

PROJECT LEAD THE WAY

PLTW

Igniting imagination and innovation through learning.

Engineering Notebook

Engineering Notebook

- What Is an Engineering Notebook?
- Why Keep an Engineering Notebook?
- Who Keeps an Engineering Notebook?
- Contents
- Engineering Notebook Sections
- Best Practices

What Is an Engineering Notebook?

An engineering notebook is a book in which an engineer will formally document, in chronological order, all of his/her work that is associated with a specific design project.

- Clear and detailed description of your design process



Why Keep an Engineering Notebook?

An engineer's notebook is recognized as a *legal document* that is used in patent activities to...

- Prove the origin of an idea that led to a solution
- Prove diligence in turning the idea into a solution
- Prove when an idea became a working solution (“reduced to practice”).



Who Keeps an Engineering Notebook?

All Types of Engineers that work on R & D

- Legal documentation of work
- Continuity in projects

College engineering students

- Develop time management skills
- Improve research, documentation and communication skills
- Basis for professional presentation of work



Contents

- Discovering the problem
- Research
- Sketches with labels and descriptions
- Brainstorming
- Calculations
- Your daily thoughts and ideas
- Pictures
- Expert input (names, positions, contact info, details of conversations)
- Work session and meeting summaries
- Test procedures, results, and conclusions
- Digital technical drawings
- Design modifications

Everything you do/think related to a specific design project

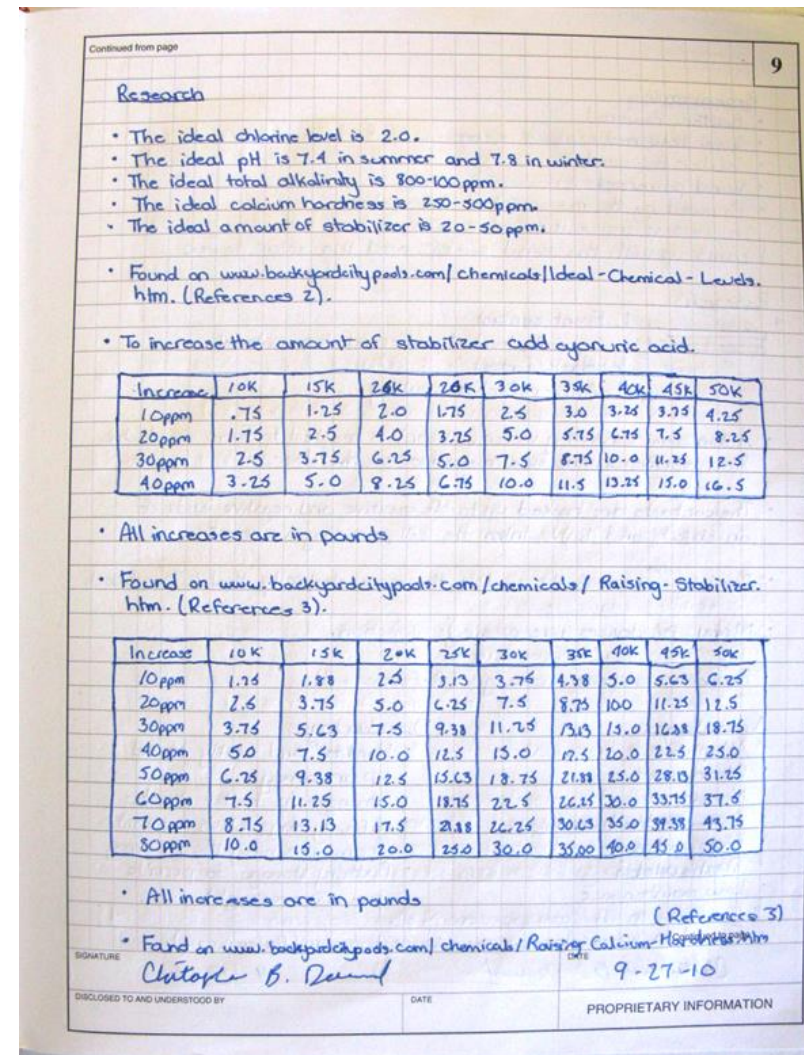
Engineering Notebook Sections

- Title Page
- Table of Contents
- General Chronological Entries
- References
- Business/Expert Contacts

TABLE OF CONTENTS		
PAGE	SUBJECT	DATE
1	Schedule Drafting, Research Problem Statement	9-15-10
2	Updating Schedule, Research Pool Chemicals	9-16-10
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4	System Sketch, Research Chlorine	9-20-10
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7	Solubility Research	9-23-10
8	Borax Research	9-24-10
9	Ideal chemical levels Research	9-27-10
10	Brainstorm and Research Power Systems	9-28-10
11	Brainstorm pH Specifications, Chlorine Matrix	9-29-10
12	Sodium Dichloroisocyanurate Anhydrous Research	9-30-10
13	pH Sensor Research	10-1-10
14	Chlorine : pH Buffer Decisions, Alkalinity Testing Research	10-4-10
15	pH down Decision, Alkalinity Testing Research	10-5-10
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17	Water Hardness Up/Down Decisions	10-7-10
18	Valve Research	10-12-10
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20	Chlorine Sensor Specifications, Valve Research	10-14-10
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22	Globe Valve, Actuator Research	10-18-10
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24	Schedule Update, Solenoid Valve Research	10-20-10
25	Actuator Research	10-21-10
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27	Fluid power Actuator Research	10-25-10
28	Product Specifications	10-26-10
29	Turbidity Research	10-27-10
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Best Practices

- Quad ruled paper
- Bound
- All work is in pen
- All pages are
 - Numbered
 - Dated
 - Signed by the designer
 - Signed by a witness
 - Include a statement of the proprietary nature of notebook



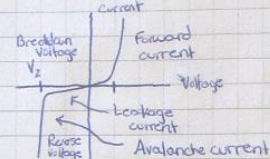
Best Practices

- Do not leave blank space. If there is extra space, draw an X or a line across it and sign.

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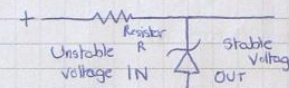
Research

- Zener Diodes
 - Allows forward bias as well as reverse bias when the voltage is above a certain value: the breakdown voltage known as the zener voltage
 - The zener voltage of a standard diode is high, but if a reverse current above that value passes through it, the diode is permanently damaged
 - Zener diodes are designed with a lower zener voltage
 - The voltage drop across a zener diode is equal to the zener voltage regardless of how high the reverse bias voltage is.



- The voltage vs. current graph shows forward bias as well as reverse bias when the voltage overcomes the breakdown voltage (V_z).

- Zener diodes can be used to regulate voltage



- The output voltage is fixed at the zener voltage of the zener diode used

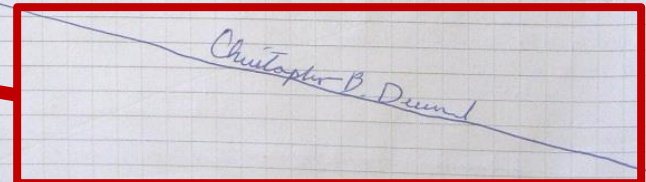
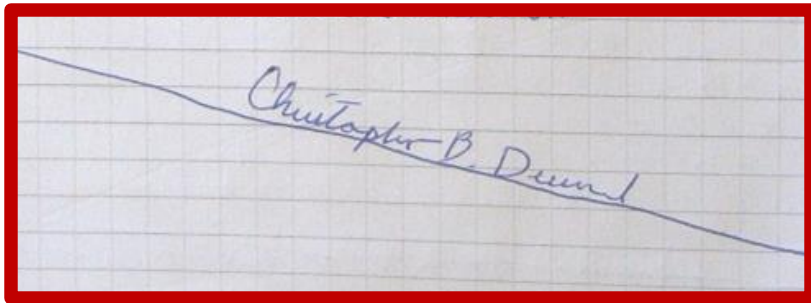
- As the input voltage increases, the current passing through the zener diode increases, but the output voltage remains constant.

- Found on www.reuk.co.uk (Reference 89)

Continued to page

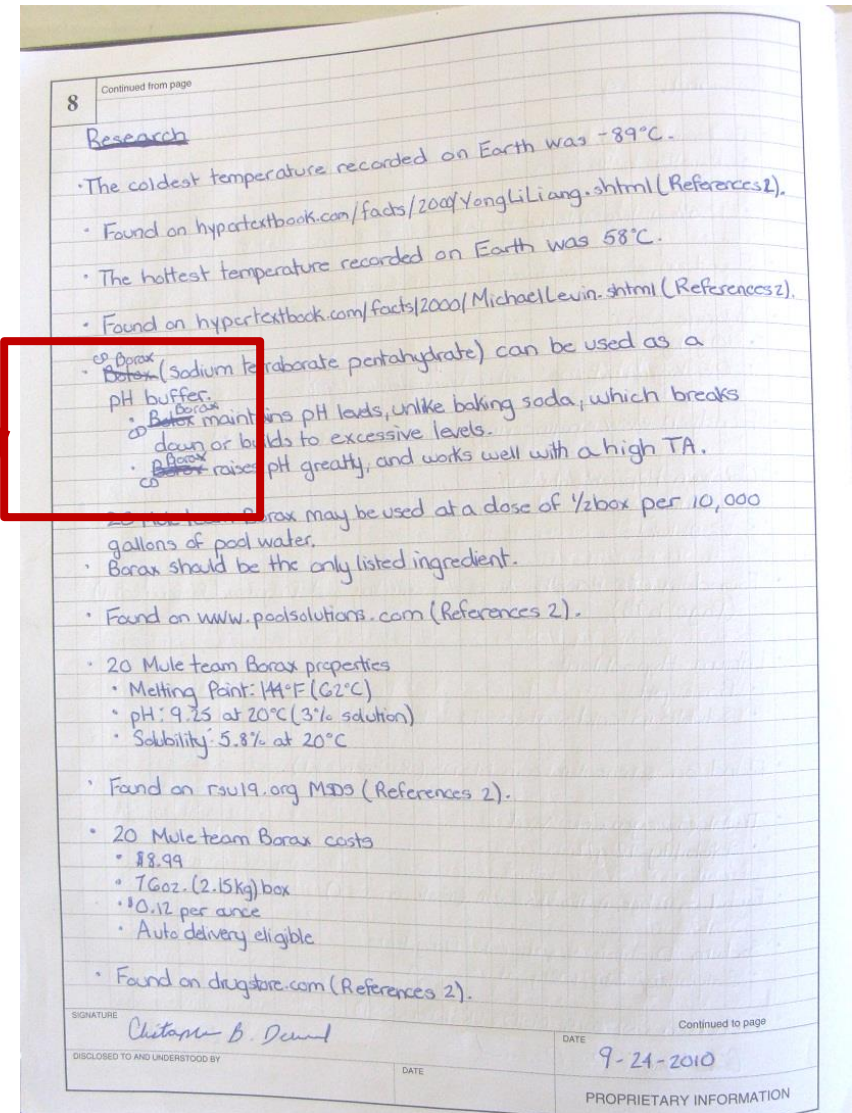
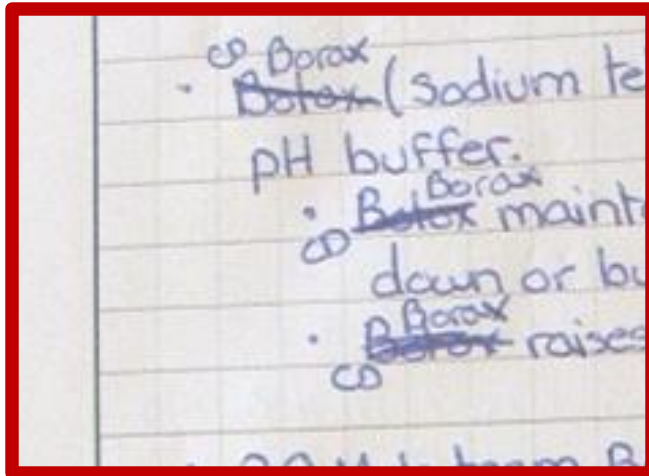
SIGNATURE Christopher B. Deem DATE 12-9-10

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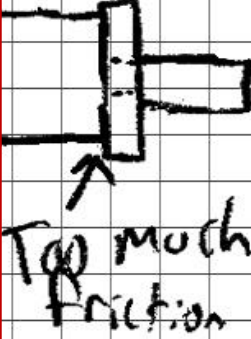
Best Practices

- If you make a mistake, draw a line through it, enter the correct information, and initial the change.



Best Practices

- Date each entry

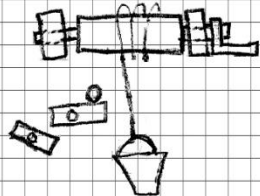


5/15 It's Sunday to work on the project modifying the wheel. I think it is going to hold it in place. Technology Lab at aluminum bar stock.

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1st Idea for a Wheel and Axle Sub-System 125

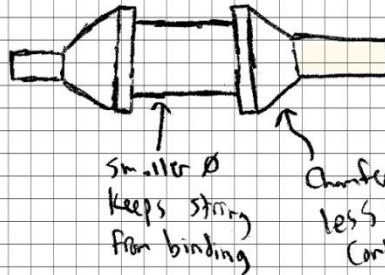
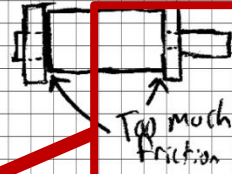
5/13 I came up with a way to use the wheel and axle in my design. A weight falls into the bucket and causes the axle to spin. The wheel (what looks like a hand crank in this case) is attached to the axle and would also spin hitting something and transferring its energy to the next part of the system. Now I have to figure out how to use it in my system.



My instructor let me borrow a book to help me get some ideas for my system. I found a great idea for a screw and wedge mechanism on page 194.

Chironis, N., and Slater, N., (1996) Mechanisms and Mechanical Devices Sourcebook (2nd edition) New York, NY: McGraw-Hill.

5/15 It's Sunday, and I came in at 10:00 AM to work on the project. I spent the morning modifying the wheel and axle design, because I think it is going to cause too much friction between the side walls and the bracket that will hold it in place. I also went to the other Technology Lab and found some 1/2 diameter aluminum bar stock to make my wheel and axle.



2nd Idea Modified Wheel and Axle address potential friction issue

Continued on page 126

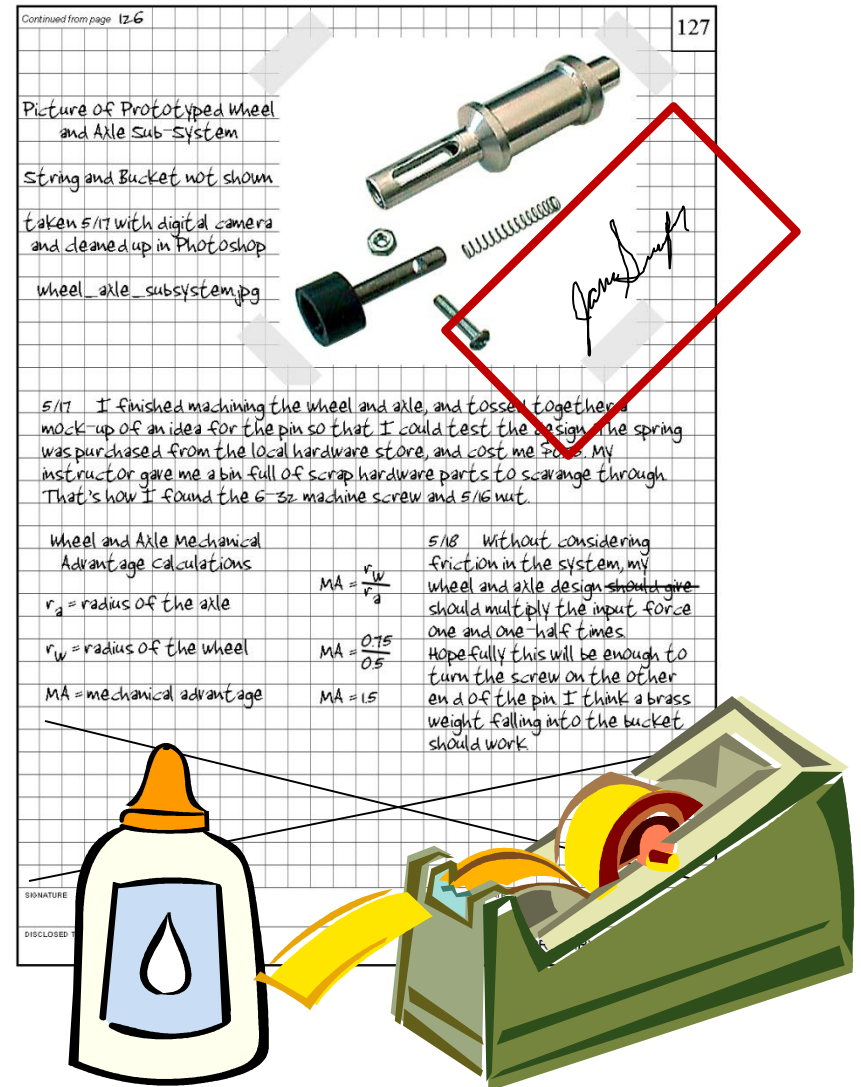
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PROPRIETARY INFORMATION

Best Practices

- Cut and paste print-outs of digital files that you create or use as reference.
- Sign your name so that it extends across both the notebook page and the inserted document.



Best Practices

- Sign and date each page before the next page is begun.

Continued on page 126		
SIGNATURE <i>Robert P. Johnson</i>		DATE <i>12-16-11</i>
DISCLOSED TO AND UNDERSTOOD BY <i>Julian Clark</i>	DATE <i>12-16-11</i>	PROPRIETARY INFORMATION

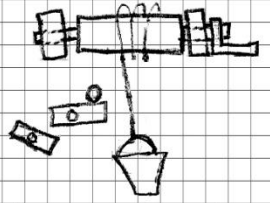
Best Practices

- Sketches
 - Label all parts of the sketch
 - Describe each sketch

Continued from page 124

1st Idea for a Wheel and Axle Sub-System 125

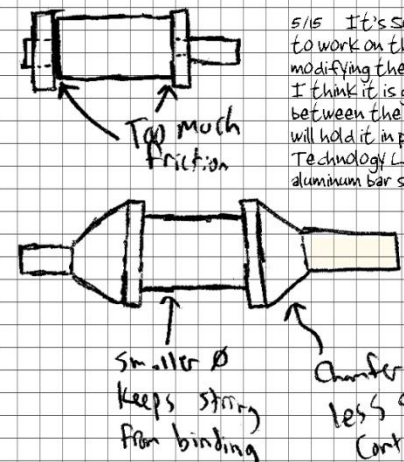
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Signature _____ Date _____

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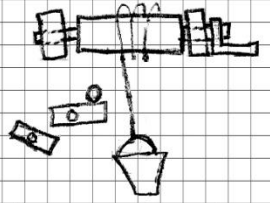
Best Practices

- Progress Entries
 - Reflect on tasks accomplished, successes, and failures
 - Reflect on future needs and tasks to be completed

Continued from page 124

1st Idea for a Wheel and Axle Sub-System 125

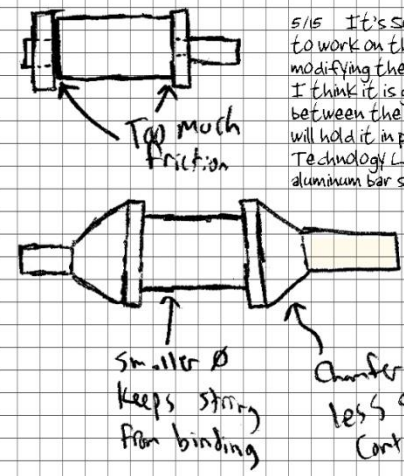
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Continued on page 126

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Best Practices

Be **NEAT**,
be **ACCURATE**,
be **LEGIBLE**,
and be **THOROUGH**.

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