



Faculty of Engineering  
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## INCORPORATING TABLES AND FIGURES INTO TECHNICAL REPORTS

A common feature in technical documents is the inclusion of tables and figures. These illustrations display data in an easy-to-read way.

Technical writing has numerous conventions for how tables and figures should be designed and inserted into a technical report. This document explains what an author must do when incorporating tables and figures into written work.

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## TABLES AND FIGURES: AN INTRODUCTION

While these terms are commonly confused, it is actually very easy to differentiate one from the other. **Tables** contain columns and rows, and they typically (but not always) contain textual data in the form of words or numbers. **Figures** are any other type of illustration that does not contain rows and columns. Typical types of figures include bar graphs, line graphs, pie charts, diagrams, and flow charts.

## GUIDELINES FOR TABLES AND FIGURES

Although they are not in the same category, tables and figures do have some features in common. Many guidelines for tables also apply to charts. The following guidelines are true for both charts and figures:

### MUST HAVE A CLEAR PURPOSE

There needs to be a reason why each illustration is included in the document. If the author cannot answer the question "Why are you including this illustration?" then it should not be included. Typically, during the planning stages, the author should consider which illustrations will be needed in each section. The writing should be done with the selected illustrations in mind to reduce redundancy.

### MUST BE STANDALONE

A good illustration should be understandable on its own. In other words, if a figure or table was removed from the document it was in, a person familiar with the subject matter should be able to read that figure or table and understand the meaning. Making illustrations self-contained means that all components must be properly labelled, and all necessary information must be contained within the illustration or its caption.

### MUST BE NUMBERED

Every illustration must have a number. Figures and tables are numbered separately, so a document can have both a Table 1 and a Figure 1. There are two accepted methods for numbering: sequentially and by section. Sequential numbering is best used when there are not many illustrations in the document. Sequential numbering gives the advantage of immediately knowing the location of the figure, but it is a more complex system. It should be used in documents with many illustrations. Table 1 shows how the illustrations for the same document would be numbered using each method.

Table 1. Sequential Versus Section Numbering

SECTION	SEQUENTIAL NUMBERING	SECTION NUMBERING
1. Introduction	Figure 1	Figure 1.1
2. Water Testing	Figure 2	Figure 2.1
2.1 Bacterial Testing	Figure 3 Table 1	Figure 2.1.1 Table 2.1.1
2.2 Mineral Testing	Figure 4 Figure 5 Table 2	Figure 2.2.1 Figure 2.2.2 Table 2.2.1
2.3 pH Testing	Table 3 Figure 6	Table 2.3.1 Figure 2.3.1
3. Government Standards	Table 4	Table 3.1
4. Conclusion	-	-

Sequential numbering is straightforward, with a separate sequence for figures and tables. With section numbering, each figure or table takes the number of the section (or subsection) it is in, plus an added .x to indicate which figure/table it is in that section.

### MUST BE TITLED/CAPTIONED

In addition to the number, every illustration must have a title and/or a caption. If only one is required, the title/caption should be as detailed as possible. For example, "Figure 4. Wind Velocity" is inferior to "Figure 4. Average Sustained Wind Velocity at Cape Spear, 2005–2017." Titles/captions are placed **ABOVE TABLES** and **BELOW FIGURES**. This convention is true in virtually all styles.

### MUST HAVE SOURCES CITED WHEN REQUIRED

When the data in an illustration come from an outside source, the data need to be cited. This might involve putting citations within individual cells of a table, or adding a citation in the caption of the illustration. When it is not just the data but also the illustration itself that is being used, a citation phrase must be added to the end of the caption. There are three possibilities for these phrases [1], which are outlined in Table 2.

Table 2. Phrases Used When Citing Illustration Sources

SCENARIO	CITATION PHRASE
Illustration was copied without any alterations from an outside source.	Reproduced from [#].
Illustration was modified from a figure/table that was published elsewhere. These changes could be additions, deletions, or any other divergences from the original. These changes would be considered minor.	Adapted from [#].
Illustration was created by the author, but it is based on data from another author's figure or table. This new illustration would be considered quite different from what it was based on.	Redrawn from [#].

### MUST BE EXPLICITLY REFERRED TO IN THE TEXT

Figures and tables, without exception, need to be referenced in the document's text. This could be as explicit as stating "Figure 1 displays..." or as implicit as writing a sentence that ends with "(see Figure 1)." The reader is meant to view the illustrations as they are mentioned, not necessarily when they appear. That being said, the mention of the illustration should be placed as closely as possible to the illustration itself.

# DESIGNING TABLES

Tables are used when there is ample data, and displaying this data graphically would not make sense. A table is also a good choice when exact figures rather than approximations are needed.

The defining feature of a table is that it contains columns and rows. Tables are read left to right and top to bottom. As such, the left-most and/or top-most cells are headers that contain categories for all the items in that column/row. Units of measurement should be located in the headers rather than repeated inside every cell.

Tables have the following additional requirements:

## MUST BE LEGIBLE

The reader must be considered when designing a table. Cells in a table need to be sufficiently padded so that they are easy to read. Cramming data into small cells is not desirable. In some cases, making alternating rows/columns shaded slightly lighter/darker (usually a shade of grey) than the adjacent ones is possible. However, this shading should be limited to two shades, and the difference should be very minor. Making the cells vastly different colours will cause the reader to think the cells are being highlighted for some reason.

## MUST LIMIT THE “WHITE SPACE”

There is a preference for tables to be wider rather than higher. A narrow but high table will create much white space on one or both sides, and that is undesirable. Whenever possible, tables should be designed so that they are read across. If necessary, tables can be oriented in a landscape fashion in a document, but this is not preferred. If the data in landscape tables are not vital, they can be added in an appendix instead.

## MUST PROVIDE EXPLANATIONS WHERE REQUIRED

As previously stated, tables must be understandable on their own. If anything about the table might be confusing to the reader, it should be noted using a footnote. For example, if one cell is missing data, a footnote should be added explaining why this is the case. These footnotes appear after the last row in the table, and do not join the main text of the document. They are considered part of the table.

# DESIGNING FIGURES

Whereas most tables look similar to one another, there is a wide range of illustrations that are labelled “figures.” Their variation in appearance is linked to the varying purposes of figures (see Table 3).

Table 3. Purposes of Various Figure Types

PURPOSE	APPROPRIATE TYPE OF FIGURE
Showing trends	Line graph
Showing percentages of a whole	Pie chart
Depicting amounts pictorially for comparison purposes	Bar graph
Displaying a process, step by step	Flow chart

Figures have the following additional requirements:

## MUST BE LEGIBLE

Like tables, figures need to be easily readable. There are a myriad of additional factors that can impact the readability of a figure. For one, colours are used in many types of graph/chart, but it is often forgotten that differences in media or even in vision can affect how the colours are interpreted. One reader might see two colours as being quite different, while another might see them as being identical. Line graphs can be especially problematic. An effort should be made to minimize the number of lines, especially when much overlapping occurs.

## MUST NOT BE MISLEADING

Although tables should be objective displays of data, they are often manipulated to serve the purposes of the author. This practice is unethical. This might involve changing the scale of an axis to make two values seem more similar or different. Furthermore, data that disagree with the desired result should not be omitted from a figure. Instead, it should be included and then an attempt to explain it should happen in the text.

## MUST NOT CONTAIN TOO MUCH DATA

There is a tendency to try to create mega-figures by combining different, tangentially-related data. This is a mistake. In general, one figure should have one purpose, and the more purposes of a figure, the more confusing it will be.

## LISTS OF TABLES AND FIGURES

In documents where there is a large number of tables and/or figures, a list of each is sometimes placed at the beginning of the document. Alternatively, they can be combined as a *List of Illustrations*. If combined, the figures are typically listed first, and the tables are listed after the figures have all been listed. Each one is listed in the **order of appearance** in the document. The usual placement for these lists is directly after the Table of Contents (ToC).

These lists appear much like a ToC. On the left is the number and title of the table/figure, and on the right is the corresponding page number. Figure 1 is an example of what a list of illustrations looks like.

LIST OF ILLUSTRATIONS		
<b>Figures</b>		
Figure 1.1	U.S. R&D Spending on Biotechnology .....	11
Figure 1.2	ESCA R&D Spending v. Biotech R&D Spending .....	14
Figure 2.1	Annual Sales .....	16
Figure 3.1	Hypothetical New-Product Decision Tree .....	21
Figure 3.2	Annual Sales .....	23
<b>Tables</b>		
Table 1.1	Industry Costs of the Final Rule (2005 Dollars).....	12
Table 1.2	Industry Costs of the Final Rule (2010 Dollars).....	12
Table 2.1	Government Costs of the Final Rule (2005 Dollars) .....	17
Table 2.2	Government Costs of the Final Rule (2010 Dollars) .....	18
Table 3.1	Applications Not Subject to ESCA .....	23
Table 3.2	Examples of Microbial Applications Under ESCA .....	26

Figure 1. Example of a List of Illustrations. Reproduced from [2].

## DESCRIBING ILLUSTRATIONS

This topic is covered in detail here:

<https://www.mun.ca/engineering/media/production/memorial/academic/faculty-of-engineering/faculty-of-engineering-and-applied-science/technicalcommunications/DescribingChartsAndGraphs.pdf>

## REFERENCES

[1] "Copyright Permissions: Tips for Authors," Wiley, [Online]. Available: [https://onlinelibrary.wiley.com/pb-assets/assets/21983844/2749\\_Copyright\\_permissions.pdf](https://onlinelibrary.wiley.com/pb-assets/assets/21983844/2749_Copyright_permissions.pdf). [Accessed 20 October 2021].

[2] M. H. Markel, Technical Communication, 11th Ed., New York: Bedford/St. Martin's, 2015.