

# Designing Written Reports

Presentation for Senior Design Classes

By

Dr. Richard Kunz

Associate Professor, Mechanical Engineering

Dr. George Hayhoe

Professor, Technical Communication

Mercer University School of Engineering

## Overview of Topics

- 1) Purpose and audience for PDR **report/proposal** and CDR **report**
- 2) Parts of the formal proposal document
- 3) Differences between PDR and CDR
- 4) Words of Wisdom for PDR
- 5) “Best Paper” competition



In Senior Design, as in the workplace, you wear two different hats: as engineer and as writer-presenter

- To perform your professional **engineering** duties requires one mindset
- To **communicate** your results to others requires a different mindset
- Don't remove your engineer's hat when you write



Think about your purposes for proposals and reports

- **Why are you writing or presenting this information?**
  - Demonstrate your oral and written communication skills (ABET)
  - Demonstrate engineering solutions to clients
  - Demonstrate competence to managers (and instructors)



## Consider the multiple audiences for Senior Design proposal and report

- **Who is in your audience?**

- Your client (#1)
- Tech advisors
- Project manager
  - In job setting, would review prior to presenting to client
- Other faculty and students



- Create an audience analysis chart to keep all in mind

## Review the requirements for the Preliminary Design Review (PDR)

- Present the **problem** clearly
  - Confirms your understanding of client's problem, with any constraints or parameters, within contexts
- Present real **alternatives**, defends choice
  - Feasibility and merit criteria related to *problem*, not just to *technical* possibilities
- Give timetable, resources, ways to measure success
- Contains some elements of persuasion, but **first** must demonstrate engineering competence objectively
  - On the job, you would have competitors for the contract
- **Asks for permission** to build and test

Remember the basic structure for any proposal, as taught in TCO 341:

- Summary (abstract, executive summary are different—you produce executive summary)
- Introduction
- Project Description
- Work Accomplished
- Final Design Specifications
- Conclusions

Let's review each part in more detail

## Parts of a PDR proposal

- **Introduction**—the subject, problem definition, purpose, any background needed, scope, forecast of the report's structure and conclusions
- **Project Description**—how you propose to solve the client's problem
  - What will define success in solving this problem?
  - **Feasibility criteria** —constraints of any solution
    - Yes/no, possible/not possible
  - **Merit criteria** —desirability of possible solutions
    - Measures used to judge relative success of options
    - Weighted for sensitivity, importance

### ...Parts of a PDR proposal

- ***Work accomplished*** — show your engineering credibility with documentation
  - Engineering sketches, drawings, discussion
  - Engineering analysis to predict performance of preliminary designs
  - Discussion and application of appropriate Codes and Standards
- ***Final design Specifications***
  - A complete and inclusive set of specifications for all components
    - Includes drawings, plans, procedures, . . .

### ...Parts of a PDR proposal

- ***Conclusions/Recommendations***
  - Summarize the best design alternative
  - Present a plan for implementing and validating the design
  - Present a budget of projected prototype costs
  - The timeline to accomplish these tasks
  - Request for permission to proceed
- ***References, bibliography***—give credit due, build credibility for your research

### ...Parts of a PDR proposal

- Appendices and annexes (attachments)
  - Any supporting or additional materials not essential to the main body of the report, but useful to some readers
    - Calculations, working drawings, extended analyses, lists, photos, etc.
- Résumés of the team, targeting competence to solve the problem
  - Professionally focused, not “student” focus

### ...Parts of a PDR proposal

- Front matter—complete this part last—but allow plenty of time to perfect it!
  - Title page
  - Executive summary
  - Acknowledgments (thanks to those who assisted—optional, but courteous to do)
  - Table of contents with page numbers
  - List of figures, tables, symbols, illustrations
  - Glossary if needed

## Differences in writing your report for Critical Design Reviews

- Not just a repeat of the PDR *proposal*, but a *report* on results
  - Very *brief* review of problem, choice of solution—recap what was agreed upon in PDR
- Strong emphasis on what you did, why, and with what results
  - Chronology of actions, especially any changes
    - Document change requests, explain any problems
  - Explanation of test results (tests related to feasibility and merit criteria)
  - Request approval (in real world, \$\$\$\$)

## ...Differences in writing your report for CDR

- **Change in Project Goal for CDR:** focus on what has resulted from your design, construction, and testing; degree of success you achieved
- **Changes in Recommendations for CDR:** discuss any future actions as prototype enters production; ask for approval of the completed design

For PDR & CDR: Important to demonstrate both your *engineering* and *communication* skills

Assemble professionally designed PDR and CDR documents

- Use good descriptive headings, dividers
- Edit carefully; get peer reviews
- Be sure your **writer's** tasks are done as well as your **engineer's** tasks
- Be sure your **engineer's** tasks are done as well as your **writers's** tasks



## Words of Wisdom

- Figures and tables should have **descriptive** captions.  
Compare:
  - *Figure 12. Analysis results, versus*
  - *Figure 12. Stress analysis shows maximum is well below material allowable, FS = 2.5*
- No orphans
  - Each figure/table should be referred to in the text
  - Each Appendix should be referred to in the text
  - Text and graphics complement each other
- Be sure figure numbers line up in text and captions



## More Words of Wisdom

- Your PDR is a **persuasive engineering** document
  - Your best persuasive arguments will be based on sound engineering, not on flowery language
- Be sure the context is clear
  - Why are you performing these analyses?
  - What do the results mean, why are they important?
  - Why did you rule out options A and B in favor of option C?
- Ideally, your PDR should give your client no reasonable alternative other than to proceed with your plan

## “Best Paper” Competition

Honor awarded to best CDR paper of the year (since 2002-2003), presented at Honors Day Convocation

- Nominated by EGR faculty (usually 5-10 teams)
  - Evaluated by TCO and STC judges
  - Sponsored by Mercer Chapter STC & TCO Dept.
  - Perpetual plaque with team names on display in MUSE
- Criteria for Evaluation:
    1. Clarity of technical information
    2. Document design, including integrated visuals
    3. Skill in writing (organization, voice, grammar)
- 

Any questions about this presentation?