

Comments on Civil Engineering Lab Reports – DOs and a few DO NOTs

This document addresses common errors and inadequacies observed in lab experiment reports. While not necessarily strict rules, the DOs and DO NOTs given below represent accepted practice for most technical writing, and represent the standards recommended when writing engineering course assignments and reports. You should add writing style references to your personal library to help you develop and refine your writing ability. Such general writing references include titles such as “The Holt Handbook” by Kriszner and Mandell, “The Scott Foresman Handbook for Writers” by Hairston, Ruszkiewicz and Friend, and many others. There are others useful specifically for technical writing as well.

A. General - Writing the Report

1. **DO** use an appropriate writing style. The past-tense and third party passive voice writing style has been considered the norm for writing engineering reports and communications for many years. Keep in mind that passive style is often harder to read than active style. In some cases, particularly where you know the recipient well and the purpose of the memo is to request or provide relatively simple information, you should use first-person, active voice style.
2. **DO** use proper paragraph structure. Begin each paragraph with a topic sentence for the paragraph. For example, “Following the transducer calibration procedure, transducer signal versus water column height data were collected for each of the three cylinders.” Then describe in concise terms the main steps taken to complete that phase of the experiment. Be sure to mention the most relevant data that were collected and how those measurements were made. Finally, describe where the reader can find the data (as an attachment to the memo).
3. **DO** include the following parts unless instructed otherwise:
 - Header – to, from date, subject
 - Introduction/purpose – What the experiment was about, what is to be learned by doing it
 - Procedure – general procedure followed the lab, standard procedures referenced, deviations from the standard procedure, data collected
 - Analysis – how the data were analyzed, where the data and calculations can be found in attachments, results of the analysis
 - Conclusion – summarize the findings, recommend additional work is necessary
 - Attachments – summary of results, data and analysis (tables and graphs as needed), sample calculations
4. **DO** make clear, unambiguous statements. For example, when describing the output signal from a transducer corresponding to a range of water column heights, say something like “The pressure transducer’s output signal, measured in millivolts and displayed on the signal conditioner’s digital display, was recorded in Table 2 for each water column height increment.”
5. **DO** explain what was done by you or others, not what you “had” to do or were “supposed” to do.

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6. **DO** state that an appropriate and specific standard method or procedure was used where possible. As long as the standard procedure is available to your intended audience to, it is not usually necessary or desirable to explain the procedure followed in detail since that is typically covered in the referenced standard. An exception to this might be if the procedure or standard method directed you to follow some step but you were not able to, you should mention what you actually did to try to achieve the desired end of the required steps where you needed to deviate from the standard. For example, if the procedure directed you to measure the diameter of a post within one inch of each exposed end of the post, but the bottom end had pieces of hardened concrete on it preventing an accurate measurement, you could write something like “The standard procedure requires measuring the post diameter within one inch of each end of the post. However, on sign post structure number 123-AC4 the diameter of the bottom end of the post was measured about 6 inches above the base since that was as close to the bottom that the diameter could be determined due to hardened concrete on the surface of the post.”
7. **DO** state the most significant finding(s) first when stating your conclusion. If there are other observations that you see in your analysis, but they appear to be less significant, state those in terms that convey why they may be less significant than your most important finding.
8. **DO** be careful when making declarative statements. For example, to say, “The water pressure does not depend on the volume of water.” is not an accurate statement. It would be more accurate to say, “The water pressure at the base of the water column is related to the volume of water retained in the cylinder, but the magnitude of the pressure depends on other factors such as...”
9. **DO NOT** use superlative words or statements. For example, to make statements like “our test result were very accurate” or “we found the best combination of factors”, or “the procedure was done flawlessly” invites further scrutiny and in the real world could lead to litigation, especially if you cannot back up those statements with factual, provable evidence. Such pronouncements sound boastful to many readers and as a result make your document appear unprofessional.
10. **DO** state your conclusion as simply as you can. Avoid too much discussion about alternatives or less significant factors in your concluding paragraph – you should take care of all factors, including determining the significance of them, in the analysis section.
11. **DO** use care when selecting colors and shades for any part of a technical document, particularly for charts and graphs.
 - a. **DO NOT** depend on colors or shades of gray to convey important information because that information will be lost if the original is reproduced in a single color. Also, consider that your reader may be color blind.
 - b. **DO NOT** use colors or shades of gray that will not be plainly visible on the paper you intend to use or when photocopied or scanned.
12. **DO** proofread the entire document. Check for spelling and grammar errors and sentence structure, as well as all other qualities that make or break a good report. If possible, have someone else read it as well. Try to put yourself in your reader’s position to see if you are addressing the appropriate audience. Test what you read to be sure it is easy to understand, says what you want it to say and that it makes sense. Sometimes it works

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well to print the hard copy and take it somewhere else to read. Use a pen or pencil to make marks for edits. Learn and use proofreader/editor marks.

13. **DO** initial your name (in your own handwriting after printing the memo) when sending memos– this helps to authenticate that it came from you since there is no signature line.

B. Numerical Values

1. **DO** be sure to always include a unit of measurement for every number that has one. Only some numbers are dimensionless by design (e.g. π , Froude number, etc.)
2. **DO** use a consistent way of expressing dimensional units. For example, you could use “inch”, “inches” or “(in)”, but choose one of them and use only it throughout the document. Note: You should avoid using tick marks for feet (') and inches (") – they are easily obscured or misinterpreted, especially in photocopies.
3. **DO** show a leading zero to the left of the decimal point for all numbers that have an absolute value of less than one. This can help prevent confusion, or worse, an error for the reader. For example, if a decimal point is accidentally omitted or a photocopy picks up some unintentionally placed dust particles, the presence of the leading zero can suggest to the reader that something isn't right about the number displayed leading them to determine if there is an error somewhere (e.g. **Do** show the zero as in “0.12”, **not** like “.12”).
4. **DO** spell out numerical values using one or two words if they can be. Otherwise, express them in numerical figures. Always use numerical figures when expressing the numeric parts of addresses, dates, and time (except if followed by “o'clock”, i.e. use “*eleven o'clock*” instead of “*11 o'clock*”).

C. Charts, Graphs and Tables

1. **DO** align column headings and their corresponding contents.
2. **DO** show the unit of measurement for each table column and/or row, depending on how they are arranged.
3. **DO** select the appropriate type of chart to use for the data and analysis required. The ‘line’ and ‘scatter plot’ types look similar but are quite different. Learn to select and use the right one.
4. **DO** show the fewest significant digits possible on graph axis labels. Additional trailing zeros to the right of the decimal point do nothing but clutter the graph. The values along the axis grids are presumed to represent exact values.
5. **DO** use “round” numbers for graph axis scales whenever possible. This will make it easier to determine data point coordinates.
6. **DO NOT** include a legend on graphs with one data series.
7. **DO** label each table as Table, each graph or chart as Figure or Chart, each picture as Figure or Illustration. Tables are usually labeled above the table; figures, charts and illustrations are usually labeled below the corresponding object. Be sure to include a descriptive title or caption as well.

8. **DO** look at engineering and science text books and other technical publications for good examples to follow. Caution: Some publications, especially newspapers and magazines not intended for technical readers, often use graphical techniques for eye-catching results but may unintentionally (maybe sometimes intentionally) mislead the casual reader.
9. **DO** make the formatting of each graph or chart similar unless the information in or intent of the chart or graph would be better served with different formatting.

D. Sample Calculations

1. **DO** include actual data and correct units when writing sample calculations. The main purpose for showing sample calculations is to demonstrate to the reviewer that you know how to select the appropriate equation or formula for the problem at hand, and can select the right data to correctly compute the result. It also allows the reviewer to consider whether this or another analysis method would be better, more reliable, etc.
2. **DO** state the particular set of conditions or operating mode for which the data you are using come from.
3. **DO** annotate (label) the calculation steps so that the reviewer can easily follow your computation procedure.
4. **DO** underline or box key results so the reviewer can readily identify and refer back to them.
5. **DO** check your sample calculations results very carefully. Remember that in virtually all computations if the units don't work out then you probably did something wrong. The exceptions are typically where there is some coefficient in the equation that assumes that all of the correct units are used but the end result is in some other unit or is dimensionless by design.
6. **DO** learn to visualize quantities. You can quickly catch gross errors if you have a good feel for what range of numerical values you can expect for any measurement.
7. **DO** learn, practice and use ways to check your work. Always examine the results of calculations to verify reasonable quantities and proper units.
8. **DO** explicitly show all assumptions and conversions in your calculations. To omit them will probably cause problems for the reviewer, for you and possibly others, especially if those assumptions or conversions are incorrect. Comments explaining the process are also recommended.
9. **DO** show numerical results with an appropriate number of significant digits. For example, if you use a scale with the smallest division in sixteenths of an inch, you should probably round to the nearest 1/16 inch, or about 0.06 inch. It wouldn't make much sense to use the decimal equivalent of 0.0625 inches since that implies you measured to the nearest 0.0005 inch.