**DESIGN REPORT: PRODUCT / PROJECT NAME**

[insert graphic or photo of product design]

Your Name

Research & Development

Plantenberg Enterprises, Inc.

Date

**Writing Tips**

* Use Calibri for report heads and subheads.
	+ Use UC for MAIN heads, and U&LC for Subheads.
	+ Click on the sample for font sizes.
* Use 12 point Cambria for text.
	+ Line spacing for text: Use single spaced, as is common in professional reports.
	+ Indents: Use 5-space indents for all paragraphs in the document.
	+ Skip lines between paragraphs and subsections for easier reading.
	+ Margins: Use a ragged right margin vs. justified to avoid white gaps in the text.
* Use a two-part title: Type of Document: Topic of Document (your Boss reads many items every day – help your Boss understand what this document is about).

**DESIGN REPORT: PRODUCT / PROJECT NAME**

Your Name

Research & Development (this is your department)

Plantenberg Enterprises, Inc. (this is your company)

Date

**EXECUTIVE SUMMARY**

Design Reports are written to inform the reader of the status of a new product or system design. The report should offer details on the background for the project (why is the product needed?), a description of the product design, features of the design (strength, weight, etc.), testing (verification of the design’s credibility), and next steps that will keep the design moving through the development and approval stages.

The Executive Summary is for the reader in a hurry. S/he may read only this portion of the report, so it has to contain all the important parts. The Executive Summary typically runs about 10% of the original document.

What to include: Include the topic sentence from each major section of the report, along with the thesis statement. Example of a topic sentence about the need for a new design: “The Company is entering a new market, computer peripherals, and needs a low-end consumer product to build its name.” If yours is a redesign vs a new design, say whether the redesign succeeded and by how much (use numbers and percentages).

What to omit: Detailed explanations, graphics, examples, calculations, attributions and credit lines (those appear in the report itself and in the References).

**Writing Tips**

* Replace the text in this template with your own text.
* Use a formal tone: Third person, complete sentences, no casual language, no opinions.
* Proofread to help ensure credibility for your report.
* Be sure to delete the blue Tips boxes after you use them.
* When you are done, make sure your final version is clean. Under the Review tab, click the down arrow under “Accept” and then chose “Accept All Changes.”  Then click the “Tracking” button to disable tracked changes. Your final report should be free of any mark-ups or comments.

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**Writing Tips**

* Find the T of C feature under References on the Word toolbar.
* Double check – on the Final Draft – that the titles of the appendices are correct and that all pages in the T of C are listed correctly.
* Be sure to delete the Writing Tips after you have used them.

# INTRODUCTION

**Purpose**

In the Introduction, make sure that you give the audience enough background to understand the problem and why the problem was addressed. A good test for this section is to imagine how well it would orient you should you read it a year from now. Remember, your audience reads many reports, memos and other documents every day. You cannot assume that the reader will remember your particular project. You must offer a context for your project.

The Introduction – the entire Design Report, really – must be credible so that the technical reader is confident about the design and the data being presented. The appearance, writing, design analysis, graphics, and references must work together to persuade the reader that the design is worth pursuing. As the author, you cannot simply say that you did something or that something is true – technical readers demand evidence. You supply this through the use of References for secondary research and through your explanations in the Design Analysis. You must explain the choices you made.

**Research**

This section contains secondary research, but does not contain primary research. This section should be heavily referenced as it shows the reader you have researched previous designs. For example, you would offer information about previous designs and their performance issues. “As seen in Brown’s experiment [2], aluminum proved to be…” This gives a context for what is different and more effective about your design, which you will describe in the Results and Discussion. Don’t worry about boring your reader, who may be an expert in this area. Your goal here is to show that your design was generated based on research, not opinion.

**Limitations**

Also, in the Introduction, be sure to state any limitations about the topic, which might include unavailability of material, time constraints, or lack of funding.

Remember: Be sure to include a transition from the Introduction to the Results and Discussion.

**Audience Tips**

The audience that you are writing for is a *subject matter expert (SME)*. You do not have to define common engineering terms such as *stress*, *force*, or *acceleration*. However, determine whether your reader is familiar with your particular design or research problem. Make sure that the reader is fully informed before s/he reads the discussion.

NOTE: Your reader is an SME who is functioning as a decision maker. S/he will decide whether your design is worth pursuing in terms of time and money needed to develop, as well as your design’s technical aspects.

**Writing Tips**

* Use subheads to guide the reader through the text and to introduce new topics.
* Be sure to use ASME style for in-text citations.
* Refer to extra material you have made available in the appendices.

# RESULTS AND DISCUSSION

**Design Problem**

Results and Discussion contains your primary research: What you did (the problem you identified), how you did it (what you attempted to fix and how), and the results that you obtained (did your design work?). In Design Problem, describe the issue with the current design – or, if this is a new design – describe the problem your design will fix.

**Specifications**

Include the Design Specifications you were working against, and cite your source. Remember, specifications are “must haves” for your design.

**Criteria**

Describe or list the Design Criteria stipulated, and cite your source. Remember, criteria are “would like to haves” for your design.

**Design Analysis**

**Design 1**

 Explain your approach to Design 1 and name the design tool you used (ex., SolidWorks). You may want to reference the existing design as a basis of comparison. Use a graphic to show Design 1 (see Appendix A for tips on how to format Figures and Tables). You must refer to the graphic in the text before you show it – and you should locate it close to where it is mentioned. Describe the issues with Design 1, and use this as a transition to Design 2. Sometimes, Design 2 is generated simply to try the design with a new material.

**Insert Figure 1 with title and caption**

**Design 2**

 Explain your approach to Design 2 and name the design tool you used (ex., SolidWorks). Use a graphic to show Design 2 (see Appendix A for tips on how to format Figures and Tables). You must refer to the graphic in the text before you show it – and you should locate it close to where it is mentioned. Describe the issues with Design 2, and use this as a transition to Design 3. NOTE: Projects vary. Some require two design iterations, while some need more.

**Insert Figure 2 with title and caption**

*Remember: Keep all parts of the graphic on the same page.*

**Design 3**

 Explain your approach to Design 3 and name the design tool you used (ex., SolidWorks). Use a graphic to show Design 3 (see Appendix A for tips on how to format Figures and Tables). You must refer to the graphic in the text before you show it – and you should locate it close to where it is mentioned. Unless this is your final design, continue with the analysis of Design 4.

**Insert Figure 3 with title and caption**

Reminder: Do not stack all your graphics on one page. Integrate them into the text.

**FEA Testing**

 Explain how you arrived at FEA test results and capture the data in a table (see Appendix A for tips on how to format Figures and Tables). For a redesigned product, use the text to indicate what amount of improvement was achieved. Use percents, amounts, etc.

**Insert Table 1 with title and caption**

**Physical Testing**

This section is included only when actual physical testing has been done. Explain how you arrived at your physical test results and capture the data in a table (see Appendix A for tips on how to format Figures and Tables).

**Insert Table 2 with title and caption**

**Assumptions**

 Describe how Design 3 (Final Design) meets the specifications and criteria.

Remember: Be sure to provide a transition from Results and Discussion (the body of the report) to the Conclusion and Recommendations (the final section).

**Writing Tips**

* Remember: SME readers ask “How does this change what I already know?” Implicit in this question is “Why should I believe you?” “Why should I change my mind?” “Why should I risk my reputation to back you/your design?” If you don’t answer those questions, the reader stops reading.
* Use subheads to identify different areas of the discussion. In addition to guiding the reader, subheads introduce new topics and are an effective way of repeating key ideas.
* Refer to extra material available in the appendices.

**CONCLUSION AND RECOMMENDATION(s)**

**Conclusion**

Remind your reader of the design problem you set out to fix, and briefly describe how your Final Design solves the problem.

This section summarizes the document and provides closure. The difference between this section and the Executive Summary is that the Conclusion is for someone who has read the report.

**Recommendation(s)**

In this section, a good idea is to use your last sentence to emphasize an important detail or result in the report. For example, what needs to happen next? Close out the project? Adopt a new material? Schedule additional testing? Approve for manufacturing?

Don’t be shy about offering a next step (or two). Your reader will appreciate that you have thought ahead, and your ideas may save the reader time.

However, you can never frame your recommendation as a personal opinion. Instead of writing, “I believe the Company should pursue Design #2 because…” try “Based on strength and weight data, the Company should pursue Design #2.” In the second example, you are citing evidence, which makes the recommendation more credible to the reader.

Finally, all recommendations should clearly flow from the report body (the Results and Discussion). No new information should be offered here.

**Writing Tips**

* Maintain the formal tone. Even when making a recommendation, use third person.
* Remember, your reader should be familiar with your research and results, so the Recommendation should make sense to him/her.

**REFERENCES**

Place all sources here and use The American Society of Mechanical Engineers (ASME) style.

You can find ASME citation resources on the course BlackBoard site, the ASME site (<http://www.asme.org/shop/proceedings/conference-publications/references>), and the University of Missouri at <https://libraryguides.missouri.edu/mae/asmecitation>.

For example:

[1] Lastname, F. M., Lastname, F. M. and Lastname, F. M., Year of Publication. Title of Book*.* Publisher, City, ST of publication.

[1] Watt, J. H. and van der Berg, S.A., 1995, Research Methods for Communication Science, Allyn and Bacon, Boston, MA.

**Citation Tips**

* Keep a list of your sources as you use them.
* Remember, ASME uses a number vs. alphabetical order listing for References.

# APPENDIX A: How to Use Graphics in a Design Report

The following is an example of how to properly label Figures and Tables. Note that graphs are also considered Figures and should be labeled as such. Remember, Figures and Tables are not stand alone; you must refer to them within the text before you insert them.



**Figure 1:** **Title of the Figure.** Use a phrase, not a sentence, for the title. If you include a caption, place it here. A caption can point out information important to interpreting the data.

**Table 1: Title of the Table.** Use a phrase, not a sentence, for the title. If you include a caption, place it here. A caption can point out information important to interpreting the data.

|  |  |  |
| --- | --- | --- |
| **Bell crank design** | **Weight (oz)** | **Strength (lb)** |
| **Design 1** | 0.8 | 100 |
| **Design 2** | 0.7 | 110 |
| **Design 3** | 0.6 | 90 |

 Again, a graph is considered a figure and should be introduced in the text and labeled as such.

(See next page for graphics tips)

## Graphics Tips

* SME readers expect data to be properly displayed in graphic formats, so use figures, graphs, and tables to illustrate concepts and summarize data.
* Before writing, decide which data is best displayed graphically and which in text.
* Be sure to refer to the graphic in the text before presenting the graphic. Ex., “As shown in Figure 1, under stress, Design #1 broke...”
* Be sure to place the graphic where you refer to it in the text (vs. locating all graphics on a page at the end of the discussion – or even less helpful – bundled together in an Appendix).
* Keep all parts of the graphic together (ex., do not split Figures or Tables between pages). If needed, start the graphic on a new page to keep it together.
* Similarly, keep all numbers and their units of measurement on the same line (ex., 25 mm, 13 cycles, ¼ inch).
* Place Figure titles below the figure and number your Figures sequentially.
* Place Table titles above the table and number your Tables sequentially.
* Center Figure and Table titles.
* Place captions with the titles. Use captions to call attention to the point you want the reader to understand.
* Use Calibri for titles and captions for graphics to distinguish them from the report text.
* Use white space and/or lines to set off your graphics from the text to make reading easier.

# APPENDIX B: How to Use Appendices in a Design Report

Before you begin to write your design report, you must make decisions. These decisions, of course, are based on your purpose and your reader:

* what information is best displayed in text format?
* what information is best displayed graphically?
* what information is critical to the reader’s understanding of the project – and which can be offered as supplemental material in an Appendix? Appendices are particularly useful when you have a mixed audience. The primary reader might be an executive, while the secondary reader is an SME who will appreciate the additional data you provide in an Appendix.

Your first appendix is titled Appendix A: Topic of Appendix. Your second appendix is called Appendix B: Topic of Appendix, and so on. If you include graphics in your Appendix, label them as Figure A-1, Figure A-2, Table A-1, Table A-2, and so on. Label graphics in Appendix B in the same way, Figure B-1, Table B-1, and so on.

Note that each Appendix begins on a new page. Also note that each Appendix should be introduced somewhere in the text portion of the report. Ex., “Detailed lab results are provided in Appendix A on page x.”

**Writing Tips**

* Note the different size fonts in the header.
* Remember: The singular is Appendix, but the plural is appendices.
* The rubric for grading the Design Report is on the BB site for the particular class you are enrolled in.