

Final Design Reports

The following format is suggested for design reports. It may be modified if there is an important reason for doing so. Consider and address the Design Report Content and Elements.

Report Headings

Report heading may vary with the topic but typically the below heading could be used.

Executive Summary

Include a brief (100-200 words) overview of the goal, the proposed solution, results, and conclusions. If the work is continuing, describe planned efforts to complete the goal. Write this last even though it appears first. The Executive Summary should be written so that if executives read nothing but this, they will have a comprehensive view of the project including why, what, how, and conclusions.

Introduction

State the reason for the document before the reader. State the goal(s) of the work undertaken. Follow this by a brief description of how the goal is to be achieved. Do not go into detail because subsequent sections will provide detail. Think of this as a travel agent's description of a planned trip you purchased. It is not the slide show of the many pictures you took on the actual trip. It is a good idea in this section to describe for the reader how the report is organized so that they can more easily put themselves in your mind set.

Theory

Every undertaking in engineering – certainly design projects – rely on a certain body of theoretical relationships necessary to the description of the engineering solutions employed. Use this section to present those fundamental items for reference later in the report when their use is critical to the understanding the underpinning for the decisions made in the work undertaken. For example, example, if one needs to describe solution hardening of Al-Cu alloys, it would certainly be essential to have an Al-Cu Phase diagram in the theory section. Likewise, if one is using high pressure steam to fracture a water-filled pipe, the Classius-Clapeyron Equation would be needed in this section. Label every equation on the right-hand side of the page in parentheses as follows:

$$\Delta G^0 = -RT \ln \left(\frac{1}{p_{O_2}} \right) = RT \ln p_{O_2} \quad (1)$$

Note the one-inch left indentation and the use of the right-justified tab for the reference to Eq (1). Use references fastidiously to credit sources and other's work.

Design (or Experimental)

Present your design (or experimental work). A figure should be referenced in the first (second at the latest) paragraph. *Never attempt to describe a physical piece of equipment without first referring the reader to a figure showing the equipment you are to describe.* If your work is purely theoretical, there may be a figure showing sample locations, or paths taken through a theoretical diagram such as the cooling path through a TTT diagram. As each element of the design is presented use references to equations or diagrams you have in the Theory section. For example, “Temperature in the furnace were computed using Eq (14).” If you have very detailed and lengthy computations (or data) place them in an appendix and refer to the appendix in the body of your report. If the information in an appendix is never mentioned in the body of the report, do not include it in the report.

Results

Present the results of your work here. Typically, this will be very brief since everything you were planning to do and need to describe it was already presented in the preceding two sections. Minimize any discussion of the results in this section. Save that for the next section. Figures are preferable to tabular data. Never present both tables and figures of the same date unless there is an overwhelming need to do so.

Discussion

If you keep a list of everything you are uncertain about or think might be pursued in greater detail as you right the paper, it can form the basis of the discussion. If you have completed the work so thoroughly and convincingly that there is nothing whatsoever to say about the results, then the discussion is unnecessary. This will not be the case for any student work. Do not be hesitant to criticize your own work and discuss uncertainties and needed improvements. Anticipate the readers’ questions and afford them the courtesy of answering their questions in the discussion; otherwise, they may never have an opportunity to consider your answer. Leave hard and fast conclusions to the following sections.

Conclusions

Reread the introduction for the goals and objectives of the work. Then write the findings that satisfy them. Match your conclusions as closely as possible to the stated goals. If the goals changed, consider rewriting the introduction as though the goals were always what they turned out to be. If you like, some mention of difficulties and the need for changes might be broached in the discussion if it has some intrinsic value beyond “we just did not know what we were doing at the start”. Never make statements that are questionable. Never draw conclusions that are not completely substantiated. It is acceptable to use terms such as it *appears that* or *may* in the conclusions when the results are less than definitive.

General

- Table captions appear at the top of the table and are numbered 1, 2, 3, --.
- Figures are labeled at the bottom and numbered 1, 2, 3, --.

- Appendices are labeled A, B, C, - -. Each appendix is labeled at the top of the first page.
- Margins are 1 inch at the top, bottom, and right and 1.5 inches on the left (for binding).
- Landscape formatted pages are placed so the top is along the bound edge (left for one side printing).
- Refer to figures as Figure 1 or Fig. 1 (discouraged but allowable).
- Refer to tables as Table 1.
- Refer to equations as Equation (1) or Eq (1) or Eq. (1).
- Be consistent in formatting.
- References are numerical superscripts. See Metallurgical Transactions Guide for Authors for details.
- A convenient practice is to use an elongated cell at the top of a table to hold the table caption. Remove the top, left, and right borders.
- Use third person only: no “we”.

Table 1. Widgets produced in 2008 by quarter			
Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
3453	4356	2954	3412

Dotted border on Caption shown for edification only

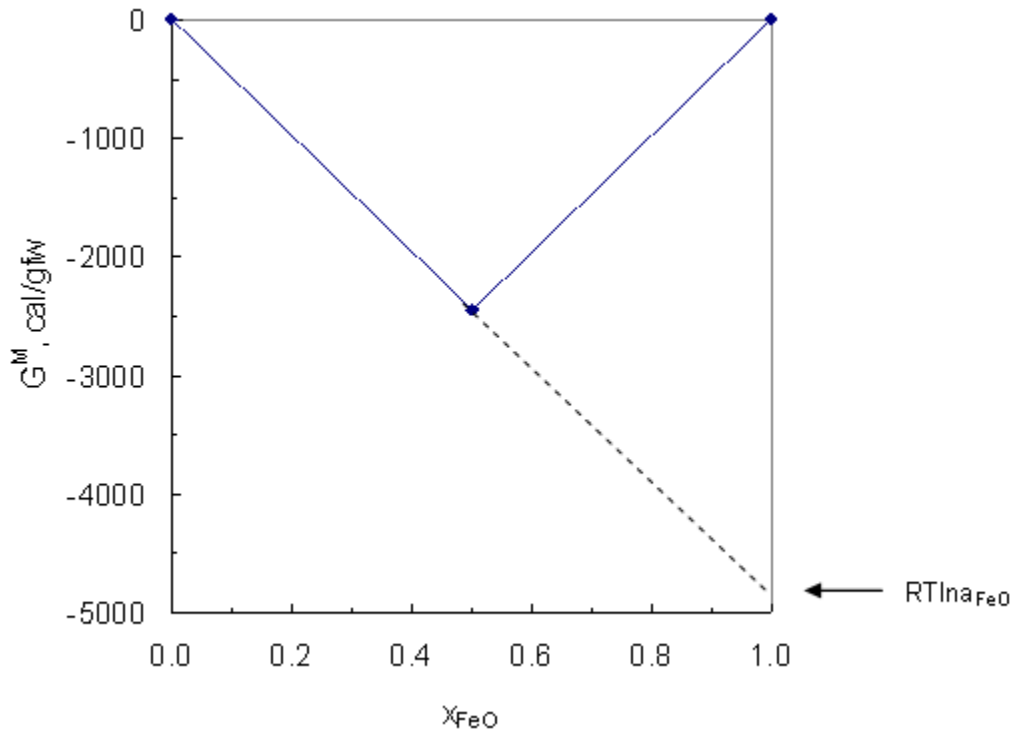


Figure 1. Integral molar Gibbs energy of mixing for the solid alumina-wustite system at 1000 °C

Appendix A

Computation of convective heat transfer losses from forge iron during forging.

The computation of ----

Treat this writing as a coherent document. You may refer to equations, figures, and tables elsewhere in the report. Use complete coherent paragraphs, equations, figures, etc. These may be prefixed with the appendix number (viz. Equation (A-1), Figure A-1, etc.

(Use a separate page for each appendix)

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Information continues on the following page.

Design Report Content

- a) Project title and team members
- b) A brief problem statement including starting inputs, customer needs (outputs), and goals
- c) State the established effective internal (team) review processes
- d) Detailed design inputs, constraints¹
- e) Considered designs
- f) Alternative analyses that incorporate constraints²
- g) Justification for accepting the selected design
- h) Reasoned design implementation plan with Gantt chart schedule
- i) Progress achieved compared to Gantt chart schedule
- j) Substantial problems (anticipated and realized) that can be resolved with available resources and how they are to be resolved
- k) Problems that cannot be resolved without external (to the team) resources and what specific resource is needed.
- l) Summary and conclusions

¹ Design Elements: Technical analysis
Use and adherence to applicable standards
Economic
Environmental
Sustainability
Manufacturability
Ethical
Health and safety
Societal
Political
(Do not ignore any of these. However, when one is of no particular concern to your project you may make a statement to that effect.)

² A Decision Matrix is often used

Grading Factors

- a) Clear, concise, effective written and oral communication
- b) Meaningful summary and conclusions
- c) Technical depth and correctness
- d) Timeliness
- e) Accomplishments