
DOCUMENT DESIGN

Automated announcement: [ding] There are 1,200 minutes of productivity remaining until the weekend. [ding]

—Visioneers (2008)

3.1 IN THIS CHAPTER

This chapter dives into the details of document design, sequentially reviewing formatting and visual design aspects of headings, equations, figures, and tables. This chapter builds on Section 2.4, Introduction to Document Design Tools. Not everyone needs this chapter. If you are an experienced professional who already has *STREAM Tools* templates at your disposal (in other words, a User, according to the definition given in Table 1.4), you should only need to take a cursory look at the material in this chapter, probably in order to refer the less experienced members of your team to it. If you are a Novice, you stand to benefit a great deal from the visual design aspects discussed here. Finally, if you are an aspiring Expert, this chapter is essential for you, as it will enable you to lead your organization when it comes to document design.

In several instances, the instructional approach taken in this chapter involves telling the reader “what not to do.” For example, we found that going through a list of common mistakes turns a Novice into a budding User very quickly. For further personal growth, the generic advice we present in this chapter about designing your documents should be supplemented by specialized advice in your field. For example, the requirements for drawings in patent applications differ substantially from the requirements of a trade magazine.

One final note: we discuss references (literature citations) in Chapter 4. This important subject is treated separately in Chapter 4 because it requires a separate software package and is not applicable to all writers.

3.2 CREATING TEMPLATES

If you or your team members desire to create templates, you have probably already made the transition from Novice to User, and perhaps to Expert. Creating templates requires that you consider all the elements of a document and that you avoid common mistakes as you create your template. In the sections that follow, we step through the major document elements and present frequent mistakes to help you to avoid making them yourself. In other words, the purpose of this section is to enable you to create templates from scratch in the event that other *STREAM Tools* templates are not available for your purposes.

3.2.1 Headings

Definition: Headings are the titles of chapters, sections, and subsections.

3.2.1.1 How to Create and Cross-Reference a Heading Template. There are two ways to make headings:

1. Copy an existing template.
2. Create a new heading.

To reuse an existing heading by copying one already in a template, see Section 2.4.2.1.

To create a new heading:

1. Type the heading text where you want it in the document.
2. While keeping the cursor on this heading line, click on the **Styles** ribbon in the **Home** tab, and pick the heading level you want.
3. To update the numbering and the table of contents, press **Ctrl-A** and then **F9**. Alternatively, if you’d like to use a shortcut to the above three steps, you can simply type **Ctrl-Alt-Number**, where the number corresponds to the heading level, to insert the next heading place-holder.

To cross-reference a heading:

1. Click **References** → **Cross-Reference** and select **Heading** from the drop-down menu.
2. Select desired heading for cross-referencing.
3. Select how much information you would like the cross-reference to include from the drop-down menu on the right. The most frequently used set of options for a typical writer is: *Insert reference to:* **Heading number**, uncheck *Insert as hyperlink*, and uncheck *Include above/below*. Naturally, those who write with the Web in mind may keep the option of inserting as a hyperlink. If you do not intend to use the hyperlink option, keeping the hyperlink on will only annoy you during future editing iterations.

3.2.1.2 How to Alter a Heading Template. Writing teams will often need to change the appearance of headings to meet the needs of a particular writing situation. The two most common changes include altering style (e.g., font and size), and altering format (e.g., numbering schemes).

To alter the heading style:

1. Highlight the heading.
2. Click the **Home** tab in the toolbar.
3. Select the heading level in the **Styles** ribbon.
4. Right click on the style and select **Modify**.
5. Alter the font, size, spacing, etc, in the dialogue box that appears.
6. Select **Automatically Update**.

Members of writing teams also frequently need to change the format of headings when using legacy content. For example, your team might need to change:

1. *Introduction.*

to the format:

Chapter 1. Introduction.

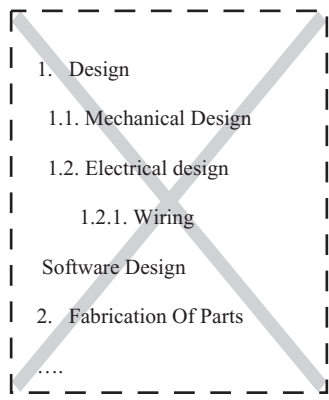
To alter the heading format:

1. Place the cursor on the heading text.
2. Click the **Home** tab, then press the arrow to the right of the numbering icon under **Paragraph**.
3. Select **Define New Number Format**.
4. In the *Number format* dialogue box, type the word “Chapter” before the auto-text number.
5. Arrange the spacing and punctuation around the auto-text as desired.
6. Click **OK** and **Yes** buttons to exit dialogue boxes.

3.2.1.3 Common Formatting Mistakes in Headings. The most common typesetting mistakes pertaining to headings include:

- *Manually numbering headings instead of creating automated templates.* While this approach works for short documents, it defeats the idea of automatic generation of the table of contents, and the automatic heading numbering. It also eliminates the ability to cross-reference the heading in text.
- *Excessive switching of fonts.* In most technical and scientific manuscripts, the font of the headings is the same as the font of the main text. Mixing serif and sans serif fonts in the same manuscript is generally not a good idea. Of course, if your publisher expects mixed fonts, follow their instructions.

3.2.1.4 Common Stylistic Mistakes for Headings. The following example contains several common stylistic mistakes. An analysis of these mistakes follows after the box. Shaded cross-bars indicate that this is an example that contains intentional errors.



PROBLEM 1: ORPHAN HEADINGS. The term *orphan heading* means that the list of headings on a certain heading level has only one entry. For example, heading 1.2.1 in the example above is an orphan. If there is no 1.2.2, then 1.2.1 should not exist. It is acceptable to have orphan headings during the writing stage, but it is important to make sure that no orphan headings exist in the final version of the manuscript.

PROBLEM 2: INCONSISTENT OR INCORRECT CAPITALIZATION. In the example above, both words are capitalized in heading 1.1, but only the first word is capitalized in the heading 1.2. Both capitalization schemes are frequently used, but writers should pick one and maintain consistency throughout the document by following a “style guide” (see Section 5.3.5.2).

In heading 2 of the example, the word “Of” is capitalized. The American English standard is to leave prepositions as lowercase (“and,” “of,” “for,” etc.) and articles (“a,” “the”).

3.2.1.5 *Tips and Tricks for Headings.*

MAINTAIN THE TABLE OF CONTENTS UNTIL THE LAST MOMENT. Long journal papers and research proposals usually do not require a table of contents. However, your team should keep the table of contents in the manuscript until submission time. Doing so helps your team develop the structure of the manuscript as it evolves by presenting the team with a birds-eye view of the document. You can delete the table of contents right before submission.

ALTER SPACE BEFORE AND AFTER HEADINGS.

To change the automatic spacing before and after heading:

1. Click on the **Home** tab.
2. Right click on the **Styles** ribbon corresponding to the heading of interest.
3. Click **Modify** → **Format** → **Paragraph**, and then change spacing as desired in the *Spacing selection* boxes.
4. Click OK in the open dialogue windows to get back to editing mode.

Note: Occasionally, formatting is not successful when you update your document. If this happens, try turning on Microsoft Word's "Formatting" view by clicking the paragraph symbol ¶. This view uncovers hidden formatting commands in Microsoft Word. From this view, confirm that you have selected all appropriate formatting elements, including those just before and just after the element you copied.

3.2.2 Equations

Most technical documents contain multiple formulas, so writing teams must either create new equations from scratch or alter existing formulas. In this section, we describe the two most efficient ways of creating equations as well as an efficient method for editing them.

3.2.2.1 *How to Create and Cross-Reference an Equation Template.*

STREAM Tools uses two methods for creating equations:

1. Copy the template equation (recommended for most cases).
2. Create a new equation template.

To reuse an existing equation by copying the template equation, see Section 2.4.2.2.

An equation consists of the equation (formula) itself and the equation number associated with it (unless it is an inline equation). Inline equations can be entered using MathType or equation editor. This sub-section covers numbered equations. In most cases, publishers expect that the equation itself is centered in the line, and the equation number is right-justified and enclosed in parentheses on the same line, like this:

$$E = mc^2$$
(1)

The following sequence teaches you how to create a template of a centered, numbered equation from scratch. It is a long process, but remember that you will not normally go through this process for every equation in every document. Instead, you will reuse the template already created as outlined in Section 2.4.2.2. Creating a new template equation requires first inserting the equation and then numbering it.

To insert an equation object:

- 1. Click **Insert** → **Equation** → **Insert New Equation**.
- 2. Write your equation in the window that appears in the body of the document.
- 3. Click on the arrow to the right of the equation window.
- 4. Click **Save as New Equation**.
- 5. Name the new equation in the *Create New Building Block* dialogue box.
- 6. Create placeholder parentheses for the equation number, by typing them after the equation. The equation and the parentheses jump to the left side of the page and look like this:

$E = mc^2$ ()

To create the equation number:

- 1. Place the cursor between the parentheses, and click **References** → **Insert Caption**.
- 2. Click the **New Label** button in the *Caption* dialogue box.
- 3. Create a new label “eq.”
- 4. The dialogue box under *Caption* will read “eq 1.”
- 5. Click **OK**.
- 6. The equation jumps back to the middle of the page and will look like this:

$E = mc^2$ (eq 1)

- 1. Remove letters “eq” and space between them and the numeral 1.
- 2. The equation will look like this:




$E = mc^2$ (1)

Note: “eq” is just an identifier; you could call it eq_grp1 instead and have multiple groups of equations that run independent of each other.

Adjust the font size and style of the caption to be consistent with the rest of your manuscript by clicking on the **Home** tab and then altering the font, size, etc. The equation will now look like this:

$$E = mc^2 \quad (1)$$

Now, you need to format the placement of the equation and its number.

1. Create a new style:
 - a. Place a cursor on the equation line to the left of the equation box.
 - b. Select **Home**, then **Styles**.
 - c. Click the down arrow with the line above, , it to display the *More Options* dialogue.
 - d. Select **Save Selection as New Quick Style**.
 - e. In the box **Name** write a name for this style, for example “EquationLine.”
 - f. Click **OK**.
2. Now, modify the new style to provide the alignment:
 - a. Confirm that your rulers are visible by selecting the **View** tab and then clicking the **Ruler**.
 - b. Select the centering tab, , by clicking the tab selector available on the top of the left ruler until the centering tab selection appears.
 - c. Place the centering tab on the ruler, in the middle of the line width.
 - d. Now, select the right-justified tab, , and place it on the right side of the ruler.
 - e. Enter two tab characters, one immediately before the equation but *not* in the equation box itself and one immediately before the left parenthesis of the caption.
3. Now, update the style:
 - a. Click **Styles**.
 - b. Right click the style called EquationLine.
 - c. Select **Update the EquationLine to Match Selection**.
 - d. Click **OK**. Your formula looks like this:

$$E = mc^2 \quad (1)$$

Again, you should only go through this lengthy procedure to create the equation template once (or not at all, if you use the provided template). For all subsequent equations, copy the template to the new location and reuse it. The equation numbers will update automatically upon entering **Ctrl-A, F9**.

Cross-referencing of equations was covered in Section 2.4.2.2, but we repeat it here with additional details. It is important to notice that auto-numbered captions for equations, figures, and tables are all created in a similar way. However, the cross-reference method for equations is *different* from that for figures and tables because, in order to cross-reference an equation, first you need to create a bookmark.

To create a bookmark:

1. Select the number on the right in the equation line.
2. Click **Insert, Bookmark**. Give this bookmark a short descriptive name that starts with “eq,” for example, eqNewtonsFirstLaw.
3. Click **OK**.



Then, to cross-reference the equation:

1. Click **Insert, Cross-Reference**.
2. Select *Reference type*: **Bookmark**.
3. Uncheck *Insert as hyperlink*.
4. Select *Insert reference to*: **Bookmark text**.
5. Pick the desired bookmark from the list.
6. Click **OK**.

3.2.2.2 How to Alter an Equation Template. The variety of alterations your team might make to the equation template depends upon the disciplinary requirements of your audience. However, two primary variations occur: switching from single to double columns in the manuscript, and switching from single numbering to dual numbering (e.g., changing from 1 to 1.1).

Switching from a single column to a double column (and back) manually is not a trivial task if you have many equations because the centering of equations and the alignment of equation numbers does not adjust automatically. In order to switch automatically, change the style settings in the equation template.

To switch to double columns:

1. Place the cursor on the line of one of the equations that will become the updated template.
2. Move the centering tab, , to the new desired location on the ruler in the center of the column.
3. Move the right-justified tab, , to the new desired location on the ruler in the column.
4. Now, update the style:

- a. Highlight the new equation template.
- b. In the **Styles** ribbon, right click the style called EquationLine.
- c. Select **Update EquationLine** to match selection.
- d. Click **OK**.

Long manuscripts such as books and dissertations require dual numbering of equations (as well as figures and tables). In order to switch between the dual-number style for longer manuscripts and a single-number journal style throughout the manuscript, follow this sequence.

To switch to dual numbering:

1. Click **References** → **Insert Caption**.
2. Pick the *Label* “eq.”
3. Click the **Numbering** button.
4. Select your preferences for the appearance of the caption (single or dual, dash or period between the numbers, etc.).
5. Click **OK** in all dialogue boxes.
6. Press **Ctrl-A, F9** to update the cross-references.

3.2.2.3 Common Formatting Mistakes for Equations.

- *Sloppy centering and justification.* Setting the position of the equation and number with strings of tab or space characters does not work well for camera-ready manuscripts. When each element is a few millimeters off from the alignment position, the entire document looks sloppy.
- *Inconsistent variable sizes.* The font size of variables should be proportional to the size of text and the font size of variables in equations should be the same as the font size of the variables in the text.
- *Using different fonts in equations and in text.* Novices are notorious for ignoring font conventions for variables when they use Microsoft Word. With novices, it is not uncommon to see “W” in the equation, “W” in another part of text, and “W” in figure caption, all referring to the same variable. While the font selection does not matter in undergraduate homework, it is important in rigorous technical and scientific writing. The distinction, for example, between a matrix, vector variable, or scalar variable is maintained through proper font selection. Microsoft Word users must apply a conscious effort to maintain a consistent style.

Here is an example of poor formatting:

$E = mc^2$ (1.1)

where m is mass..

3.2.2.4 Common Stylistic Mistakes for Equations.

- *Incorrect cross-referencing.* In the middle of the sentence, the equation numbers should be placed in parentheses and referenced without the word “equation.” The proper style for cross-referencing equations is:

“... substitution of (3) into (2) yields (4)...”

Examples of improper style:

~~“...substitution of equation 3 into equation 2 yields equation 4...”~~
~~“...substitution of 3 into 2 yields 4...”~~
~~“...substitution of [3] into [2] yields [4]...”~~

In the beginning of the sentence, the proper style is: “Equation 3 shows ...”

- *Forgetting to define variables.* All new variables that appear in the equation should be defined in the text, immediately following the equation.
- *Using subscripts and superscripts incorrectly.* Large variations exist between disciplines for subscript and superscript font conventions. Be sure to check the conventions for your field.
- *Confusing bookmark names.* A bookmark “eq14” will not work well because the equation is not likely to be equation number 14 an hour later. A bookmark “newt” will not work well either because it is too short and will mix with other bookmarks (including non-equation bookmarks). A bookmark “eq:NewtonsFirstLaw” will work well. It has “eq:”—an equation identifier, and a clear description of what it is. Spaces are not allowed in bookmarks; capitalization of individual words is a convenient alternative.
- *Bookmarking the parentheses next to the equation number.* Most of the time, highlighting parentheses with the equation number while creating a bookmark makes it more convenient to cross-reference the equation in the text. However, some publishers expect equations to be referenced in the text as “Equation 5 shows...” instead of “(5) shows...”, so including parentheses around “5” in the original bookmark will make typesetting more difficult. Therefore, parentheses should be kept as regular text both in the equation line and in the cross-referencing text.
- *Ambiguous display of units and use of incorrect units.* Although the standards for indicating units are delineated quite clearly for each scientific discipline,

many writers routinely ignore these standards. Conference committees are usually forgiving, and important publications are typeset by professionals who take care of errors automatically. On the other hand, with almost no additional effort you can follow the conventions of your field. Most technical publishers require the use of either SI (metric) units or, when necessary, dual units, including SI as well as other systems. Units representing ranges should be separated by the word “to,” as opposed to ellipsis (“...”) or dash (“-”). Examples:

Incorrect version	Correct version
... in the range from 200 to 400 lfm in the range of 1 m/s to 2 m/s (200 lfm to 400 lfm)
... the air velocity is 1-2 m/s the air velocity is 1 m/s to 2 m/s ...
... the air velocity is 1...2 m per second the air velocity is 1 m/s to 2 m/s ...

3.2.2.5 Tips and Tricks for Equations. If you have a lot of math in your manuscripts, your team should probably invest time in learning MathType and Microsoft Word keyboard shortcuts. Below is a list of frequently used shortcuts in both programs.

KEYBOARD SHORTCUTS IN MICROSOFT WORD. The following table lists some of the most useful keyboard shortcuts. Many other shortcuts are available and are listed in the help files for Microsoft Word.

Task	Shortcut
Apply Heading 1	Alt+Ctrl+1
Apply Heading 2	Alt+Ctrl+2
Bold	Ctrl+B or Ctrl+Shift+B
Copy	Ctrl+C
Cut	Ctrl+X
Field Codes	Alt+F9
Find	Ctrl+F
Hyperlink	Ctrl+K
Italic	Ctrl+Shift+I
Save	Ctrl+S
Subscript	Ctrl+=
Superscript	Ctrl+Shift+=
Undo	Ctrl+Z

Inserting Task

Task	Shortcut
Superscript	Ctrl+H
Subscript	Ctrl+L
Joint super/subscript	Ctrl+J
Underscript	Ctrl+T, U
Matrix template	Ctrl+T, M
<i>n</i> th root	Ctrl+T, N
Product	Ctrl+T, P
Summation	Ctrl+T, S
Absolute value	Ctrl+Shift+T, l
Root	Ctrl+R
Integral	Ctrl+I
Fraction	Ctrl+F
Slash fraction	Ctrl+/
Parentheses	Ctrl+(or Ctrl+9
Brackets	Ctrl+[
Braces	Ctrl+{
Overbar	Ctrl+Shift+Hyphen
Vector arrow	Ctrl+Alt+Hyphen
Tilde	Ctrl+~
Single prime	Ctrl+Alt+'
Double prime	Ctrl+Alt+''
Single dot	Ctrl+Alt+.

Inserting Space into Equations

Space Size	Shortcut
Zero space	Shift+Spacebar
1-point space	Ctrl+Alt+Spacebar
Thin space (one-sixth em)	Ctrl+Spacebar
Thick space (one-third em)	Ctrl+SHIFT+Spacebar

Inserting Symbols

Space Size	Shortcut
Arrow	Ctrl+K, A
Partial derivative	Ctrl+K, D
Infinity	Ctrl+K, I
Element of	Ctrl+K, E
Times	Ctrl+K, T
Not an element of	Ctrl+K, Shift+I
Contained in	Ctrl+K, C
Not contained in	Ctrl+K, Shift+C
Less than or equal to	Ctrl+K, <
Greater than or equal to	Ctrl+K, >

INSERTING GREEK CHARACTERS WITH THE KEYBOARD. When you're working in Equation Editor, typing **Ctrl+G** followed by a letter of the alphabet (shifted or not) inserts the corresponding Greek character. For example, **Ctrl+G, L** inserts, Γ .

ACCESSING SYMBOLS AND TEMPLATES WITH THE KEYBOARD. To access any palette, press **F2**, and then use the left and right arrow keys to move to the appropriate palette. When you reach the desired palette, press the down arrow key to open it. Select the desired item and press **Enter**. You may choose to record macros for the most frequent entries.

CONVERTING EQUATIONS FROM MATHTYPE TO TEX/LATEX. Some readers might need to maintain compatibility between their Microsoft Word documents and LaTeX documents because, for example, they have a subset of collaborators who use only LaTeX. MathType offers a convenient tool for converting Microsoft Word equations to LaTeX. To convert an equation from MathType to TeX or LaTeX, pick your preferences by clicking in the MathType window **Preferences, Translators, Translation to other Language (text)**. After setting your preferences, copy your equation from the MathType window into TeX/LaTeX window using the standard **Ctrl-C/Ctrl-V** (copy/paste) commands.

ENTERING TEX OR LATEX DIRECTLY. Starting with Microsoft Word 2007 and concurrent recent versions of MathType, it is now possible to type TeX or LaTeX commands directly into equation editors. This long-awaited feature ameliorates the complaints of many LaTeX users who feel that it is important for them to enter math without using the mouse. In addition, incorporating TeX/LaTeX features will produce, generally speaking, the most professional-looking output.

Presenting the entire array of the TeX/LaTeX language is beyond the scope of this book. However, if you are a novice, you can rely on the shortcuts described below to get started and supplement them with an occasional point-and-click of the mouse. You can also use the Toggle TeX command (**Alt+**) to turn what you have typed into an equation. Use it again to edit the TeX language. If you use a lot of math, you will eventually memorize all the commands that you use frequently. As you increase your expertise with TeX, you might even arrive at a point where you discover commands and possibilities that are not well documented.

Greek Letters

LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command
α	<code>\alpha</code>	π	<code>\pi</code>
β	<code>\beta</code>	σ	<code>\sigma</code>
δ	<code>\delta</code>	μ	<code>\mu</code>
γ	<code>\gamma</code>	ϕ	<code>\phi</code>
ϵ	<code>\epsilon</code>	η	<code>\eta</code>
ω	<code>\omega</code>	κ	<code>\kappa</code>
λ	<code>\lambda</code>	θ	<code>\theta</code>

Greek Letters *Continued*

LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command
ρ	<code>\rho</code>	ψ	<code>\psi</code>
τ	<code>\tau</code>	υ	<code>\upsilon</code>
ξ	<code>\xi</code>	Δ	<code>\Delta</code>
χ	<code>\chi</code>	Γ	<code>\Gamma</code>
\omicron	<code>\omicron</code>	Π	<code>\Pi</code>
Σ	<code>\Sigma</code>	Φ	<code>\Phi</code>
Λ	<code>\Lambda</code>	Ξ	<code>\Xi</code>
Θ	<code>\Theta</code>	Ψ	<code>\Psi</code>
Ω	<code>\Omega</code>	φ	<code>\varphi</code>
Υ	<code>\Upsilon</code>	ζ	<code>\zeta</code>

Loglike Symbols

LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command
\arcs	<code>\arcs</code>	\csc	<code>\csc</code>	\ker	<code>\ker</code>	\min	<code>\min</code>
\arcsin	<code>\arcsin</code>	\deg	<code>\deg</code>	\lg	<code>\lg</code>	\Pr	<code>\Pr</code>
\arctan	<code>\arctan</code>	\det	<code>\det</code>	\lim	<code>\lim</code>	\sec	<code>\sec</code>
\arg	<code>\arg</code>	\dim	<code>\dim</code>	\liminf	<code>\liminf</code>	\sin	<code>\sin</code>
\cos	<code>\cos</code>	\exp	<code>\exp</code>	\limsup	<code>\limsup</code>	\sinh	<code>\sinh</code>
\cosh	<code>\cosh</code>	\gcd	<code>\gcd</code>	\ln	<code>\ln</code>	\sup	<code>\sup</code>
\cot	<code>\cot</code>	\hom	<code>\hom</code>	\log	<code>\log</code>	\tan	<code>\tan</code>
\coth	<code>\coth</code>	\inf	<code>\inf</code>	\max	<code>\max</code>	\tanh	<code>\tanh</code>

Miscellaneous Symbols

LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command
$\sqrt{}$	<code>\surd</code>	\forall	<code>\forall</code>
\spadesuit	<code>\spadesuit</code>	∂	<code>\partial</code>
∞	<code>\infty</code>	\natural	<code>\natural</code>
\blacktriangle	<code>\blacktriangle</code>	\exists	<code>\exists</code>
\blacktriangledown	<code>\blacktriangledown</code>	\aleph	<code>\aleph</code>
∇	<code>\nabla</code>	\parallel	<code>\parallel</code>

Arrows

LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command
\leftarrow	<code>\leftarrow</code>	\leftrightarrow	<code>\leftrightarrow</code>
\uparrow	<code>\uparrow</code>	\updownarrow	<code>\updownarrow</code>
\rightarrow	<code>\rightarrow</code>	\Leftrightarrow	<code>\Leftrightarrow</code>
\nearrow	<code>\nearrow</code>	\Rightarrow	<code>\Rightarrow</code>
\searrow	<code>\searrow</code>	\Downarrow	<code>\Downarrow</code>
\downarrow	<code>\downarrow</code>	\Uparrow	<code>\Uparrow</code>

Binary and Operational Symbols

LaTeX Symbol	LaTeX Command	LaTeX Symbol	LaTeX Command
\leq	<code>\leq</code>	$*$	<code>\ast</code>
\geq	<code>\geq</code>	$<$	<code><</code>
\bullet	<code>\bullet</code>	$>$	<code>></code>
\prod	<code>\prod</code>	\dagger	<code>\dagger</code>
\sum	<code>\sum</code>	\mid	<code>\mid</code>
\blacktriangleleft	<code>\blacktriangleleft</code>	\div	<code>\div</code>
\blacktriangleright	<code>\blacktriangleright</code>	\ddagger	<code>\ddagger</code>
\approx	<code>\approx</code>	\perp	<code>\perp</code>
\in	<code>\in</code>	\notin	<code>\notin</code>
\neq	<code>\neq</code>	\times	<code>\times</code>
\oplus	<code>\oplus</code>	\otimes	<code>\otimes</code>
\equiv	<code>\equiv</code>	\oslash	<code>\oslash</code>
\supset	<code>\supset</code>	\supseteq	<code>\supseteq</code>
\subset	<code>\subset</code>	\supseteq	<code>\supseteq</code>
\subseteq	<code>\subseteq</code>	\varsubsetneq	<code>\varsubsetneq</code>
\pm	<code>\pm</code>	\therefore	<code>\therefore</code>

Note: Occasionally, formatting is not successful when you update your document. If this happens, try turning on Microsoft Word’s “Formatting” view by clicking the paragraph symbol ¶. This view uncovers hidden formatting commands in Microsoft Word. From this view, confirm that you have selected all appropriate formatting elements, including those just before and just after the element you copied.

3.2.3 Figures

Since nearly every technical document contains figures, learning how to create and edit them efficiently should be one of your team’s main document design goals. In the sections that follow, we discuss in detail the *STREAM Tools* method of creating and cross-referencing figures as well as the *STREAM Tools* method of altering a figure template.

3.2.3.1 How to Create and Cross-Reference a Figure Template. Before beginning your work with figures, it is important to understand that what we would consider one figure actually consists of two independent objects that happen to sit next to each other, the caption and graphic. Each of these are manipulated separately, but if you use the methods described below, the graphic and the caption will “travel” together in your document as one linked unit.

There are two ways to create figures:

- 1. Copy a template figure (recommended for most cases).
- 2. Create a new figure from scratch.

To reuse an existing figure by copying the template figure and caption, see Section 2.4.2.3. Section 2.4.2.3 also lists the entire procedure for copying and pasting graphics, so we won't cover that again here. *However*, remember to use **Paste Special** for line art (as opposed to Bitmaps) because using **Paste Special** gives you a chance to edit figures later without saving them to a separate file. Using **Paste Special** also increases the odds that your figure will remain compatible with the work of other writers. The most common selection that works well for **Paste Special** is *Picture (Windows Metafile)*, although this is not a foolproof selection. You may have to experiment with your pasting procedures to make the graphics look right.

Sometimes the fine features of the line art get distorted with **Paste Special**, and this problem can be fixed by inserting a .png file created by a graphics package (Corel Draw, for example). To insert a .png file, insert your cursor at the position where you'd like the image to appear, select the **Insert tab** → **Picture**, navigate to the image you'd like to insert and click **Insert**. The selected image will be placed at the position of the cursor. Most likely, your file size will grow more if you use .png source file rather than .wmf or .emf.

To cross-reference a figure once you have copied the template and pasted in a new graphic (or created one):

1. Click the **References Tab** → **Cross-Reference**.
2. Select *Reference type*: **Figure**.
3. Uncheck *Insert as hyperlink*.
4. Select *Insert reference to*: **Only label and number**.
5. Pick the desired figure from the list and click **Insert**.

3.2.3.2 How to Alter a Figure Template. Aside from altering the actual graphic in the figure, writers frequently need to edit the caption style or numbering style because the *STREAM Tools* templates use a different style. The steps for altering the figure template's caption styles appear below.

TO CHANGE THE CAPTION STYLE. Of the needs for changing the figure templates, writers most often need to change the caption style. For example, your team might need to change the figure caption style from "Figure 1" to "Fig. 1." This change can be accomplished in several ways, but the most portable method is to manually change the caption's text from "Figure 1" to the text "Fig. 1" directly in the caption without creating a new label. After updating the entire document with **Ctrl-A, F9**, all cross-references will be updated according to the new style.

TO CHANGE THE NUMBERING STYLE. While many different instances of changing a numbering style might occur, one of the most common is switching from a single number ("Figure 2") to a dual number ("Figure 2.1") This change occurs most often when writers transition from a shorter document such as a journal article or stand-alone report to a thesis or longer document that has several major sections or chapters. To change between the styles:

1. Select one of the caption numbers that you'd like to update.
2. Click the **References Tab** → **Insert Caption** → **Numbering**.
3. Select your preferences for the appearance of the caption in the dialogue box.
4. Click **OK** in all dialogue boxes and the caption changes to reflect the styles you chose.
5. Press **Ctrl-A**, **F9** to update the cross-references in the entire document.
6. Confirm that your changes have occurred in other parts of the document.

3.2.3.3 Common Formatting Mistakes in Figures

- *Forgetting to reference and explain the figure.* Each figure should be mentioned in the text *before* its first appearance in the manuscript and each figure should be explained in the text carefully to highlight the important points it shows. Finally, the figure should ideally be placed as closely as possible to the introductory and explanatory text.
- *Using excessive resolution.* Including a multi-megabyte photo when a much lower resolution option would suffice is not a problem when there are only a couple of images in the manuscript. However, if a document contains scores—or even hundreds—of images, having too many memory-hungry figures will become a problem for working with the document. In general try to keep your documents as lean as possible while retaining high enough resolution for the printing needs.
- *Using corrupted fonts.* Many mainstream plotting software packages label vertical axes in such a way that they look good on the screen but become corrupted when pasted into Microsoft Word. This problem most frequently occurs when writers produce figures using MS Excel. Why this happens is outside of the scope of this book, but below we will describe a sensible procedure to fix this problem when it occurs.

Suppose your source is Excel; you want to label the x -axis and the y -axis of a two-dimensional graph, add arrows and short comments to the picture, and paste the result into Microsoft Word. In the process, you discover that your y -axis looks unattractive in Microsoft Word, and that the arrow pointers have inexplicably moved to a different location. Your best option is fix the graphic in CorelDraw.

TO CHANGE A GRAPHIC IN CORELDRAW.

1. Generate your plot, with axis titles and all other features in MS Excel.
2. Select and **Copy** the entire graph from MS Excel.
3. **Paste Special**, as **Picture (Metafile)**, into CorelDraw.
4. Click the **Ungroup** button.
5. Delete the corrupted elements.
6. **Select All**.
7. Click **Arrange** → **Convert to Curves**. You will not be able to edit your text directly after that. Instead, should you need to make changes, you will have

to remove the label, type new text, rotate it as needed, and convert it to curves again.

8. Select All.
9. **Copy** the entire graph from CorelDraw.
10. Switch to Microsoft Word. **Paste Special** your graphic, following the procedure described in Section 2.4.2.3.
11. Save your CorelDraw graph if you choose so. However, it is not necessary, as you will be able to copy this graph from Microsoft Word, put it back in CorelDraw, and edit it again—as long as you used **Paste Special** in the previous step.

DISTORTING THE FIGURE. If the figure is too big or too small, change the size by pulling on the corner of the figure—not on the side—so that the height-to-width ratio is preserved. If you need to present several figures that are all exactly the same size:

1. Right click on the graphic.
2. Click **Format Picture**.
3. Pick the **Size** tab, change **Scale** to the same number for all figures.
4. Confirm that a checkmark appears in front of the **Lock Aspect Ratio** menu line.

ATTEMPTING TO USE FIGURES WITH TEXTBOXES. Figure captions and textboxes do not get along. A caption placed in a textbox is usually not seen by the Table of Figures, frequently does not follow auto-numbering settings, and can create many other problems. Therefore, avoid placing captions inside textboxes. The implications of this peculiarity can severely impact your documents. If you want to embed a figure side-by-side with text instead of using it to break up blocks of text, you have to resort to a multi-column approach rather than using textboxes. In this case, you would turn a portion of your single-column document into a double-column, with enough text to fill the left side of the page, and manually place the figure on the right side of the page. Alternatively, you can place your figures inside a table and then make the table borders invisible. The latter method offers you a bit more flexibility on figure sizing but takes longer to set up and does not work well with text/figure combinations. Giving up textboxes might be quite difficult for some of your co-workers, but the efficiency gained by using auto-text features of Microsoft Word, especially when multiple people work on a document, far outweighs the benefits of using text boxes.

3.2.3.4 Common Stylistic Mistakes in Figures

GRAPHIC ELEMENTS ARE TOO SMALL. As a general rule of thumb for figure elements, make sure that all elements in the figure are visible when the figure is shrunk to double-column paper format, in other words, when the figure spans only half-page width. If all elements are easily distinguishable in the double-column format, they will

also be large enough for PowerPoint Presentations and bold enough for making photocopies. For each element, particularly check the following items:

- Line thickness
- Size of arrowheads
- Marker size (squares, dashes, triangles)
- Font size in graphs. Notice that default settings in MS Excel and Matlab lead to font sizes that are too small for double-column display.

USING A SERIF FONT TYPE. Unless specified otherwise by the publisher, use Arial or a similar font for labels in your figures. Whatever you use, the font should be sans serif, common and recognizable, not too narrow, and easy to read. The default Times New Roman is not optimal for figures because the serifs (the small lines at the end of each letter-stroke) become “gummed up” when reproduced. An important exception is figures for patents—requirements for those differ from general requirements for figures for journal and conference papers and books. Refer to the patent guidelines for these specifications.

USING COLOR INAPPROPRIATELY. Remember that publications are mostly black and white so that even if the original document contains color elements, readers will often print or reproduce a manuscript in black and white. Therefore, red and blue lines in the graphic that look great in Power Point will be indistinguishable in print. For the same reason, referring to a “red line” in the text is meaningless if your graph is black and white in the printed copy of the manuscript. Rather than using color for manuscripts destined for print, consider using non-color-based markers in your figures, such as hash marks or triangles, which can distinguish features in a way that is easily reproducible in black and white. You should still use colors in addition to using markers, in order for the graph to look its best when color viewing is available.

FUZZY IMAGES. Lines must be crisp. Use line art, not bitmaps, whenever possible.

“AS SHOWN IN FIGURE 1 ...” The preferred usage is “Figure 1 shows...” or “... *explanatory text* (see Figure 1).”

MIXING LABELS AND CAPTION STYLES. One should pay attention not to mix labels, such as “Figure” and “Fig.” in the same manuscript. This problem arises frequently, for example, when two conference papers are being combined into a journal paper. For ways to create consistency in your document, see Section 5.3.5.2.

MEANINGLESS OR REPETITIVE CAPTIONS. The caption “*Figure 12. Temperature vs. Humidity*” is not a good caption if temperature and humidity correspond to the axes already indicated in the graph. Whenever possible, captions should be concise and informative rather than simply descriptive, because the caption can add meaning or

interpretation to the text. In the example above, a better caption would be “*Figure 12. Glass transition consistently takes place earlier than predicted by theory.*” A good caption briefly summarizes the importance of the figure.

DUAL CAPTIONS. The default settings in plotting programs, such as MS Excel or Matlab, often place captions or titles above a figure, which are then incorporated into the figures themselves when they are imported into Microsoft Word. The figure in the manuscript should *not* be double-captioned. If this happens, touch up the figure by removing the caption in the native graphic. Additionally, the convention holds that figure captions should be below the graphic, not the above it, so, unless your publication guidelines specify otherwise, place figure captions below the graphic. (Note that table captions, on the contrary, are usually placed above the table.)

SHOWING A 3D PLOT FROM A BAD ANGLE. Three-dimensional plots must show salient features of the data rather than simply functioning to make figures “pretty.” If a 3D component does not add to the information value of the figure, then eliminate the 3D aspect entirely. If, however, the 3D aspect does help readers discern the meaning of a figure, the plot should be rotated into the most advantageous viewing position. Likewise, multiple 3D plots with the same axes should be shown from the same angle for ease of comparison. In general, however, your team should seek to avoid 3D plots when possible, because they tend to confuse readers more than they assist with understanding. With that said, there are many cases when 3D representation is truly the most appropriate for the data.

3.2.3.5 Tips and Tricks for Figures. Microsoft Word does not replicate some of the more powerful figure positioning capabilities of LaTeX and some of Microsoft Word’s abilities might not be suitable for very long technical manuscripts. However, it is possible to overcome many limitations of Microsoft Word with clever formatting. We discuss the most important of these below.

ORPHAN CONTROL. The figure and its caption should stay on the same page. If part of a caption runs over to the next page, it is called an “orphan.” The *STREAM Tools* template file is already formatted to prevent that from happening. However, if you’ve created a new template, and wish to enable orphan control (and we recommend you do), force the caption to attach to the graphic above it this way:

1. Select both the graphic and the caption.
2. In the **Paragraph** ribbon.
3. Select **Line and Page Breaks**.
4. Select the boxes **Keep with next** and **Keep lines together**.

As a result, you may end up with a block of white space on the previous figure. Unfortunately, we cannot recommend an elegant solution to this problem. Microsoft Word does not come even close to LaTeX when it comes to figure positioning. Our experience is that paragraph text may have to be moved around in the nearly final

version of the manuscript in order to optimize figure placement. Despite this inconvenience, figure placement problems in Microsoft Word do not propagate too far into subsequent pages, whereas in LaTeX, a difficulty with placing one figure may affect many figures downstream.

FIGURE POSITIONING. The individual preferences (and publisher requirements) for figure positioning vary widely. The procedures described above work for figures that occupy the entire width of text and do not need to be pushed to the top or bottom of the document. In a single-column document, if the figure is narrow and page-space needs to be conserved, a viable option is to switch to a double-column format, either grouping two figures together or placing text to one side of a lone figure. An equally convenient method is to create a table with two rows and two columns, filling out the top row with graphics and the bottom row with the corresponding text captions. After that, make table borders invisible to give the document a more seamless appearance. In general, try to avoid mixing single and double column templates because it will add complication to your team's process.

Some users prefer to place figures with their captions inside textboxes. The advantage of this approach is that the textbox can be pinned to a specific location, for example, at the bottom of the page, allowing the remaining text to wrap around the figure. Unfortunately, while textboxes allow for better control of figure positioning, they are not compatible with figure caption auto-numbering. Until this problem is fixed in the software, we do not recommend using textboxes for figure positioning in long documents.

CROSS-REFERENCING A REMOTE FIGURE. If the figure is located far away in the manuscript, help the reader by using the style "Figure 18 on page 132 shows ..." Naturally, the page number should be an auto-text. You can do it by clicking **References**, **Cross-reference**, selecting *Figure* in the *Reference type box*, and selecting *Page number* in the *Insert reference to box*. Ideally, however, your figures should be located as close to the text that describes them as possible to assist readers.

ERROR! MESSAGES. Unfortunately, automatic cross-referencing of figures and tables in Microsoft Word is far from foolproof. Often, the auto-text cross-references disappear during editing stages, and are replaced with text reading "**Error! Reference source not found.**" This happens most frequently when auto-text is copied to two locations and the references become ambiguous, colliding with each other. For example, suppose you begin with a piece of text that references Figure 4. You copy Figure 4 and its caption to a new location in the document, and after updating the cross-references, the new instance of Figure 4 becomes Figure 1. But what can you say about text references to the figure? Microsoft Word has no way of knowing whether your intent is to reference the initial Figure 4 or the clone Figure 1. Depending on the sequence of your text updating, you may get error messages. It is prudent to search the final version of the document for the text "Error!" to see if any such problems have arisen during the final stages of editing.

Note: Occasionally, formatting is not successful when you update your document. If this happens, try turning on Microsoft Word’s “Formatting” view by clicking the paragraph symbol ¶. This view uncovers hidden formatting commands in Microsoft Word. From this view, confirm that you have selected all appropriate formatting elements, including those just before and just after the element you copied.

3.2.4 Tables

Like figures, tables are common and important elements in technical documents, and they need to be easily editable by all contributors. In this section, we describe the *STREAM Tools* method for creating and editing tables.

3.2.4.1 How to Create and Cross-Reference a Table Template. The logic behind creating and positioning tables is the same as for figures. Therefore, before beginning your work with tables, it’s important to understand that each table actually consists of two independent objects that happen to sit next to each other—the caption and the tabular information (table). Each of these are manipulated separately, but if you use the methods described below, the tabular information and the label will “travel” together in your document as one linked unit.

There are two ways to create tables:

1. Copy the template table (recommended for most cases).
2. Create a new table.

To reuse the existing table by copying the template table its caption, see Section 2.4.2.4. Section 2.4.2.4 also lists the entire procedure for copying and pasting tables so we won’t cover that again here. After you have inserted a table, you will want to reference it somewhere in the text.

To cross-reference a table:

1. Click the **References Tab** → **Cross-Reference**.
2. Select *Reference type:* **Table**.
3. Uncheck *Insert as hyperlink*.
4. Select *Insert reference to:* **Only label and number**.
5. Pick the desired table from the list and click **Insert**.

3.2.4.2 How to Alter a Table Template. Aside from altering the actual content of the table, writers frequently need to edit the caption style or numbering style to be different from the *STREAM Tools* templates. The steps for altering a template’s caption style appear below.

CHANGING THE NUMBERING STYLE. While many different instances of changing a numbering style might occur, one of the most common is switching from a single number (“Table 2”) to a dual number (“Table 2.1”). This change occurs most often when writers transition from a shorter document such as a journal article or stand-alone report to a thesis or longer document that has several major sections or chapters. To change between the styles:

1. Select one of the caption numbers that you’d like to update.
2. Click the **References Tab** → **Insert Caption** → **Numbering**.
3. Select your preferences for the appearance of the caption in the dialogue box.
4. Click **OK** in all dialogue boxes and the caption changes to reflect the styles you chose.
5. Press **Ctrl-A, F9** to update the cross-references in the entire document.
6. Confirm that your changes have occurred in other parts of the document.

3.2.4.3 Common Typesetting Mistakes.

TABLES RUN ACROSS MULTIPLE PAGES. Obviously, you want your tables to be as concise as possible, and sometimes where you place a table in the text causes it to run across multiple pages. To prevent this from happening:

1. Select the entire table.
2. Click **Page Layout** → **Breaks**.
3. Select **Next Page** under Section Breaks.

Occasionally, your team might need to generate large tables that travel across pages. If this is the case, first ask whether the table can be divided into several, smaller tables to highlight salient features in greater detail. If the table must be large, then be sure to break the table at a new column/row rather than in the middle of a column/row. Likewise, on the new page, retype the headings for the column/row in case the pages of the table are somehow separated or users can’t view them as a single larger sheet (as in a bound book).

POOR ALIGNMENT WITHIN THE CELLS. Be judicious when selecting alignment options within the cell (right-justified, left-justified, or centered). The goal should be to make the table as readable as possible.

3.2.4.4 Common Stylistic Mistakes in Tables.

OMITTING UNITS AND VARIABLE NAMES IN THE TABLE HEADINGS. Include the variable name, variable symbol, and the units of that variable in every table so that readers can be certain of the table’s meaning.

PLACING UNITS IN EVERY CELL RATHER THAN IN THE ROW OR COLUMN HEADING. While units are necessary, if the units are the same for all entries in the table column, place them in the heading of that column rather than after each entry. It makes the table more concise and easier to read.

USING TOO MANY LINES (RULES) IN A TABLE. Writers typically include far too many lines in the tables they create, thinking that the extra rules will help readers sort among items. In fact, the rules frequently cause the exact opposite reaction as readers get bogged down in searching the boxes. Aspire to design elegant tables where the data can be presented completely, but also with as little intrusion as possible by nondata elements such as rules. Use rules only when absolutely necessary, such as separating heading text from the columns/rows.

TYPE IS TOO SMALL. Be sure that your table can be read when reproduced. Technical tables often contain a great deal of data and consequently writers frequently shrink type to fit more data into the table. This mistake leads readers to become frustrated as they study a table and can present problems when the table is reproduced. For example, after photocopying or shrinking a document, a six (6) might begin to look like an eight (8). Choosing the right font size will help your team as you strive to create smaller, clearer, more focused tables rather than larger, more expansive ones that attempt to cover too much data at once.

“AS SHOWN IN TABLE 1 ...”. The preferred usage is “Table 1 shows...” or “... *the text of the sentence* ... (see Table 1).

MEANINGLESS OR REPETITIVE CAPTIONS. Just as with figures, the caption “*Table 12. Humidity Levels*” is not a good caption if humidity corresponds to the rows or (more likely) the columns already indicated in the table. Captions should be concise and informative rather than simply descriptive whenever possible because the caption should add meaning or interpretation to the text. In the example above, a better caption would be “*Table 12. The humidity levels changed over time as predicted*” because it briefly summarizes the importance of the table.

TABLES LABELED AT THE BOTTOM. General conventions state that table captions should be above the table and not below. Unless your publisher’s guidelines suggest otherwise, place the table caption above the table. (Note that figure captions, on the contrary, are normally placed below the figure).

3.2.4.5 Tips and Tricks for Tables.

ORPHAN CONTROL. The table and its caption should stay on the same page. If part of the table or the caption runs over to the next page, it is called an “orphan.” The template file is already formatted to prevent that from happening. In order to force the lines to stay together:

1. Select both the graphic and the caption.
2. In the ribbon **Paragraph**.
3. Select **Line and Page Breaks**.
4. Select boxes **Keep with next** and **Keep lines together**.

TABLE POSITIONING. The individual preferences (and publisher requirements) for table positioning vary widely. For a document written in double-column format, it is acceptable to switch to a single-column format if the table is very wide. However, in general, you should avoid mixing single and double column templates, because it will complicate your team's process.

CROSS-REFERENCING A REMOTE TABLE. If the table is located far away in the manuscript, help the reader by using the style "Table 18 on page 132 shows ..." Naturally, the page number should be an auto-text. You can do it by clicking **References**, **Cross-reference**, selecting *Table* in the *Reference Type* box, and selecting *Page number* in the *Insert reference to* box.

3.2.5 Front Matter

Long documents such as theses or books often require so-called front matter, such as a preface, acknowledgments, or table of contents. The headings for these sections are usually treated differently from the main document headings because they are generally numbered in Roman numerals while the main text must be numbered with Arabic numerals. The following two sections discuss how to create a template that does exactly these things so that your team can quickly embark on creating longer documents.

3.2.5.1 Controlling Page Numbers. In order to number the initial portion of your manuscript in Roman numerals, first make sure that your document has page numbers.

To insert page numbers:

1. Click the **Insert** tab in the **Header & Footer** group, click **Page Number**.
2. Pick your preference, for example, Bottom of the Page.
3. Pick your desired appearance.

You now have the entire document numbered sequentially. Next, you need to break it in two sections, so that the first section will have Roman numerals and the second section will have Arabic numerals. To accomplish this, you need to introduce a section break between the section that will be Roman-numbered and the section that will be Arabic-numbered.

To create section breaks:

1. Place the cursor at the end of the portion that is supposed to be Roman-numbered.
2. On the **Page Layout** tab, in the **Page Setup** group, click **Breaks**.
3. In the **Section Breaks** group, select **Next Page**. This inserts a section break between the two pages.
4. Keeping the cursor in the first section, on the **Insert** tab in the **Header & Footer** group, click **Page Number**, and select **Format Page Numbers**. Next to the **Number Format**, select **Roman numerals**.

At this point, everything is set, except your Arabic numerals for the second section need to restart from page 1, currently, the numbering simply continues from the first section. For example, if your last Roman numerals page is numbered vii, the next page is numbered 8, instead of number 1.

To restart numbering after a section break:

1. Place the cursor in the second portion of your manuscript, on any page with Arabic numerals.
2. On the **Insert** tab in the **Header & Footer** group, click **Page Number**, and select **Format Page Numbers**.
3. In the **Page Numbering** box, select **Start at: 1**.

Using the same controls, you may also want to adjust other settings, for example, to make sure that the numbers do not show on the title page.

3.2.5.2 Table of Contents. Sometimes you want to add entries to the table of contents that are not numbered Chapter 1, Chapter 2, etc. For example, the preface, acknowledgments, and abstract should be listed in the table of contents, but wouldn't be sequentially numbered headings. In order to include these entries, you first have to create a new style, and then modify the table of contents to include the new style.

Step 1: Create a new style for Front Matter:

1. Manually change the title of the front matter heading to look the way you want. For example, Arial 20, Bold, centered.
2. Put the cursor on your newly-formatted heading and click **Home** → **Styles** ribbon and click the down arrow at the right.
3. Choose **Save Selection as a New Quick Style** to open a dialogue box, and type in the style name, for example, Front_Heading.
4. Click *Modify* and then under *Style for the Following Paragraph*, pick **Normal**.
5. Click **OK**.
6. Apply this style formatting to all other front heading entries using the **Styles** ribbon just as you would apply any other heading style.

Step 2: Add the front matter sections to the table of contents:

1. Delete the existing table of contents, if there is one.
2. Click **References**, **Table of Contents**, select **Insert Table of Contents**.
3. In the pop-up window **Table of Contents**, click the button **Options**.
4. In the pop-up window **Table of Contents Options**, find the *Available styles* dialogue box, and in the dialogue window *TOC level* put 1 for Front_Heading. (Note, if you are using Heading 6 for back matter, at this point, remember to put 1 in the corresponding dialogue window as well. Detailed procedures for the back matter are discussed in the next section.)

You should now have a new table of contents with the headings from your front matter listed with their respective page numbers. If you completed the first part of the process listed in this section, then the numbers would be Roman numerals for the front matter and Arabic numerals for the remaining chapter/section headings.

3.2.6 Back Matter

In addition to front matter, large documents also have back matter, such as appendices, an index, or a glossary. You can use Headings 1 through 5 for your document and Heading 6 for your appendices. The *STREAM Tools* template file *BasicThesisOrBookTemplate.doc* already contains appendices preformatted in this manner, but you can use the process below to create new back matter in your document.

3.2.6.1 Appendices.

To create a new appendix template in a new document:

Stage 1: Create the appendix:

1. Type a title of the appendix in a new line where you want it to be.
2. Change the style of that line to **Heading 6** by clicking the style selection window in the menu.
3. Click **Home** → **Styles** and select the down arrow next to Heading 6.
4. Select **Modify**.
5. Change the font and size to look the way you want.
6. Click the button **Format** → **Numbering**.
7. Click the button **Define New Number Format**.
8. In the *Number Format* dialogue box, remove all auto-fields except for the last one, for level 6.
9. In the *Number Style* dialogue box, change style to A, B, C.
10. In the *Number Format* dialogue box, add the word “Appendix” before the letter A.
11. Click the button **Font**, select your desired font size, and click **OK**.
12. In the *Number Position* and *Space Position* dialogue boxes, adjust the spacing as desired. You may have to experiment before you get the spacing you like. Click **OK**.
13. Click **OK**.

Stage 2: Add the appendix to the table of contents:

Most likely, you will need to change the settings in the table of contents so that the appendices show in it. Delete the previous table of contents and make a new one, with the desired settings, by following this sequence:

1. Click **References** → **Table of Contents**.
2. Select *Insert Table of Contents*.
3. In the dialogue box *Show Levels*, select 6.
4. Click **Modify**.
5. In the pop-up window *Style*, notice the settings (such as font size and style for TOC 1).
6. Click on **TOC 6**.
7. Click **Modify**.
8. Adjust font size and font style, to match those for TOC 1 Style.
9. The default line indent for Heading 6 is too deep. To reduce it, click **Format, Paragraph**.
10. In the pop-up window *Paragraph*, find the *Indentation* dialogue box and change indentation as desired (use 0pt for no indentation).
11. Click **OK** in all pop-up windows.
12. Confirm that the table of contents now looks the way you want it to.

3.2.6.2 Indices. An index at the end of a book allows the reader to find the pages that mention specific words. An index is most frequently encountered in textbooks or manuals. The Microsoft Word Help files provide a comprehensive description of the process of creating an index, should you need it.

However, we want to describe the process briefly here for those teams that might want to create an index because the process is relatively straightforward. First, it's best to save creating an index until near the very end of your writing project because this step will add inline code to your document on every word that is indexed and this code will make the text difficult to read. However, you can hide these marks by clicking on the **Home** tab and then selecting *Show/Hide Paragraph Markings* (indicated by a paragraph symbol).

Once you are ready to create an index, you need to mark the entries for it, and then build the index at the end of the manuscript much like how you would build a table of contents at the front.

To mark entries for the index:

1. Highlight the word you wish to index.
2. On the **References** tab, in the **Index** group, click **Mark Entry**.
3. In the dialogue box pick options that correspond to your needs.

To insert the index:

1. Place cursor where you want it, typically at the end.
2. On the **References** tab, in the **Index** group, click **Insert Index**.

Just like with any other automatically generated list, it will be updated once you press **Ctrl-A, F9**.

3.3 USING MULTIPLE TEMPLATES

Teams that use a great deal of legacy content must understand the importance of changing the basic *STREAM Tools* templates. Let's use an example to demonstrate why. Suppose you conducted an important experiment and described your experimental setup and measurement procedures, followed by the display of experimental results, the discussion of what they mean, and the comparison of these results to those reported in earlier publications. This portion of the manuscript becomes the core of the six-page, double-column, camera-ready conference paper. This portion of the manuscript now contains, let's say, three headings, four figures, eight equations, and seven literature citations, all cross-referenced automatically. How many times will you reuse this portion? How different will the formatting requirements be for these future documents?

Here is a typical roster of documents in a mid-size lab that might reuse this portion:

- *A conference paper.* Formatting requirements: double-column, single-spaced, Times New Roman font size 10, single-numbered headings and captions (e.g., Figure 8 rather than Figure 3.2), letter numbering of sections (e.g., *A. Introduction*)
- *A journal paper.* Formatting requirements: single-column, single-spaced, Courier font size 12, single-numbered headings and captions (e.g., Figure 8 rather than Figure 3.2), Arabic numerals numbering of sections (e.g., *1. Introduction*)
- *A master's thesis.* Formatting requirements: single-column, 1.5 lines spacing, Times New Roman font, size 12, dual-numbered headings (e.g., Figure 3.2 rather than Figure 8), numbered chapters (e.g., *Chapter 1. Introduction*)
- *Intermediate and final reports to a funding agency.* Formatting requirements: single-column, single spaced, Arial font size 10.5, dual-numbered headings and captions, letter numbering of section
- *An annual report to the academic department.* Formatting requirements: blue-colored Helvetica font, etc. etc.—you get the idea)
- *A Ph.D. dissertation*
- *An invention disclosure*
- *A report of a participating undergraduate student to the agency that funds his or her scholarship*
- *Three proposals to federal agencies*, some of which will be resubmitted multiple times
- *Three proposals to state agencies* and private foundations
- *A book chapter*
- *A report to investors in a collaborating start-up company*
- *A project web page ...*

... and then some. While the text and figures will hopefully change slightly as the content is refined through iterations, and while the different aspects of your work that

need to be highlighted will change depending on the audience, your team will save huge amounts of time by using *STREAM Tools* to reformat all of these documents instead of formatting manually. This time can now be spent thinking about ideas, conducting other experiments, or playing Frisbee with your dog.

To reduce the overhead time costs of formatting, one needs to pay attention to styles. By properly defining and maintaining the styles throughout your document, you will be able to change the appearance of your documents quickly and completely—nearly at the touch of a button. You can get more or less sophisticated with the methods you use to go between the styles, but your first step, in any scenario, is to keep track of styles in your initial document.

3.3.1 Controlling Styles

As demonstrated above, styles are extremely important for those who write long documents and/or reuse their material in different documents. Rather than simply formatting the text sequentially by clicking the user interface buttons for each element of your manuscript, you should first assign a style to each element, for example, a figure caption, main body text, a quote, or a heading. Then, when you want to change how your document looks, you change the characteristics of that style, and these changes are applied throughout the document.

Here is a simple example: suppose you are in the process of writing a 15-page proposal and at a certain point you decide that, in order to fit all your material, you want to drop the font size from 12 to 11. You cannot simply select the entire text and change it to size 11, because your headings are size 14, 13, and 12 (different sizes for different levels), the figure captions are size 10, and the main text is size 12. All you want to change is the font size for the main text from 12 to 11. You can achieve that a hard way or an easy way.

The hard way is to go to each paragraph, right-click on the paragraph text, select **Paragraph**, and then select options you want. After that, you can use **Format Painter** to transfer the new paragraph format to all paragraphs in the document. For a long document, this would be a dreadful process.

An easier way is to make sure that all paragraphs have the same style, for example, Normal. Then you would right-click on the Normal style window in the *Styles* ribbon under the *Home* tab, select **Modify** → **Format** → **Paragraph**, select your settings, and click **OK** in the open dialogue windows. The appearance of text will change throughout the document.

An alternative path to achieve the same result is to change the appearance of one paragraph first and highlight a section. Then select the **Styles** ribbon, right click on the style you wish to change, and choose *Update [heading name] to Match Selection*. You will probably discover multiple alternative paths of navigating through the menu, using keyboard shortcuts to apply styles faster, and creating your own individually defined styles. If you work in a team, do not get carried away creating too many custom styles—it will increase the amount of knowledge that you need to transfer to your team before you get started. In fact, you may find it more efficient not to teach every contributor about altering styles but instead establish a system of keyboard shortcuts that

allows a select group of editors to quickly format documents to which others have contributed.

To create keyboard shortcuts:

1. Right-click on the desired style window in the **Styles** ribbon under the **Home** tab (e.g., **Heading 1**).
2. Select **Modify** → **Format** → **Shortcut Key**.
3. In the dialogue window that opens, under the heading *Press new shortcut key*, select a combination of keys that you can remember.
4. Press **Close** → **OK** to return to editing mode.

Since most **Ctrl**+key combinations are used for various functions in Microsoft Word, it is better to rely on **Alt**+key and **Alt**+**Ctrl**+key combinations in this dialogue window.

3.3.2 Switching Between Single-Column and Double-Column Formats

Switching between one and two columns on the page is a frequent operation for those who, for example, often write two-column camera-ready conference papers and then need to reuse the same material in single column manuscripts, such as theses or grant proposals. In general, the conversion is straightforward. Simply select the text that you want to use, click on the **Page Layout** tab then **Columns** button in the **Page Setup** ribbon, and select the desired number of columns. Most of the manuscript will reformat itself without any problems, but there are likely clean-up issues, mostly with figures, tables, and equations.

Figures may need to be resized. If all of your figures are different, then it is a manual process. If you have many figures that are the same size and need to be enlarged or reduced to the same proportion, rather than dragging the corner every time, you can perform the resizing operation once and then use the Repeat function (either by clicking the counterclockwise arrow in the upper left corner of the Microsoft Word screen, or by typing **Ctrl**+**Y**) to resize all other figures to the same ratio. To resize the initial figure, right-click on the figure, select **Size**, and change figure size as desired.

Tables might also need to be resized to fit the column width. Just as with figures, if you have many similar tables, you can resize the column width by clicking on the border and dragging it to a standard position, and then repeating the operation with each table.

Equations usually need to be centered on the line and their number needs to be right-justified. As discussed in Section 3.2.2, the position of the equation and the equation number is defined by the tabs. So, if you use *STREAM Tools* templates and the paragraphs that contain your equations have a dedicated style throughout your manuscript, the positioning of your elements will adjust automatically. If that does not happen, then you should either switch templates or create a dedicated style for equations following the procedures described in Section 3.2.2.

3.3.3 Master Documents

A “master document” is a Microsoft Word feature that, in principle, allows compiling long documents from shorter ones. The idea is that by turning off individual sub-documents, for example, chapters in the book, the word processing will take less computing resources. While a noble idea, in practice master documents are not all that useful because auto-numbering, cross-referencing, and literature citations fail when sub-documents are used. It is conceivable that a certain class of documents that have many graphics and no need for auto-numbering could be better processed using master documents. Most documents developed by scientific and technical writers simply do not fit into this category.

3.4 PRACTICE PROBLEMS

The problems in this section do not provide a comprehensive review of writing and typesetting rules. They contain only the most common mistakes made by inexperienced writers. Experienced technical writers can safely skip this section.

3.4.1 Headings

Find typesetting and stylistic mistakes in the hypothetical table of contents below:

Table of Contents:

Chapter 1. General Approach7

1.1. Motivation for Good Typesetting.....7

1.2. Microsoft Word vs. LaTeX.....8

1.2.1. Introduction.....8

1.2.2. Comparson.....9

1.2.3. Common Misconceptions.....10

1.3. Software you need.....10

1.3.1. Selection of Platform.....12

Chapter 2. The Blitz Intro14

2.1. Overall Philosophy of the *STREAM Tools* System.....15

2.2. General Principles.....17

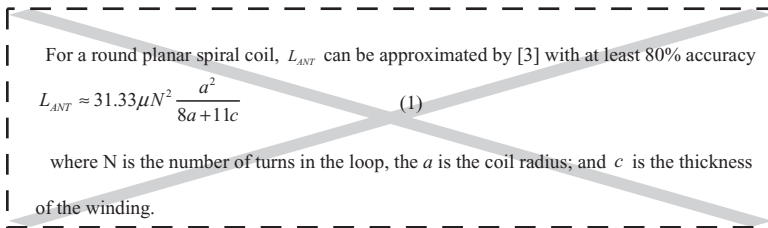
The answers are on the next page.

Answers:

- The capitalization of subheading 1.3 is inconsistent with the rest of the text.
- Subheading 1.3.1 is an orphan.
- The word “Comparison” is misspelled.
- The style of sub heading 2.1 is not consistent with the rest of subheadings. In this case, it is too wordy. Long headings are not prohibited, but the author should maintain a consistent style throughout the manuscript.
- The word “Blitz” might have a negative connotation with some audiences.

3.4.2 Equations

Find typesetting and stylistic mistakes in the hypothetical excerpt from an engineering paper below:



For a round planar spiral coil, L_{ANT} can be approximated by [3] with at least 80% accuracy

$$L_{ANT} \approx 31.33 \mu N^2 \frac{a^2}{8a + 11c} \quad (1)$$

where N is the number of turns in the loop, the a is the coil radius; and c is the thickness of the winding.

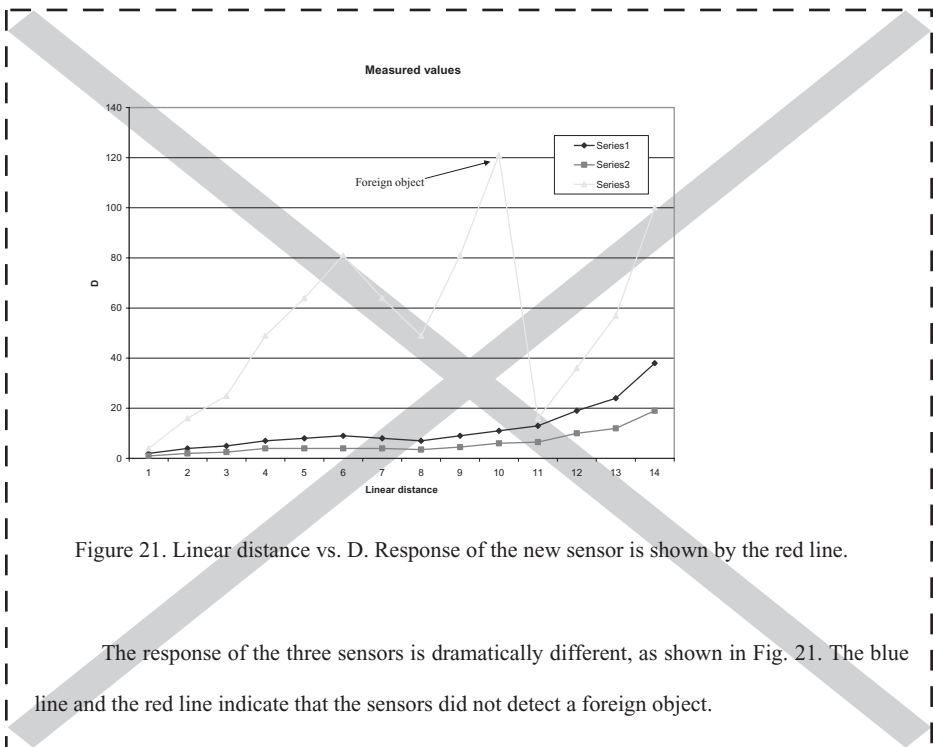
The answers are on the next page.

Answers:

- The in-line symbol “ L_{ANT} ” is too small; it should be the same size as the symbol “ L_{ANT} ” in the equation.
- Referenced equation numbers should be enclosed with round parentheses, (3), not with square parentheses, [3].
- Unless specified otherwise by the publisher, the equation should be centered on the line.
- The equation number should be right-justified on the line.
- The word “where” does not start a new paragraph and should not be indented.
- The in-line symbol N should be the same font as the equation symbol N .
- The use of commas and semicolons is inconsistent in the last sentence.
- The word “the” before “ a is the coil radius” should be deleted.
- The variable μ is not defined.

3.4.3 Figures

Find typesetting and stylistic mistakes in the hypothetical figure below:



The answers are on the next page.

Answers:

- All fonts are too small. A figure should shrink well to a double-column format, and then the font size will be adequate for PowerPoint presentations as well. Since Excel and Matlab default graphs have proportionally small fonts, it is a very common typesetting mistake.
- The x and y axes are not labeled properly. The most common appropriate style is to have variable name, followed by variable symbol, and then by units, usually in square brackets. For example: “Distance, L [cm]”
- The labeling is not descriptive. Series 1, Series 2, and Series 3 are likely to stand for something and should be renamed accordingly.
- The size of the markers is too small, therefore the lines are difficult to distinguish.
- The caption “Measured values” on the top is usually unnecessary. Plotting software puts such captions into figures, but your document will have figure captions underneath for this purpose.
- The graphic should be centered.
- What is shown looks like experimental data, and therefore the markers should not be connected by straight lines. The lines should be used for approximating curves and theoretical values.
- The first sentence of the caption is not informative. The fact that y is plotted against x is obvious from the figure itself. The second sentence of the caption makes an attempt to emphasize important features of the displayed data, but it stops shy of reaching its goal.
- The caption and the text below make references to a “red line” and to a “blue line.” Remember that, in most cases, the graphic will be reproduced in black and white, and the lines should be easily distinguishable in this case as well.
- The lines are too thin and the arrow is too small. They are hard to see and will not copy well. Publishers provide different rules, but generally, the line thicknesses vary between 0.2 pt to 2 pt, with the default line thicknesses for the most common elements either 0.5 pt or 1 pt. Check publisher requirements and use your judgment. Do not assume that default lines coming from the graphics software package will be the best.
- The text, “Foreign object” would look much better in a sans-serif font, such as Arial.
- The font of the figure caption and the font of the text below is the same. Generally speaking, it is a good idea to use different font sizes or styles for the caption and the text so that they do not blend in the reader’s eyes.
- The text refers to “Fig. 21,” whereas the caption is marked “Figure 21.” Be consistent about caption marker styles throughout the manuscript.
- The expression “as shown in Fig. 21” is passive voice. Typically, an active voice “Fig. 21 shows” is preferred by publishers.

3.4.4 Tables

Find typesetting and stylistic mistakes in the hypothetical table below:

TABLE 5. RESPONSE AT DIFFERENT FREQUENCIES

Frequency	Capacitance	G	Notes
10	3.8 pF	-	na
60	3.9 pF	-	na
300	4.4 pF	$3.2344 \cdot 10^{-5}$	higher
1000	4.8 pF	$3.555838 \cdot 10^{-6}$	lower

The answers are on the next page.

Answers:

- Centering of entries is inconsistent throughout the table.
- In columns 1 and 3, units are not given, while in column 2, the units are provided. However, they would be better placed at the top line of the table.
- Columns 1 and 2, in the top line, provide variable names, but do not provide their symbols. Column 3 provides the symbol, but does not provide variable name.
- The symbol “G” should probably be “*G*.”
- The comments in column 4 are far too cryptic.
- The top line could use bold text to set it apart from the other table entries.
- The precision (number of significant digits) in column 3 is unreasonable.

3.5 ADDITIONAL RESOURCES

A large portion of this chapter discusses the nitty-gritty details of document formatting and we expect that many readers are already familiar with the functions described here. If you are one of those readers, you may think that you need only the occasional reference to Microsoft Word Help in order to accomplish everything you want with your documents. However, even if you are comfortable with the features in Microsoft Word, we encourage you—and every member of your team—to become familiar with the operations in this chapter. Not only does the *STREAM Tools* approach show users how to perform certain tasks, it ensures that each team member approaches tasks in the same manner. When team members use the same functions and processes, a document can flow among numerous implementations (e.g., a conference paper to a journal article) as well as among multiple authors with minimal formatting changes. As a result, your team can spend its time on creative work and research rather than sorting through documents performing minor changes such as manually changing every instance of a heading to bold, 14 point and italics. Time spent on such petty tasks is, pure and simple, time taken away from the more important work of actually generating content, researching, and innovating.

If you feel like you still need a little help with Microsoft Word even after reading this chapter, or if you want more advanced description of Microsoft Word functions, countless online and printed resources are available. You may enjoy some of the following reference books:

- *Word 2007 For Dummies* (For Dummies (Computer/Tech)) by Dan Gookin
- *Microsoft® Office Word 2007 Step by Step* (Step By Step (Microsoft)) by Joyce Cox and Joan Preppernau
- *Teach Yourself VISUALLY Word 2007* (Teach Yourself VISUALLY (Tech)) by Elaine Marmel

Some of the most useful website on the subject include:

<http://office.microsoft.com/>

<http://word.mvps.org/>

Even though some readers may desire supplementary materials, we expect that most readers of this book will have enough knowledge of Microsoft Word's primary functions to jump right into the descriptions we explain here. For example, we expect that most readers know how to "copy and paste" or to navigate the menu ribbons or to select choices from a dialogue box, and so we don't treat these basic functions at all. In other words, we generally expect that our readers will have a functioning knowledge of Microsoft Word and the items listed in this chapter represent an upgrade to the skills you already possess. More importantly, we expect that the processes outlined here as part of *STREAM Tools* will generate consistency among all collaborators so that your team members can work efficiently on documents that are mutually compatible. After all, the major objective of *STREAM Tools* is to assist your team with producing quality documents as efficiently as possible.

EXERCISES

Exercise 3.1.

- (A) Locate an existing template file for your next conference or journal paper, funding agency proposal, corporate report, or Ph.D. thesis.
 - (B) Locate the version of this template in Microsoft Word.
 - (C) Introduce auto-numbering features throughout the document.
- (**Note:** Consider sharing the result with your colleagues. If you think this template will be useful for the greater community, consider submitting it to our website, streamtoolsonline.com.)

Exercise 3.2. Download a single-column document template from our website at streamtoolsonline.com and manually convert it to a double-column format.

Exercise 3.3. Create a new custom style for a portion of your document so that you can later convert every first paragraph of every section of the entire document to *italics* and **bold** with less than 10 button clicks.

Exercise 3.4. Go through the list of people in your organization and decide which level of *STREAM Tools* knowledge is appropriate for them.