1, above, but probably wouldn’t be given because the equation and its discoverer are so well known.

When needing to name specific software or other tools, but trying to avoiding commercialism, describe generically the item and cite instead its user’s manual in your References section. E.g., “A commercial HVAC load calculation program was used to determine the needed peak capacity of the equipment [Trane 2009]” in the text, and in your References section show:


Webpages can and do often change frequently, so cite the original, printed source of the information instead. If you cannot avoid citing something from the web or other nonpermanent, nonreadily-available source, obtain or print a hardcopy of that source and keep it in your files in case a reviewer asks about it, or when you or a reader needs to see it many years from now. Generally, “personal communications” or “letters” are not considered appropriate, citable sources for technical writing.

If you want to reuse copyrighted materials such as figure, tables, lengthy direct quotes, etc., you’ll need prior copyright permission from the copyright holder who is usually the publisher, not the author, of that material. If not available to you or too expensive, don’t use the material. For unusable figures, a solution may be for you to redraw them in a substantially different ways so that they become original. Remember that, with few exceptions, all published work is copyrighted even if the copyright symbol (©) or other statement does not appear.
Don’t state things parenthetically (like this). Instead, make them part of the sentences or create whole new sentences with the information.

“It’s” means it is, or it has. “Its” shows possession. It’s its color.

Latin’s “e.g.” means “for example”; “i.e.” is “that is”.

Datum is or was; data are or were.

Atria, and not atriums. So plenum/plena; auditorium/auditoria; gymnasium/gymnasia; etc.

Use because (a reason), since (a time), and like (not for “as if”) correctly.

Spell separate and parallel correctly.

Although convenient, “and/or” is not appropriate; “or” is correct for such situations.

Reduce wordiness, e.g., “in order to” should be “to,” “located at” should be “at,” and “prior to” should be “before.”

Fight redundancy, e.g., “10 a.m. in the morning” should be “10 a.m.,” and “exact same” should be “same.”

Use the percent symbol (%) instead of the word unless starting a sentence. So, for example, it’s 100% outside air.

Use the temperature degree symbol (°) instead of spelling-out “degrees.” However, degrees are not used with K, but are for °C, °F, and °R.

Other common math symbols, and the Greek alphabet, are available in your wordprocessing software, so use them; for MS Word®, use the “Symbol” link. However, many publishers unfortunately can’t or won’t accommodate overstrikes, so reconsider using overbars or dots, for example.

Despite strong opinions otherwise, using the serial comma is correct (CMS §6.18). So, for example, “The cars on the dealer’s lot were Fords, Toyotas, Chevys, and Hondas.” Not using serial commas, such as just after “Chevys” in this example, was a space- and lead-saving shortcut developed long ago by newspapers’ typesetters.

Experiencing writer’s block? Just write! Blurt it all out. Don’t worry about flow, corrections, or style until much later.
Save your work frequently. Back it up often too, e.g., at the end of each day.

Mark drafts with a large “DRAFT” at their beginnings to avoid problems; some organizations require that every page be marked with such. Only remove the DRAFT when submitting the final version for review or publication.

After you finish a draft leave it alone and do other things for as long as possible. Then come back and edit the draft – you’ll be amazed at all the improvements you’ll make with each revision after such breaks. Creative-writing conventions suggest doing this at least five times before submitting each manuscript.

When you’re satisfied with the draft have someone independent, but who is fluent in English, review it before submitting your manuscript. When you get the edits and comments back from reviewers do not take them personally – their intent is to help you make the manuscript better, or to inform you of prior work that you missed in your literature review. Research journals will often use the “double-blind” approach so that both the authors and the reviewers can be frank with their comments. Reviewers are obliged to be, but are not always fully constructive with their comments, so having a “thick skin” is beneficial. Always address every comment in your revised manuscript, or respond to the reviewer with why a particular change was not made; not doing either often results in rejection of the manuscript.

If submitting your manuscript via a hardcopy, create it using a laserprinter. But beware that changing printers often “repaginates” your document, so check its as-printed formatting carefully.

Acknowledgments

This list of technical writing hints, tips, and tricks includes advice from many people, a multitude of publications, and from several decades of reviewing manuscripts and having manuscripts reviewed. Some more-memorable sources were a high school creative writing teacher, a technical editor at a national laboratory, fellow students, and various academic advisors.

References