Chapter 1
“Engineers and Writing.”

- Main Objective:
  - Convince you that writing is important for professional engineers and to find out what they write about.

Chapter Outline

- Engineers Write a Lot
- Engineers Write Many Kinds of Documents
- Successful Engineering Careers Require Strong Writing Skills
- Strong writing skills can be learned—like any task.
- Noise and the Communication Process
- Controlling the Writing System

Importance of Writing as an Engineer

- Engineers spend 20 to 40% of their working hours writing.
  - At a salary of $60,000, that's $24,000 a year for writing.
- Engineers Communicate new or improved design ideas.
- Engineers Communicate effectively with the public.

Engineers and Writing

- **Communication skills are extremely important.**
  - Unfortunately, both written and oral skills are often ignored in engineering schools.
  - Engineers may have excellent ideas and a strong case to make, but they do not know how to make it
  - If you can't make the case, no matter how good the science and technology may be, you are not going to see your ideas reach execution/completion.

Engineers and Writing

- Engineers like working with numbers, equations, machines, and instruments

  HOWEVER YOU DO NOT LIVE ALONE IN THIS WORLD

  - You also need to know how to communicate and transmit your ideas and work to different kinds of people (professionals or non professionals).
    - This means that you have to write and speak in a very efficient way

Engineers and Writing

KEEP IN MIND THE FOLLOWING:

- Engineers write a lot
- A successful engineering career requires strong writing skills
- Engineers write many kinds of documents
- Engineers can and must learn to write well

Engineers and Writing

During the engineers career, the engineer may need to write all kinds of documents such as:

- **Studies:** Research, Analytical, Development…etc
- **Publications:** Articles, Catalogs, Textbooks, Newsletters…etc
- **Standard Reports:** Weekly, Annual, Progress, Lab…etc
- **Special Reports:** Recommendation, Trip, Investigation, Site…etc
- **Technical Reports:** Evaluation, Specification…etc
- **Manuals:** User's Handbook, Repair, Instructions, Maintenance…etc
- **Interoffice:** Memos, Letters, Minutes…etc

Engineers and Writing

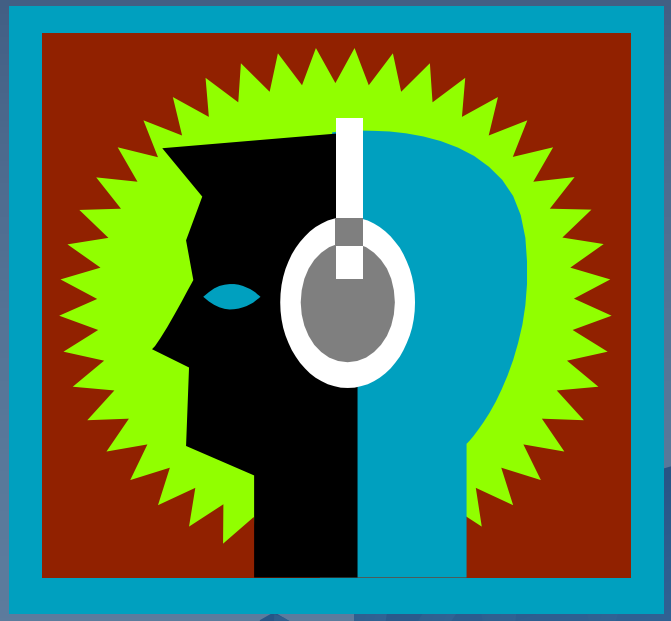
KEEP IN MIND THE FOLLOWING:

- Good document needs more and more of **EDITING**
  - This includes: scribbling, additions, deletions, rewordings, and corrections
- When you write, you are sending a message (signal) to other people (receivers).
  - To receive it clear and without interruption or confusion, it should be free of **NOISE**

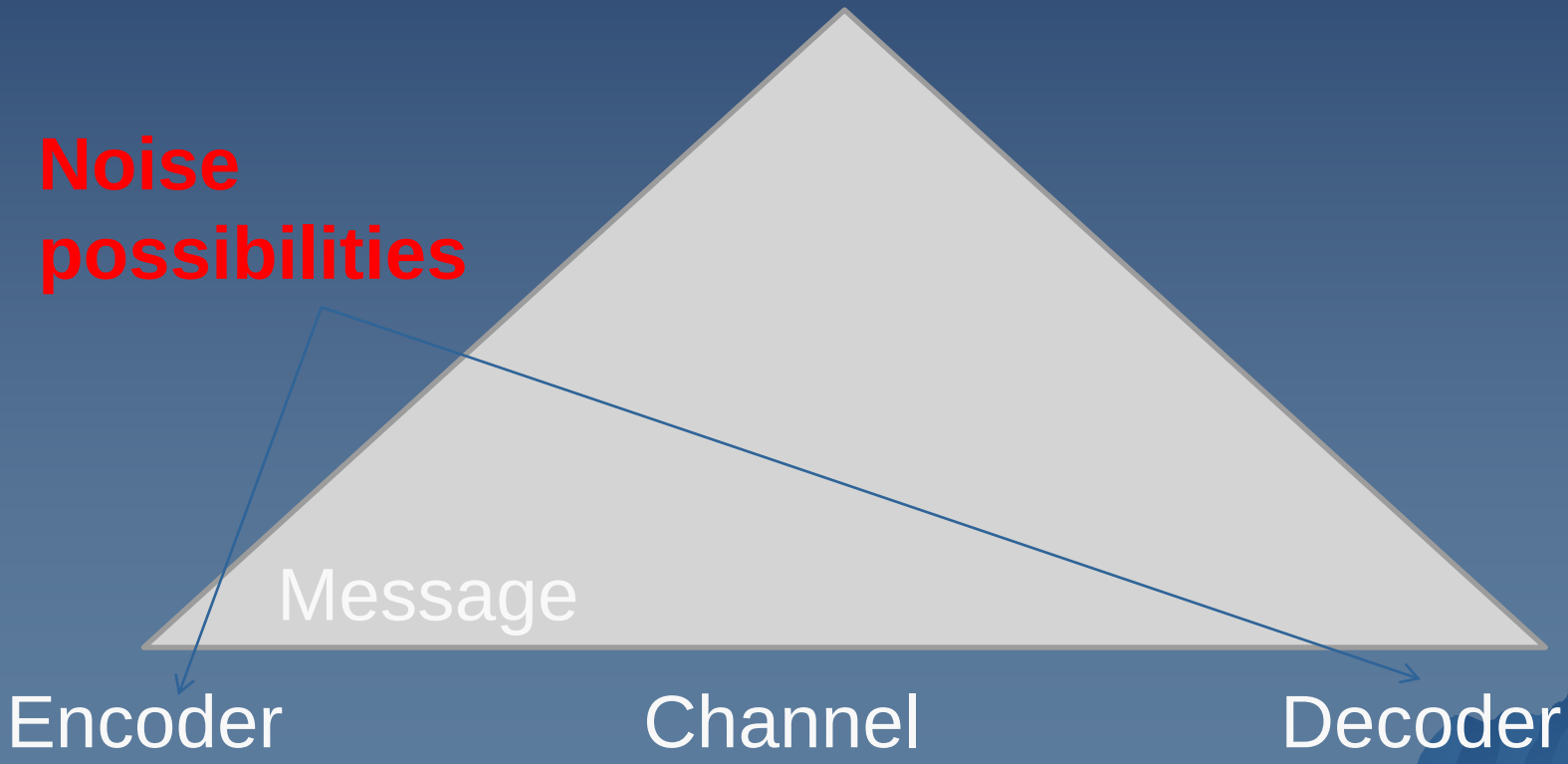
Writing Problems

- Historically, only 5% of engineering education focused on writing or communication in general.
- Noise in the system

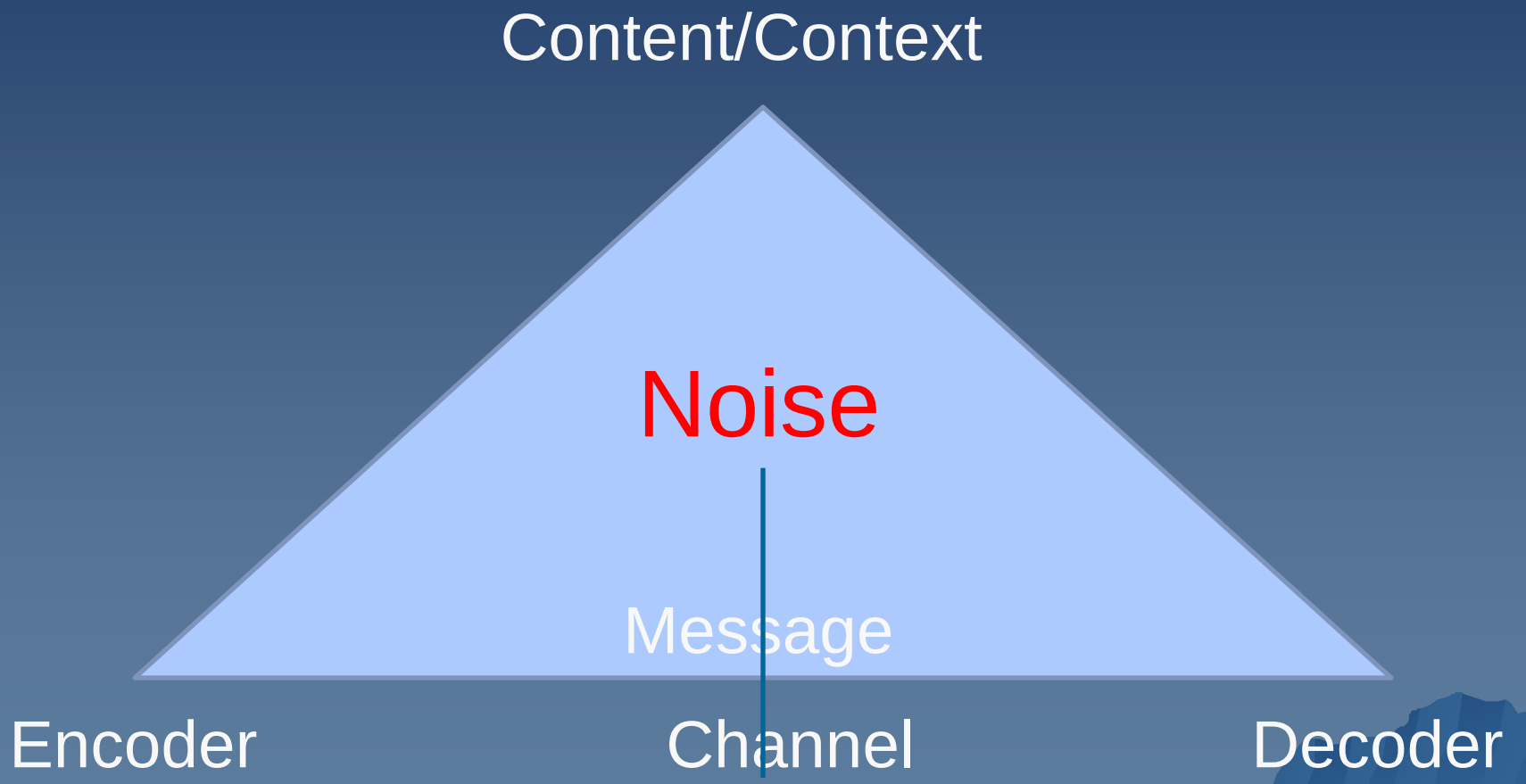
  (outside factors affecting communication)



Communication System Content/Context



Communication System: Noise



Sources of Noise

- Punctuation, grammar, usage errors
- Wordiness, lack of emphasis
- Word-choice problems
- Audience-adaptation problems
- Failure to achieve document's purpose

Engineers and Writing

Noise and the Communication Process

- Have you ever been annoyed by interference on your TV screen or may be could not hear a friend on the phone because someone was using a vacuum cleaner in the next room or the stereo was booming?
- Have you ever not been able to answer an exam question because you did not understand what the question wanted?

Engineers and Writing

Noise and the Communication Process

- In each case what you were experiencing was noise interfering with the transmission of information
  - When ever a message is sent, someone is sending it and another is receiving it
  - Applying this concept to engineering writing, we can say that anything causing a reader to hesitate in uncertainty, frustration, or even amusement is noise

Engineers and Writing
Examples of Noise in Sentences

- **Noisy Sentence:**
  There was not a sufficient enough number of samples to validate the data
- **Revised Sentence:**\
  There weren't enough samples to validate the data
  Noise is redundancy (sufficient and enough have the same meaning)
- **Noisy Sentence:**
  Our intention is to implement the verification of the reliability of the system in the near future
- **Revised sentence:**
  We want to verify the system's reliability soon

Engineers and Writing
Examples of Noise in Sentences

- It is relatively easy to identify and remove simple noise like this. More challenging is the kind of noise that results from fuzzy and disorganized thinking.
  - **Example of Too Much Noise in s Sentence!!**
    - Your final exam, oh, sorry, mid exam could be, if I remember, between, or let me say in the first week of not this month, but the next month if I am around. If I am not available at that time, which is mostly the case, we might rearrange another time, and this might be two or three days after I come back, unless you have other suggestions, but you have to tell me one or two days before I leave, otherwise, the exam time is fixed

Engineers and Writing

When you get the response that you want from your communication, it means you communicated well

Eliminating Intermittent (Sporadic) Noise in Writing

Noise mostly occurs in spelling, punctuation, sentence structure, technical usage

1. Spelling and spell checkers
2. Punctuation
3. Sentence Sense
4. Technical Usage
5. Writing Editing
6. Reviewing by Others

1. Spelling and Spell Checkers

To correct your spelling, use reliable dictionaries and electronic spell checkers

2. Punctuation

such as:

period, commas, semicolons, colons, parentheses, exclamations points, quotation marks…etc

Meaning of a sentence may change depending on the punctuation

2. Punctuation – Commas

- Confusion sometimes exists about commas "," because frequently their use is optional
- The question to ask is, Does adding or omitting a comma in a given sentence create noise? In general, if no possible confusion or strain results, the tendency in technical writing is to omit unessential commas
- Often, omitting a comma after introductory words or phrases in a sentence will cause the reader to be momentarily confused

2. Punctuation – Commas

- **Noisy sentence:**

  After the construction workers finished eating rats emerged to look for the scraps.

  - **Solution:**
    - **After the construction workers finished eating, rats emerged to look for the scraps.**
- **Noisy sentence:**

  In all the containers were in good condition considering the rough journey.

  - **Solution:**
    - **In all, the containers were in good condition considering the rough journey.**

2. Punctuation – Commas
Usage of Commas (1)

- **Link independent clauses**

  The bus leaves early, and the sky looks clear.

- **After introductory clauses, phrases, or words**

  1. When it comes to spending money, you should consider the financial situation of your family.

  2. Since 1987, the economy of Jordan started to face essential problems.

  3. Yes, you have to focus on your study.

2. Punctuation – Commas
Usage of Commas (2)

- **To separate items in series (serial comma)**

  Fresnel's equations determine the reflectance, transmittance, phase, and polarization of a light beam at any angle of incidence.

- **serial comma may also prevent confusion**

  1. Athens, Technobuild, johnsons and Turblex build the best turbines.

  Unless Johnsons and Turblex are the name of one company, you will need a serial comma:

  2. Athenturbines.s, Technobuild, johnsons, and Turblex build the best

2. Punctuation – Commas
Usage of Commas (3)

- **In dates, names, addresses, and numbers**

1. **She was born in May 16, 1985. (OR 16th May, 1985)**

2. **This article was written by Al-Ansari, Ameen. (last name, first name)**

1. **H.U. , Zarqa, Jordan.**

2. **It is written in page 22, line 6.**

3. **It costs $ 25,000.**

2. Punctuation – Semicolons

- Often, the semicolon ";" is replaced by a comma.
- More frequently, we simply use a period and start a new sentence, but then a psychological closeness might be lost
- It is used for independent clauses, which are clearly related in meaning

  1. Your program is working well; however, mine is a disaster.

  2. Take Professor Hixson's class; you'll find he's a great teacher.
- The relationship between these statements are not as clearly stressed by the use of a comma or a period

2. Punctuation – Colons

- **Colons ":" are used to separate the hour and minute in a time notation and to divide parts of book or article titles:**

  1. This proposal is due in the morning at 8:30 sharp.

  2. One of the books, recommended for the seminar, is "The Limits of Safety: Organization, Accidents, and Nuclear Weapons"

- **The most common use of the colon within a sentence, however, is to introduce an informal list:**

  1. The class room needs the following items: Chairs, table, screen, data show, and computers.

  2. For the final exam, you will need several items: a pencil, calculator, and three sheets of graph paper.

2. Punctuation – Parentheses

- **Parentheses "(" and ")" are to set off facts or references in your writing (almost like a quick interjection in speech)**

  1. Resistor R5 introduces feedback in the circuit (see Figure 5).

  2. This reference book (published in 1993) still contains useful information.

- **If what you place within parentheses is not a complete sentence, put any required comma or period outside the parentheses.**

  Whenever I design a circuit (like this one), I determine the values of the components in advance.

2. Punctuation – Parentheses

- **To enclose interrupting words**

  In the last ten years, people (mainly, the educated) started to pressure the governments for more freedom.

- **For certain numbers**

  His rank is four (4) among sixty seven (67) graduated students.

- **For references**

  The study shows that the pollution increases as the number of cars increases (Kamella, 1986).

2. Punctuation – Exclamation points

- The best advice is to avoid the exclamation points “!”
- It in professional writing except in the case of warnings (DANGER: Sodium cyanide is extremely toxic!) or strong command (Avoid speed, the coming section is extremely danger!)

2. Punctuation – Quotation Marks

- Use quotation marks “ ” to set off direct quotations in your text, and put any needed period or comma within them, even if the quoted item is only one word
- After direct question He asked, “How was the class?”
- Direct quotation in the text Did you see “Made in Germany” on the tag of the T–Shirt?

3. Sentence Sense

- We discussed it at the beginning. Also, review the information in this section and look to grammar textbooks

4. Technical Usage

- Jargon (necessary technical terminology)

  bytes, modem, internet…etc

- Abbreviations (used to save time and prevent boring readings)

  CD-ROM, NASA, IBM, UN, UNISCO, FORTRAN…etc

4. Technical Usage – Numbers

- Use numbers rather than words for time, money, or measurements

  2 p.m., J.D. 3000, 12m
- Form the plural by adding an “s”

  1930s, 50s
- Place zero before decimal

  0.35m
- When using very large or very small numbers, use scientific notation

  2.1 x 10 – 12 [m], 4.89 x 106 [kN]

4. Technical Usage – Units of Measurements

- SI metric system is most widely used (m, N, s)
- Don't mix English (lb, ft) system with metric system. In some cases you may mix

  5.1 cm (~2 in)
- Use correct symbol when referring to units of measurements

  $P = I E$

  Where

  P = power, in watts [W]
  E = Electromotive force, in volts [V]
  I = current, in amperes [A]

4. Technical Usage – Equations

- Equations and formulas slowdown the reading process, so use them when they are necessary
- Most word processing softwares have the ability for writing equations
- Make sure you are writing the equations clear, correct, and numbered (to refer to them in the text)
- See Figure 3-3 for clear multi–line equations

5. Writing Editing (carefully)

6. Reviewing by Others

- Let some one read your document before you hand it to the intended audience

SOME GUIDELINES FOR GOOD ENGINEERING WRITING

1. *Focus on why you are writing*
2. *Focus on your readers*
3. *Satisfy document specifications*
4. *Get to the point*
5. *Present your material logically*
6. *Make your ideas accessible*
7. *Use lists for some information*
8. *Format your pages carefully*
9. *Express yourself clearly*
10. *Use efficient wording*
11. *Manage your time efficiently*
12. *Share the load: write as a team*

1. Focus on why you are writing

- Before starting to write, you should have a good idea of precisely what you want to communicate to your audience

- If these goals are not first defined in your own mind, you can't really expect your readers to get a clear message

- Broadly speaking the purpose of most technical writing is either to present information, or to persuade people to act or think in a certain way. However frequently your documents will have to be both informative and persuasive

1. Focus on why you are writing

Questions to be asked before writing, Do I Want to…..

- ***Inform:*** *p*rovide information without necessarily expecting any action on the part of my reader(s)?
- ***Request:*** Obtain permission, information, approval, help, or funding?
- ***Instruct:*** Give information in the form of directions, instructions, procedures so my readers will be able to do something?
- ***Propose:*** Suggest a plan of action or respond to a request for a proposal?

2. Focus on why you are writing

- ***Recommend:*** suggest an action or series of actions based on alternative possibilities that you've evaluated

- ***Persuade:*** convince or "sell" your readers, or change their behavior or attitudes based on what you feel to be valid opinion or evidence

- ***Record:*** record how something was researched, carried out tested, altered or repaired

2. Focus on your readers

- How you write any document should be guided by:

  A. what you want your audience to do with your information

  B. what they need from the document to be able to do it.

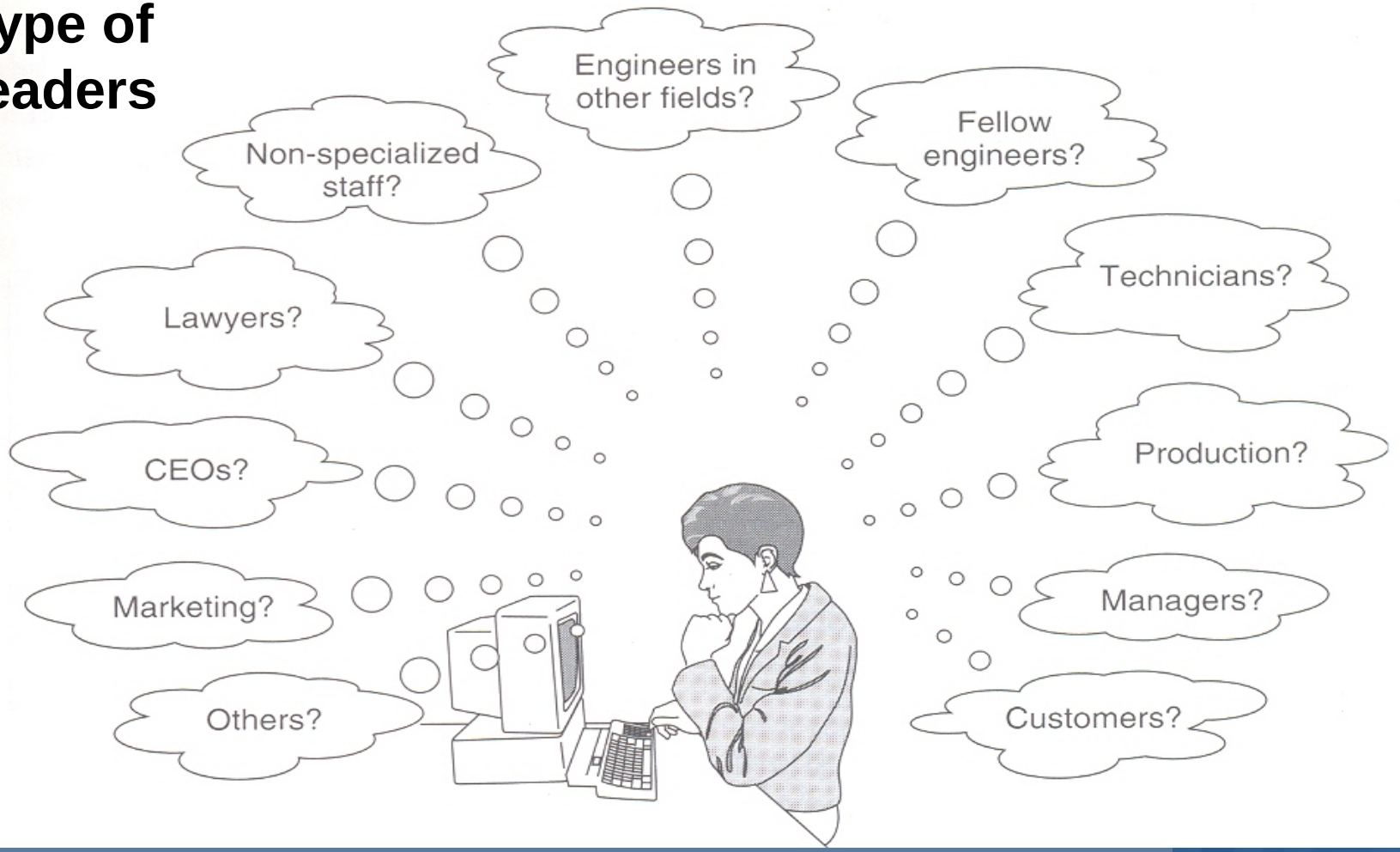
- Thus your audience plays a defining role in determining how you approach your task

Who is going to read this document?

- Answering this question helps you to consider the:
  - Knowledge,
  - Abilities,
  - Interests and expectations of the readers.
- Sometimes you will write to your supervisors, sometimes to your fellow engineers and sometimes to technicians or even to the general public.

2. Focus on your readers

Type of readers



Knowledge of the readers

- Are they engineers in my field and have a similar background, and there is no need for details or basics?
- Are they engineers from other disciplines who will need some background?
- Are they managers or supervisors who do not have specific knowledge but need to take decisions?
- Are they technicians who have practical knowledge?
- Are they people from marketing, sales or finance who are interested for "non-technical" reasons.
- Are they a mixture of people?

Ability of the readers

- Is the information being communicated at the standard of my audience?
- Are there appropriate examples, figures, and definitions?
- Is the level of expected understanding reasonable?

Interest of the readers

- Why will they read this document?
- How much time will they have to read it?
- Does the document contain the information they want?
- Does the document contain what is required to keep them interested?
- What will their attitude be?

3. Satisfy document specifications

- Number of pages
- You may need to provide short summary
- Headings, fonts, figures size, margins...etc
- Certain topics in your report (writing about specific thing)

e.g., request for proposal for a government research program

*Each proposal shall consist of not more than five single spaced pages plus a cover page, a budget page, a summary page of no more than 300 words, and a page detailing current research funding. All text shall be printed in single-column format on 8.5*11 inch paper with margins of at least one inch on all sides*

4. Get to the point

- Provide the most important information at the places where the readers can access easily and efficiently
- The most important information needs to be at the beginning

Example

- **SUBJECT:** Employee safety (**Vague**)
- **SUBJECT:** Need for employees to wear hard hats and safety glasses (**Better**)

4. Get to the point

- Your sentences need to be direct, short and clear.
- State the most important information at the beginning instead of losing them in the details.
- Before reading the details, people need to know your key points, findings, conclusions or recommendations.
- Not everybody would read all the details.
  - Examples:
    - Letter: Opening sentences
    - Memo: Subject line
    - Reports: Clear title + summary or abstract

5. Present your material logically

- You must organize your material so that each idea, point, and section is clearly and logically laid out within an appropriate overall pattern
- As always think before writing and keep your readers firmly in mind

- If there are a number of points that need to presented, start with the most important to the least or vice-versa.
  - Examples:
    - Progress report: Chronological order
    - Technical manual: Clear consecutive steps

6. Make your ideas accessible

- Structure your material in an easy way:

  A. Subdivision of material into sections and subsections with hierarchical headings and subheadings

  B. Don't use long paragraphs

6. Make your ideas accessible

Hierarchical Headings

Even in short engineering documents, a system of headings is essential to keep your material clearly organized and to let readers know what is in each section of the document. Headings and subheadings are also signposts that help a reader to get through a report without getting lost or to go to a specific point in the report

Example of Hierarchical Headings

FIRST LEVEL 1. QUALITY ASSURANCE PROVISIONS
Second Level 1.1 Contractor's Responsibility
Third Level 1.1.1 Component and material inspection
Fourth Level 1.1.1.1 Laminated material certification

6. Make your ideas accessible

Paragraph Length

No one, especially in technical fields, wants to read a solid page of wall-to-wall text of difficult material. A busy manager, for example will want to absorb your information in as easily digestible pieces as possible. **Remember that:**

1. Dense text on a page creates noise simply because it is too discouraging.

2. Technical information are usually demanding, so present material in short straight forward manner

3. A paragraph in technical writing should not be longer than 12 lines at max.

7. Use lists for some information

- A well-organized list is the most efficient way to communicate information.
- If you have to present steps in a procedure, materials to be purchased, items to be considered, reasons for a decision or groceries to be bought, a list might be the best way to go with because readers retrieve information from a list more easily and faster

Example describing procedures to install software

To install the Microsoft office software, turn on your computer, then insert the CD of office. Click on the icon setup, then make sure you interred the key number, then click ok. ***You can do better if you list the procedures***

1. Turn on your computer
2. Insert Microsoft office CD .
3. Click on the icon "setup“
4. Inter .....

7. Use lists for some information

Types of lists

- **Numbered lists**
- **Check lists**

  It is a list where you have to check the items that apply

  1. connect the monitor to the computer
  2. connect the keyboard and mouse to the computer
  3. Connect the power supply to the computer ...
- **Bulleted lists**

  Bulleted lists are commonly used when items in the list are no specific order, as in the following example.

  - Air pollution control
  - Public water supply
  - Wastewater
  - Solid waste disposal

8. Format your pages carefully

- **Margins:** Leave consistent margin around your text. Standard around 1 in. (2.5 cm)
- **Typeface:** Serif (as Times New Roman) or sans-serif (as Arial)
- **Font size**: Standard size 10 or 12 (For specific locations you may larger or smaller
- **White spaces**: single or double space

9. Express yourself carefully

- Be clear and Avoid ambiguity (undecided: sentence may have many meanings)
  - Avoid vagueness (no useful meaning)
  - Make your writing coherent (how well paragraphs are stick together)
  - There should not be any room for different interpretations or misunderstanding

10. Use efficient wording

- Use simple words as you can
- Do not repeat words with same meaning (Redundancy) Like: The parts of the machine are connected together (connected and together have the same meaning)

11. Manage your time efficiently

- Finding and using time
- Make outlines for what you are going to write
- Put a timeline (schedule) including the deadline for completion the final version

12. Share the load: write as a team

- Communicate
- Coordinate
- Collaborate
- Compromise

Writing Letters, Memoranda, and E-mail

When you need to communicate with others you may:

- **Talk to them face-to-face**
- **Talk to them by the phone**
- **Send them an E-mail**
- **Write to them on paper (memo or letter)**

Phone and Face-To-Face Communication

- No permanent records for the conversation
- The person you need to talk with may not be available at that time
- Recipients may not take the phone or in-person communication as seriously as they would if it were in writing
- Some topics are just too much for a conversation due to purpose, length, and complexity of the topic.

  you can't present details of product specifications or a proposal over the phone

E-mail

- **You need to consider that the recipients may not have access to the email frequently**
- **SECURITY ISSUES: Emails may be seen by other persons in the world**
- **Some people may still not considering electronic messages seriously**
- ***These days, people are using the email very widely, and through it the letters or memos are sent as attachment files***

Letters and Memos

- **Memo (memorandum)**

  Written communication within an organization such as a business company, university, and government agency

- **Business letter**

  Written communication among members who are not in the same organization

Business Letters

- Note that not all of the components that will be discussed in the next couple of slides are necessary to be included in each letter

- Face–to-face, telephone, and email communications are just not right for certain kinds of correspondence

- Use a hardcopy letter
  1. If you want to make sure that the recipient receives it and takes it seriously
  2. If you want the recipient to study it at length
  3. If the communication is long and packed with information
  4. If you want a permanent record of communication

Business Letters – Standard Components

- **Company or personal logo**

  Usually on the first page only.
  - **If you use a sheet with logo, start your letter about 2.5cm below it**

- **Heading**

  Sender's address and date.
  - **If you are using letterhead stationary, only the date is needed**

- **Inside address**

  Name, title, company, and address of the recipient

- **Subject line**

  announce topic or purpose of the letter

Business Letters – Standard Components

- **Salutation**

  "Dear Sir/Madam:" or "To Whom It May Concern:" or "Dear Department members:", or…

  - **Where no obvious recipient exists or where the recipient does not matter, omit the salutation.**
  - **It is better if you know exactly whom you are writing to, call the recipient's organization (ask also for the title and the department name). "Dear Recruitment officers:"**
  - **Note that the salutation for business letters is punctuated with a colon. A comma implies a friendly nonbusiness communication**

- **Body of the letter**

  Single space text inside the paragraph, and double space between paragraphs

Business Letters – Standard Components

- **Complementary close**

  "Sincerely yours", or "Best Regards", or …etc
- **Signature block**

  This is a blank area for the signature, followed by your typed name, title, and organization. In professional correspondence, don't forget to include these letters that identify the degree or title that you worked hard to earn
- **End notations**

  Such as "Cc:" and "Encl.:" abbreviations come below the signature block. The first set is the initials of the sender and typist, respectively, "JMC/rbs". Labels such as "Encl.:" "Enclosure:" or "Attachments:" indicate that other documents have been attached: "Encl.: specifications."

Business Letters – Standard Components

- "Cc:" followed by one or more names indicates to whom a copy of the letter was sent

- "Bcc:" identifies "blind" recipients
- If you receive a letter with "Bcc:" at the bottom, the people whose names follow "Bcc:" do not know that you received the letter, nor do they know that you know that they received the letter

- **Following pages**

  If you use letterhead stationary, use the matching stationary (the same quality and style of paper but without the letter head)

Business Letters – Standard Components

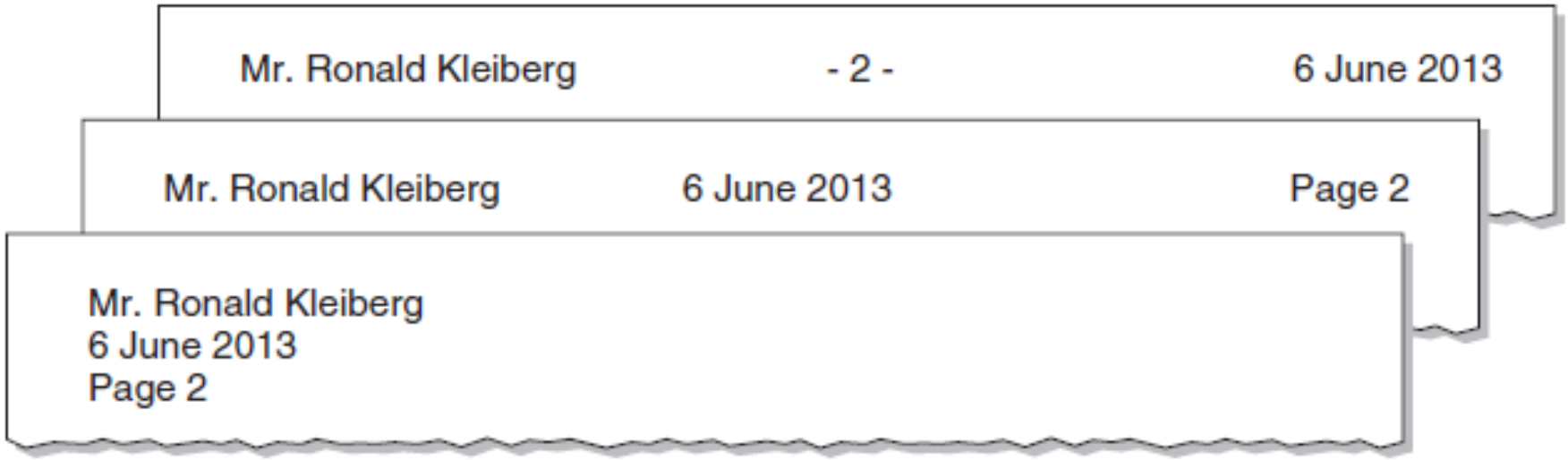


Figure 4-3 Three separate formats for following pages in business letters.

Common Business Letter Formats

Date

Heading (sender's address)

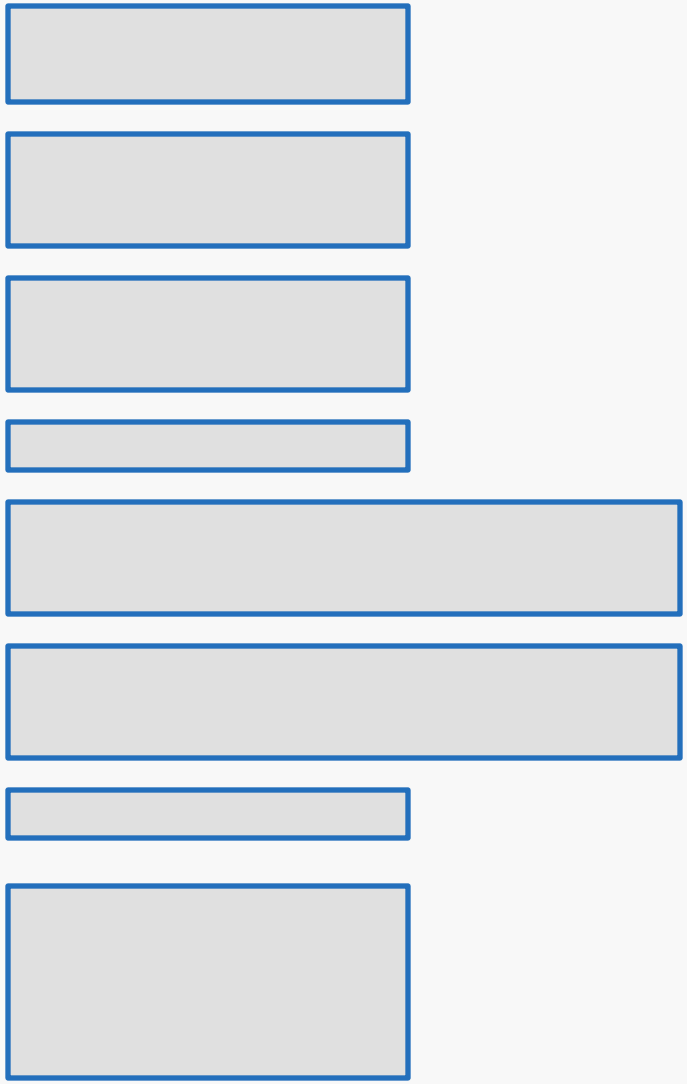
Inside address (recipient)

Salutation (punctuated with a *colon*)

Body (multiple paragraphs)

Complimentary close

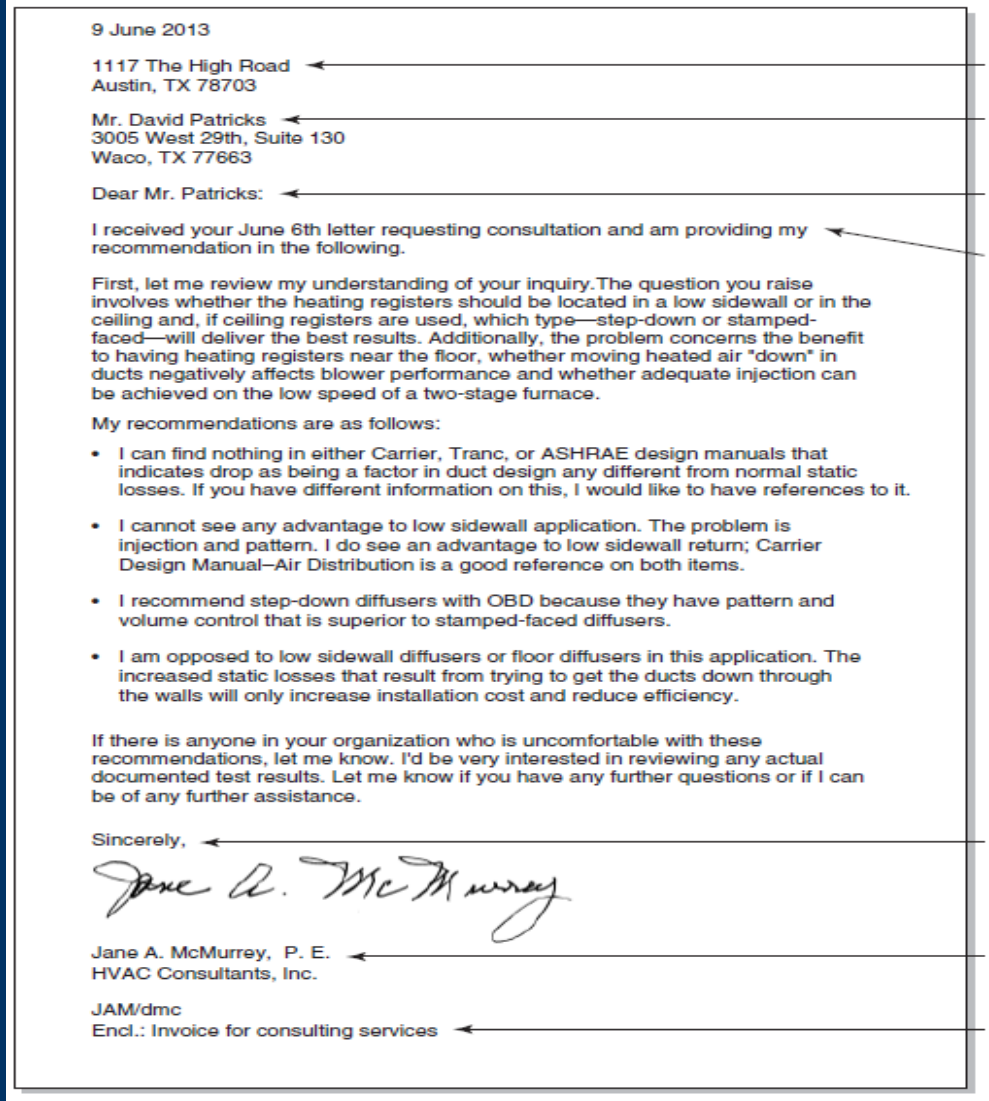
Signature block



Common Business Letter Formats

Standard Block Letter

- This is the easiest and most commonly used letter format
- All elements are flush left
- All serious communications use this format



9 June 2013

1117 The High Road
Austin, TX 78703

Heading: the date and sender's address

Mr. David Patricks
3005 West 29th, Suite 130
Waco, TX 77663

Inside address: name and address of the recipient of the letter

Dear Mr. Patricks:

Salutation

I received your June 6th letter requesting consultation and am providing my recommendation in the following.

Introduction: indicates context and states topic and purpose

First, let me review my understanding of your inquiry.The question you raise involves whether the heating registers should be located in a low sidewall or in the ceiling and, if ceiling registers are used, which type—step-down or stamped-faced—will deliver the best results. Additionally, the problem concerns the benefit to having heating registers near the floor, whether moving heated air "down" in ducts negatively affects blower performance and whether adequate injection can be achieved on the low speed of a two-stage furnace.

Body text of the letter: single spaced text with double spacing between paragraphs; no first-line indentation

My recommendations are as follows:

- I can find nothing in either Carrier, Tranc, or ASHRAE design manuals that indicates drop as being a factor in duct design any different from normal static losses. If you have different information on this, I would like to have references to it.
- I cannot see any advantage to low sidewall application. The problem is injection and pattern. I do see an advantage to low sidewall return; Carrier Design Manual–Air Distribution is a good reference on both items.
- I recommend step-down diffusers with OBD because they have pattern and volume control that is superior to stamped-faced diffusers.
- I am opposed to low sidewall diffusers or floor diffusers in this application. The increased static losses that result from trying to get the ducts down through the walls will only increase installation cost and reduce efficiency.

Use of special formatting within the letter: use bulleted and numbered lists, even headings

If there is anyone in your organization who is uncomfortable with these recommendations, let me know. I'd be very interested in reviewing any actual documented test results. Let me know if you have any further questions or if I can be of any further assistance.

Sincerely,

Complimentary close

Jane A. McMurrey, P. E.
HVAC Consultants, Inc.

Signature block

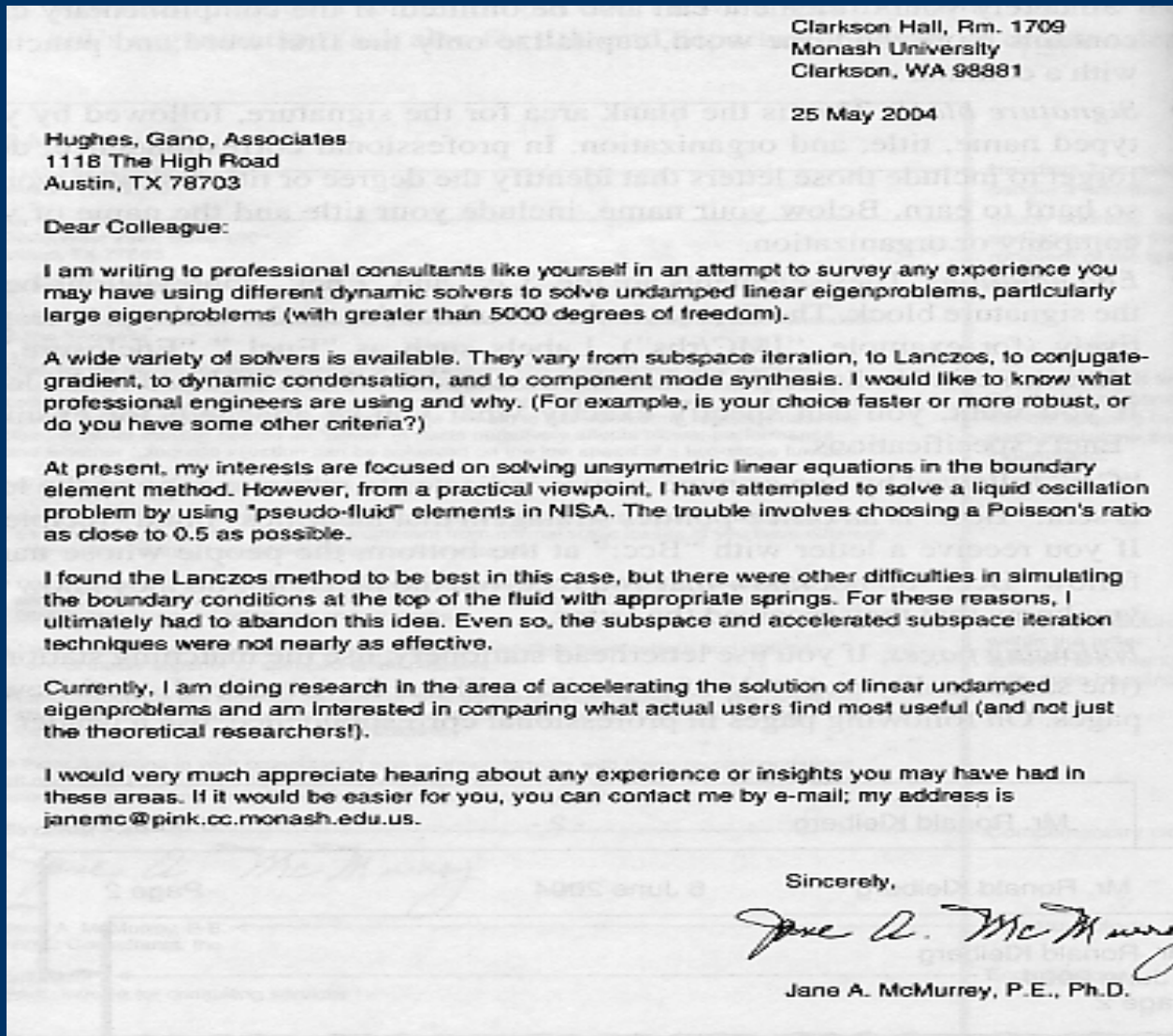
JAM/dmc
Encl.: Invoice for consulting services

End notations

Common Business Letter Formats

Standard Semi-Block Letter

Similar to the block format except that the heading, complimentary close, and signature block are on the right margin



Clarkson Hall, Rm. 1709
Monash University
Clarkson, WA 98881

25 May 2004

Hughes, Gano, Associates
1118 The High Road
Austin, TX 78703

Dear Colleague:

I am writing to professional consultants like yourself in an attempt to survey any experience you may have using different dynamic solvers to solve undamped linear eigenproblems, particularly large eigenproblems (with greater than 5000 degrees of freedom).

A wide variety of solvers is available. They vary from subspace iteration, to Lanczos, to conjugate-gradient, to dynamic condensation, and to component mode synthesis. I would like to know what professional engineers are using and why. (For example, is your choice faster or more robust, or do you have some other criteria?)

At present, my interests are focused on solving unsymmetric linear equations in the boundary element method. However, from a practical viewpoint, I have attempted to solve a liquid oscillation problem by using "pseudo-fluid" elements in NISA. The trouble involves choosing a Poisson's ratio as close to 0.5 as possible.

I found the Lanczos method to be best in this case, but there were other difficulties in simulating the boundary conditions at the top of the fluid with appropriate springs. For these reasons, I ultimately had to abandon this idea. Even so, the subspace and accelerated subspace iteration techniques were not nearly as effective.

Currently, I am doing research in the area of accelerating the solution of linear undamped eigenproblems and am interested in comparing what actual users find most useful (and not just the theoretical researchers!).

I would very much appreciate hearing about any experience or insights you may have had in these areas. If it would be easier for you, you can contact me by e-mail; my address is janemc@pink.cc.monash.edu.us.

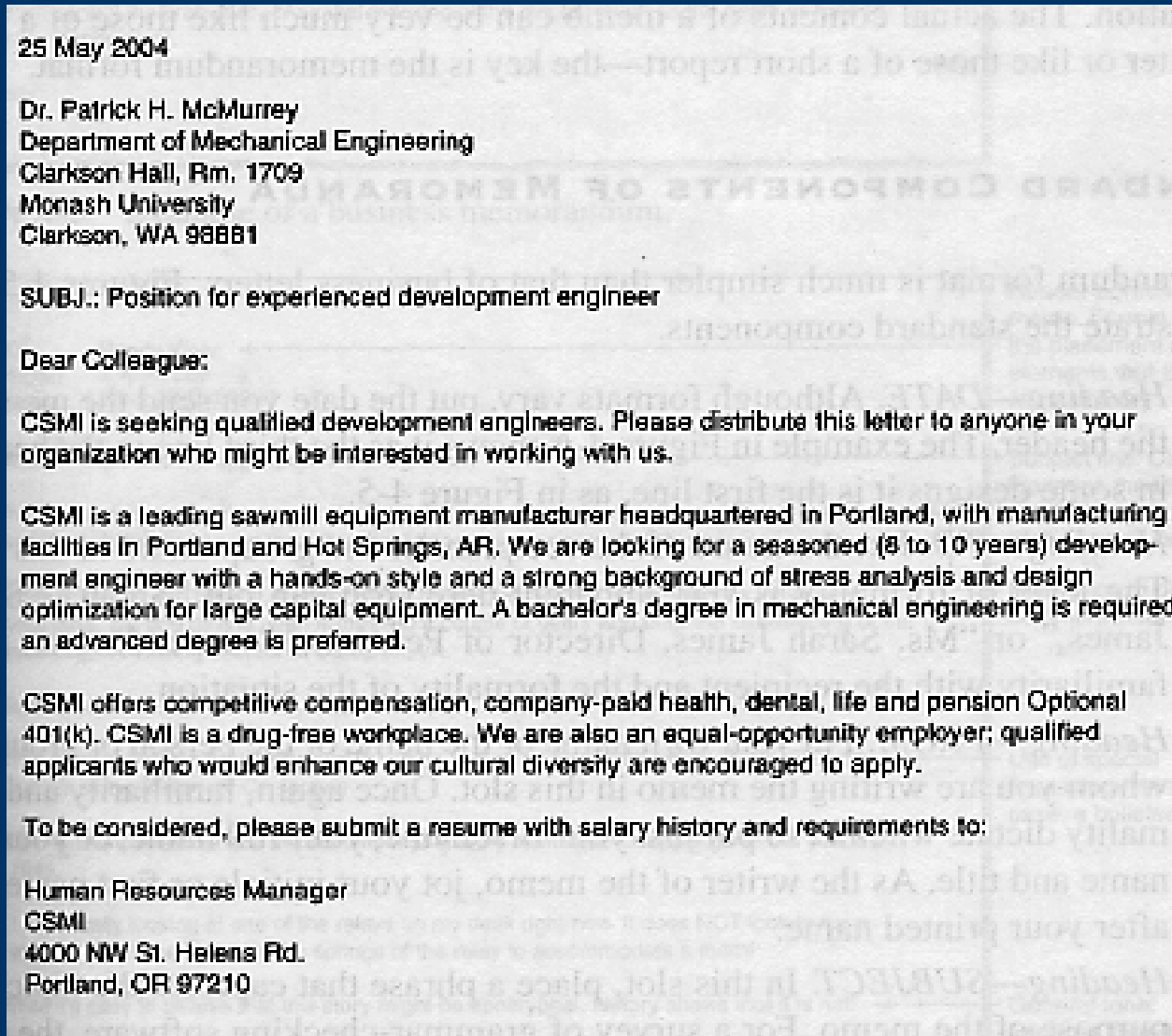
Sincerely,

Jane A. McMurrey, P.E., Ph.D.

Common Business Letter Formats

Other Semi-Block Letter

The same as the standard semi-block format except that it adds a subject line and omits the complimentary close



25 May 2004

Dr. Patrick H. McMurrey
Department of Mechanical Engineering
Clarkson Hall, Rm. 1709
Monash University
Clarkson, WA 98881

SUBJ.: Position for experienced development engineer

Dear Colleague:

CSMI is seeking qualified development engineers. Please distribute this letter to anyone in your organization who might be interested in working with us.

CSMI is a leading sawmill equipment manufacturer headquartered in Portland, with manufacturing facilities in Portland and Hot Springs, AR. We are looking for a seasoned (8 to 10 years) development engineer with a hands-on style and a strong background of stress analysis and design optimization for large capital equipment. A bachelor's degree in mechanical engineering is required an advanced degree is preferred.

CSMI offers competitive compensation, company-paid health, dental, life and pension Optional 401(k). CSMI is a drug-free workplace. We are also an equal-opportunity employer; qualified applicants who would enhance our cultural diversity are encouraged to apply.

To be considered, please submit a resume with salary history and requirements to:

Human Resources Manager
CSMI
4000 NW St. Helens Rd.
Portland, OR 97210

Business Memoranda

- For internal communication in an organization, use memorandum format

1. A call for employees to attend a general meeting
2. A reminder that status reports are due
3. A request to an employee to provide information

- The actual contents of a memo can be very much like those of a business letter or like those of a short report

Business Memoranda
Standard Components

- **Heading**

  Date, To:, From:, and Subject

- **Body of memo**

  single spaced paragraph, and double space between paragraphs

- **Complementary close**

  some times not included

- **Signature block**

Memo Format

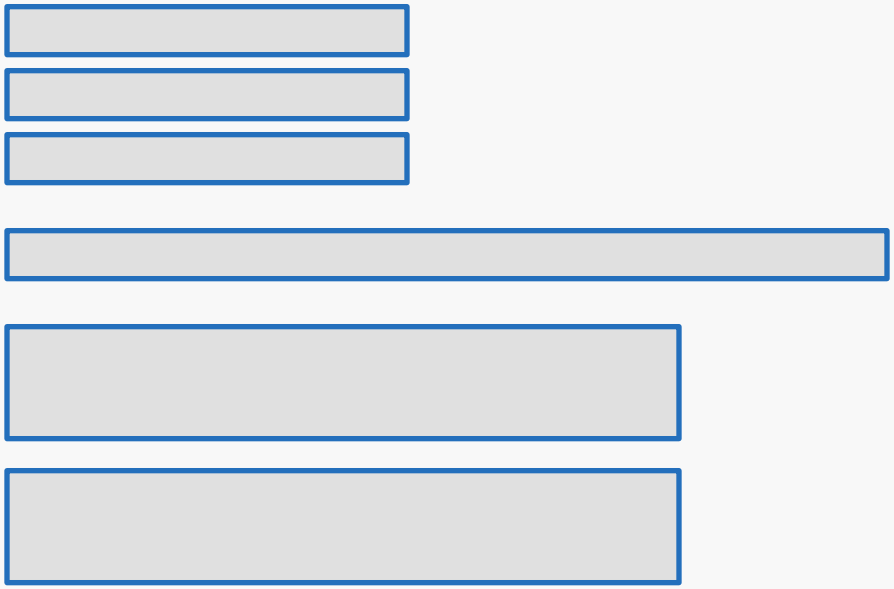
DATE:

TO:

FROM:

SUBJECT:

(Body: multiple paragraphs)



Business Memoranda

DATE: 25 May 2004
TO: Designers using AutoCAD
FROM: Tony Cheung

SUBJECT: Problems with AutoCAD delays

Several of you have been having problems with longish delays in picking entities when using AutoCAD. Here are some suggestions:

When you pick a point, AutoCAD has to search through all of the vectors that are visible on the display (or in the current viewport) for one that crosses the pickbox (the little box centered on your crosshairs). This is how AutoCAD finds out what object is associated with the vector geometry that you select on the screen when picking objects for object selection or object snap.

If there are a large number of vertices visible (each circle is represented on the display as a chain of as few as a dozen to as many as thousands of vectors), then there will be a noticeable delay as AutoCAD tries to find an object at the pick point.

One way to reduce the overhead of display operations is as follows:

1. Issue the VIEWRES command.

2. Specify a smaller Circle Zoom Percent value.

In a large drawing, you can lower this value to 25, which should have a significant impact on display performance, with the tradeoff being that your circles will look like hexagons or octagons (but will not plot that way).

In addition to VIEWRES, you can also experiment with the TREEXXXX system variables, which control the granularity of spatial indexing of the display (such as the depth vs breadth of the display tree).

Tony

Memo header

Descriptive subject line

Use of special formatting, in this case, a numbered list (to indicate an ordered sequence)

Business Memoranda

TO: Randy Klear
FROM: J. A. N. Lee
DATE: Wed, 12 Oct 1994

SUBJ.: When was the bug taped to the log book?

This is in response to your memo dated 10 October concerning the famous bug in the Mark II that many believe led to the term "bug" used to refer to computer problems.

I have written to Jon Eclund, Curator at the NMAH; he has the actual logbook in his care these days, the bug having been transfered a couple of years ago from the safekeeping of the Naval Surface Warfare Center at Dahlgren, VA.

Here is the information I have:

- The story of the bug and a photo of the page occurs on page 285, of Vol. 3, No. 3, of the *Annals of the History of Computing*.
- The date shown is 9/9 and the accompanying story from Grace Hopper gives the year as 1945.
- I am literally looking at one of the relays on my desk right now. It does NOT look to have enough clearance between the springs of the relay to accommodate a moth!

While it's easy to believe that this story might be apocryphal, history shows that it is not!

—Jan

Header portion of the memo: Format varies on the placement of these elements, but they are all necessary

Subject line: Clearly identifies the topic and, in this case, the context of the communication

Reference to previous communication

Use of special formatting—in this case, a bulleted list

General tone: Informal, friendly, direct

Email Writing

- Make the email brief. No one like to read long pages on the screen
- Make the subject line specific to make sure the email will be read
- Important information at the beginning
- Short paragraphs, and make spaces between them

Email Writing
(Important Email Functions)

- **Save email into files or folders:** Organize your sent and received email into meaningful folders-for example, ”clients,” “staff,” “projects.” “friends & family”
- **Keep copies of email you send:** You may need it later either because the email was lost or because you need to remember what you wrote in it
- **Use templates:** if you have standard contents set up a template
- **Attach files for emails**

Email Writing
(Important Email Functions)

- **Search email folders:** Know how to search email folders for topics or names of recipients and senders
- **Create and use aliases and distribution lists:** Increase your email efficiency by creating aliases (short abbreviations for email addresses) and distribution lists (groups of related email addresses, such as those for staff or customers)
- **Use a signature:** If you need to include your full name, title, organization, phone and fax numbers, …etc in your email, set up a "signature". It automatically pops that information into every mail you send or reply

Email Writing – Format and Style

- **Informality:** Adjust the tone of your email according to the recipients and situation. Think twice about using humor, sarcasm, and informality with business clients and higher level management-especially those whose native language is not English
- **Brevity:** Email messages are normally rather short, under a dozen lines
- **Specific subject line:** To ensure emails get read and has the desired impact, make the subject line specific and compelling
- **Important information first**
- **Short paragraphs and space between paragraphs**

Email Writing – Format and Style

File Edit View Go Message Tools Window Help

Subject: Re: When was the bug taped to the log book?
From: J. A. N. Lee <janlee@VTOPUS.CS.VT.EDU>
Date: 10/21/1994 11:23 AM
To: Randy Klear <rklear@census.gov>

OK I was going to wait until Jon Eklund, Curator at the NMAH, responded since he has the actual logbook in his care these days, the bug having been transferred a couple of years ago from the safekeeping of the Naval Surface Warfare Center at Dahlgren VA.

1. The story of the bug and a photo of the page occurs on page 285, of Vol. 3, No. 3, of the *Annals of the History of Computing*.
2. The date shown is 9/9 and the accompanying story from Grace Hopper gives the year as 1945.
3. I am literally looking at one of the relays on my desk right now. It does not look to have enough clearance between the springs of the relay to accommodate a moth!

P.S. The story has been repeatedly told and retold, printed and reprinted both in the *Annals* and other journals over the years -

John A. N. (JAN) Lee
Dept. of Computer Science
Virginia Tech
Blacksburg VA 24061-0106
Ph: (703) 231-5780
FAX: (703) 231-6075
E-mail: janlee@cs.vt.edu

> Do you have any information on the exact day that Grace Murray Hopper extracted the famous bug from the Mark II? I thought this story was apocryphal. I understood that "bugs in the equipment" and "working the bugs out" were engineering slang dating back to Edison's time at least, and that these engineering bugs felt right at home in the new computing machinery of the 1940s.
>
> However, I have no sources on this. I'm wondering if any EEs (Etymological Engineers) can clear this up? 😑
>
> Randy Klear
> U.S. Bureau of the Census
> rklear@census.gov

Document: Done

Recommendations for Business Writings (for letters, memos, and emails)

- Indicate the topic in the first sentence
- Be brief and go to the point
- Indicate any situation or preceding communication "based on last phone call" or "based on our meeting in the company" or "referring to your letter dated June 1st, 2005"
- Keep paragraphs short. Divide the communication to paragraphs when the topic changes
- Use lists and paragraph if necessary
- Be clear if you expect any response form the readers

Writing Common Engineering Documents (Informal Reports)

- Inspection Reports
- Laboratory and Field Reports
- Specifications Reports
- Proposals
- Progress Reports
- Instructions
- Recommendation Reports

Writing Common Engineering Documents (Inspection Reports)

- Briefly report on the inspection of a site (Facility or property)
- These reports contain lots of description, narration, and discussion of related causes and effects. It may also contain evaluation
- These reports include:
  1. Trip Reports
  2. Investigation or an accident reports

Writing Common Engineering Documents (Inspection Reports)

1. **Trip Reports:** summarize a business trip, discuss the events, findings and other aspects of a business trip. This type documents observations so that people in your organization can share them
2. **Investigation or accident reports:** describe your findings concerning a problem, explore its causes, its consequences, and explaining how it can be avoided

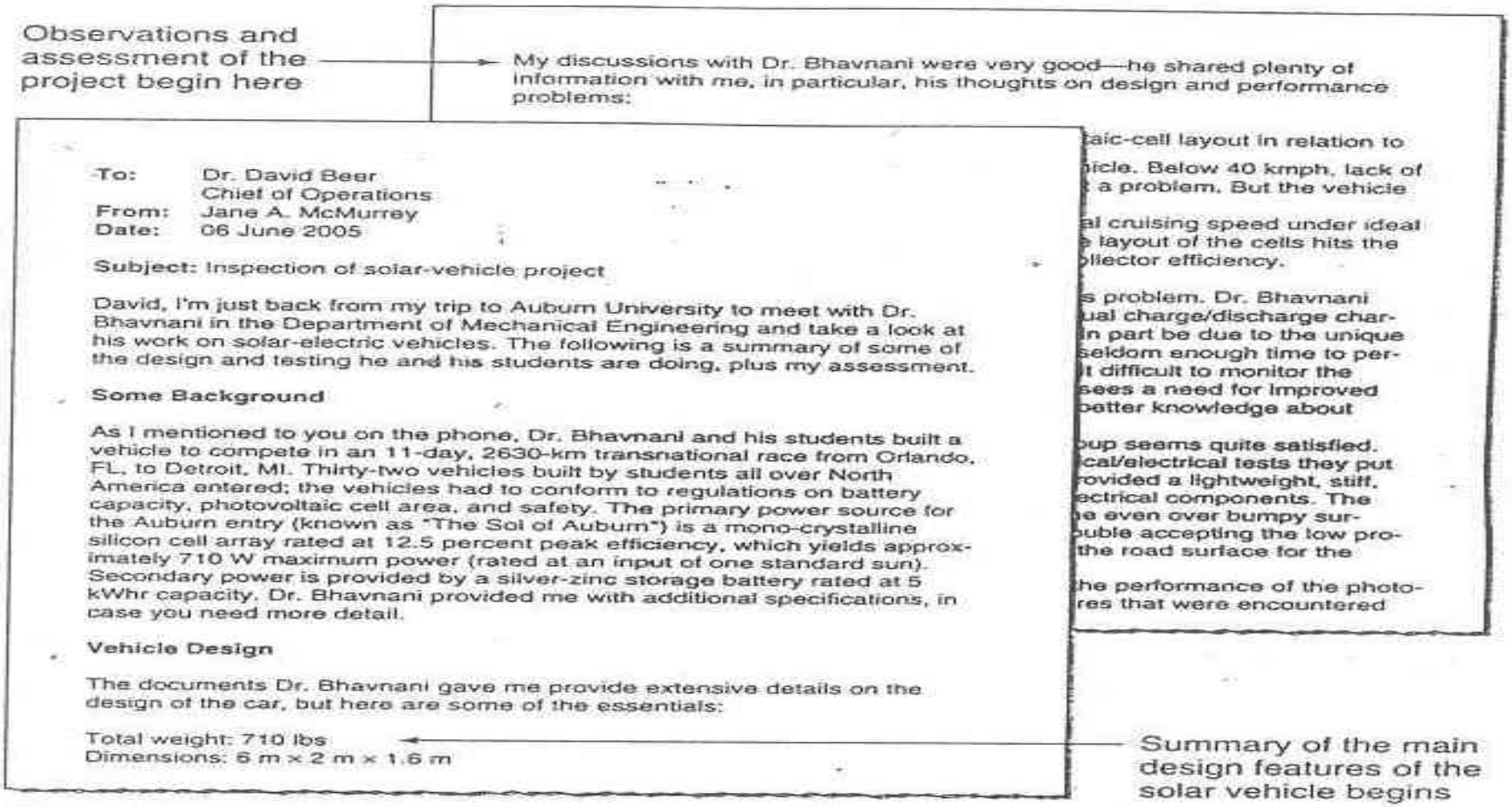
Writing Common Engineering Documents
(Content and Organization of Inspection Reports)

- **Introduction:** Indicate purpose of the report and provide a brief overview of its contents
- **Background:** To explain the context of the report. why inspect the site? Who sent you? what are the basic facts of the situation – the time, date, place, and so on?
- **Accurate Discussion:** describe the accident, facility, property, or the proposed equipment. what happened in the trip? where did you go? whom you met…etc?

Writing Common Engineering Documents
(Content and Organization of Inspection Reports)

- **Action Taken:** If you are investigating a problem, and you are suggesting solutions, your report should contain a step-by-step discussion of how you determined the problem and corrected it
- **Interpretative, Evaluative, or Advisory Discussion:** Evaluate the property or equipment, explain what caused the accident, interpret the findings, suggest further action, or recommend ways to prevent the problem in the future

Writing Common Engineering Documents (Inspection Reports)



Observations and assessment of the project begin here

My discussions with Dr. Bhavnani were very good—he shared plenty of information with me, in particular, his thoughts on design and performance problems:

aic-cell layout in relation to
icle. Below 40 kmph, lack of
a problem. But the vehicle

al cruising speed under ideal
layout of the cells hits the
llector efficiency.

s problem. Dr. Bhavnani
ual charge/discharge char-
in part be due to the unique
seldom enough time to per-
t difficult to monitor the
sees a need for improved
better knowledge about

up seems quite satisfied.
cal/electrical tests they put
ovided a lightweight, stiff,
ectrical components. The
e even over bumpy sur-
uble accepting the low pro-
the road surface for the

he performance of the photo-
res that were encountered

To: Dr. David Beer
Chief of Operations
From: Jane A. McMurrey
Date: 06 June 2005

Subject: Inspection of solar-vehicle project

David, I'm just back from my trip to Auburn University to meet with Dr. Bhavnani in the Department of Mechanical Engineering and take a look at his work on solar-electric vehicles. The following is a summary of some of the design and testing he and his students are doing, plus my assessment.

Some Background

As I mentioned to you on the phone, Dr. Bhavnani and his students built a vehicle to compete in an 11-day, 2630-km transnational race from Orlando, FL, to Detroit, MI. Thirty-two vehicles built by students all over North America entered; the vehicles had to conform to regulations on battery capacity, photovoltaic cell area, and safety. The primary power source for the Auburn entry (known as "The Sol of Auburn") is a mono-crystalline silicon cell array rated at 12.5 percent peak efficiency, which yields approximately 710 W maximum power (rated at an input of one standard sun). Secondary power is provided by a silver-zinc storage battery rated at 5 kWhr capacity. Dr. Bhavnani provided me with additional specifications, in case you need more detail.

Vehicle Design

The documents Dr. Bhavnani gave me provide extensive details on the design of the car, but here are some of the essentials:

Total weight: 710 lbs
Dimensions: 6 m × 2 m × 1.6 m

Summary of the main design features of the solar vehicle begins

Figure 5-1 Short business-trip report—excerpts. The writer summarizes her visit with researchers involved in the solar-vehicle design and provides an assessment of that work. (Information for this report was developed from S. H. Bhavnani, "Design and Construction of a Solar-Electric Vehicle," *Journal of Solar Energy Engineering* (February 1994), pp. 28–34).

Writing Common Engineering Documents (Laboratory and Field Reports)

- Report on an experiment, test, or survey
- Present the data collected and discuss and analyze it
- The report also include the method of testing, theory, procedures, equipments (if any), and conclusions
- it may explore the applications of the findings, and any recommended further investigation

Writing Common Engineering Documents (Content and Organization of Laboratory and Field Reports)

- **Introduction:** Indicate purpose of the report and provide a brief overview of its contents

- **Background:** Provide a discussion of the background leading up to the project. Typically this involves discussing a research question or conflicting theories in the research literature. Explore the background to enable readers to understand why you are doing this work. Provide citations for the sources of information you use

Writing Common Engineering Documents (Content and Organization of Laboratory and Field Reports)

- **Literature Review:** Often, a discussion of the research literature related to your project is included in the lab or field report. You summarize the findings of other researchers that have a bearing on your work

Depending on the length and complexity of the report, all three elements just discussed: introduction, background, literature review may all be combined in one paragraph without subheadings

Writing Common Engineering Documents (Content and Organization of Laboratory and Field Reports)

- **Theory, Methods, Procedures, and equipments:** The next major section in the laboratory or field report presents your theory or approach to your project
- **Observations, Data, Findings, or Results:** You collect data then organize and present it in a section of its own. The common approach is to present the data, often formatted into tables, graphs, or charts, without interpretive discussion. The discussion and analyzing of results comes in a section by it self

Writing Common Engineering Documents (Content and Organization of Laboratory and Field Reports)

- **Conclusions:** derive conclusions based on the data gathered, and explain why you think those conclusions are valid

- **Implications and Further Research:** Laboratory and field reports typically explore the implications of conclusions, considering how they can be applied and outlining further research possibilities

Writing Common Engineering Documents (Content and Organization of Laboratory and Field Reports)

Format

Lab or Field trip reports can be presented in memo format if it is short and presented within the organization. Otherwise, use the formal format as will be discussed in Chapter six

Writing Common Engineering Documents (Laboratory and Field Reports)

The data—the findings—from the research are presented. Tables, charts, and graphs can be used to show the relationships and trends more vividly. (Large tables can be shifted to an appendix.)

Background on the project: The problem is introduced, and related research is summarized.

Introduction

The increasing use of plastic films for co
drink calls for more information concerni
plastic packaging materials with food an

During droughts, it is a common problem
to make local water potable and to store
taste and odors are known to develop in
after direct exposure to sunlight for long
for these organoleptic changes have bee

In fact, it is often the transfer of materials
aging that is the origin of off-flavors in fin
more, plastic packaging film is often prim
ual solvents such as hydrocarbons, alcol
hens, et al. 1984) into the plastic. These
packaged food (Kim and Gilbert, 1989) a
because of their low flavor thresholds (H

This study reports on the concentrations
pounds released into drinking water sam
and printing ink.

Experimental Section

Local well water was used for this work unless otherwise stated. Polyethylene (PE) was an Enichem product. HPLC-grade water was a Merck product. Horseradish peroxidase was a Sigma product. Samples were stored in a well-aerated dark room and were analyzed after 15 days. The exposition to direct sunlight occurred when the samples were put on the roof of the building for 15 days in June.

Results and Discussion

The count rate (expressed as counts per second, kcps) is in principle determined by the number of particles in the scattering volume, which has to exceed 100 (Wiener, 1991). This is equivalent to a count rate higher than 10 kcps for the present PCS equipment. From the laboratory experiments, it was found that the count rate was proportional to the colloidal concentration in the range 0.03–2, 0.1–2 and 0.1–7 mg/l, for the μ-Fe_2O_3, γ-$Al(OH)_3$ and SiO_2 reference colloids, respectively (Fig. 2).

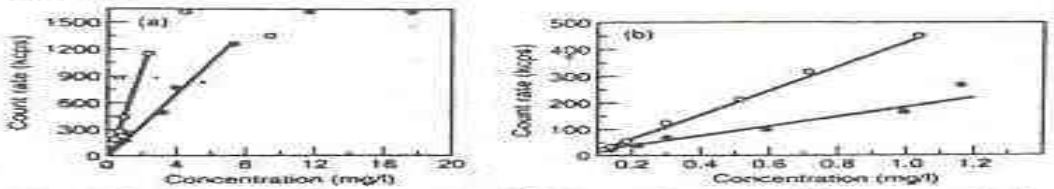


Fig. 2 Relationship between the PCS count rate and the concentration of reference colloids. The initial size distributions were in the range of 50–270 and 10–75 nm for SiO_2 and Fe_2O_3, respectively, at pH 6.0 ±0.5.0 Fe_2O_3 (○) SiO_2 (●). (a) Concentration range 0–20 mg/l, (b) concentration range 0–1.1 mg/l.

Conclusions

The following conclusions can be drawn:

The PCS technique can be adapted for characterization *in situ* of the colloidal fraction in natural waters, e.g., for concentration levels down to at least 0.1 mg/l.

This study clearly illustrates the importance of careful handling and preparation of a water sample in order to prevent any changes to its...

Conclusions based on the data are discussed. Applications of this research along with thoughts on further research are often explored at this point in the report.

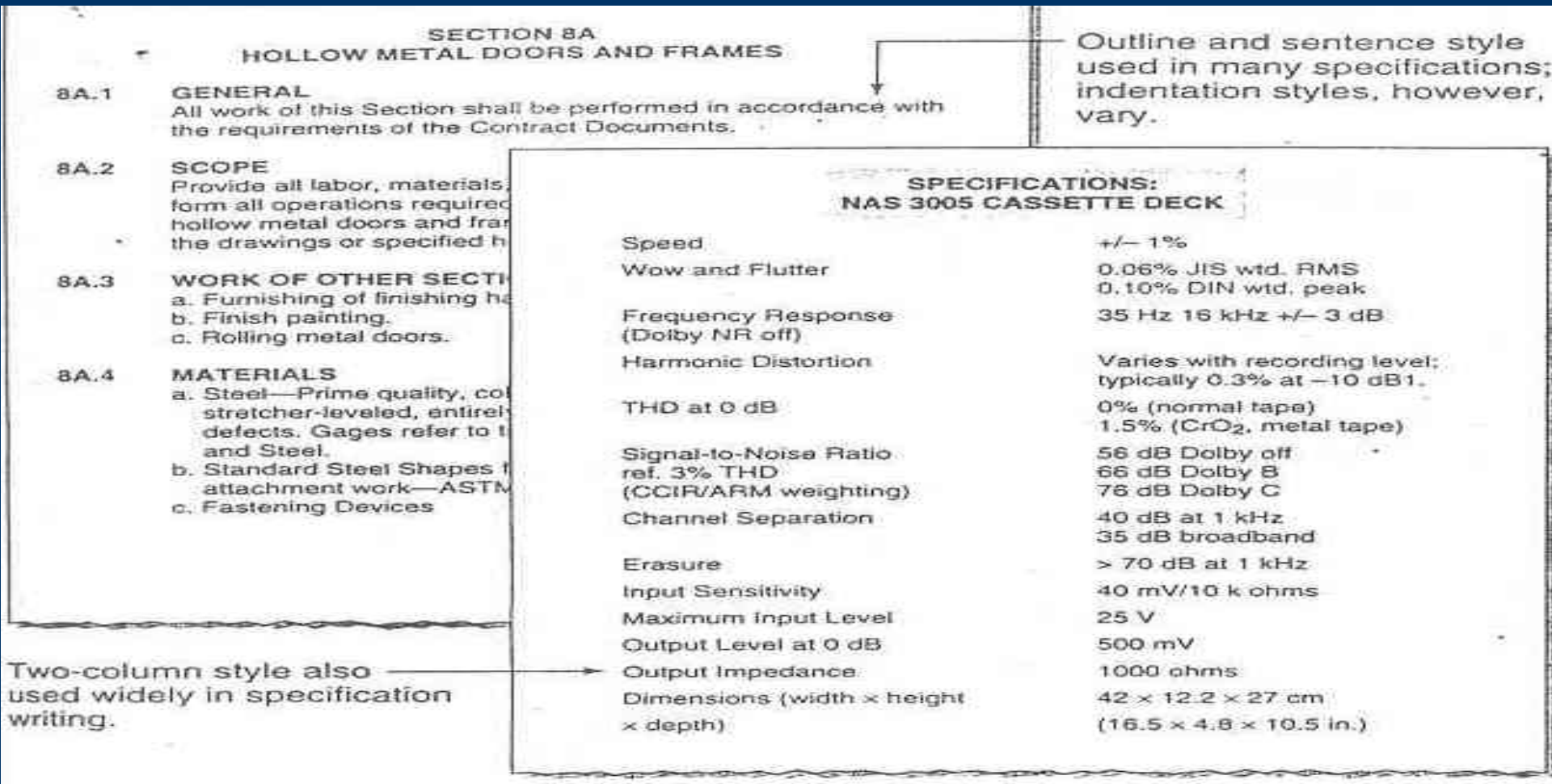
Background on the theory and method of the research is discussed: Procedures and facilities are described.

Figure 5-2 Laboratory report excerpts with background, research methods, data, and conclusions. (Excerpts on the plastic-packaging experiment were drawn from Lucia Calvosa et

Writing Common Engineering Documents (Specifications Reports)

- Provide detailed requirements for a product to be developed or detailed descriptions of an existing product
- provide specifics on design, function, operation, and construction
- Such documents may come with certain kinds of products such as DVD players or Computers
- These describe the key technical characteristics of those items.

Writing Common Engineering Documents (Specifications Reports)



SECTION 8A
HOLLOW METAL DOORS AND FRAMES

8A.1 GENERAL
All work of this Section shall be performed in accordance with the requirements of the Contract Documents.

8A.2 SCOPE
Provide all labor, materials,
form all operations required
hollow metal doors and fra
the drawings or specified h

8A.3 WORK OF OTHER SECTI
a. Furnishing of finishing ha
b. Finish painting.
c. Rolling metal doors.

8A.4 MATERIALS
a. Steel—Prime quality, col
stretcher-leveled, entirel
defects. Gages refer to t
and Steel.
b. Standard Steel Shapes f
attachment work—ASTM
c. Fastening Devices

Outline and sentence style used in many specifications; indentation styles, however, vary.

SPECIFICATIONS:
NAS 3005 CASSETTE DECK

Speed	+/– 1%
Wow and Flutter	0.06% JIS wtd. RMS 0.10% DIN wtd. peak
Frequency Response (Dolby NR off)	35 Hz 16 kHz +/– 3 dB
Harmonic Distortion	Varies with recording level; typically 0.3% at –10 dB1.
THD at 0 dB	0% (normal tape) 1.5% (CrO_2, metal tape)
Signal-to-Noise Ratio ref. 3% THD (CCIR/ARM weighting)	56 dB Dolby off 66 dB Dolby B 76 dB Dolby C
Channel Separation	40 dB at 1 kHz 35 dB broadband
Erasure	> 70 dB at 1 kHz
Input Sensitivity	40 mV/10 k ohms
Maximum Input Level	25 V
Output Level at 0 dB	500 mV
Output Impedance	1000 ohms
Dimensions (width × height × depth)	42 × 12.2 × 27 cm (16.5 × 4.8 × 10.5 in.)

Two-column style also used widely in specification writing.

Figure 5-3 Specifications—excerpts. Outline and two-column style are commonly used to present information in specifications. Graphics, tables, and lists are heavily used, but some details can only be provided through sentences and paragraphs.

Writing Common Engineering Documents (Content and Organization of Specifications Reports)

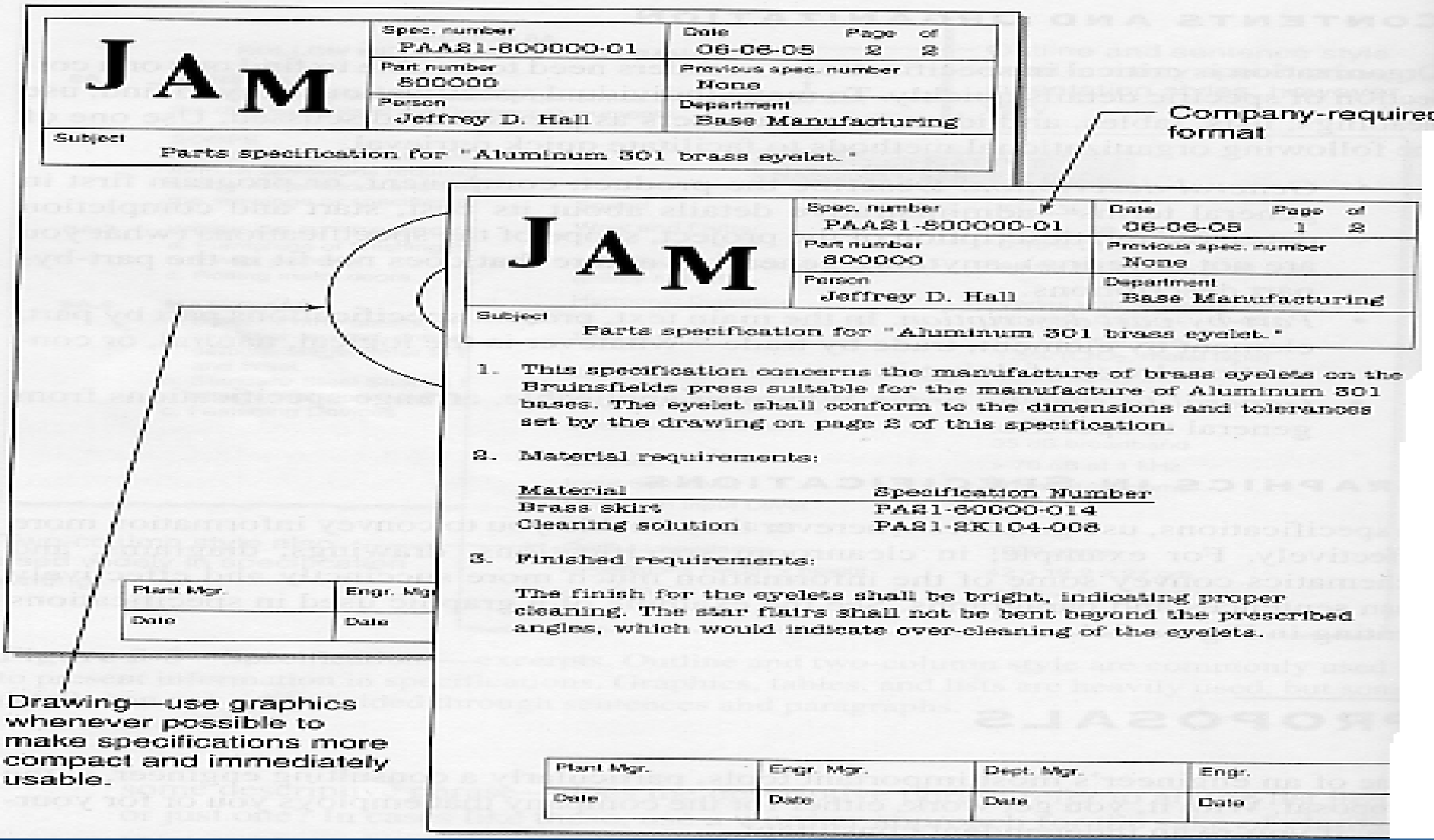
- **General Description:**

  Describe the product, component or program first in general terms. Anything general in nature that does not fit in the part-by-part description comes here.

- **Part–by–Part Description:**

  Present specifications part by part, element by element, trade by trade, what ever is the logical, natural or conventional way of doing it

Writing Common Engineering Documents (Specifications Reports)



Writing Common Engineering Documents (Proposals)

- The proposal of the most important tools for engineers, particularly consulting engineers
- With it, you get work, either for the company that employs you or for yourself
- Proposals seek a contract, approval, or funding to do a project; function as a competitive bid to get hired to do a project
- Promote you and your organization as a candidate for a project, promote the project itself, showing why it is needed

Writing Common Engineering Documents (Types of Proposals)

- **Solicited:** If an organization issues a request for proposals, the proposals said to be solicited – they have been requested
- **Unsolicited:** Individuals and companies often initiate proposals without formal requests from the recipients. They may see that an individual or organization has a problem or opportunity. This type of proposal requires harder work in order to convince the individual or organization

Writing Common Engineering Documents (Types of Proposals)

- **Internal:** If you address your proposal to someone within your organization, the format and contents change significantly. The memo format is usually appropriate, and sections such as qualifications and costs may not be necessary
- **External:** For organizations or individuals outside your company, you must present your qualifications and use some combination of the business-letter and formal-report formats

Writing Common Engineering Documents
(Content and Organization of Proposals)

- **Introduction:** Make reference to some prior contact with the recipient of the proposal or your source of information about the project. Also give a brief overview of the contents of the proposal
- **Background:** In unsolicited proposal, you should discuss the reason for writing the proposal. In solicited proposals, the party requesting the proposal know the reasons well. However little background can be useful as it demonstrates that you fully understand the situation

Writing Common Engineering Documents
(Content and Organization of Proposals)

- **Actual Proposal Statement:** Include a short section in which you state explicitly what you are proposing to do. Proposals often refer to many possibilities, which can create some vagueness about what's actually being offered. Sometimes an explicit statement about what you are not offering may be needed
- **Description of the Work Product:** Some times you may need a section explaining actually what the results of your project are going to be, and what the recipient is going to end up with

Writing Common Engineering Documents
(Content and Organization of Proposals)

- **Benefits and Feasibility of the Project:** To promote the project to the recipient, some proposals discuss the benefits of doing the project. Others discuss the likelihood of those benefits. This is particularly true in unsolicited proposals
- **Methods or Approach:** Some proposals need a section that explains how you plan to go about the project and justification of the approach, even the theory relating to your approach

Writing Common Engineering Documents
(Content and Organization of Proposals)

- **Qualifications and References:** This may include previous work, full resumes of who will work on the project. For internal projects where people know each other, this section may be omitted
- **Schedule:** including dates or a timeline for the major milestones. This may be included in the methods and procedure section or in a section on its own. This gives the recipient an idea of what lies ahead and a chance to ask for changes; it also enables you to show how systematic, organized, and professional you are

Writing Common Engineering Documents
(Content and Organization of Proposals)

- **Costs:** break it down to detailed cost, labor, equipment, components,…etc

- **Conclusions:** Normally, the final paragraphs of your proposal urge the recipient to consider your proposal, contact you with questions, and of course accept your bid or request. This is also good spot to allude once more to the benefits of doing the project

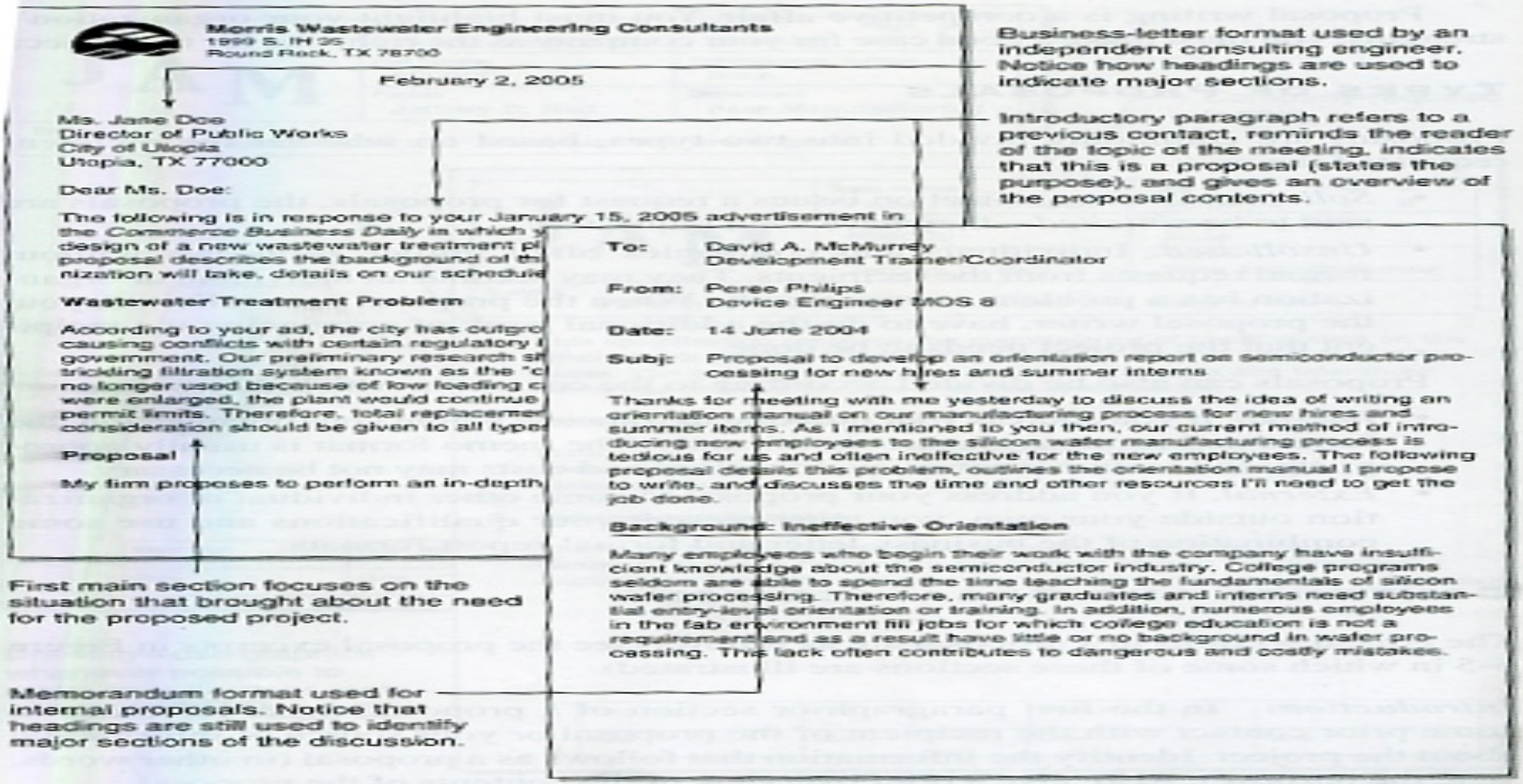
Writing Common Engineering Documents
(Content and Organization of Proposals)

Format

- **Memorandum format:** If your proposal is short (less than three pages) and internal, use simple memo format and include headings as you would for any other document (see Figure 5.5)

- **Business-letter format:** If your proposal is short but external use business letter format and include headings as you normally would (see Figure 5.5)

Writing Common Engineering Documents (Proposals)



Morris Wastewater Engineering Consultants
1899 S. IH 35
Round Rock, TX 78700

February 2, 2005

Business-letter format used by an independent consulting engineer. Notice how headings are used to indicate major sections.

Ms. Jane Doe
Director of Public Works
City of Utopia
Utopia, TX 77000

Dear Ms. Doe:

Introductory paragraph refers to a previous contact, reminds the reader of the topic of the meeting, indicates that this is a proposal (states the purpose), and gives an overview of the proposal contents.

The following is in response to your January 15, 2005 advertisement in the *Commerce Business Daily* in which y
design of a new wastewater treatment pl
proposal describes the background of th
nization will take, details on our schedule

Wastewater Treatment Problem

According to your ad, the city has outgro
causing conflicts with certain regulatory
government. Our preliminary research sh
trickling filtration system known as the "c
no longer used because of low loading c
were enlarged, the plant would continue
permit limits. Therefore, total replacemen
consideration should be given to all type

Proposal

My firm proposes to perform an in-depth

First main section focuses on the situation that brought about the need for the proposed project.

To: David A. McMurrey
Development Trainer/Coordinator

From: Peree Philips
Device Engineer MOS 8

Date: 14 June 2004

Subj: Proposal to develop an orientation report on semiconductor processing for new hires and summer interns

Thanks for meeting with me yesterday to discuss the idea of writing an orientation manual on our manufacturing process for new hires and summer interns. As I mentioned to you then, our current method of introducing new employees to the silicon wafer manufacturing process is tedious for us and often ineffective for the new employees. The following proposal details this problem, outlines the orientation manual I propose to write, and discusses the time and other resources I'll need to get the job done.

Background: Ineffective Orientation

Many employees who begin their work with the company have insufficient knowledge about the semiconductor industry. College programs seldom are able to spend the time teaching the fundamentals of silicon wafer processing. Therefore, many graduates and interns need substantial entry-level orientation or training. In addition, numerous employees in the fab environment fill jobs for which college education is not a requirement and as a result have little or no background in wafer processing. This lack often contributes to dangerous and costly mistakes.

Memorandum format used for internal proposals. Notice that headings are still used to identify major sections of the discussion.

Figure 5-5 Proposal excerpts—one external, the other internal. These examples integrate the cover letter (or memo) and the proposal proper into one continuous document. (Example proposals are drawn from work by Peree Phillips and Christine Morris, students at Austin Community College.)

Writing Common Engineering Documents
(Content and Organization of Proposals)

Format

- **Separate proposal with cover memo:** If your proposal is long (over 4 pages) and internal or external and it is being passes around among reviewers, make it a separate document with its own title and attach a cover memo or letter (memo for internal and business letter for external) to the front

  In the memo or business letter, restate the key elements of the introduction and the conclusion (see Figure 5.6)

Writing Common Engineering Documents (Proposals)

PROPOSAL
to
Develop a Guide for Writing
Policies and Procedures

The following is a proposal fo
business people in writing po
included in this proposal is a
guide like this, a description
schedule for its development

Problem: Businesses without

Many small businesses in Au
handbook or guide for emplo
dures governing that busines
usually ill-equipped to develo
ure the pressure of their norm
ty with this type of document
writing experience.

However, the lack of such op
various kinds of problems for
productivity, loss of sales opp
lawsuits by unhappy employe

Proposal

Morris Business Consultants
book for distribution to Austin
of Commerce. This handbook
local business people in deve
procedures manuals.

Actual proposal: The introduction repeats information in the cover letter (the letter may not remain attached).

MORRIS BUSINESS CONSULTANTS
135 Twin Towers Suite 105
Austin, TX 78700

May 25, 2005
Mr. Patrick H. McMurrey
Chamber of Commerce
100 West 1st Street
Utopia, TX 78777

Dear Mr. McMurrey:

I enjoyed meeting with you this past Monday, May 21st, concerning your interest in a manual on how to write policies and procedures. Local-area businesses do need help in this very important area of their operations. With the lack of good practical guides available commercially, developing and making one available through the Chamber will serve a great need.

The attached proposal outlines the details of our conversation concerning the content of the guide, costs, schedules, and so forth. I've added my qualifications for review by your other colleagues.

If you have any questions, please feel free to call me at 455-1122 during business hours.

Respectfully,

Gayle Morris
Business Consultant

Attachment: Proposal

Cover letter (attached to the front of the proposal)

Figure 5-6 Proposal with cover letter. The proposal proper uses a title at the top of the page and repeats some of the contents of the cover letter (in case the letter is separated from the proposal). (Example proposal is drawn from work done by Gayle Morris, student at Austin Community College.)

Writing an Engineering Report (Formal Reports)

- Reports are the most important and common documents that the students or engineers write in their life
- You need to organize the report in a way that the readers can get what they want from it directly and easily

Standard Components of Typical Engineering Reports

- Transmittal Letter
- Covers and Label
- Table of Contents
- List of Tables (if any)
- List of Figures (if any)
- Abstracts and Executive Summary
- Introduction (could be divided to subsections)
- Body of the Report (divided to sections and subsections)
- Appendices and References

Standard Components of Typical Engineering Reports
(Transmitter or Cover Letter)

- It is bounded with the report or attached with clip to the outside cover of the report
- It has the format of the business letter (external) or memo (internal)
- It is a communication from you to the recipient. Essentially it says, “Ok, here’s the report that we agreed I’d complete by such-and-such a date. Briefly it contains this and that, but does not cover this or that. Let me know if it meets your needs

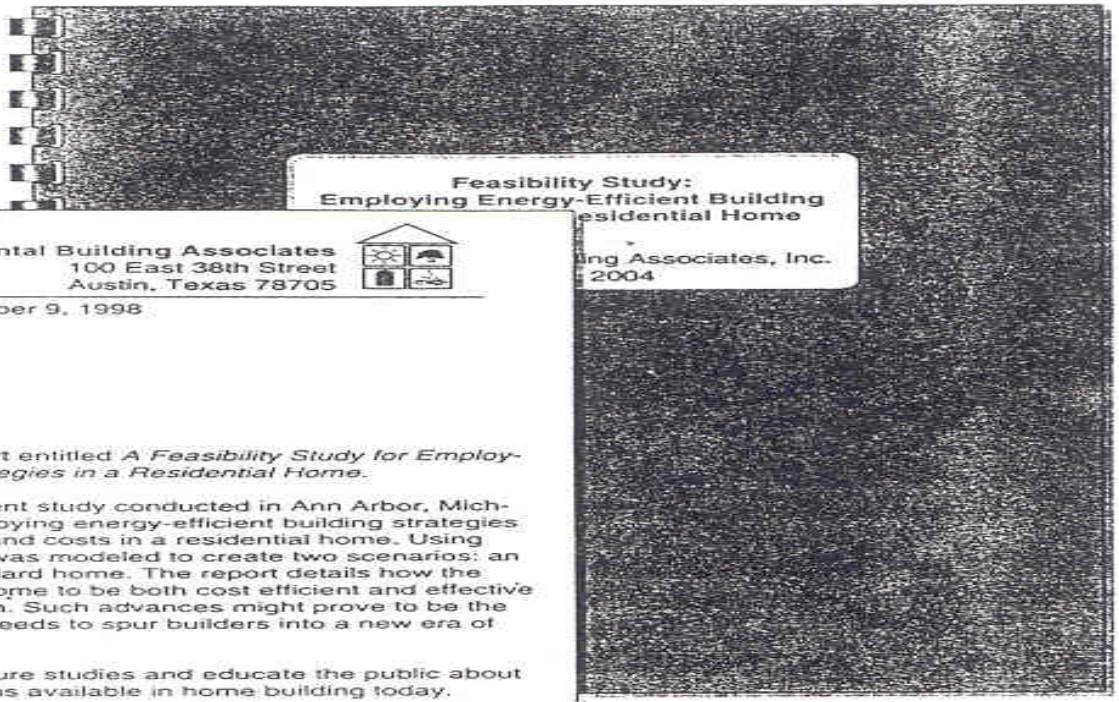
Standard Components of Typical Engineering Reports
(Transmitter or Cover Letter)

It contains in order:

- **First paragraph:** Name of the report (*Italic font*) and date of agreement to write the report
- **Second Paragraph:** Focuses on the Purpose of the report and gives a brief overview of the report's contents
- **Final Paragraph:** Encourage the recipient to contact you if there are any suggestions, or concerns. It closes with a gesture of good will, expressing hope that the reader finds the report satisfactory

Standard Components of Typical Engineering Reports
(Transmitter or Cover Letter)

Report binding and cover with label



Environmental Building Associates
100 East 38th Street
Austin, Texas 78705

December 9, 1998

Dr. David McMurrey, Chairman
EnergyWorks of Austin
2000 W. 38th Street
Austin, TX 78705

Dear Dr. McMurrey:

I am submitting the attached report entitled *A Feasibility Study for Employing Energy-Efficient Building Strategies in a Residential Home.*

This report is an analysis of a recent study conducted in Ann Arbor, Michigan, on the effectiveness of employing energy-efficient building strategies to minimize energy consumption and costs in a residential home. Using software technologies, the home was modeled to create two scenarios: an energy-efficient home and a standard home. The report details how the study found the energy-efficient home to be both cost efficient and effective at decreasing energy consumption. Such advances might prove to be the catalyst that the housing market needs to spur builders into a new era of home construction.

I hope this report will generate future studies and educate the public about the environmentally friendly options available in home building today.

Sincerely yours,

Rachel L. Miller

Rachel L. Miller, Vice-President
Environmental Building Associates, Inc.

Encl.: Feasibility Study for Employing Energy-Efficient Building

Transmittal letter

Standard Components of Typical Engineering Reports
(Transmitter or Cover Letter)

As with any other element in an engineering report, you may have to modify the contents of this letter for specific situations. For example, you might want to add another paragraph, listing questions you'd like readers to consider as they review the report

Standard Components of Typical Engineering Reports
(Cover and Label)

- If the report is more than 10 pages, bind it and place a label on the cover. (the cover protects the report and makes it look more professional)

- The label usually contains: the report title, your name, your organization's name, report tracking number (if any), and date. (It may also include the Recipient's organization name). There is no standard way, however it may exist within your organization.

Standard Components of Typical Engineering Reports
(Page Numbering)

- All pages (except front and back covers, and transmittal letter) should be numbered. However on some pages the numbers may not be displayed
- All pages before the introduction page are numbered with lower case roman numerals (i, ii, iii, iv, …..xi, xii), while the other pages are numbered by Arabic numerals (1, 2, 3,….)
- Usually page numbers are placed bottom centre of the page

Standard Components of Typical Engineering Reports
(Abstract and Executive Summary)

Most engineering reports contain at least one abstract. It summarizes the contents of the report

- **Descriptive abstract**: Overview the purpose and contents of the report.
- **Executive Summary**: Overview the purpose and contents of the report, and summarize the key facts, findings, and conclusions contained in the report. Usually it is 1/10 to 1/20 of the length of the report. however should not exceed 3 pages with long reports (over 50 pages)

Standard Components of Typical Engineering Reports
(Table of Contents – TOC)

Tells the readers about the topics that are covered in the report and the page numbering of the covered sections. For levels of heading, indentation, spacing and capitalization:

- Don’t include the very low level of heading (boring if you go like 4.2.5.1.6.2).
- Notice that in figure 6.2 that each of the three levels of headings are aligned with each other. Page numbers are aligned with each other.

Standard Components of Typical Engineering Reports (Table of Contents – TOC)

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii
LIST OF FIGURES AND TABLES iv
1.0 INTRODUCTION 1
2.0 TECHNICAL BACKGROUND 2
2.1 Functional Units of the House 2
2.2 Standard Home (SH) .....
2.2.1 Modeling .....
2.2.2 Materials .....
2.3 Energy-Efficient Home (EEH) .....
2.3.1 Modeling .....
2.3.2 Energy-efficient strategi
2.4 Energy Consumption Determin
2.4.1 Heating and cooling sys
2.4.2 Electrical systems .....
3.0 CONSUMPTION COMPARISONS .....
3.1 Gas Consumption .....
3.2 Electricity Consumption .....
4.0 COST ANALYSIS .....
4.1 Determination of Cost .....
4.1.1 Construction .....
4.1.2 Energy costs .....
4.2 Accumulated Cost Analysis ....
5.0 RANKING OF ENERGY-EFFICIEN
6.0 CONCLUSIONS .....
REFERENCES .....

Page-numbering style used in traditional report design: lowercase roman numerals for everything up to the body of the report; arabic numerals thereafter.

EXECUTIVE SUMMARY

This feasibility report analyzes a recent study conducted on a 2,450 ft^2 residential home (referred to as SH or Standard Home) built in Ann Arbor, Michigan. The goal of the study was to determine the effectiveness of employing energy-efficient building strategies to minimize energy consumption and costs in a residential home.

The home was modeled using Energy-10, a sophisticated software package capable of calculating the energy consumed during the use of the home over a 50-year period. While keeping the basic functional units (such as floor plan, occupancy, type and number of appliances, and internal volume) of the home consistent, SH was then modeled to reduce the energy consumption by employing various energy-efficient strategies (referred to as EEH or energy efficient home).

The total life-cycle energy consumption of SH was found to be 15,455 GJ, which consisted of space and water heating and cooling, lighting, ventilation, and appliances. The total life-cycle energy consumption of EEH was reduced to 5653 GJ. The purchase price of SH was $240,000 (actual market value) and was determined to be $22,801 more for EEH. The cost analysis performed found that despite a 9.5% increase in the purchase price of an energy-efficient home, lower annual energy expenditures make the present value nearly equal to the more energy-consuming version. The accumulated life cycle costs are higher in EEH until year 48 and are $1,054 (or 0.1%) less at year 50.

It was found that the most effective strategy for reducing overall annual energy costs is installation of a high-efficiency HVAC system. However, for reducing overall energy consumption, insulation was the most effective strategy followed by high-efficiency HVAC and air leakage control.

Standard Components of Typical Engineering Reports
(Table of Contents – TOC)

- Main chapters or sections are all caps; First level headings use initial caps on each main word, Lower level sections use initial caps on the first word only, Finally always remember if you change anything in the text go and do the same with the TOC.
- They are used to easily find the illustrations such as diagrams, figures, drawings, photographs, tables, and charts. Tables are not considered figures
- For longer reports (contain dozens of figures and tables), create separate lists of figures and tables

Standard Components of Typical Engineering Reports (Table of Contents – TOC)

TABLE OF CONTENTS

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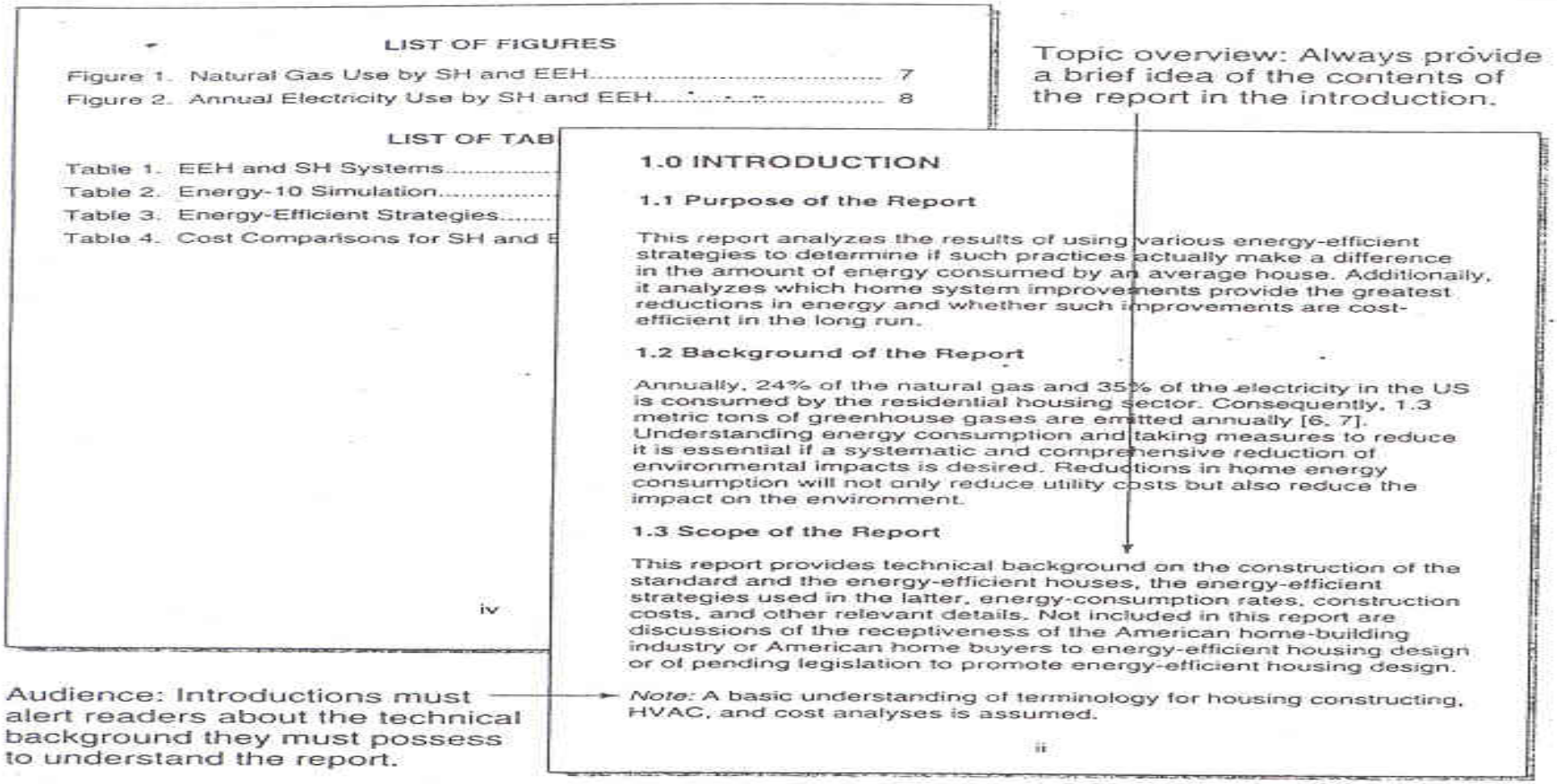
Standard Components of Typical Engineering Reports (Table of Contents – TOC)



LIST OF FIGURES

Figure 1. Natural Gas Use by SH and EEH..... 7
Figure 2. Annual Electricity Use by SH and EEH..... 8

LIST OF TAB

Table 1. EEH and SH Systems.....
Table 2. Energy-10 Simulation.....
Table 3. Energy-Efficient Strategies.....
Table 4. Cost Comparisons for SH and E

iv

Topic overview: Always provide a brief idea of the contents of the report in the introduction.

1.0 INTRODUCTION

1.1 Purpose of the Report

This report analyzes the results of using various energy-efficient strategies to determine if such practices actually make a difference in the amount of energy consumed by an average house. Additionally, it analyzes which home system improvements provide the greatest reductions in energy and whether such improvements are cost-efficient in the long run.

1.2 Background of the Report

Annually, 24% of the natural gas and 35% of the electricity in the US is consumed by the residential housing sector. Consequently, 1.3 metric tons of greenhouse gases are emitted annually [6, 7]. Understanding energy consumption and taking measures to reduce it is essential if a systematic and comprehensive reduction of environmental impacts is desired. Reductions in home energy consumption will not only reduce utility costs but also reduce the impact on the environment.

1.3 Scope of the Report

This report provides technical background on the construction of the standard and the energy-efficient houses, the energy-efficient strategies used in the latter, energy-consumption rates, construction costs, and other relevant details. Not included in this report are discussions of the receptiveness of the American home-building industry or American home buyers to energy-efficient housing design or of pending legislation to promote energy-efficient housing design.

Note: A basic understanding of terminology for housing constructing, HVAC, and cost analyses is assumed.

ii

Audience: Introductions must alert readers about the technical background they must possess to understand the report.

Standard Components of Typical Engineering Reports
(Introduction)

The introduction indicates the following:

- **Purpose and topic of the report (at the beginning)**
- **Situation that brought about the need for the report**
- **Background of the report (*e.g.*, concepts, history, definitions) is to get readers interested and to enable them to understand the context**
- **Scope of the report are the topics or issues that are covered and ones that are not covered (specifically, ones that some readers might expect)**

Standard Components of Typical Engineering Reports
(Report Body)

- Body of the report is the main text between introduction and conclusions
- Use headings to indicate the topics and subtopics (sections and subsections)
- You may use bulleted or numbered and two column lists to indicate the key points or other information to make them easier to follow
- When you get or borrow information from other resources (reports, papers, studies, internet…) you have to indicate the source (documentation).

Standard Components of Typical Engineering Reports
(Report Body)

- Including figures, and tables makes the report professional and easy to explore the information
- Be clear when you write. Don’t use unnecessary words, use direct and correct sentences, and use proper punctuation. (be aware of noise)
- Point readers to closely related information within your report
- Remember to always use the correct format and always define at the beginning any abbreviations or symbols used

Standard Components of Typical Engineering Reports
(Report Body)

IEEE-style citation using brackets: The borrowed information comes from source 5 listed in References.

Acronym: On this first use, it is spelled out, with the acronym shown in parentheses. The spelled-out version does not use initial caps—it's not a proper noun.

Second- and third-level headings: Notice how the system adds a decimal number to each lower-level section heading.

Wall design was given particularly careful consideration. Pierquet, et al., compares the annual energy savings of 12 different wall systems based on varying R-values [5]. Using a standard 2 × 4 stud wall with fiberglass insulation as the base case, Pierquet, et al., compared it with wall sections made of strawbale, structural insulated panels (SIPs), I-beam studs, autoclaved cellular concrete, and varying combinations of 2 × 4 construction and rigid foam insulation. Both the strawbale and the double 2 × 4 walls had very high R-values. Appliances were selected that conserve energy by being more efficient. The range and clothes dryer were switched to run on natural gas [1].

2.4 Energy Consumption Determination

For the purposes of the study, energy consumption was divided into two main home systems: heating and cooling, and electrical.

2.4.1 Heating and cooling systems. Heating and cooling energy were determined with Energy-10 for SH as well as for EEH. The program calculates the heat required to maint... temperature based on the following f...

- Average conductivity of the therma... values of the walls, ceiling, floor, fo...
- Internal temperature (includes adju... seasonal/daily temperature change...
- Outside air infiltration through gaps... forced-air ventilation systems
- Furnace and A/C efficiencies were...
- Solar heat gains through windows...

2.4.2 Electrical systems. Electrical ... determined independently from Ener... in the house was determined, which ...

6

Informal overview of the contents of this section: gas consumption; electricity consumption.

3.0 CONSUMPTION COMPARISONS

For energy consumption comparisons, resources were broken down into total annual gas and electricity consumption, and then compared for the two homes.

3.1 Gas Consumption

Figure 1 shows annual natural gas use for both SH and EEH. The dramatic decrease in natural gas consumption is due to the greatly improved thermal envelope and a much more efficient HVAC system, causing a decrease in heating natural gas consumption of 91.8%.

While EEH uses natural gas for the stove and dryer (which is not the case for SH), EEH total annual natural gas use is only 21% that of SH [1].

Chart depicting comparative natural gas usage. Notice this chart is treated as a figure and that the figure title appears below the chart.

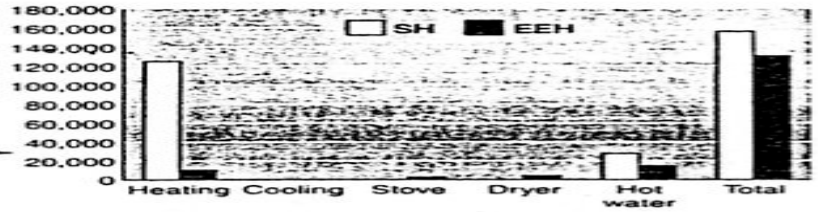
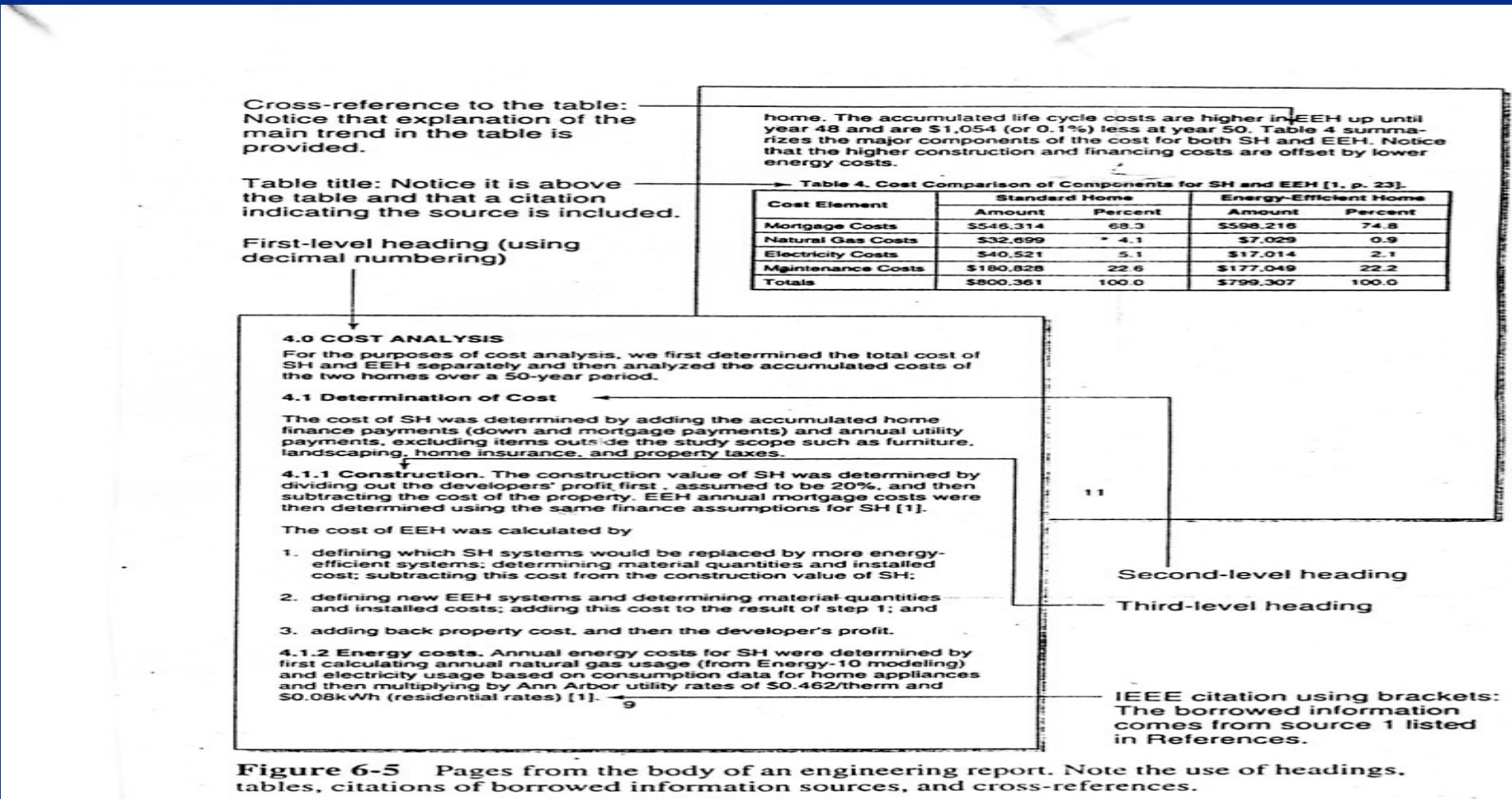


Figure 1: Comparison of Annual Natural Gas Use by SH and EEH. [1, p. 8–9]

7

Figure 6-4 Pages from the body of an engineering report. Note the use of headings, bulleted lists, citations of borrowed information sources, and the chart.

Standard Components of Typical Engineering Reports
(Report Body)



Cross-reference to the table: Notice that explanation of the main trend in the table is provided.

Table title: Notice it is above the table and that a citation indicating the source is included.

First-level heading (using decimal numbering)

home. The accumulated life cycle costs are higher in EEH up until year 48 and are $1,054 (or 0.1%) less at year 50. Table 4 summarizes the major components of the cost for both SH and EEH. Notice that the higher construction and financing costs are offset by lower energy costs.

Table 4. Cost Comparison of Components for SH and EEH [1, p. 23].

Cost Element	Standard Home		Energy-Efficient Home	
	Amount	Percent	Amount	Percent
Mortgage Costs	$546,314	68.3	$598,216	74.8
Natural Gas Costs	$32,699	4.1	$7,029	0.9
Electricity Costs	$40,521	5.1	$17,014	2.1
Maintenance Costs	$180,828	22.6	$177,049	22.2
Totals	$800,361	100.0	$799,307	100.0

4.0 COST ANALYSIS

For the purposes of cost analysis, we first determined the total cost of SH and EEH separately and then analyzed the accumulated costs of the two homes over a 50-year period.

4.1 Determination of Cost

The cost of SH was determined by adding the accumulated home finance payments (down and mortgage payments) and annual utility payments, excluding items outside the study scope such as furniture, landscaping, home insurance, and property taxes.

4.1.1 Construction. The construction value of SH was determined by dividing out the developers' profit first, assumed to be 20%, and then subtracting the cost of the property. EEH annual mortgage costs were then determined using the same finance assumptions for SH [1].

The cost of EEH was calculated by

1. defining which SH systems would be replaced by more energy-efficient systems; determining material quantities and installed cost; subtracting this cost from the construction value of SH;
2. defining new EEH systems and determining material quantities and installed costs; adding this cost to the result of step 1; and
3. adding back property cost, and then the developer's profit.

4.1.2 Energy costs. Annual energy costs for SH were determined by first calculating annual natural gas usage (from Energy-10 modeling) and electricity usage based on consumption data for home appliances and then multiplying by Ann Arbor utility rates of $0.462/therm and $0.08kWh (residential rates) [1].

11

9

Second-level heading

Third-level heading

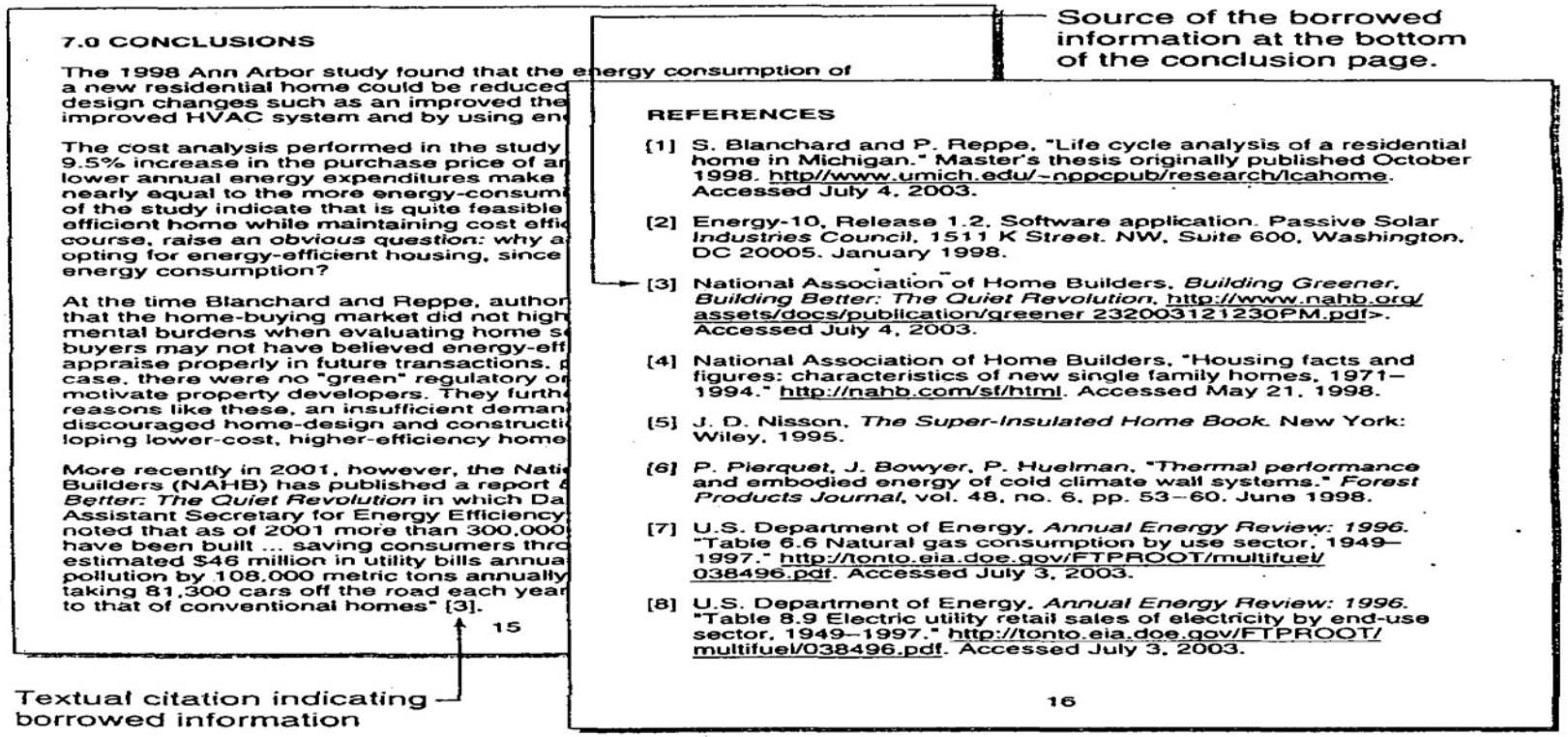
IEEE citation using brackets: The borrowed information comes from source 1 listed in References.

Figure 6-5 Pages from the body of an engineering report. Note the use of headings, tables, citations of borrowed information sources, and cross-references.

Standard Components of Typical Engineering Reports
(Conclusions)

- Draw logical conclusions from the discussion that has preceded; it makes inferences on the data that has been presented
- The summary reviews the key points and facts from what has preceded. Summaries present nothing new but leave readers with a perspective that the writer wants them to have
- The summary moves away from the specific topic of the report to a general discussion of implication, applications and future development

Standard Components of Typical Engineering Reports (Conclusions and References)



7.0 CONCLUSIONS

The 1998 Ann Arbor study found that the energy consumption of a new residential home could be reduced design changes such as an improved the improved HVAC system and by using en

The cost analysis performed in the study 9.5% increase in the purchase price of ar lower annual energy expenditures make nearly equal to the more energy-consumi of the study indicate that is quite feasible efficient home while maintaining cost effi course, raise an *obvious question:* why a opting for energy-efficient housing, since energy consumption?

At the time Blanchard and Reppe, author that the home-buying market did not high mental burdens when evaluating home s buyers may not have believed energy-eff appraise properly in future transactions. case, there were no "green" regulatory or motivate property developers. They furth reasons like these, an insufficient deman discouraged home-design and constructi loping lower-cost, higher-efficiency home

More recently in 2001, however, the Nati Builders (NAHB) has published a report *Better: The Quiet Revolution* in which Da Assistant Secretary for Energy Efficiency noted that as of 2001 more than 300,000 have been built ... saving consumers thro estimated $46 million in utility bills annua pollution by 108,000 metric tons annually taking 81,300 cars off the road each year to that of conventional homes" [3].

15

Source of the borrowed information at the bottom of the conclusion page.

Textual citation indicating borrowed information

REFERENCES

[1] S. Blanchard and P. Reppe, "Life cycle analysis of a residential home in Michigan." Master's thesis originally published October 1998. http//www.umich.edu/~nppcpub/research/lcahome. Accessed July 4, 2003.

[2] Energy-10, Release 1.2. Software application. Passive Solar *Industries Council*, 1511 K Street, NW, Suite 600, Washington, DC 20005. January 1998.

[3] National Association of Home Builders, *Building Greener, Building Better: The Quiet Revolution*, http://www.nahb.org/assets/docs/publication/greener 232003121230PM.pdf>. Accessed July 4, 2003.

[4] National Association of Home Builders, "Housing facts and figures: characteristics of new single family homes, 1971–1994." http://nahb.com/sf/html. Accessed May 21, 1998.

[5] J. D. Nisson, *The Super-Insulated Home Book*. New York: Wiley, 1995.

[6] P. Pierquet, J. Bowyer, P. Huelman, "Thermal performance and embodied energy of cold climate wall systems." *Forest Products Journal*, vol. 48, no. 6, pp. 53–60. June 1998.

[7] U.S. Department of Energy, *Annual Energy Review: 1996*. "Table 6.6 Natural gas consumption by use sector, 1949–1997." http://tonto.eia.doe.gov/FTPROOT/multifuel/038496.pdf. Accessed July 3, 2003.

[8] U.S. Department of Energy, *Annual Energy Review: 1996*. "Table 8.9 Electric utility retail sales of electricity by end-use sector, 1949–1997." http://tonto.eia.doe.gov/FTPROOT/multifuel/038496.pdf. Accessed July 3, 2003.

16

Figure 6-6 Conclusion and references page. Notice that the conclusion (which precedes the references pages) summarizes the chief finding of the report, speculates on that finding, and then glances at more recent developments. The references page uses the IEEE system of documenting borrowed information. Also see the bracketed citations in Figures 6-4 and 6-5. (See Chapter 11 for details on the IEEE system.)

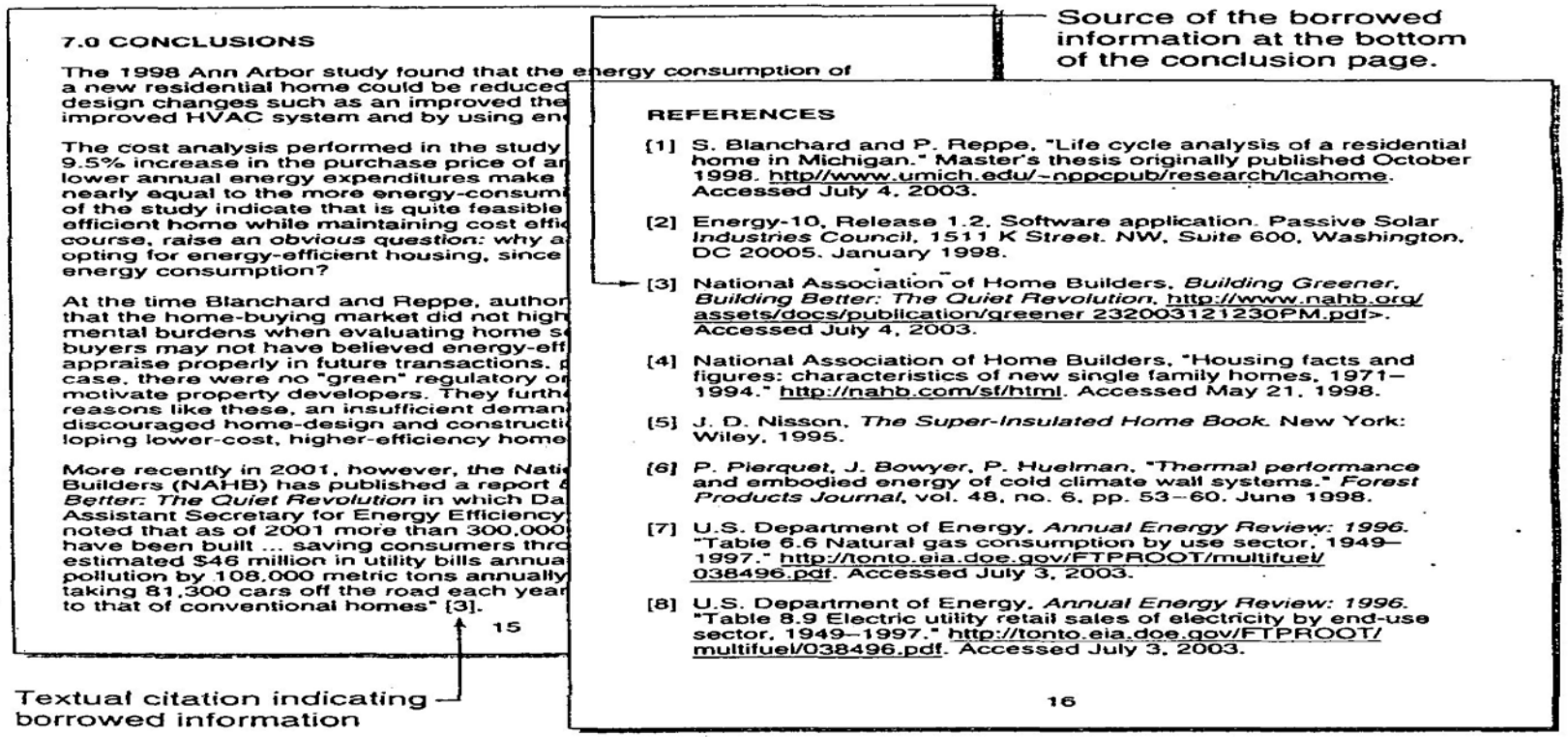
Standard Components of Typical Engineering Reports
(Recommendations)

You may recommend certain things based on the results and discussion (like more investigation on certain things, Recommend using certain procedures or methods…etc)

Standard Components of Typical Engineering Reports
(Documentation)

You have to refer to any sources of information you borrowed from the others. Citation in the text, and use reference list

Standard Components of Typical Engineering Reports (Conclusions and References)



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[1] S. Blanchard and P. Reppe, "Life cycle analysis of a residential home in Michigan." Master's thesis originally published October 1998. http//www.umich.edu/~nppcpub/research/lcahome. Accessed July 4, 2003.

[2] Energy-10, Release 1.2. Software application. Passive Solar *Industries Council*, 1511 K Street, NW, Suite 600, Washington, DC 20005. January 1998.

[3] National Association of Home Builders, *Building Greener, Building Better: The Quiet Revolution*, http://www.nahb.org/assets/docs/publication/greener 232003121230PM.pdf>. Accessed July 4, 2003.

[4] National Association of Home Builders, "Housing facts and figures: characteristics of new single family homes, 1971–1994." http://nahb.com/sf/html. Accessed May 21, 1998.

[5] J. D. Nisson, *The Super-Insulated Home Book*. New York: Wiley, 1995.

[6] P. Pierquet, J. Bowyer, P. Huelman, "Thermal performance and embodied energy of cold climate wall systems." *Forest Products Journal*, vol. 48, no. 6, pp. 53–60. June 1998.

[7] U.S. Department of Energy, *Annual Energy Review: 1996*. "Table 6.6 Natural gas consumption by use sector, 1949–1997." http://tonto.eia.doe.gov/FTPROOT/multifuel/038496.pdf. Accessed July 3, 2003.

[8] U.S. Department of Energy, *Annual Energy Review: 1996*. "Table 8.9 Electric utility retail sales of electricity by end-use sector, 1949–1997." http://tonto.eia.doe.gov/FTPROOT/multifuel/038496.pdf. Accessed July 3, 2003.

16

Figure 6-6 Conclusion and references page. Notice that the conclusion (which precedes the references pages) summarizes the chief finding of the report, speculates on that finding, and then glances at more recent developments. The references page uses the IEEE system of documenting borrowed information. Also see the bracketed citations in Figures 6-4 and 6-5. (See Chapter 11 for details on the IEEE system.)

Standard Components of Typical Engineering Reports
(Appendices)

Extra sections attached to the end of the report. They include any information that are too large or do not fit inside the body of the report such as:

1) **folded Maps**
2) **Huge data (like output runs from computer)**
3) **Derivations of formulas**
4) **Basic backgrounds**
5) **Huge results of tests**

Appendixes

Extra sections attached to the end of the report. They include any information that are too large or do not fit inside the body of the report. Such as:

1) **folded Maps**
2) **Huge data (like output runs from computer)**
3) **Derivations of formulas**
4) **Basic backgrounds**
5) **Huge results of tests**
6) **and so**

Constructing Tables and Graphics

What is the best way to present your data?

- **Text in a paragraph?**
- **Numbers in a table?**
- **Or graph/chart in a figure?**

Constructing Tables and Graphics or simply Illustrations

Illustrations are classified as either:

Tables or

Figures

Figures include: charts, graphs, line drawings, photographs and any other items.

Tables

- better for discrete data
- enable you to be more precise

Graphs

- better for continuous data
- better for showing trends and proportions.

Why Use Illustrations?

- Illustrations serve to communicate information that is difficult express verbally.
- Illustrations serve as a convenient way to summarise large bodies of precise numerical data.
- Finally, illustrations serve to break up large sections of print, making the entire report easier to comprehend.

Data in Paragraphs

In a comparison of Ford conventional vehicles and hybrid electric vehicles (HEV), the HEV proved to have a greater range (450–550 miles) than did the conventional vehicle (350 miles). And, as might be expected, these numbers were the same for gasoline range. In terms of fuel economy, the HEV was 30–50% better than the conventional vehicle. This, in turn, meant less frequent fill-ups for the HEV. Burning less gasoline causes the HEV to be 95% cleaner—far friendlier to the environment. And finally, this study found that the HEV performed more like a V-6 (more powerfully) than the conventional vehicle, whose performance was considered more like that of a 4-cylinder engine.

Converting paragraphs to tables

Table 1 shows the results of a comparison of conventional and hybrid electric vehicles done by Ford in 2002:

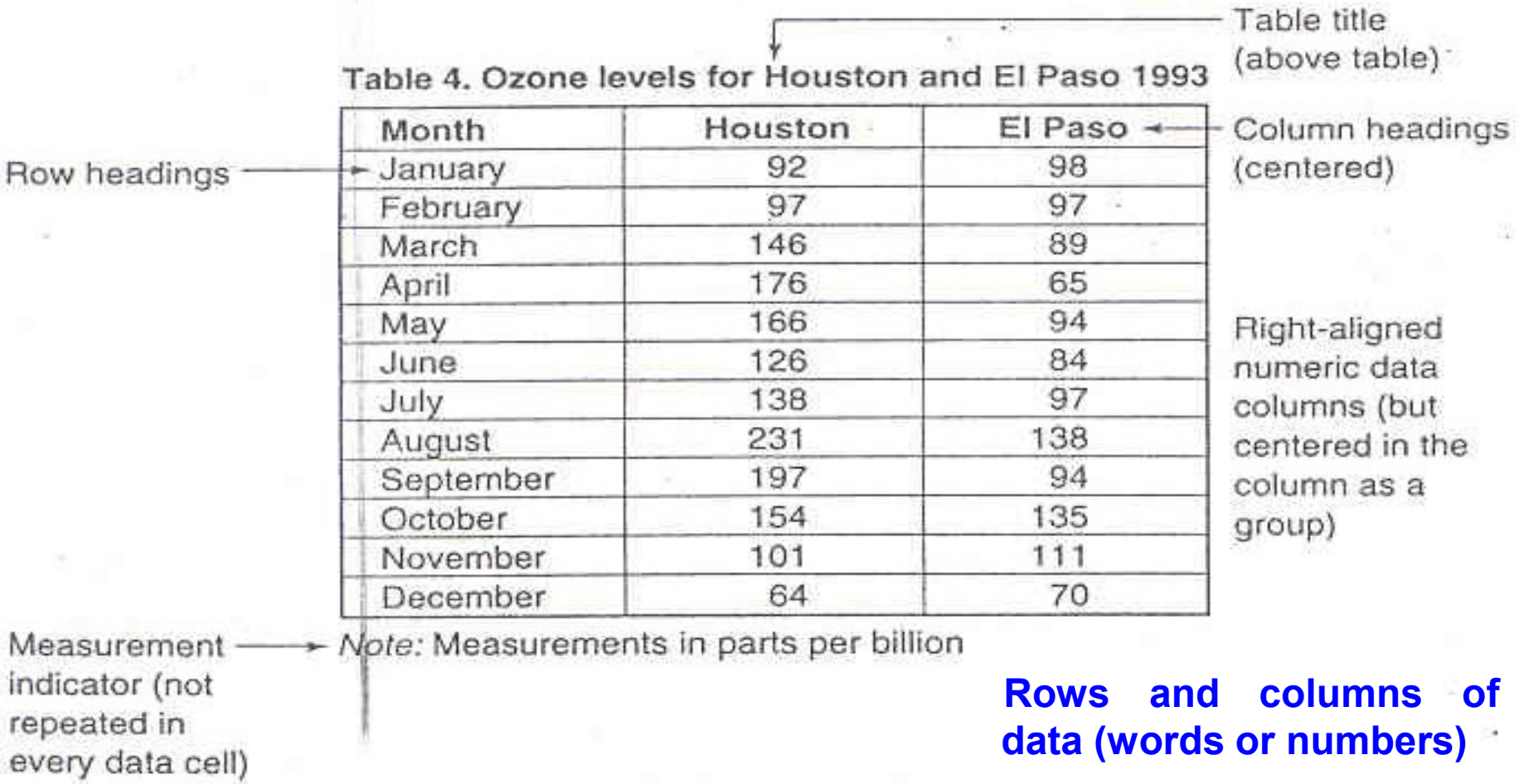
Table 1. Conventional-HEV Vehicle Comparisons

	Conventional	Hybrid Electric
Total Range	350 miles	450–550 miles
Gasoline Range	350 miles	450–550 miles
Fuel Economy	Base	30–50% over base
Re-fueling	Fill-up	Fill-up (less often)
Environmental Friendliness	Base	SULEV (95% cleaner than today's standard)
Performance	4-cylinder	Like a V-6

Source: Ford Motor Company. "Hybrid Vehicles," <www.ford.com/en/ourVehicles/environmentalVehicles/hybridElectricVehicles/>. Accessed October 6, 2002.

Figure 7-5 Transforming text into a table. In the original version, data is buried in the textual discussion; in the revised version, it is taken out of paragraph format and presented as a table, making it more quickly scannable and breaking up the text.

Tables



Month	Houston	El Paso
January	92	98
February	97	97
March	146	89
April	176	65
May	166	94
June	126	84
July	138	97
August	231	138
September	197	94
October	154	135
November	101	111
December	64	70

Figure 7-1 Table terminology. You might prefer a table design with fewer grid lines, such as the table shown in Figure 7-4. Check your word processing software; it provides many different design options for tables.

Constructing Tables and Graphics

Converting text to table and two-column lists

Energy Source
CO_2 (lb/kWh)
SO_2 (lb/kWh)
NO_x (lb/kWh)
Coal
2.12
0.0136
0.0079
Natural Gas
1.34
0.000007
0.0046
Oil
1.96
0.0123
0.0036

Table 2. Gas emissions per kilowatt-hour generated [21]

Energy Source	CO_2 (lb/kWh)	SO_2 (lb/kWh)	NO_x (lb/kWh)
Coal	2.12	0.0136	0.0079
Natural Gas	1.34	0.000007	0.0046
Oil	1.96	0.0123	0.0036

Figure 7-2 Converting text to tables. Notice that the text column is arranged in groups of four. (The table title is added afterward.)

cantilever beam	Projecting beam or member supported at one end.
current-factor	Rating system for current in transistors.
logic circuit	Circuits made up of transistors, diodes, and resist AND,
polymers	Chem comp units

cantilever beam	Projecting beam or member supported at one end.
current-factor	Rating system for current in transistors.
logic circuit	Circuits made up of transistors, diodes, and resistors. The five common logic gates are AND, OR, NOT, NAND, NOR gates.
polymers	Chemical compound or mixture of compounds consisting of repeating structural units.

Figure 7-3 Two-column lists—an easier way. The version on the right is still the same table; its grid lines are turned off.

Constructing Tables and Graphics

Importing or Copying spreadsheet data to create tables

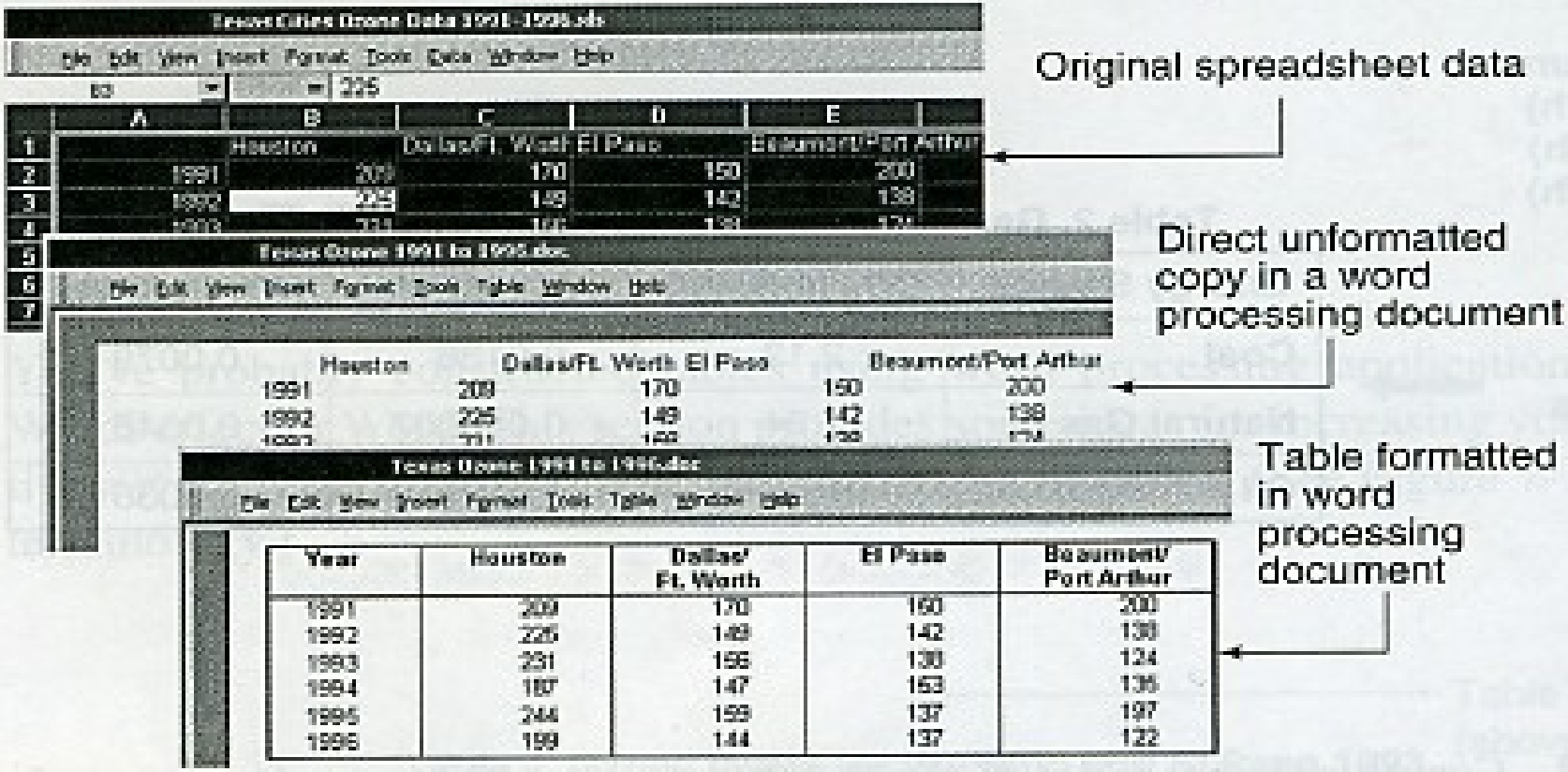


Figure 7-4 Using spreadsheets for tables. After pasting the spreadsheet data into a word processing document, you must format it, as shown here.

Constructing Graphics

1. **Graphs:** Represent data using lines that change up and down from left to right. indicating changes in the data across an independent variable (e.g.: time).

Graphs

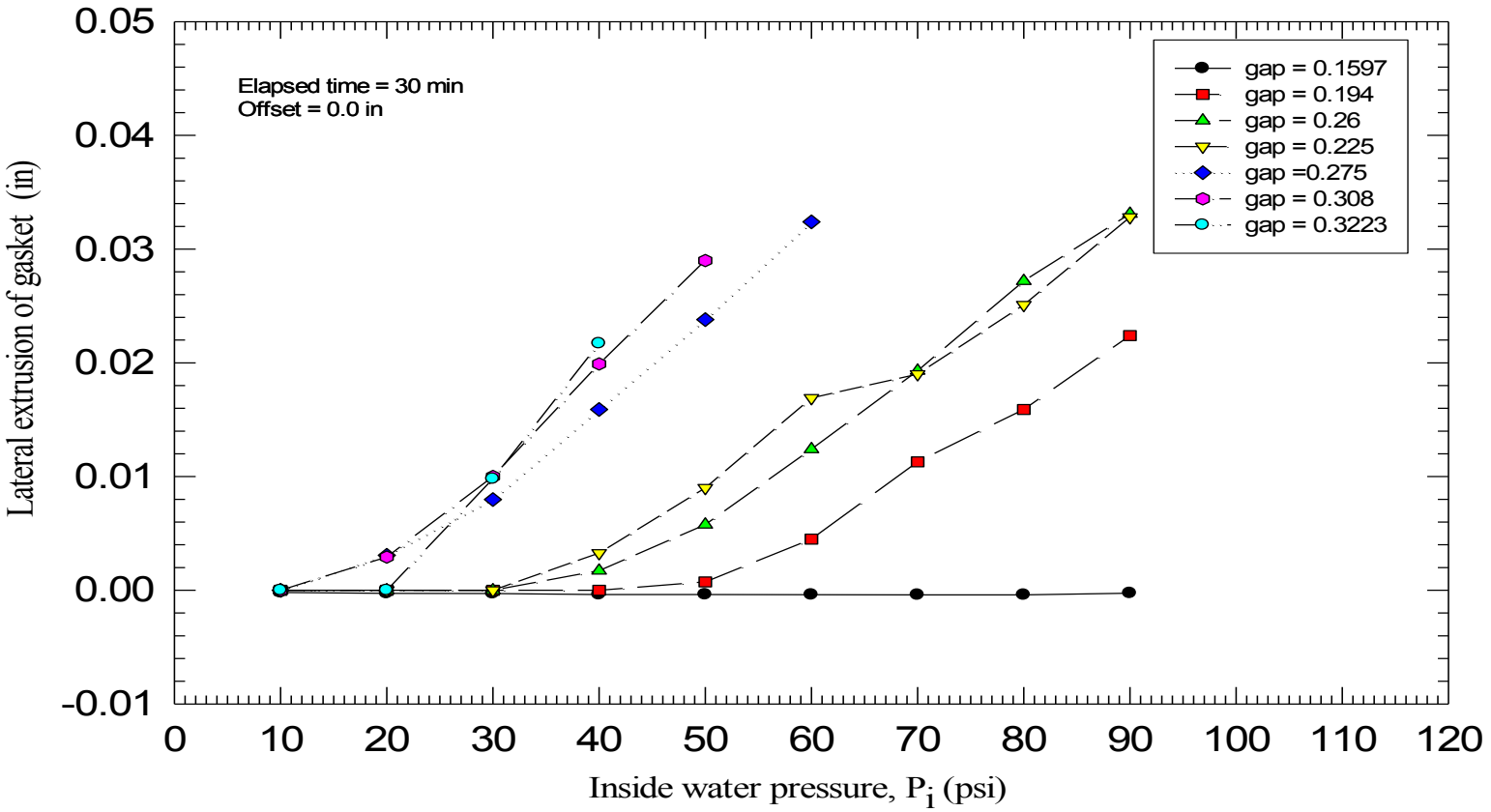


Figure 4.20 Lateral extrusion of gasket vs. inside water pressure at different initial joint gaps after 30 min. elapsed time for picture frame water leakage test using EPDM gasket

Constructing Graphics

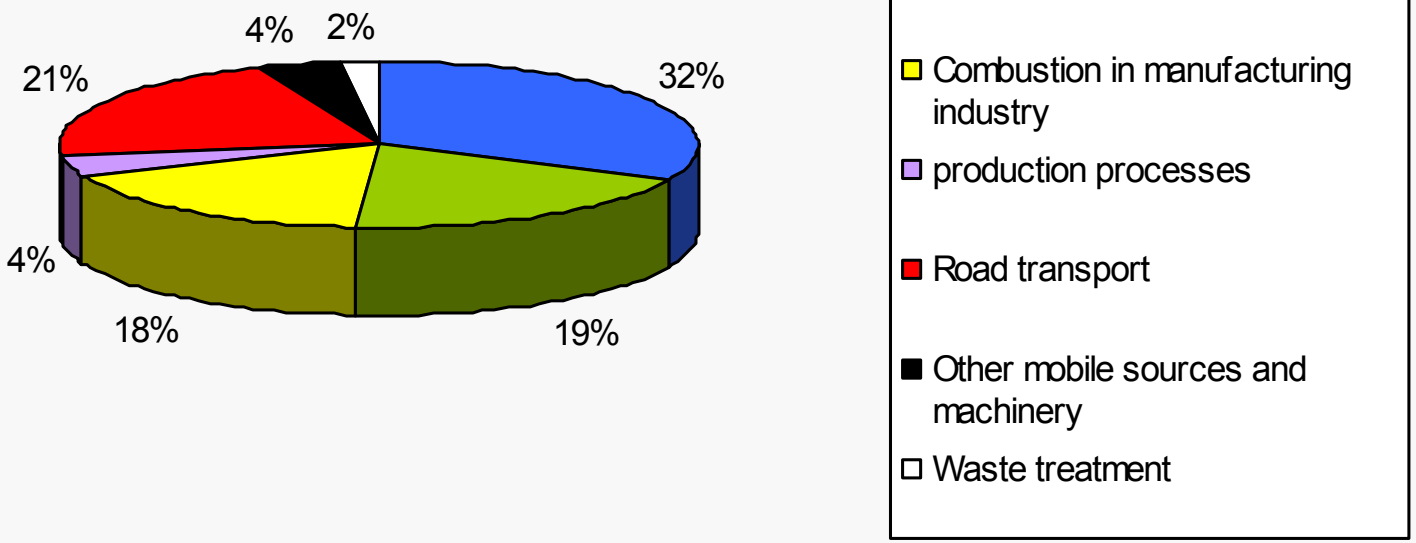
2. **Charts:** Use bars, pie slices, or other inventive means to enable comparisons of data. The most common types are **bar charts and pie charts.**

Charts

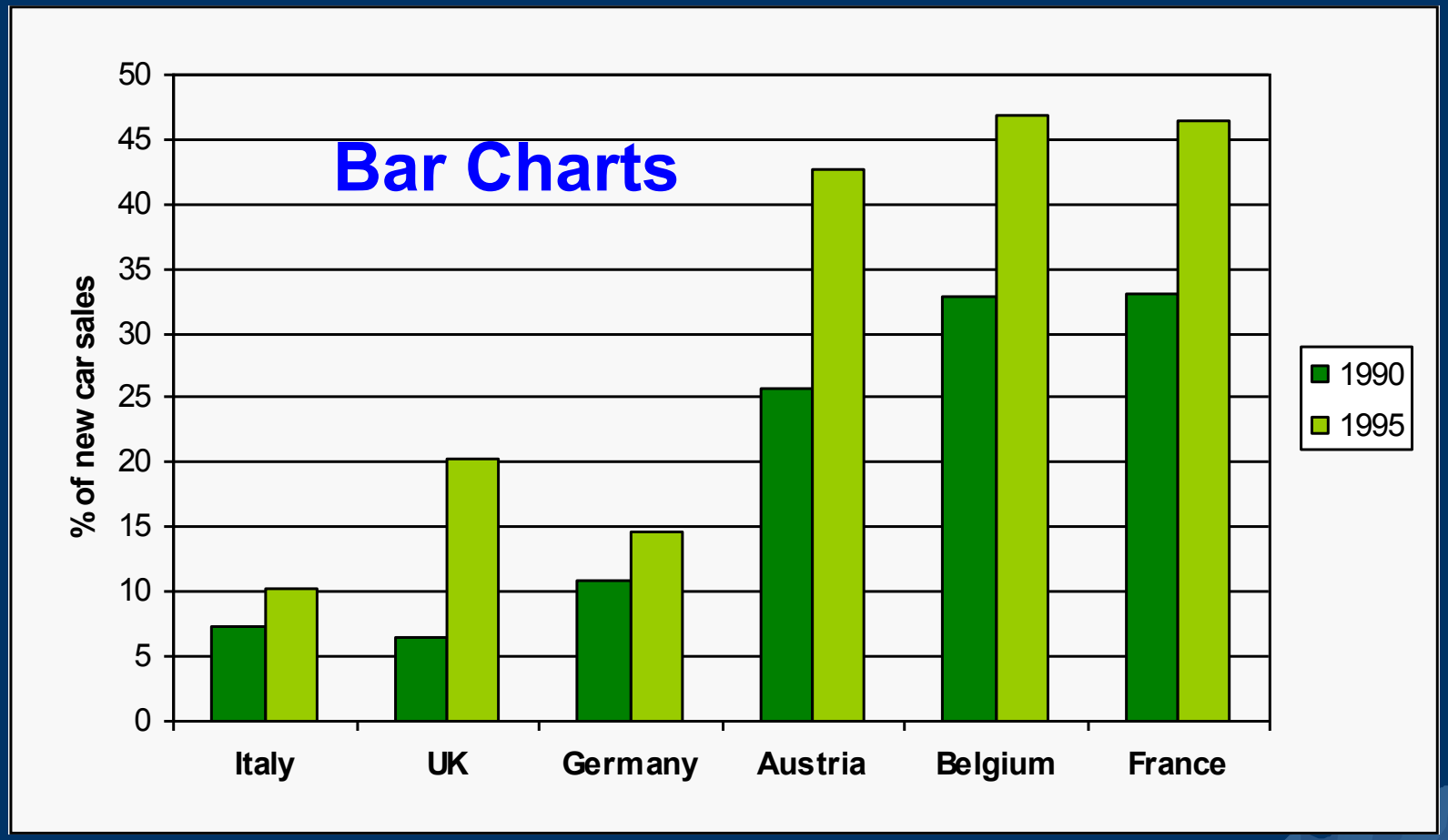
Charts: Using bar or pie charts to compare data

Graphs: Using data lines to show changes (x-y plots)

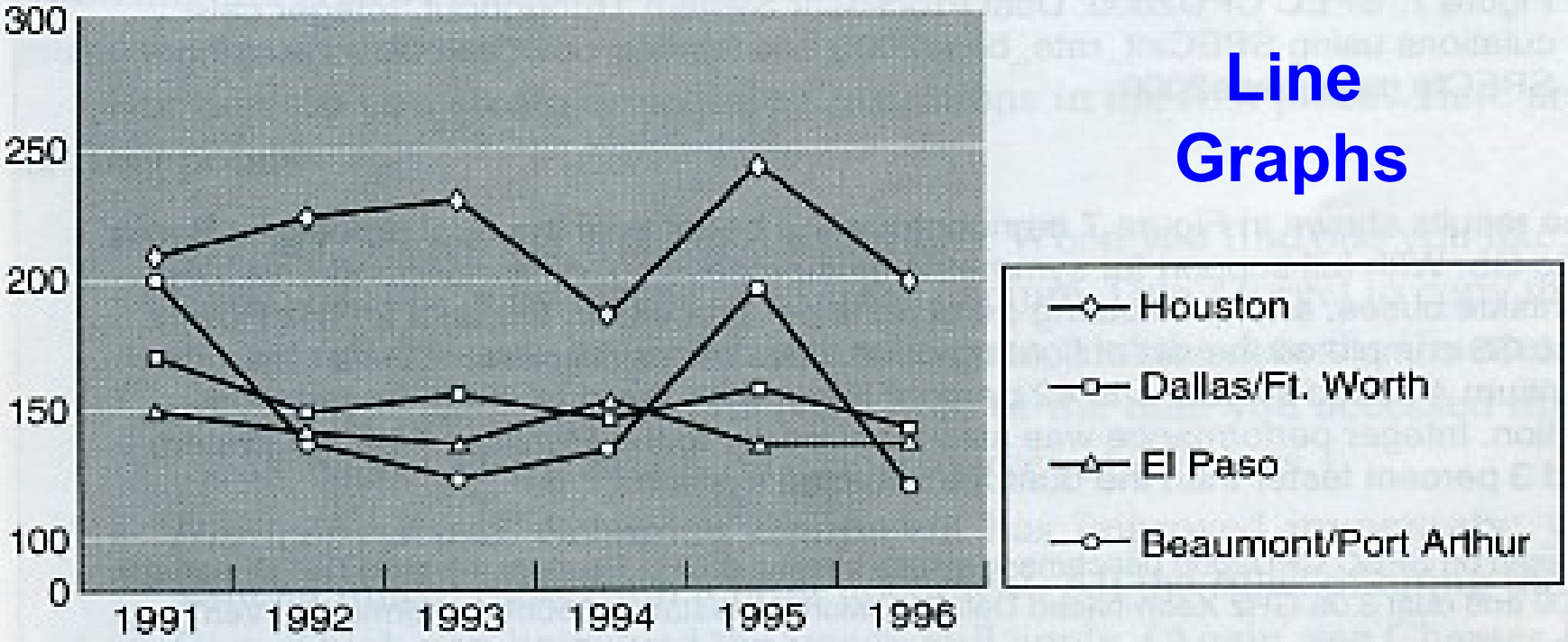
Pie Charts



Charts


Bar Charts
% of new car sales
50
45
40
35
30
25
20
15
10
5
0
Italy
UK
Germany
Austria
Belgium
France
1990
1995

Charts



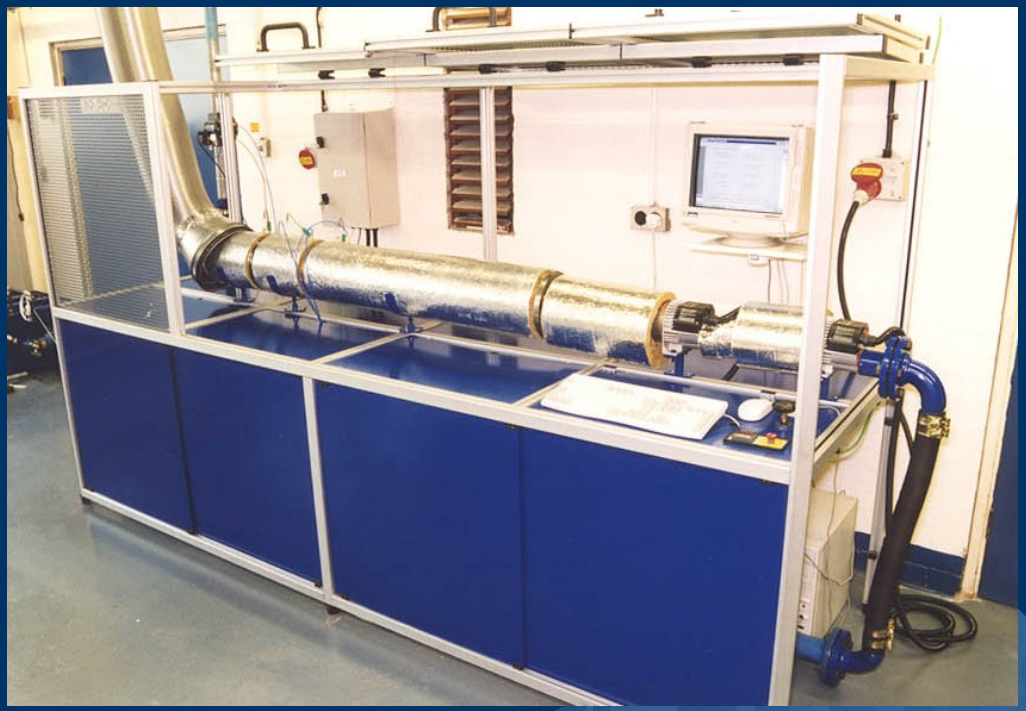
Line Graphs

Figure 6. 1991–1996 ozone data for Texas cities (parts per million). [7]

Figure 7-7 Line graph using the same data as in Figure 7-4. Spreadsheet applications can also produce line graphs like this one. Notice that the title for this figure is located *below* the figure. Notice also that the source is indicated using the IEEE style of citation (see Chapter 11 for details).

Constructing Graphics

3. **Photographs:** Supply lots of details (in some cases, too much). They are useful for example when you want to show a **model of a new product.**



Photographs

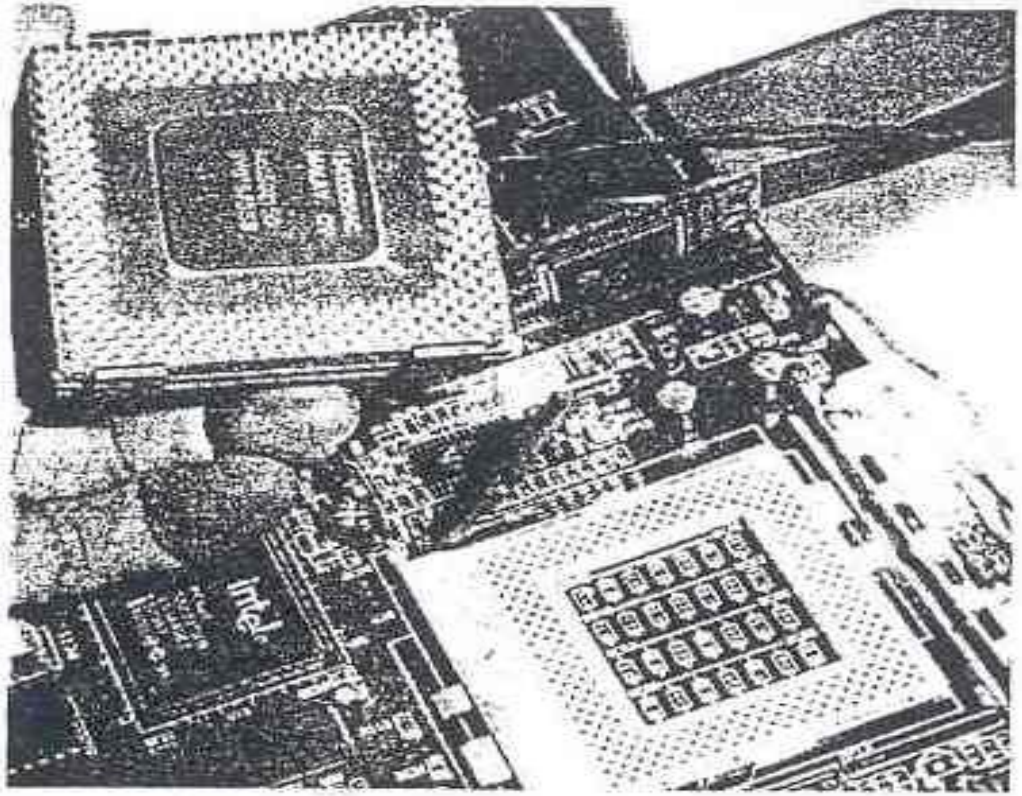


Figure 7-9 Diagrams and photographs. Getting a photograph with good detail like the one here is difficult. More often, a simple line drawing like the image on the left is clearer and more understandable for readers. (Photograph reprinted with permission from ThePC.info, "How do I upgrade my microprocessor?" www.thepc.info/CPU_upgrade.html. Diagram reprinted with permission from Dell Computer Corporation, "Dell Precision Work-Station 530 User's Guide," support.jp.dell.com/docs/systems/ws530/en/ug/html/2prsr.htm.)

Constructing Tables and Graphics

4. **Drawings:** Simplified illustrations of objects, people, and places, you see plenty of drawings used in instructions. They strip away extraneous (unrelated) detail and focus on the key objects and actions.

Drawings

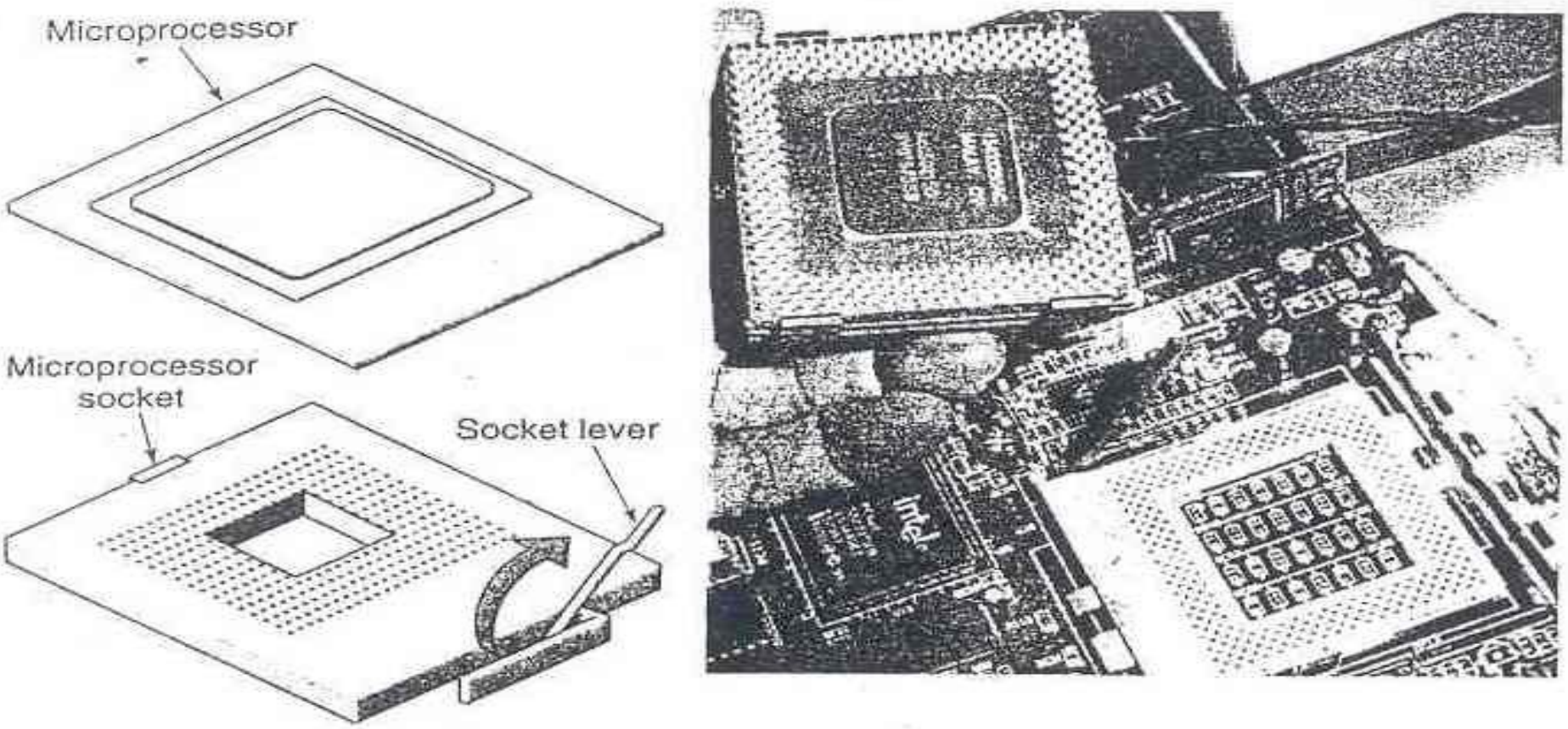


Figure 7-9 Diagrams and photographs. Getting a photograph with good detail like the one here is difficult. More often, a simple line drawing like the image on the left is clearer and more understandable for readers. (Photograph reprinted with permission from ThePC.info, "How do I upgrade my microprocessor?" www.thepc.info/CPU_upgrade.html. Diagram reprinted with permission from Dell Computer Corporation, "Dell Precision Work-Station 530 User's Guide," support.jp.dell.com/docs/systems/ws530/en/ug/html/2prsr.htm.)

Constructing Tables and Graphics

5. **Diagrams:** Abstract illustrations of objects. They focus on infrastructure.
   - Diagrams can also be used to illustrate nonphysical things such as concepts.
     - An organizational chart of a company is a typical example.
     - A flowchart of a production process is another.

Diagrams

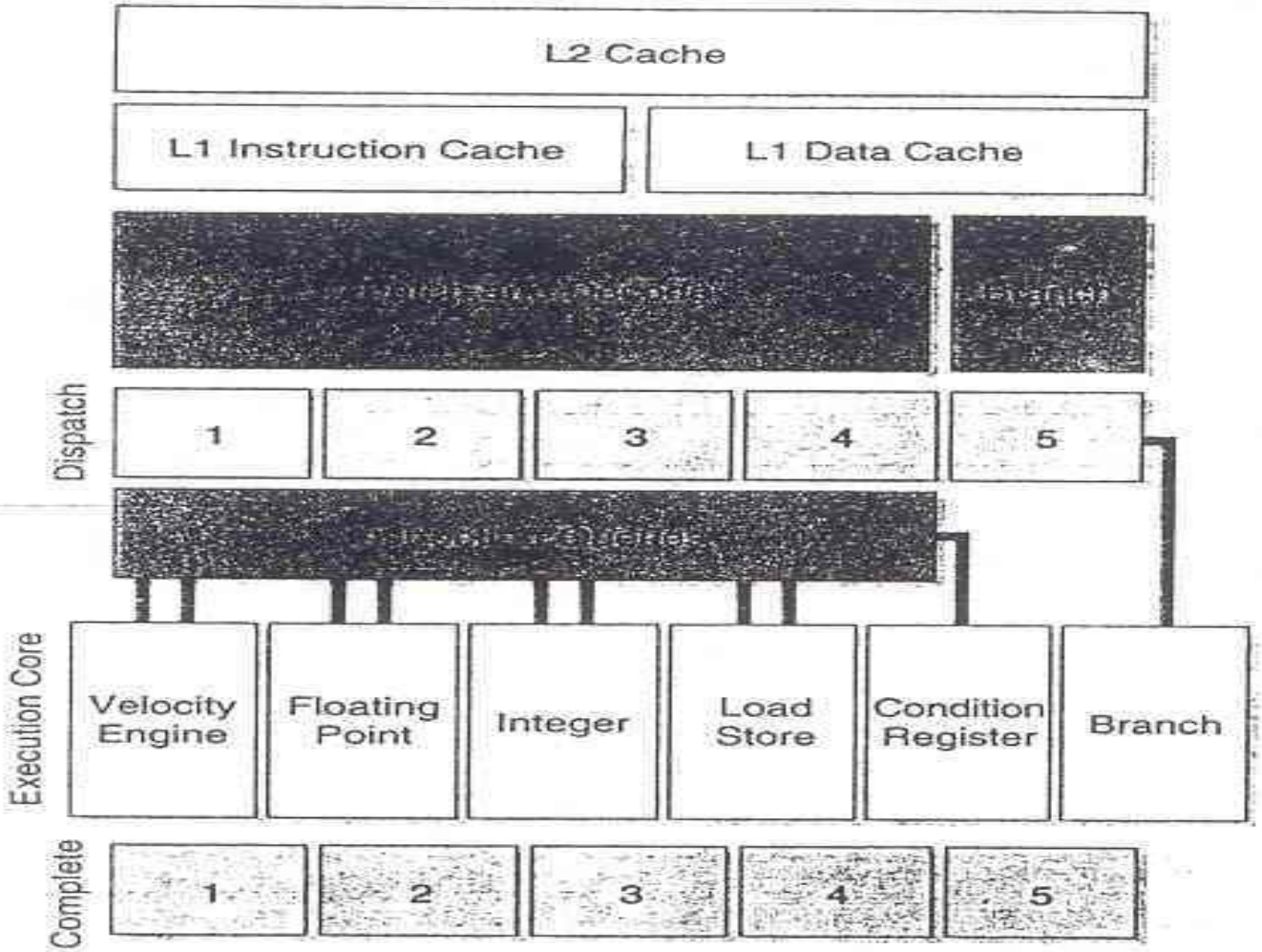
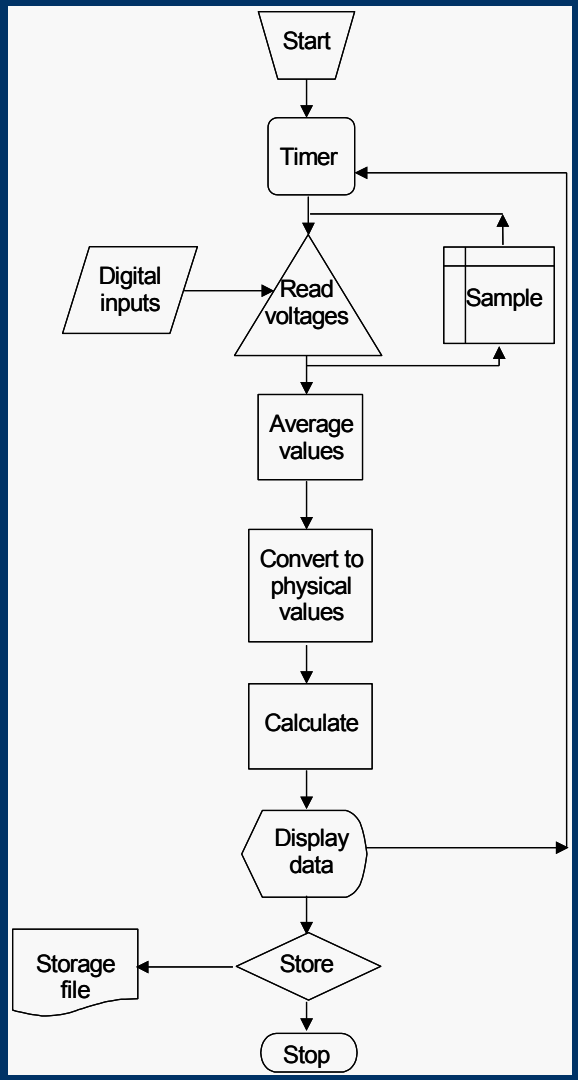


Figure 7-10 Architectural diagram of a microprocessor. This diagram is not only highly abstract but also "conceptual" in that the physical PowerPC G5 does not resemble this diagram at all—however, in terms of its hierarchy of functions and components, it does. *Source:* www.apple.com/g5/executioncore.html.

Diagrams


Start
Timer
Digital inputs
Read voltages
Sample
Average values
Convert to physical values
Calculate
Display data
Storage file
Store
Stop

Revisit: Illustrations

- Refers to photographs, drawings, diagrams, flowcharts, and schematics.

- Sources (cite the source):
  - Internet: download or copy and paste.
  - Hardcopy scan: scan the image and import it to your document.
  - Graphic professionals: They can do the drawings for you.
  - You create your drawing using special software such as CorelDraw, AutoCAD, Visio, Adobe Photoshop, …etc.

Illustrations
Graphics and Tables Guidelines

When incorporating graphics and tables into an engineering document, pay attention to their standard components, their placement, and cross references to them.

The following lists summarizes guidelines stated in this chapter.

- Add figure and table tittles
- Add labels: In illustrations, add words that identify the parts of the thing being illustrated, and a pointer from each label to the part being illustrated.
- In charts and graphs, add labels to the axes.

Illustrations (cont…)
Graphics and Tables Guidelines

- Indicate sources of borrowed graphics or tables
- Place graphics and tables at the point of first reference
- Align and position graphics carefully
- Include a legend: if your graphs or charts use different symbols, colors, shadings, or patterns to indicate different elements, include a legend (Figures 7-7 and 7-8).

Legend

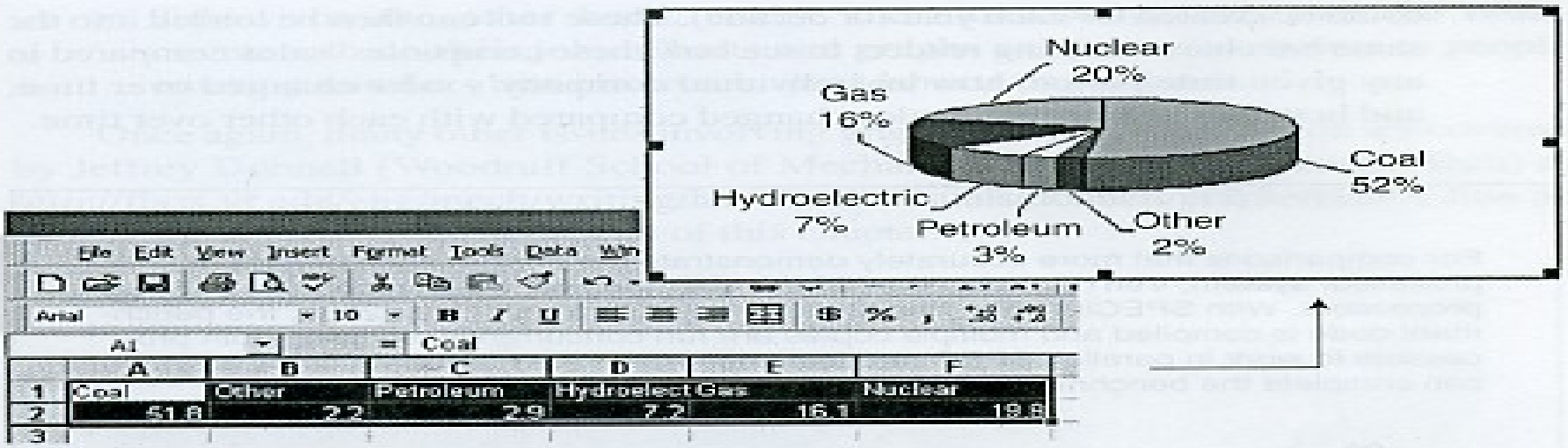


Figure 7-6 Pie charts from spreadsheets. This pie chart was created first by entering data into a spreadsheet application and then by choosing Chart from the Insert menu and making the appropriate selections. Although the chart is initially placed in the spreadsheet, you can copy it like any other object and paste it into a document.

would have the biggest slice? Figure 7-6 shows which energy source constitutes the biggest slice.

- *Bar charts* enable comparisons such as those shown in Figure 7-8. Bar charts can also, to a limited degree, indicate change over time. Imagine a bar chart showing sales for Dell, Hewlett-Packard, IBM, and Apple for 2004. However, time can be added: A set of four grouped bars for the sales of these companies

Legend

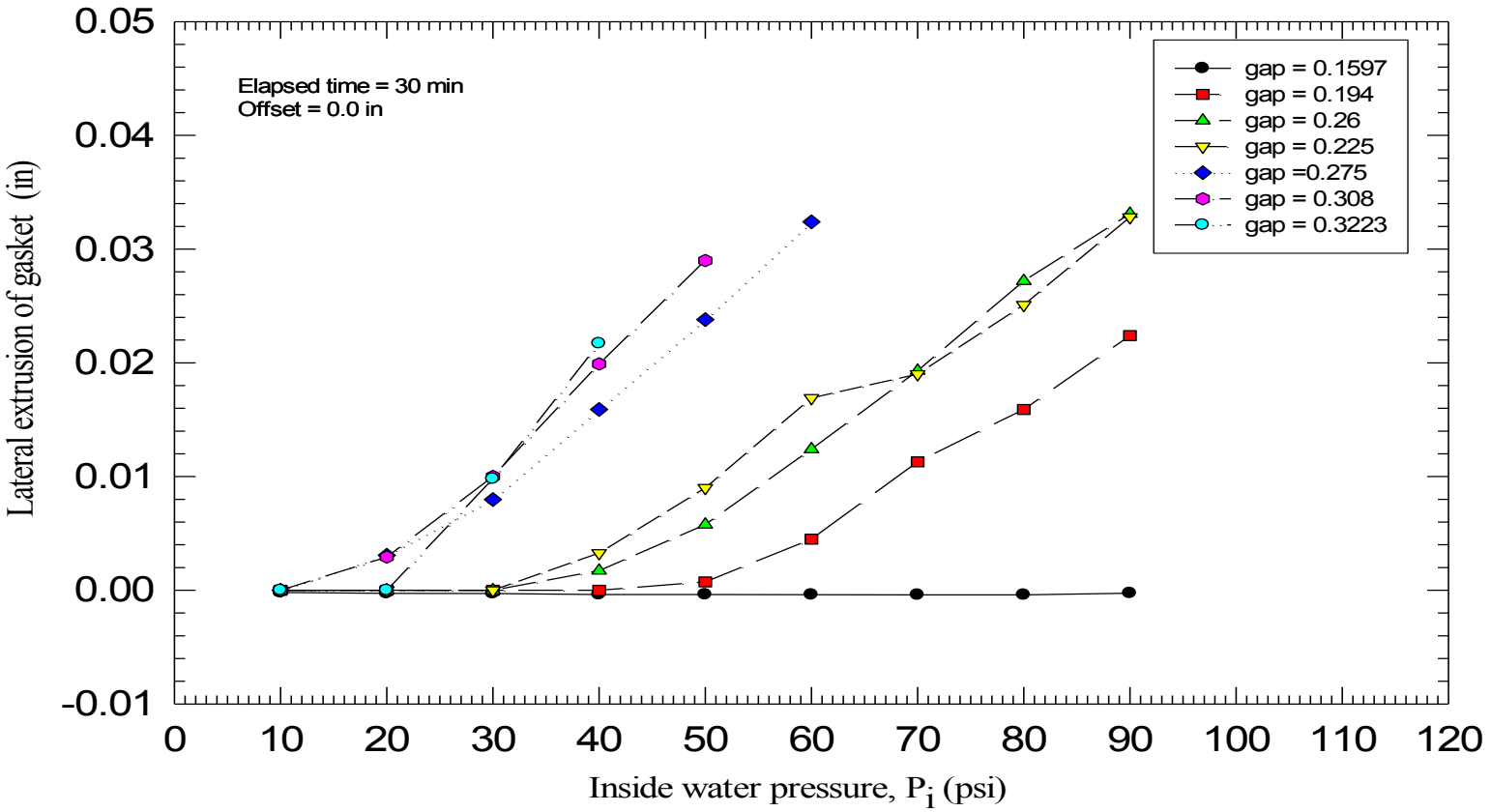


Figure 4.20 Lateral extrusion of gasket vs. inside water pressure at different initial joint gaps after 30 min. elapsed time for picture frame water leakage test using EPDM gasket

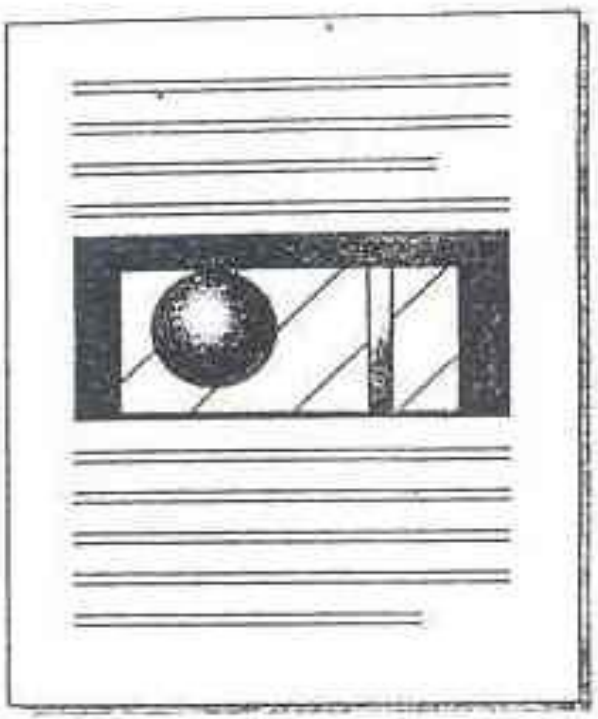
Illustrations (cont…)
Graphics and Tables Guidelines

Provide cross reference to your graphics and tables. Do not just pitch graphics and tables into engineering documents without referring to them and explaining key points, otherwise readers may have a nice picture or a pile of statistics, but no sense of purpose or meaning.

Use phrasing like the following

- As can be seen in Figure 5
- The arrangement of the network (Figure 8.2)
- Averages for the fabric cutting speeds are shown in Table 4 on the next page.

Illustrations



(a)

(b)

Figure 7-12 (*a*) Example of effective centering of a graphic on the page. (*b*) Letting text flow around a graphic can give your page a professional look.

Accessing Engineering Information

- During your study or in your career life, You need to access information related to your specialized field or other fields

- Before setting out to the library or opening your favorite Web search engine, know some strategies for planning your search and for getting the most out of your search

Accessing Engineering Information
Search Preparation

- **Purpose:** write report, select equipment or product or work on a design problem, conduct research …etc
- **Type of information:** Theoretical, practical, product information, …etc
- **Exact needs:** Raw data, overview of the subject, Historical information (e.g., for product liability), Up-to-date, state of the art information…etc

Accessing Engineering Information
Basic Search Strategies

- What is my time frame: hours, days, weeks?
- What resources do you have access to: company, university, library, internet, near by experts, publications?
- Are you going to pay for the information? And how much?

Your answer to these questions determine where to look for information.

Accessing Engineering Information
Following the Trail

- **General Books:** Recent books give up-to-date information but old books may give good background or basic information. Library, internet (e-books), or bookstores where you can find the books
- **Reference Books:** Used for quick use (not checked out of the building) such as handbooks, reference manuals, guides, …etc
- **Journals:** Hardcopies/electronic copies. They are very important to keep up with the most resent related works.

Accessing Engineering Information
Following the Trail

Table 8-2 Examples of Engineering Reference Books

Kirk-Othmer's *Encyclopedia of Chemical Technology*, 6th ed. 1992. 25 volumes. Covers all areas of technology—not just chemical. At the end of each article are useful references to patents, conference proceedings, and journal articles.

McGraw-Hill Encyclopedia of Science and Technology, 9th ed. 2002. 20 volumes. Contains almost 8000 well-written and well-illustrated articles on science, engineering, and other technical subjects. Check here first for general background.

Van Nostrand's Scientific Encyclopedia. 9th ed. 2002. 2 volumes. Concentrates on the basic and applied sciences, with over 17,000 articles. Also functions as a technical dictionary. Available online as AccessScience.

McGraw-Hill Dictionary of Scientific and Technical Terms, 6th ed. 2002. Provides more than 125,000 definitions of terms and includes some 3000 illustrations.

Encyclopedia of Energy Technology and the Environment, 1995. Part of the Wiley Encyclopedia Series in Environmental Science. Four volumes of articles on energy-related topics relating to technology and its impact on the environment.

Handbook of Industrial Engineering, 3rd ed. 2001. Almost 2900 pages of detailed information on such topics as performance measurement, quality control, engineering economy, and manufacturing engineering.

Marks' Standard Handbook for Mechanical Engineers, 8th ed. 1978. Continues the *Standard Handbook for Mechanical Engineers*. The 10th edition is available online by subscription at www.knovel.com/knovel2/Toc.jsp?BookID=346 and may be in some engineering library collections.

Perry's Chemical Engineers' Handbook, 7th ed. 1997. Includes material from general mathematics, tables, and specialized treatment of topics such as psychometry, process machinery, and distillation. A standard for petroleum and chemical engineers.

CRC Handbook of Mechanical Engineering. 1998. Like *Marks' Standard Handbook for Mechanical Engineers*, this handbook contains useful articles, tables, and data on all aspects of mechanical engineering and other subjects of use to mechanical engineers.

Standard Handbook for Civil Engineers. 5th ed. 2003. Covers construction, structural theory and design, materials, and management for the various fields of civil engineering, including environmental concerns.

Standard Handbook for Electrical Engineers. 14th ed. 1999. Substantial coverage of all aspects of electrical engineering, with numerous tables, charts, and graphs.

Accessing Engineering Information
Indexes and Abstracts

- **Indexes (periodical index): An index, in print or electronic form, lists articles grouped by subjects from selected periodicals which gives information about article titles, authors, Journal titles, volume, issues, dates, and page count**
- **Abstract: indexes enables you to find many articles. Therefore you read the abstract, which gives you a summary about the article (content, results, and findings).**
  - **Thus, you can read the abstract of the article to decide whether you will use it in your project or not. Abstracts may appear separately in indexes**

Accessing Engineering Information
Indexes and Abstracts

Table 8-3 Examples of Engineering-Related Indexes and Abstracts

Title of Paper Index	Electronic Equivalent
Applied Science and Technology Index	ASTI or ASTA
Business Information	ABI/Inform
Chemical Abstracts	CA
Computer and Control Abstracts	INSPEC
Electrical and Electronics Abstracts	INSPEC
Engineering Index	Compendex
International Aerospace Abstracts	Aerospace Database
Metals Abstracts	Metadex
Nuclear Science Abstracts (1946 to 1976)	Not available
Pollution Abstracts	Same name

When an index also contains the abstracts of the articles indexed, it is called "abstracts." These are just a few of the indexes and abstracts available in the field of engineering.

Accessing Engineering Information
Indexes and Abstracts

Title:	Effects of modified atmosphere on crop productivity and mineral content
Authors:	Chagvardieff, P.; Dumon, B.; Souleimanov, A.; Massimino, D.; Le Bras, S.; Péan, M.; Louche-Teissandier, D.
Affiliation:	CEA, Direction des Sciences du Vivant, Département d'Ecophysiologie Végétale et de Microbiologie, Centre de Cadarache, F-13108 Saint-Paul-Lez-Durance cédex, FRANCE
Journal:	Advances in Space Research, Volume 20, Issue 10, p. 1971-1974. (AdSpR Homepage)
Publication Date:	00/1997
Origin:	ELSEVIER
Abstract Copyright:	(c) 1997 Elsevier Science B.V. All rights reserved
Bibliographic Code:	1997AdSpR..20.1971C

Abstract

Wheat, potato, pea and tomato crops were cultivated from seeding to harvest in a controlled and confined growth chamber at elevated CO_2 concentration (3700 muL L^-1) to examine the effects on biomass production and edible part yields. Different responses to high CO_2 were recorded, ranging from a decline in productivity for wheat, to slight stimulation for potatoes, moderate increase for tomatoes, and very large enhancement for pea. Mineral content in wheat and pea seeds was not greatly modified by the elevated CO_2. Short-term experiments (17 d) were conducted on potato at high (3700 muL L^-1) and very high (20,000 muL L^-1) CO_2 concentration and/or low O_2 partial pressure (~ 20,600 muL L^-1 or 2 kPa). Low O_2 was more effective than high CO_2 in total biomass accumulation, but development was affected: Low O_2 inhibited tuberization, while high CO_2 significantly increased production of tubers.

Figure 8-3 Abstract—example. This abstract is typical of what you see in electronic indexing and abstracting services. You get both the index entry with bibliographic detail to enable you to find the complete article, plus the abstract, which provides a summary of the research purpose and outcomes.

Accessing Engineering Information
Indexes and Abstracts

Table 8-4 Finding Engineering Reports

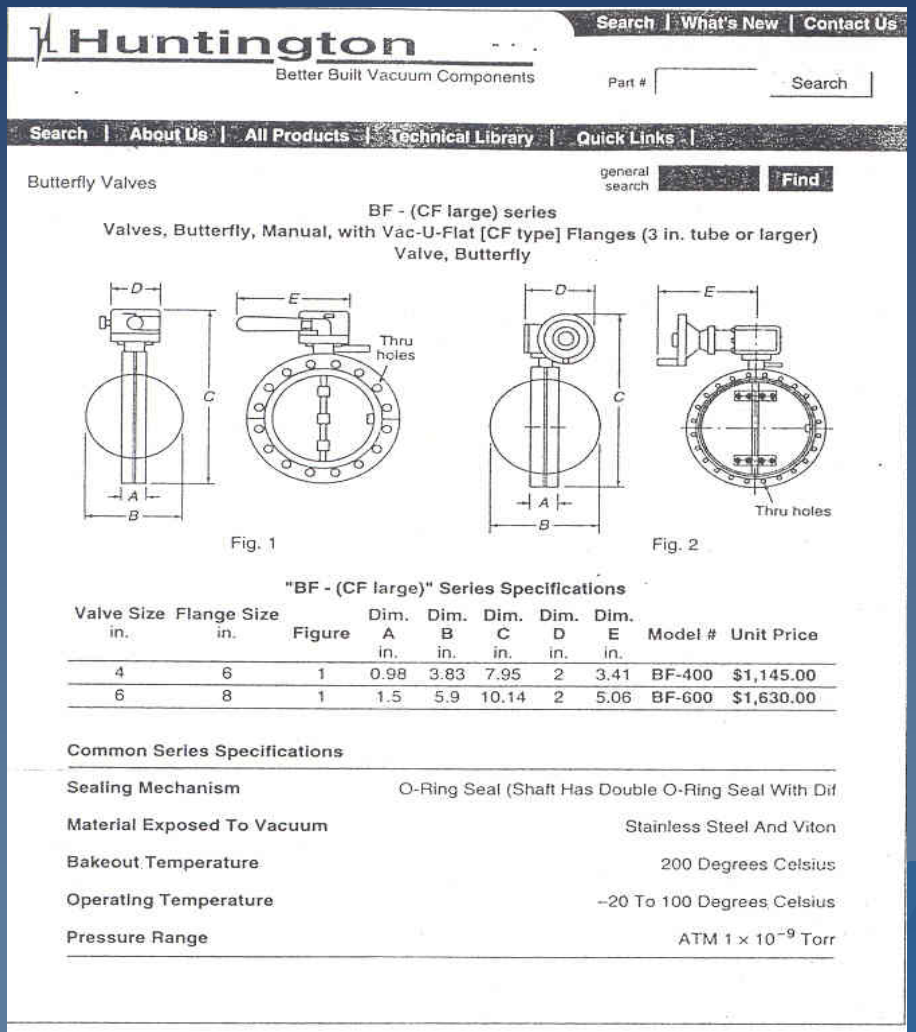
National Technical Information Service (NTIS), www.ntis.gov/	Major source for information on nonproprietary and unclassified reports sponsored by government agencies and contractors. NTIS lists the subject of each report, its individual and corporate author, and the contract and report number. You can search technical reports on government-sponsored research from organizations such as NASA, DOE, and EPA. You can read abstracts for the reports online; the reports can be purchased online.
NTRS (NASA Technical Reports Server), ntrs.nasa.gov/	Collects, archives, and makes available NASA's scientific and technical information, including research reports, journal articles, conference and meeting papers, technical videos, mission-related operational documents, and preliminary data. Available via the NASA Technical Report Server (NTRS) to provide students, educators, and the public access to NASA's technical literature.
IEEE Xplore, www.ieee.org/ieeexplore	Provides access to IEEE reports, journals, transactions, and magazines, IEEE conference proceedings, and current IEEE standards, all published since 1988.

Accessing Engineering Information
Technical Reports and Patents

- **Technical Reports:** Huge number of reports are written every year. For a search or a report, use indexes and abstracts to narrow the search. Usually reports, supported by government or contract, are easy to find
- **Patents:** Documents have detailed information about materials, design, inventions related information.

Accessing Engineering Information
Product Literature

Include products manufacturer, Company, and vendor catalogs, product selectors, buyers guides, performance data, photographs or drawings of products, data books for computers and integrated circuit devices…etc



Huntington
Better Built Vacuum Components

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Part # Search

Search | About Us | All Products | Technical Library | Quick Links

Butterfly Valves

general search Find

BF - (CF large) series
Valves, Butterfly, Manual, with Vac-U-Flat [CF type] Flanges (3 in. tube or larger)
Valve, Butterfly

Fig. 1

Fig. 2

"BF - (CF large)" Series Specifications

Valve Size in.	Flange Size in.	Figure	Dim. A in.	Dim. B in.	Dim. C in.	Dim. D in.	Dim. E in.	Model #	Unit Price
4	6	1	0.98	3.83	7.95	2	3.41	BF-400	$1,145.00
6	8	1	1.5	5.9	10.14	2	5.06	BF-600	$1,630.00

Common Series Specifications

Sealing Mechanism	O-Ring Seal (Shaft Has Double O-Ring Seal With Dif
Material Exposed To Vacuum	Stainless Steel And Viton
Bakeout Temperature	200 Degrees Celsius
Operating Temperature	–20 To 100 Degrees Celsius
Pressure Range	ATM 1×10^{-9} Torr

Figure 8-6 Web page from Huntington Laboratories' online catalog. Huntington Mechanical Laboratories, Inc., 2003, www.huntvac.com (reprinted by permission).

Accessing Engineering Information
When to use product literature?

- If you are on a design project, product literature is indispensable (essential)
- You can get the dimensions or performance figures for specific components, accessories, or equipment related to your subject or project
- These resources also help you if you are producing or marketing your own products by telling you what's already available in your field

Accessing Engineering Information
Standards and Specifications

- Most products we use are designed and produced in accordance with certain standards or specifications
- These standards are essential if you want to be able to consistently fit light bulbs into sockets, screw nuts onto bolts, replace engine parts, or rely on the strength of concrete
- As a designer you must be aware of these standards and specifications or codes that already exist that may be relevant to your product

Accessing Engineering Information
Standards and Specifications

Table 8-6 Some Producers of Standards

American Gear Manufacturers Association	AGMA
American Society of Mechanical Engineers	ASME
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Wire Rope Manufacturers Association	NRMA
Underwriters Laboratory	UL
American National Standards Institute (U.S. treaty representative to other standards producers)	ANSI
General Services Administration (a main U.S. government generator of standards)	GSA
Department of Defense (another main U.S. government generator of standards)	DOD
German Institute for Standardization (major non-U.S. engineering standards organization)	DIN
International Organization for Standardization (another major non-U.S. engineering standards organization in Geneva, Switzerland)	ISO

Accessing Engineering Information
Internet Resources for Eng. Information

- **Electronic Mailing Lists:** You subscribe (using e-mail address) to any of the discussion groups (like: Usenet which refers to news groups, chose one related to you topic) so you can get discussions or information from any one in the group.
- **Electronic Newsletters and Journals**

Accessing Engineering Information
Internet Resources for Eng. Information

Table 8-8 Examples of Engineering-Related Electronic Discussion Lists

CAEDS-L	Computer-aided engineering design (CAEDS) interest group.
CHEME-L	Covers the role of chemical engineering in technology and world economies and serves as an open forum for various technical, professional, and educational issues.
CIVIL-L	Civil engineering research and education.
ENVENG-L	For those interested in education, research, and professional practice relating to environmental engineering.
GENTECH	For the exchange of information among concerned scientists, activists of grassroot groups, and other organizations about the impacts of genetic engineering on environment and society.
MATERIALS-L	For those involved in both teaching and research in materials science and engineering. Interested participants might be in materials departments in universities, in other engineering or science departments, or in industry or government research.
MECH-L	For the discussion of mechanical engineering (ME), including finite element methods, composite materials, and other ME-related topics.
METALLURGY-L	Covers all aspects of metallurgical engineering, including (but not necessarily limited to) mineral processing, extractive metallurgy, hydrometallurgy, pyrometallurgy, metals refining, alloying, welding, casting, and metallography.
TDR-L	Discussion of time domain reflectometry issues for engineering and geo measurements.

Accessing Engineering Information
Internet Resources for Eng. Information

Table 8-10 Finding Engineering-Related Newsletters

Web search engines, such as Google. www.google.com/	Type the name of the institution in quotes and the word library in the search field, *or* type the words newsletter and engineering in the search field. *Note:* Experiment with truncating search terms (use the root of the word); for example, use engineer*.
EEVL, the Internet Guide to Engineering, Mathematics and Computing. www.eevl.ac.uk/index.htm	Try the Engineering E-journal Search Engine (EESE) at www.eevl.ac.uk/eese/ for access to newsletters and e-journals.
American Society of Civil Engineers. www.asce.org/ American Society of Mechanical Engineers. www.asme.org/ American Academy of Environmental Engineers. www.enviro-engrs.org/ Institute of Industrial Engineers. www.iienet.org/ Society of Automotive Engineers. www.sae.org/ World Coal Institute: *Ecoal*. www.wci-coal.com/	Go to the website of a professional society for your engineering specialization, and search for newsletters and journals there. To the left are some examples.
Engineering companies	These produce printed technical journals, company journals, or newsletters that, in their electronic form, may be made available to everyone.
U.S. Department of Energy. www.doe.gov/	Some government agencies, such as DOE, publish free online newsletters. For an example, go to afdc3.nrel.gov/documents/altfuel news/ and take a look at *Alternative Fuel News*.
Product, industry, nonprofit, or service-oriented websites	These organizations, such as the Solar Electric Power Association, produce newsletters to attract viewers to their sites and to inform members of events and news. For an example, see *The SEPA Record* at www.resourcesaver.com/file/toolmanager/Custom O63C178F42219.pdf.

Accessing Engineering Information
Internet Resources for Eng. Information

Table 8-12 Web Tools for Finding Web Search Tools

Search Engine Watch, searchenginewatch.com/	Comprehensive site that lists and evaluates Web search engines, provides Web searching tips, and publishes news about searching. The search engine links are in categories such as major search engines and directories and specialty search engines.
Infopeople Search Tools Chart, www.infopeople.org/search/chart.html	Good starting point for finding the appropriate search engine for your needs.
Best Search Engines Quick Guide, www.infopeople.org/search/guide.html	Another good starting point for finding the appropriate search engine for your needs.
Best Subject Directories to Use, www.lib.berkeley.edu/TeachingLib/Guides/Internet/SubjDirectories.html	Describes several general subject directories and gives tips on finding more specialized ones. This guide is part of the UC Berkeley Teaching Library Internet Workshops series.
Types of Search Tools, www.lib.berkeley.edu/TeachingLib/Guides/Internet/ToolsTables.html	Discusses search engines, directories, searchable database contents, metasearch engines, and gateway pages, with suggestions on how to decide which to use for your particular needs.
Other Internet Search Tools, notess.com/search/others/	Features specialized search tools such as email list directories, tools for searching the "invisible Web" and blogs, free online reference tools, and more.

If the URL for any of these resources has changed, look up "unified search engines" in books on the Web.

Preparing the Presentation

- **Analyze** your audience.
- **Decide** on your primary purpose.
- **Determine** your time frame and your key points.
- **Choose** an organizational plan.
- **Prepare** an outline and notes.
- **Create** supporting graphics.
- **Be careful** with presentational software (Powerpoint).
- **Make** your information accessible.
- **Prepare** handouts and outline.
- **Prepare** your conclusion and for questions.

Preparing the Presentation

- As an engineer, you may be called anytime to give a short presentation, whether you give:
  - An unplanned five minute brief presentation or
  - A formal one hour presentation at a technical seminar (or something in between)
- You should see your talk as a great opportunity to
  - share information and to
  - show that you know how to communicate
- Few of us are naturally gifted with such capabilities, and some of us are almost petrified at the thought of talking before a talk, but the skills possessed by good speakers can be learned

Preparing the Presentation

ANALYZE YOUR AUDIENCE

by focusing on your reader and purpose before writing can be applied to preparing for oral presentation

- **Ask yourself few questions about the listeners before you talk:**
  1. **Who will be the key individuals in my audience?**
  2. **What needs or concerns do they have regarding my topic?**
  3. **What are my objectives for this talk? How knowledgeable are my listeners about my subject?**
  4. **How can I get their attention and interest right away-and keep it?**

Preparing the Presentation

5. What are their attitudes likely to be regarding what I have to say?
6. Do I need to work on changing their attitudes, and if so what is the best way to go about it?
7. What benefits are they going to get from listening to me?
8. What kind of question are they likely to ask?
9. what kind of feedback do I want?
10. Why are the listeners sitting on front of you?
11. Is it for instruction, information ….etc?
12. What action(s) or change(s) do you feel they need to undertake

Preparing the Presentation

Figure 9-1 Just a few of the many kinds of presentations engineers find themselves giving.

Preparing the Presentation

DETERMINE YOUR TIME FRAME

and Never speak longer than you are supposed to

- **To avoid annoying people or speakers coming after you, check how much time you have been allotted (chosen)**
- **This tells you:**

- How much detail you need to go into

- How much time you must allow for discussion or questions

- How much time you should spend on an introduction

Preparing the Presentation

IDENTIFY YOUR KEY POINTS

- Don't expect to say every thing about your subject
- Decide what the most important points are that you want to get across to your audience and how you want to develop those points in the time you have (mathematical, introduction, conclusions….etc)
- You may allocate equal time for each topic or give different times according to length or importance
- Choose an organizational plan
- Subject, purpose and the time will help you to organize your material (introduction, main points, conclusion, question and answer period)

Preparing the Presentation

PREPARE AN OUTLINE AND NOTES

- **Writing an outline and notes** helps you clarify in your own mind how best to present your material
- **An outline of the complete talk**, with key ideas highlighted or in large print to be quickly glanced at if necessary as the presentation goes along
- **Note Cards:** Numbered in the order they will be used, with key ideas and facts clearly written on them.
- **Visual Aids:** Such as transparencies or slides. If you are really on top of your topic, your visuals themselves are all you need.

Preparing the Presentation

CREATE SUPPORTING GRAPHICS
such as animation.

- **Because we live in an increasingly visual age and people tend to remember better what they see and hear, most effective engineering speakers support their talks with illustrations of some kind**
- **Do not let your visuals suffer from information overload. Each should be as simple as possible.**
- **If your visuals consists of lists or other written information, make the words easy to read**
- **Prepare a handouts. It is a Good Idea but in a small size**

Preparing the Presentation

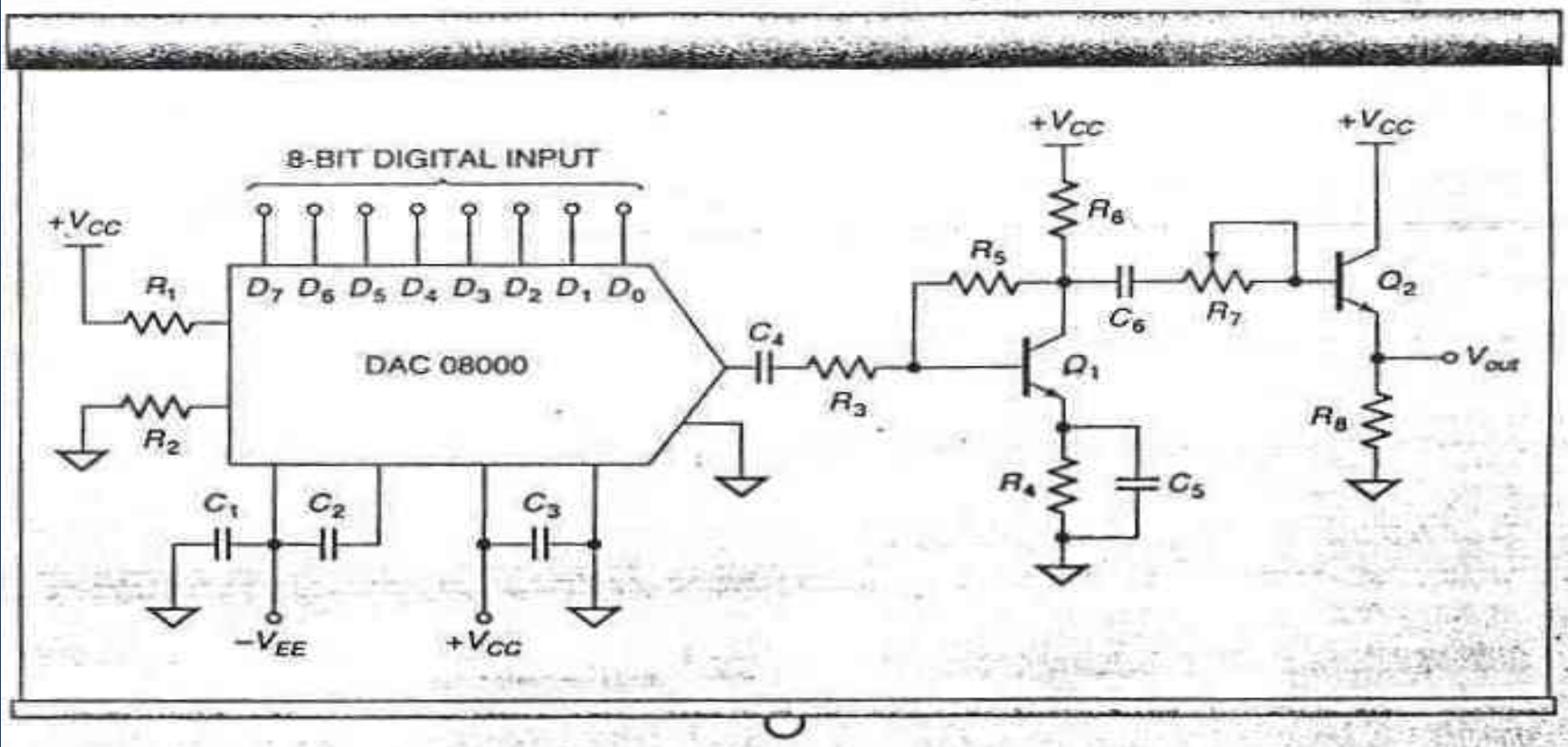


Figure 9-4 An example of an overcrowded transparency. Far too much information is thrust upon the audience here. One way to make this material more accessible would be to reduce the circuit first to a block diagram, as shown in Figure 9-5, and then, if more detail is needed, to expand the drawing one block at a time on separate visuals, as in Figure 9-6.

Preparing the Presentation

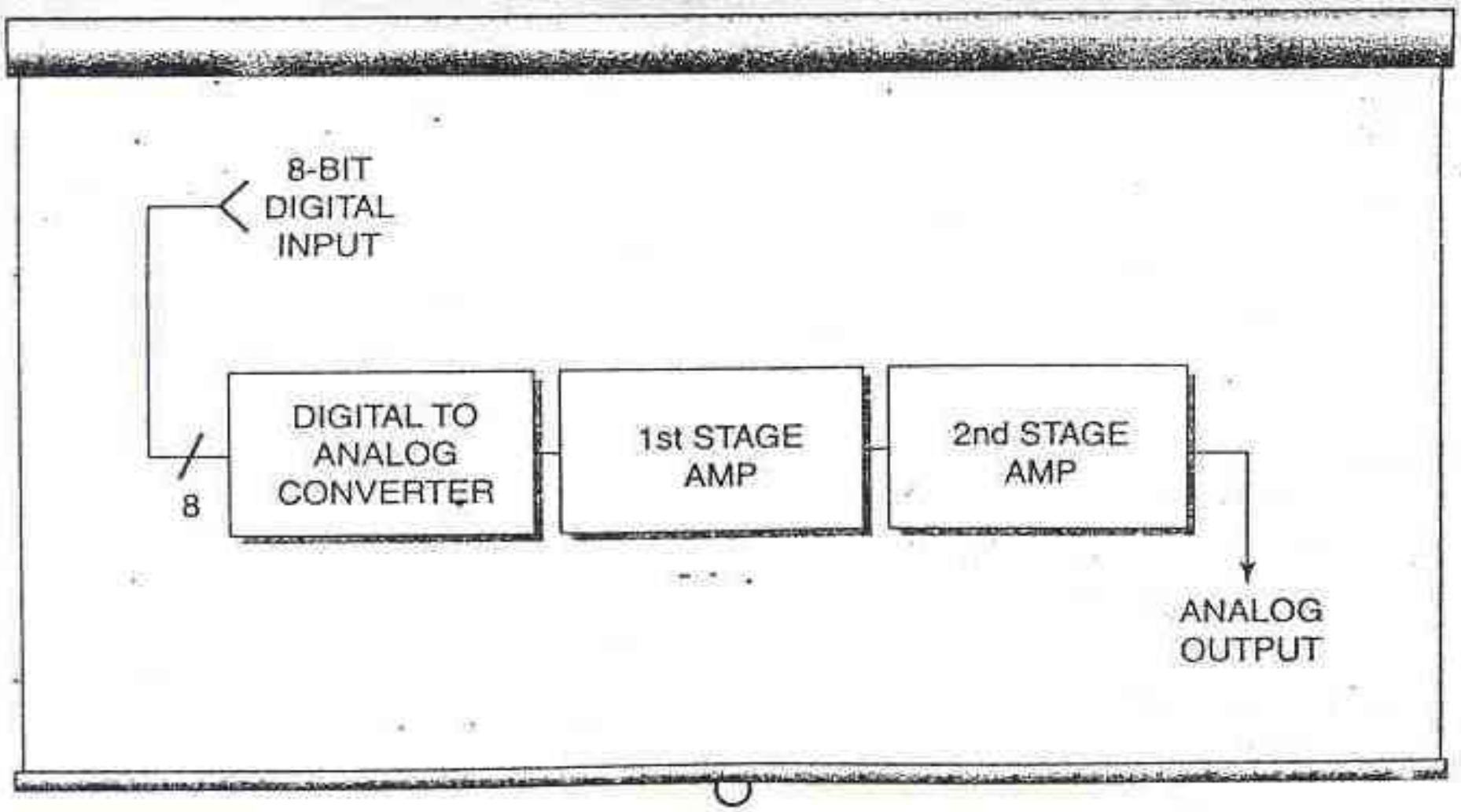


Figure 9-5 Simplified block diagram of the circuit in Figure 9-4.

Preparing the Presentation

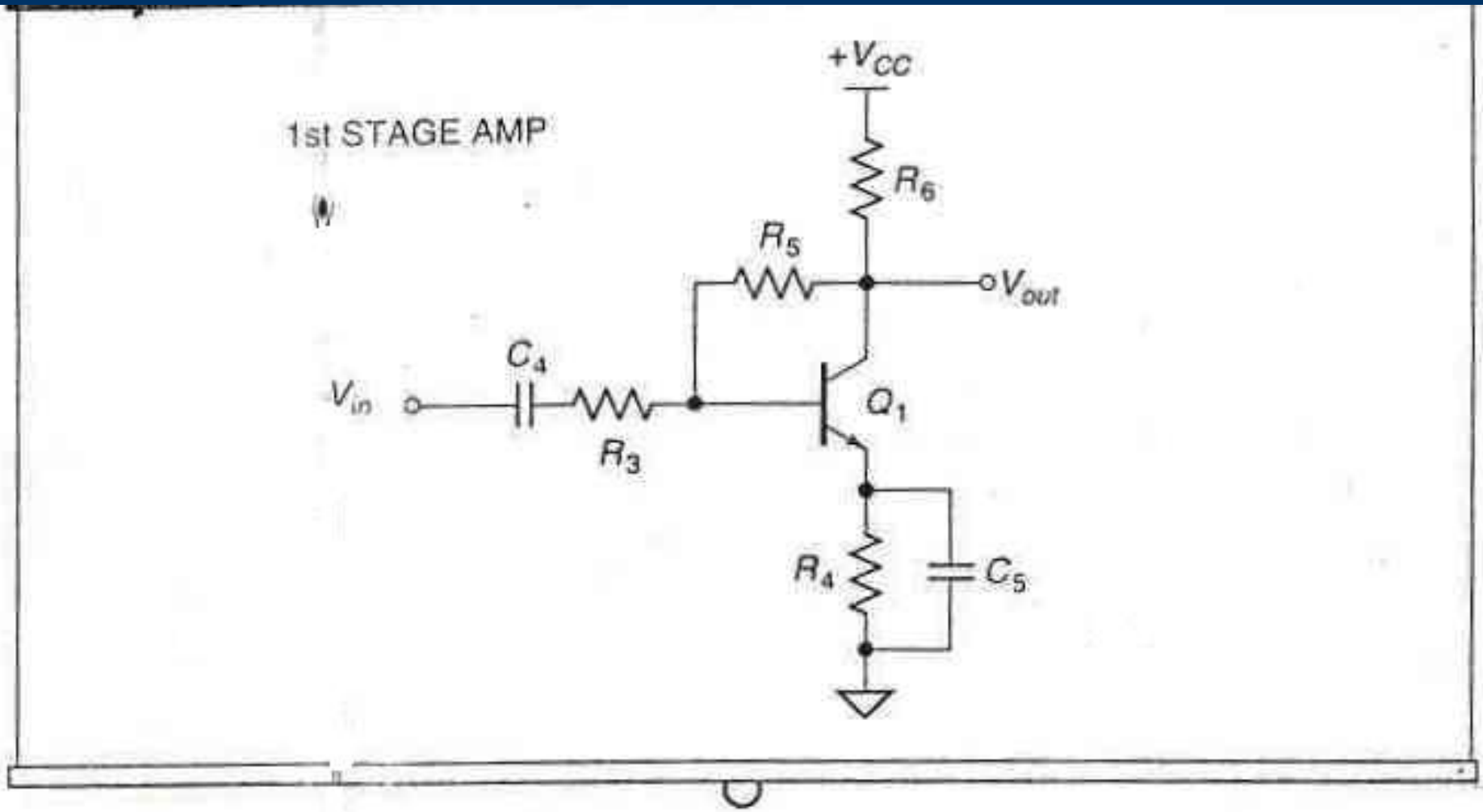


Figure 9-6 The center block from the diagram expanded to part of the original circuit.

Preparing the Presentation

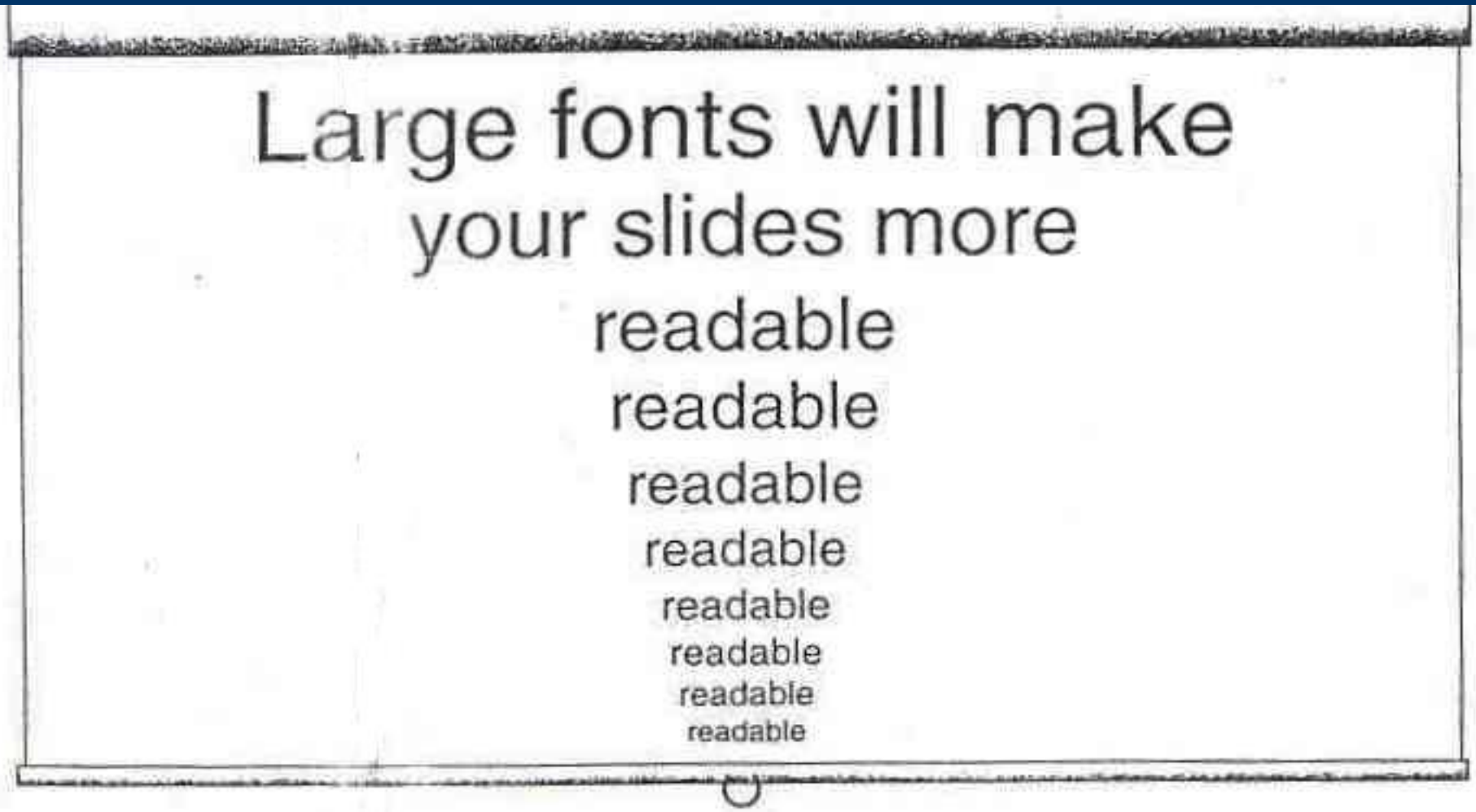


Figure 9-7 Use at least 24-point print on your overheads if you want your audience to read them.

Preparing the Presentation

PREPARE YOUR INTRODUCTION

- **Your audience may be asking themselves, why do I need to hear this or why should I be hear right now?**
- **Your audience has a limited attention span so what your topic is? And what benefit it is to them?**
- **Prepare your Conclusion:**

- Summarize what you have discussed
- Stress your central ideas once more
- Review your key points
- Restate your recommendations or decisions

Preparing the Presentation

GET READY FOR QUESTIONS and put yourself in the place of your listener:

- **Are they holding any opposing viewpoints?**
- **Are there areas you may not be able to go into as thoroughly as you would like, due to time restraints?**
- **What would be the worst question you may be asked?**
- **Think of diplomatic ways to encourage questions (Friendly smile or some comment like I love to hear your feedback and questions?)**
- **Remind yourself at this point, when questions come, it is often a good idea to repeat them aloud**

Preparing the Presentation

Delivering the Presentation

Avoiding Noise

1. **Speaking too softly:** You do not want to blast your audience out but you must be clearly heard
2. **Speak too slowly or rapidly:** Too slow causes boredom and decrease your credibility
3. **Speaking too fast** may show that you are nervous and the audience may miss important points
4. **Speaking monotonously:** vary your pace and tone
5. **using verbal filers:** uh, umm, basically, you know…etc **may distract your audience and show you are not certain of your topic**

Preparing the Presentation

Delivering the Presentation

Avoiding Noise

5. **Your movements during presentation:** Do not become a statue, pendulum or traveler
6. **Blocking the screen:** Very important for everyone to see the screen
7. **Reading From the screen:** Avoid reading from the screen. Screen is an Aid. Straight reading stops you from explaining your topic
8. **Make clear transitions:** show the connections between ideas when you are moving to another aspect of your presentation. Make it friendly dialog with simple words like; first, on the other hand, next, as you can see, furthermore, finally…etc

Preparing the Presentation

Delivering the Presentation

Avoiding Noise

9. **Use a pointer:** A pointer is the best way to focus your audience's attention on your key points while you explain what they are looking at
10. **Maintain eye contact:** You increase your credibility by looking at your audience as you talk. Whereas avoiding eye contact could give the impression that you are shifty or unprepared
11. **Be ready for unexpected questions:** Try not to appear surprised or defensive. Simply say you do not know
12. **Accept your Nervousness**

Preparing the Presentation

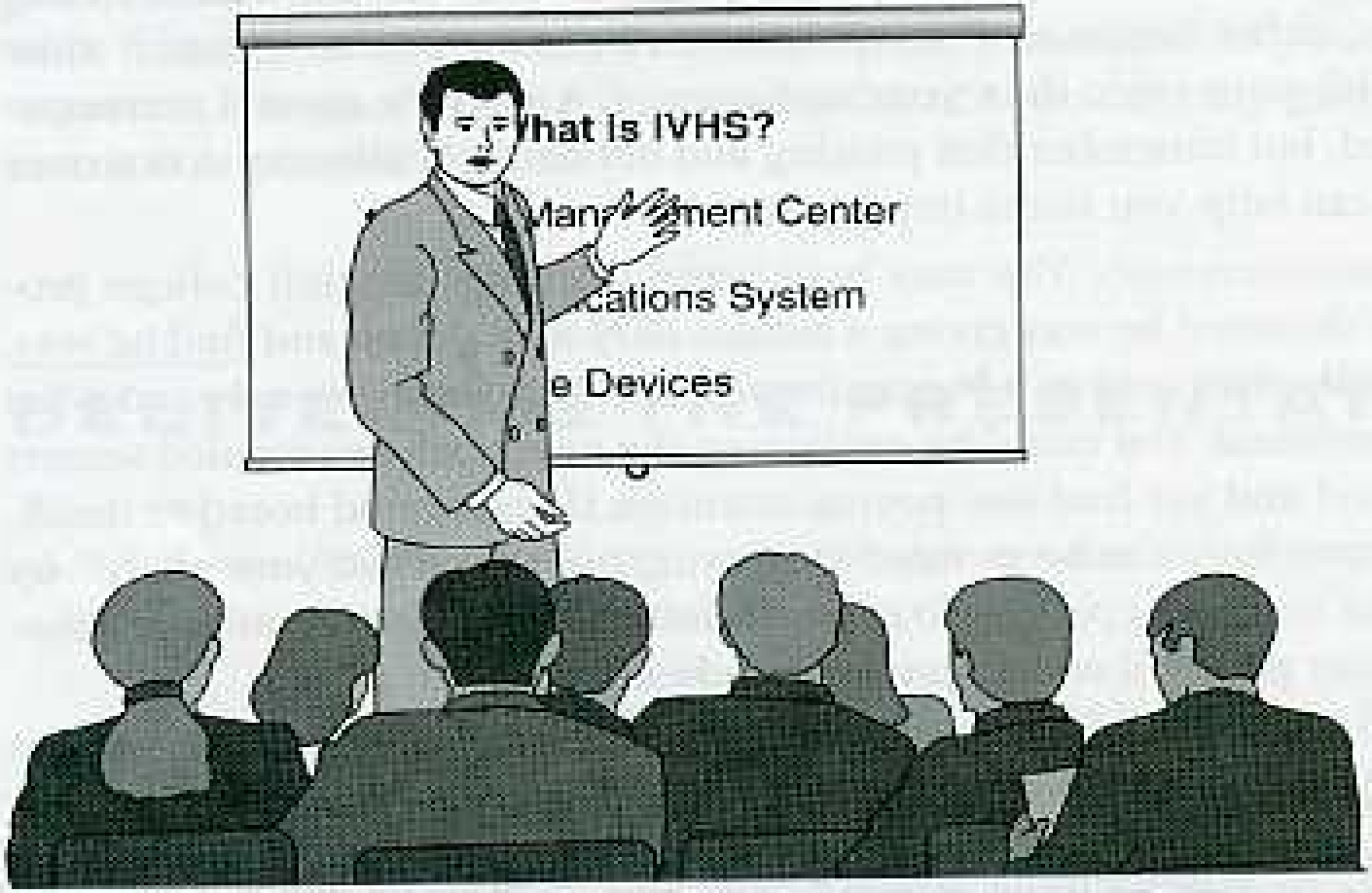


Figure 9-8 You invest a lot of planning and work into your visuals, so don't create noise by standing between them and your audience.

Preparing the Presentation

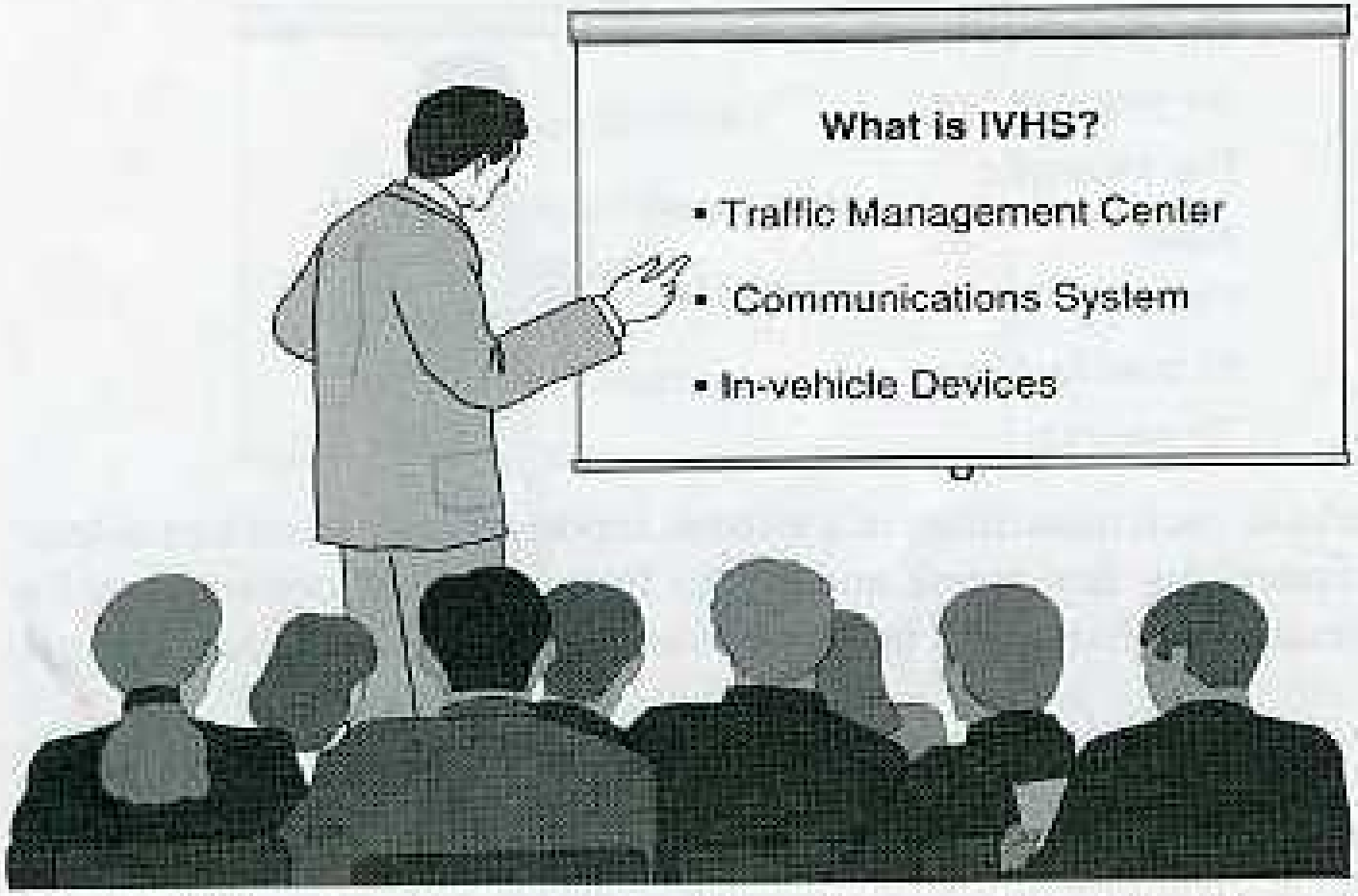


Figure 9-9 Using the arm farthest from the screen to point pulls you from eye contact with your audience.

Preparing the Presentation

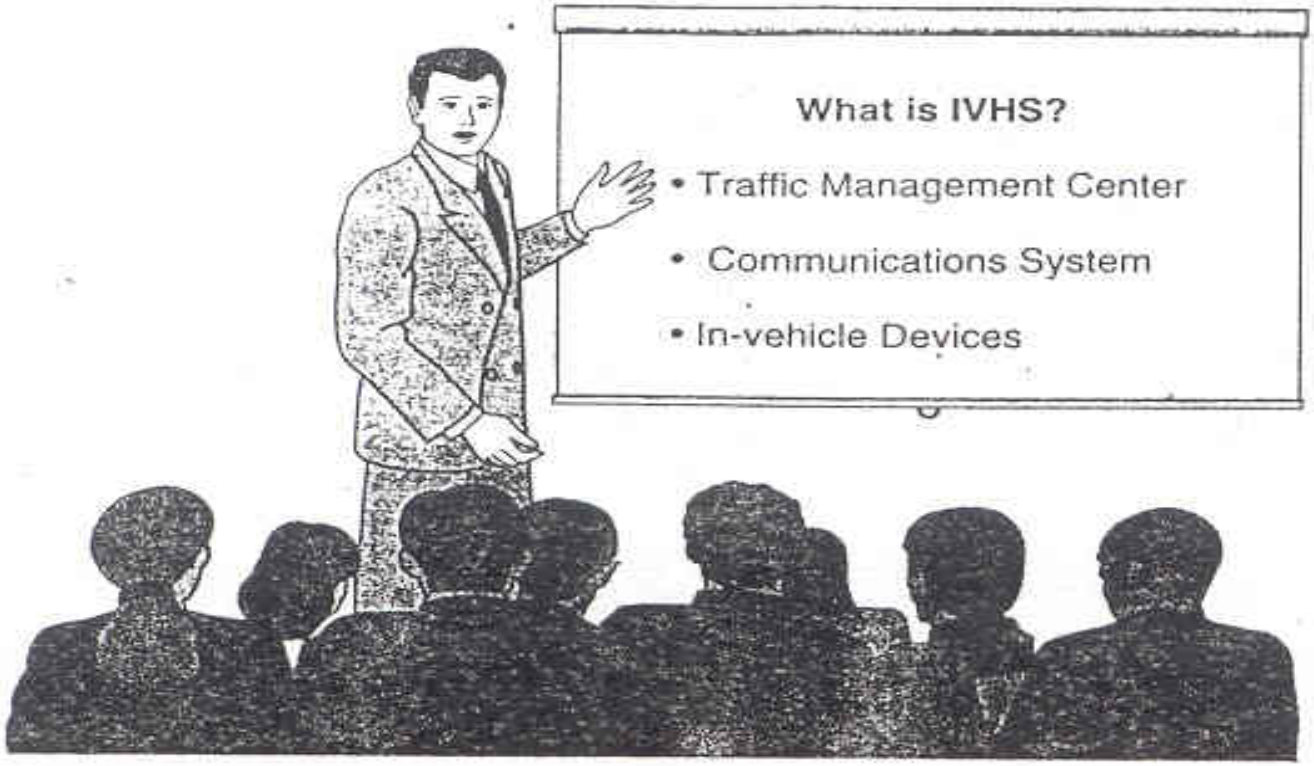


Figure 9-10 Using the arm closest to the screen allows you to talk while facing your listeners.

Preparing the Presentation

Team Presentation

Because teams of engineers frequently collaborate on a project, compile a proposal, or report on a new product, you are likely to be involved in team presentations. This type of presentation is effective because

1. Team work reduces everyone's preparation workload
2. Longer presentations are possible without exhausting one person
3. Speakers can enjoy team support during the presentation
4. Variety of speakers helps hold the audience's attention
5. Each topic can be explained (and questions answered) expertly

Preparing the Presentation

Preparing for a Team Presentation

Get together and decide

1. **Analyze** Audience and purpose
2. **Decide** on the main points to be stressed
3. **Decide** which order the material will be covered and who will cover what
4. **Stick** to the topic you are supposed to cover
5. **Stick** to the time allocated to each speaker. This is extremely important
6. **Decide** before if the questions are going to be taken after the entire presentation or after each person speaks
7. If the presentation is going to be conducted by individuals that do not know each other, they must **meet first** and get to know each other if possible

Preparing the Presentation

Check List for an Oral Presentation

You may use the following check List to evaluate your presentation

INTRODUCTION

- ☐ Creates favorable atmosphere
- ☐ Creates appropriate pace
- ☐ Hooks listener's attention
- ☐ Relates subject to listeners
- ☐ Presents clear central idea

BODY

- ☐ Reveals careful audience analysis
- ☐ Supports central idea
- ☐ Maintains audience interest
- ☐ Provides technical accuracy
- ☐ Organizes details effectively
- ☐ Allocates time carefully
- ☐ Provides clear transitions

CONCLUSION

- ☐ Ties presentation together
- ☐ Restates central idea
- ☐ Proposes action or response
- ☐ Invites discussion or questions

ATTENTION TO TIME LIMITS

- ☐ Too short
- ☐ Just right
- ☐ Too long

VISUAL AIDS

- ☐ Are clear and easy to read
- ☐ Look professional
- ☐ Avoid information overload
- ☐ Clearly support related ideas
- ☐ Are enough

DELIVERY

Sound

- ☐ Clear volume and pronunciation
- ☐ Effective diction
- ☐ Varied speech patterns
- ☐ Absence of *uh-huh, y'know, basically . . .*
- ☐ Adequate enthusiasm
- ☐ Standard grammar and usage
- ☐ Good question response

Appearance

- ☐ Professional posture and appearance
- ☐ Appropriate gestures and mannerisms
- ☐ Effective use of pointer
- ☐ Consistent eye contact with audience
- ☐ Competent handling of notes and visuals

Figure 9-11 The aspects of an effective oral presentation. Even if they don't seem important to you, they will to your audience.

Engineering Your Speaking

- Analyze your audience.
- Decide on your primary purpose.
- Determine your time frame and your key points.
- Choose an organizational plan.
- Prepare an outline and notes.
- Create supporting graphics.
- Be careful with presentational software (Powerpoint).
- Make your information accessible.
- Prepare handouts and outline.
- Prepare your conclusion and for questions.

Questions to Ask About Your Listeners

- Who will the key individuals in my audience be?
- What needs or concerns do they have regarding my topic?
- What are *my objectives for this talk?*
- How knowledgeable are my listeners about my subject?
- How can I get their attention and interest right away?
- What are their attitudes likely to be?
- Do I need to work on changing their attitudes, and if so, what is the best way to go about it?
- What benefits are they going to get from listening to me?
- What kinds of questions are they likely to ask?
- What kind of feedback do I want?

Prepare an Outline and Notes

- Outline
- Note cards
- Script
- Visual aids
- Backup plan

Prepare Your Introduction

- *Not necessarily in this order:*
- Introduce yourself.
- Explain the context.
- State your purpose.
- Provide an overview of what you'll cover.
- Generate some interest and/or motivation.

Prepare Your Conclusion

- Summarize what you have discussed.
- Stress your central idea once more.
- Review your key points.
- Restate your recommendations or decisions

Noise in Engineering Presentations

- Speaking too softly
- Speaking too slowly or rapidly
- Speaking monotonously
- Using distracting verbal fillers
- Becoming a statue, pendulum, or traveler
- Blocking the screen
- Reading from the screen or from notes

Strengthening Your Presentations

- Start with a good, well-planned introduction.
- Use an informal style.
- Make clear transitions.
- Repeat key points.
- Use a pointer.
- Maintain eye contact.
- Be Ready for unexpected questions.
- Accept Your nervousness.
- End with good, well-planned conclusion.

Detailed Guidelines

Prepare Your Presentation

- Take enough time to prepare your presentation. Ask yourself the basic questions:
  - Why?
  - What?
  - Who?
  - How?
  - Where & When?

Why & What?

- What is my reason for presenting this?
- What am I hoping to achieve?
- What is my purpose? to inform? to persuade? to educate?
- What are the points that I need to deliver to my audience?
- What information can I leave out?
- What information must I keep in?
  - Essential points
  - Important points
  - Points to include if time allows

Who?

- Who exactly will my audience be?
- What is the size of the audience?
- Why should the audience want to listen to what I have to say?
- Do they have the essential background to enable them to understand?
- How will they react?
- Will they accept my message or will they need to be persuaded?

How?

- How am I going to communicate most effectively?
- Choose the appropriate media to effectively express your message.
- These include:
  - PowerPoint presentation
  - Overhead projector
  - Flipcharts
  - Handouts
  - Video/Audio clips

How?

- How will I arrange my ideas?
  - Deductive sequence: start with the main point and go on to the explanation.
  - Inductive sequence: start with the question and build up to the answer through explanation.
- What style shall I use?
  - Formal or lecturing style.
  - Informal style utilising audience participation.

When & Where?

- What is the exact time of the presentation?
- How much time do I have?
- Where will I be delivering the presentation?
- What sort of facilities are available?
- Will I be able to use visual aids?

Design Your Presentation

- Evaluate and organise your information.
- Look at all your material, notes and results. Select only the essential and relevant information.
- Ask yourself:
  - Is this really relevant to my audience and objective?
  - Does this help me to make my point?

Design Your Presentation

- Write down all the points you want to make using notes on paper or index cards:
  - The theme
  - Section headings and subheadings.
  - The main points.
  - Approximate time for each section.
- The purpose of your notes is to:
  - Prompt your memory
  - Ensure you follow your sequence

Structure Your Presentation

- Start by introducing yourself, your presentation topic and title.
- Provide an overview of your presentation.
- Divide your presentation into sections.
- Use natural breaks in your material.
- End by summarising the main points.
- Invite questions and allow enough time for questions.

Delivery

- ***Sincerity and convection*:**
  - The audience need to feel that you believe what you are saying ***and*** that you have an interest in their opinion.
- ***Enthusiasm*:**
  - Be enthusiastic and your audience will be too.
- ***Positive attitude*:**
  - Never start by apologising or saying you're not an expert.
  - Present your ideas, information and opinions without weakening them.
  - Don't be intimidated by your audience.

Delivery

- ***Clarity*:**
  - Use simple language and familiar ideas to explain your points.
  - Avoid too much detail or complex technical information.
- ***Practice, Practice, Practice*:**
  - You must rehearse your actual presentation.
  - This will help you to feel less nervous and to check your time.
  - Ask someone to rate you and give you feedback.
  - Keep in mind that rehearsals are often more difficult than the actual presentation.

Delivery

- ***Voice:***
  - Voice control is essential to the success of your presentation. It is the vehicle that conveys your presentation.
  - You have to speak clearly and louder than usual.
  - Try to keep appropriate pace and tempo and don’t race through your presentation.

Delivery

- ***Body Language:***
  - Keep in mind that people are not only listening to you, they are also watching you. Always dress well and look smart.
  - Stand tall with your head up.
  - Look at your audience and maintain eye contact with all of them.
  - Watch for signs of boredom in the audience and use your voice, body language or even a question to grab their attention.

Delivery

- ***Notes:***
  - Avoid reading out your whole presentation. You will be boring and you will definitely loose your audience.
  - Avoid memorising a whole carefully-worded “speech”.
- ***Visual Aids:***
  - Visual aids are very useful in illustrating and complementing what you are saying.
  - Avoid using a visual aid before you really need it.

Delivery

- Here are some guidelines for acetates or PowerPoint slides:
  - Print size (24 pt at least)
  - Maximum of 7-8 points/slide
  - Use your slides as your guiding notes
  - Keep diagrams or charts simple
  - If you do a PowerPoint presentation, keep a set of acetates as a plan B

Writing to Get an Engineering Job

To look for a job you need to know how to write your resume or CV (Curriculum Vita) and an application letter

The resume is your main vehicle for presenting yourself to any potential employer. The central question to ask in preparing your resume is, "If you were an employer, would you want to read this resume?" Visual impact and appearances are extremely important.

Writing to Get an Engineering Job

Two tools commonly used to seek employment: resume + application letter. You send one or both of these to prospective employers

- **The key to an excellent resume writing is in presenting it in the right way. Most people make the error of just listing their experience and qualifications; this ends up being a rather boring document**
- **A good resume should not only demonstrate your skills and experience, but also give the reader a good indication of the type of person you are. It needs to have personality**

Writing to Get an Engineering Job

How to write an engineering resume?

- A resume is a summary of your professional experience, education, and other background relevant to the employment opportunity you are seeking. Think of it as the highlights of who you are professionally (summary of your career to date)
- An effective resume is one that highlights your best qualifications with a design that can be scanned in about 20-30 seconds. The prospective employer should be able to glance through your resume and still have a decent understanding of your background and qualification

Writing to Get an Engineering Job
Continuous Re-design and Update

- Developing a resume is not a one-time effort
- Consider it a work in progress. You may have to revise it and redesign it for every new job opportunity
- Even if you stay a long time in one place, you have to still revise it often to include all the new experiences that you have gained
- It is easy to forget small details which may prove to be important if you do not constantly update.

Writing to Get an Engineering Job

Engineering Resume – Design Components

Organize your background chronologically or functionally

- **Chronological Approach:** Divide your background into education, experience, skills, and so It is good because it shows your work history
- **Functional Approach:** Divide your background into Interrelated groups of education and experience

Writing to Get an Engineering Job

Engineering Resume – Design Components

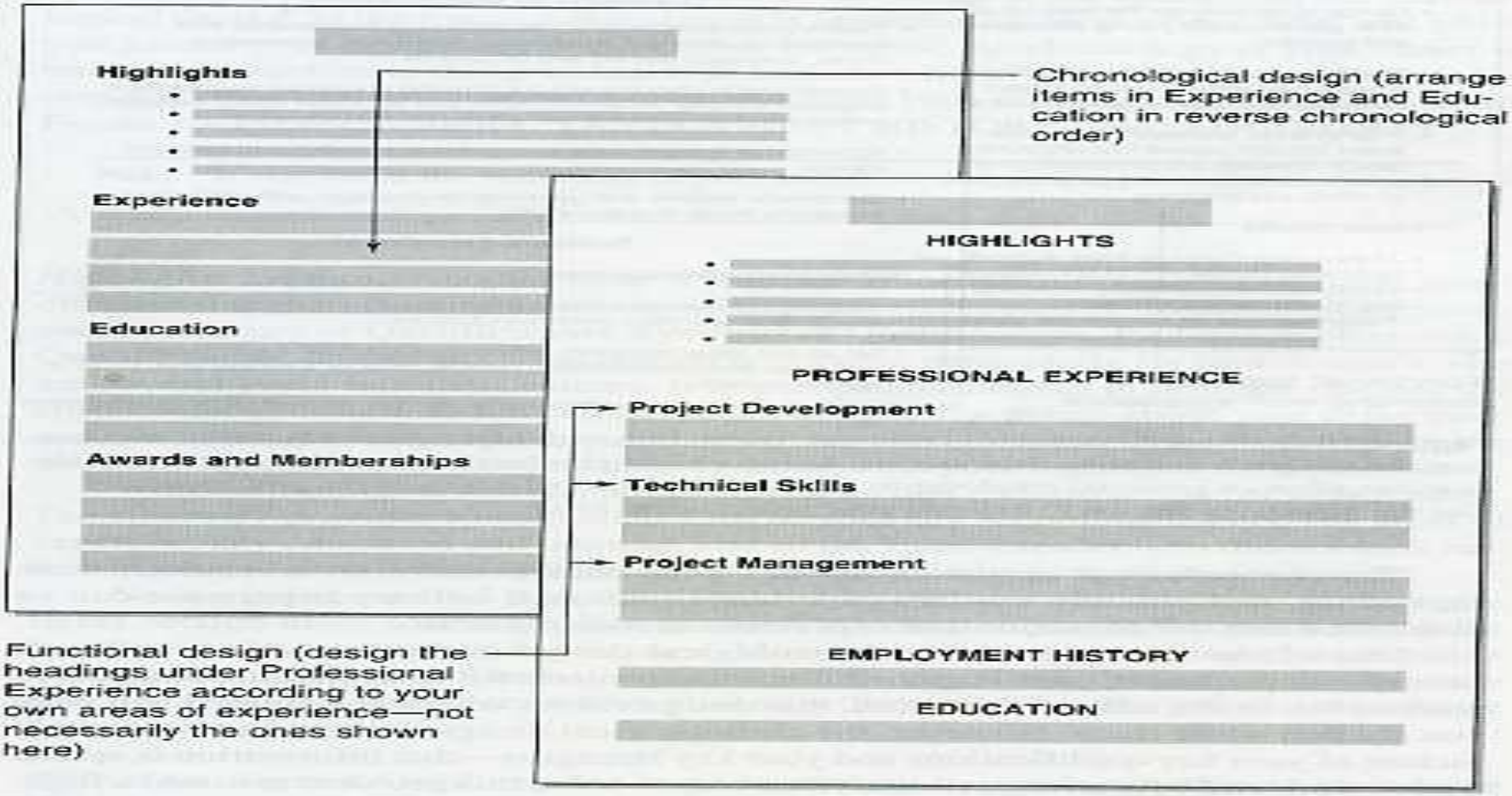


Figure 10-1 Schematic view of resume designs. Decide whether the chronological or the functional design works best for you. Visualize the headings you'll use and their relation to each other and to the body text.

Writing to Get an Engineering Job
Eng. Resume – Chronological Approach

- One of the strengths of the chronological design is that it shows your work history - in particular, your responsibilities and projects for each organization you've worked for. In the education section, this design shows where you studied and what you studied while you were there
- However, the chronological design does not give a capsule picture of your key qualifications and your key strengths - that information is spread across work and education section. One way to solve this is to add a highlight section

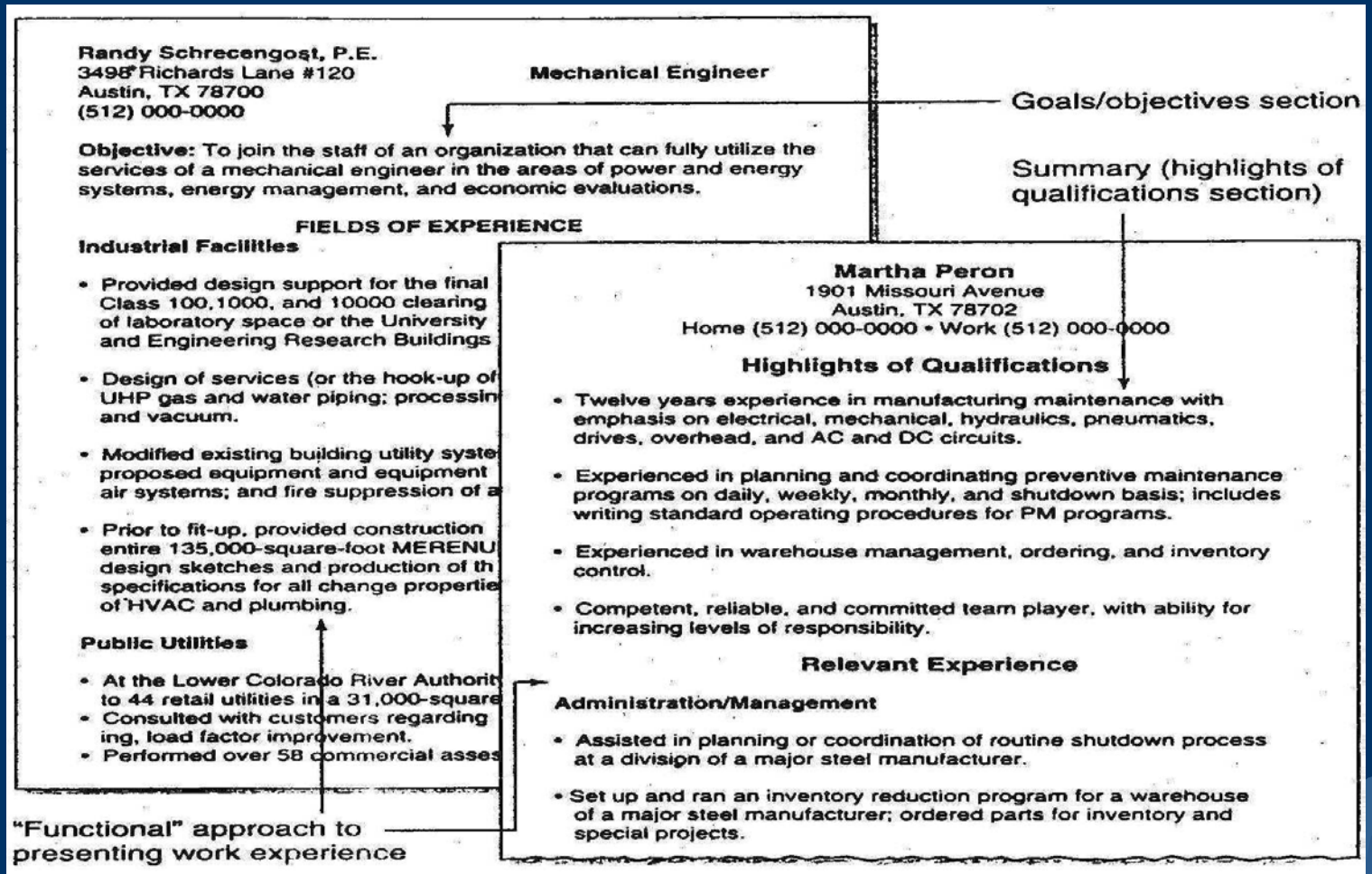
Writing to Get an Engineering Job
Eng. Resume – Functional Approach

- The great strength of the functional approach is that it consolidates information about your key qualifications, summarizing all relevant work experience and education
- Prospective employers looking for someone with project planning and management experience can quickly determine whether you have what they are looking for or not
- In this design it is not immediately clear where, how and when you gained your experience or education (Weakness) – Fig 10.1

Writing to Get an Engineering Job
Eng. Resume – Highlight Section

- **Summary, Summary of Experience, Highlights of Experience, Qualifications, and Profile (NAMES)**
- **This section is very popular, particularly for professionals who are several years into their careers. It is particularly helpful in resumes that use the chronological design**
- **The highlighted section provides a neat bulleted list of your key accomplishments, key areas of expertise, key education and training and so on. Even a reader who did not look further in your resume would still get a good picture of who you are professionally**

Writing to Get an Engineering Job
Eng. Resume – Highlight Section



Randy Schrecengost, P.E.
3498 Richards Lane #120
Austin, TX 78700
(512) 000-0000

Mechanical Engineer

Objective: To join the staff of an organization that can fully utilize the services of a mechanical engineer in the areas of power and energy systems, energy management, and economic evaluations.

FIELDS OF EXPERIENCE

Industrial Facilities

- Provided design support for the final Class 100,1000, and 10000 clearing of laboratory space or the University and Engineering Research Buildings
- Design of services (or the hook-up of UHP gas and water piping; processin and vacuum.
- Modified existing building utility syste proposed equipment and equipment air systems; and fire suppression of a
- Prior to fit-up, provided construction entire 135,000-square-foot MERENU design sketches and production of th specifications for all change properties of HVAC and plumbing.

Public Utilities

- At the Lower Colorado River Authorit to 44 retail utilities in a 31,000-square
- Consulted with customers regarding ing, load factor improvement.
- Performed over 58 commercial asses

"Functional" approach to presenting work experience

Goals/objectives section

Summary (highlights of qualifications section)

Martha Peron
1901 Missouri Avenue
Austin, TX 78702
Home (512) 000-0000 • Work (512) 000-0000

Highlights of Qualifications

- Twelve years experience in manufacturing maintenance with emphasis on electrical, mechanical, hydraulics, pneumatics, drives, overhead, and AC and DC circuits.
- Experienced in planning and coordinating preventive maintenance programs on daily, weekly, monthly, and shutdown basis; includes writing standard operating procedures for PM programs.
- Experienced in warehouse management, ordering, and inventory control.
- Competent, reliable, and committed team player, with ability for increasing levels of responsibility.

Relevant Experience

Administration/Management

- Assisted in planning or coordination of routine shutdown process at a division of a major steel manufacturer.
- Set up and ran an inventory reduction program for a warehouse of a major steel manufacturer; ordered parts for inventory and special projects.

Figure 10-2 Special sections in resumes: the summary or highlights of qualifications section and the goals and objectives section. Using a highlights section that lists your key qualifications allows a potential employer to get a quick picture of who you are professionally. Use the objectives section to indicate your professional focus.

Writing to Get an Engineering Job
Eng. Resume – Objectives Section

- Inclusion of this section is still questionable as it could narrow your opportunity. Therefore you do not have to do it
- This section describes your career and professional focus
- It indicates the type of work you want to do, the type of position you seek, the type of organization you want to work for. This section should be brief (2-3 lines only)

Writing to Get an Engineering Job
Engineering Resume

- **Membership and License Section:** This gives a list of the professional organization and licenses
- **Specialized Equipment and Knowledge Section:** Computer Specialists may list Hardware and Software knowledge, Electrical Engineers may list skills in Analog circuit analysis etc
- **Miscellaneous Sections:** Published Articles, create publication Section, Honors and awards, patents create sections any strong points highlight them
- **Personal Section:** interests, activities, hobbies, languages etc are not always necessary. In most cases you do not need them

Writing to Get an Engineering Job
Eng. Resume – Professional Experience

- Name of the organization where you worked, its address, and phone number
- Your job title and your specific responsibilities
- Brief description of the organization-its products, services, and technical aspects
- Your Major achievements, important projects, promotions, and awards
- Experiences with technologies, equipment and technical processes
- Dates of employment with organization

Writing to Get an Engineering Job
Eng. Resume – Professional Experience

Ways To Show Your Experience

1992–Present ESPEY, HUSTON & ASSOCIATES. Austin, TX
Engineering Associate III

- Provided design
of 23,000 square
Robert Mueller M
included design
- Performed inspe
calculated heatin
system design.
- Provided the det
ductwork, VAC,
the air devices fo

1992–Present Engineering Associate III
Espey, Huston & Associates

- Provided design support for renovation and expansion of 23,000 square feet in an existing terminal facility at Robert Mueller Municipal Airport (RMMA). This project included design of lighting, power, and HVAC.
- Performed an energy analysis of the area, and calculated heating and cooling loads for the HVAC system design.
- Provided the initial layout for the HVAC equipment, ductwork, VAVs, terminal dual heaters, and specified

Espey, Huston & Associates — Engineering Associate III — 12/92 to Present

Provided design support for renovation and expansion of 23,000 square feet in an existing terminal facility at Robert Mueller Municipal Airport (RMMA). This project included design of lighting, power, and HVAC. Performed an energy analysis of the area, and calculated heating and cooling loads for the HVAC system design. Provided the initial layout for the HVAC equipment, ductwork, VAVs, terminal duct heaters, and specified the air devices for the HVAC layout.

Figure 10-3 Examples of detail formats. Use combinations of list or paragraph format and italics, bold, or all caps in the design of the four main elements: date, organization name, job title, and details.

Writing to Get an Engineering Job
Eng. Resume – Educational Section

This may include

- Name and address of educational institute
- Your major and minors and grade points
- The important courses you took and their description
- Experience with equipments, and technology.
- Important projects
- Academic Awards and memberships
- Enrollment and graduation dates

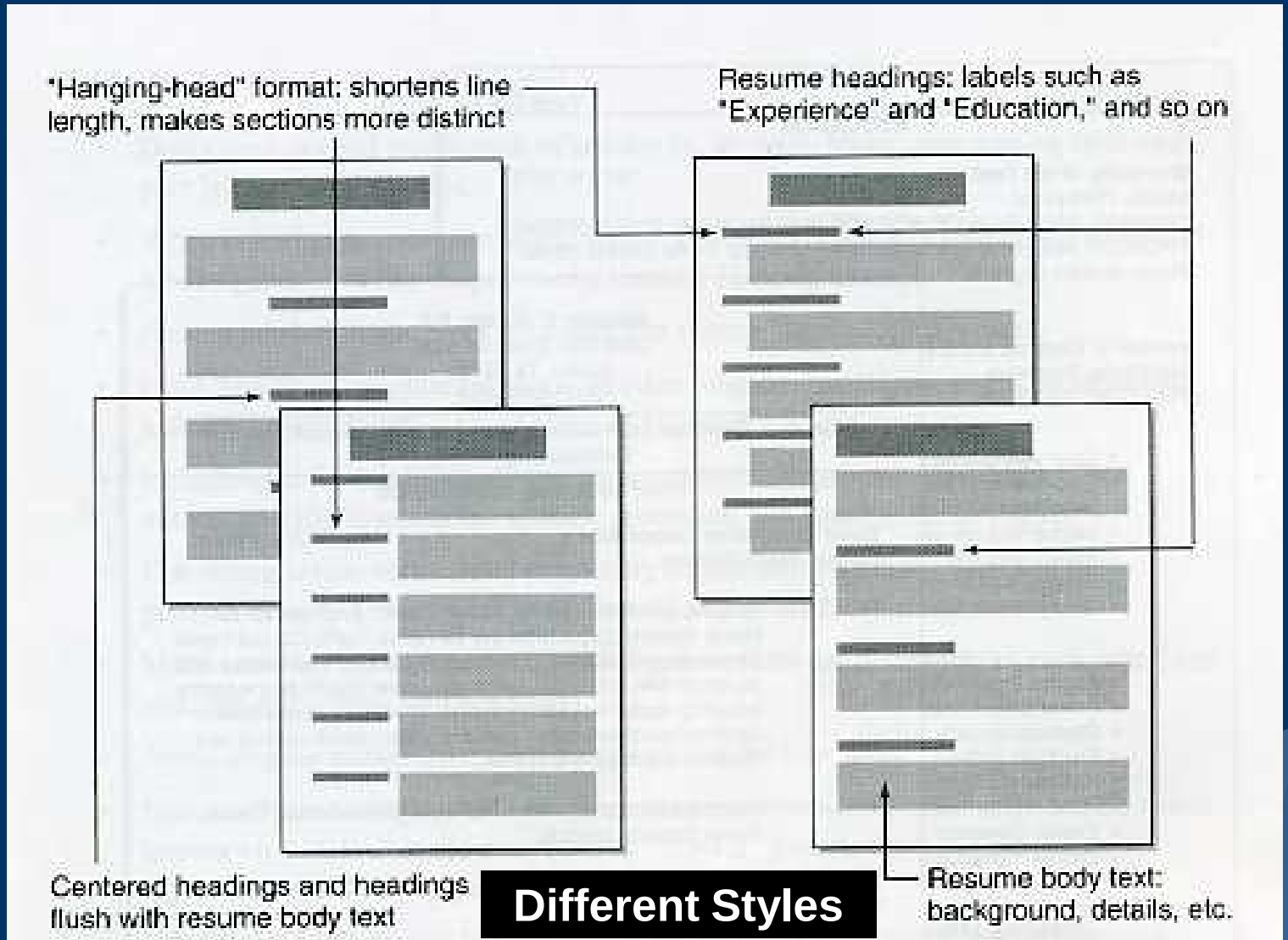
Writing to Get an Engineering Job
Eng. Resume – References Section

Available on request or you may put names and address of people you worked with or they taught you or a combination

Writing to Get an Engineering Job
Engineering Resume – Overall Format

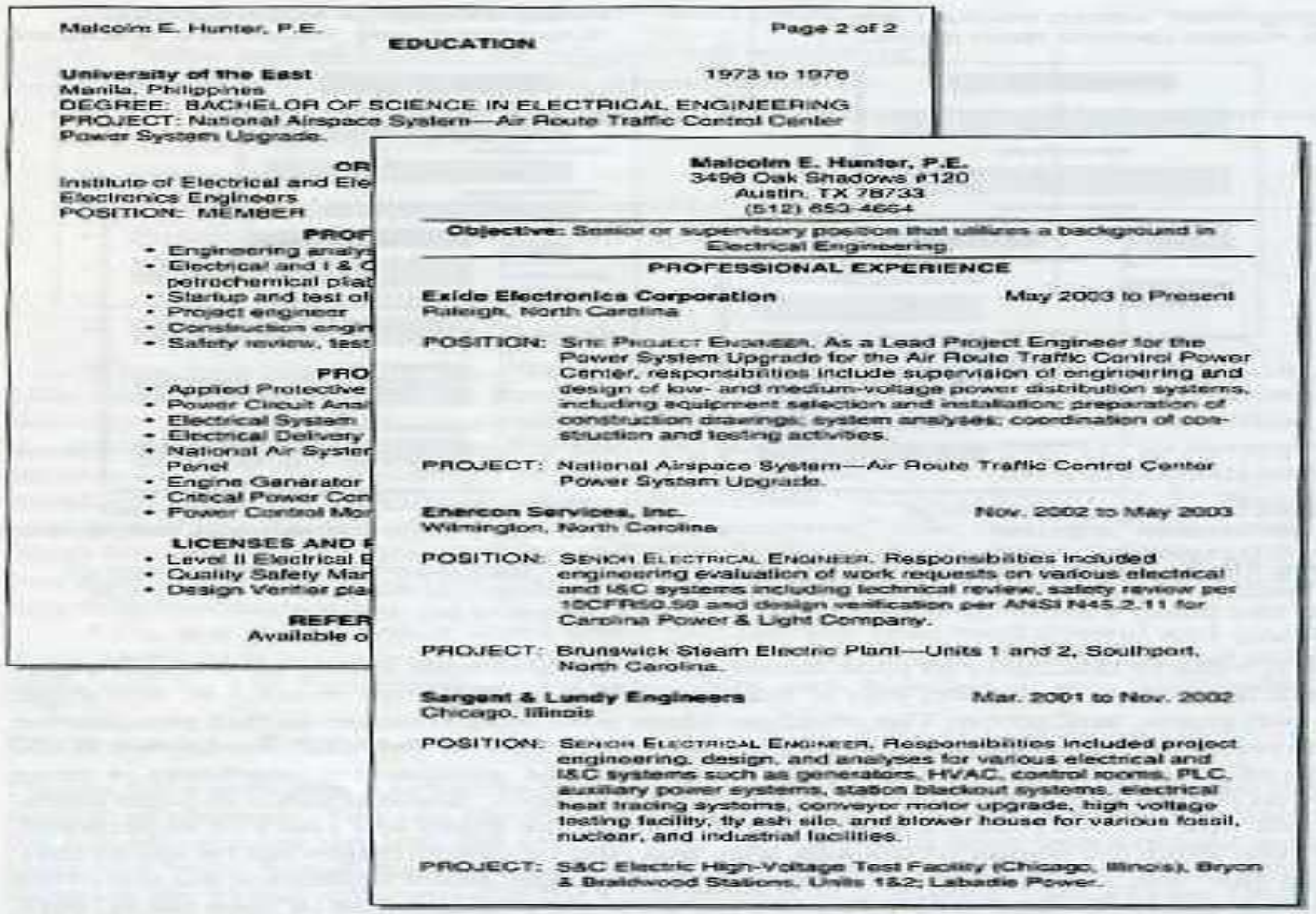
- Figure 10.4 provides some ways to design the overall format of resumes
- **Format of heading and margins:** Many resumes use a "hanging-head' design in which the headings are on the far left margin and the body text of the resume is indented about 1-2 inches. This design makes the line length of the body text shorter and more easily scannable, heading more visible. And the sections of the resume more visually distinct

Writing to Get an Engineering Job
Engineering Resume – Overall Format



Different Styles

Writing to Get an Engineering Job
Engineering Resume – Overall Format



Malcolm E. Hunter, P.E. Page 2 of 2

EDUCATION

University of the East 1973 to 1976
Manila, Philippines
DEGREE: BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING
PROJECT: National Airspace System—Air Route Traffic Control Center Power System Upgrade.

Malcolm E. Hunter, P.E.
3498 Oak Shadows #120
Austin, TX 78733
(512) 653-4654

Objective: Senior or supervisory position that utilizes a background in Electrical Engineering.

PROFESSIONAL EXPERIENCE

Exide Electronics Corporation May 2003 to Present
Raleigh, North Carolina

POSITION: SITE PROJECT ENGINEER. As a Lead Project Engineer for the Power System Upgrade for the Air Route Traffic Control Power Center, responsibilities include supervision of engineering and design of low- and medium-voltage power distribution systems, including equipment selection and installation; preparation of construction drawings; system analyses; coordination of construction and testing activities.

PROJECT: National Airspace System—Air Route Traffic Control Center Power System Upgrade.

Enercon Services, Inc. Nov. 2002 to May 2003
Wilmington, North Carolina

POSITION: SENIOR ELECTRICAL ENGINEER. Responsibilities included engineering evaluation of work requests on various electrical and I&C systems including technical review, safety review per 10CFR50.59 and design verification per ANSI N45.2.11 for Carolina Power & Light Company.

PROJECT: Brunswick Steam Electric Plant—Units 1 and 2, Southport, North Carolina.

Sargent & Lundy Engineers Mar. 2001 to Nov. 2002
Chicago, Illinois

POSITION: SENIOR ELECTRICAL ENGINEER. Responsibilities included project engineering, design, and analyses for various electrical and I&C systems such as generators, HVAC, control rooms, PLC, auxiliary power systems, station blackout systems, electrical heat tracing systems, conveyor motor upgrade, high voltage testing facility, fly ash silo, and blower house for various fossil, nuclear, and industrial facilities.

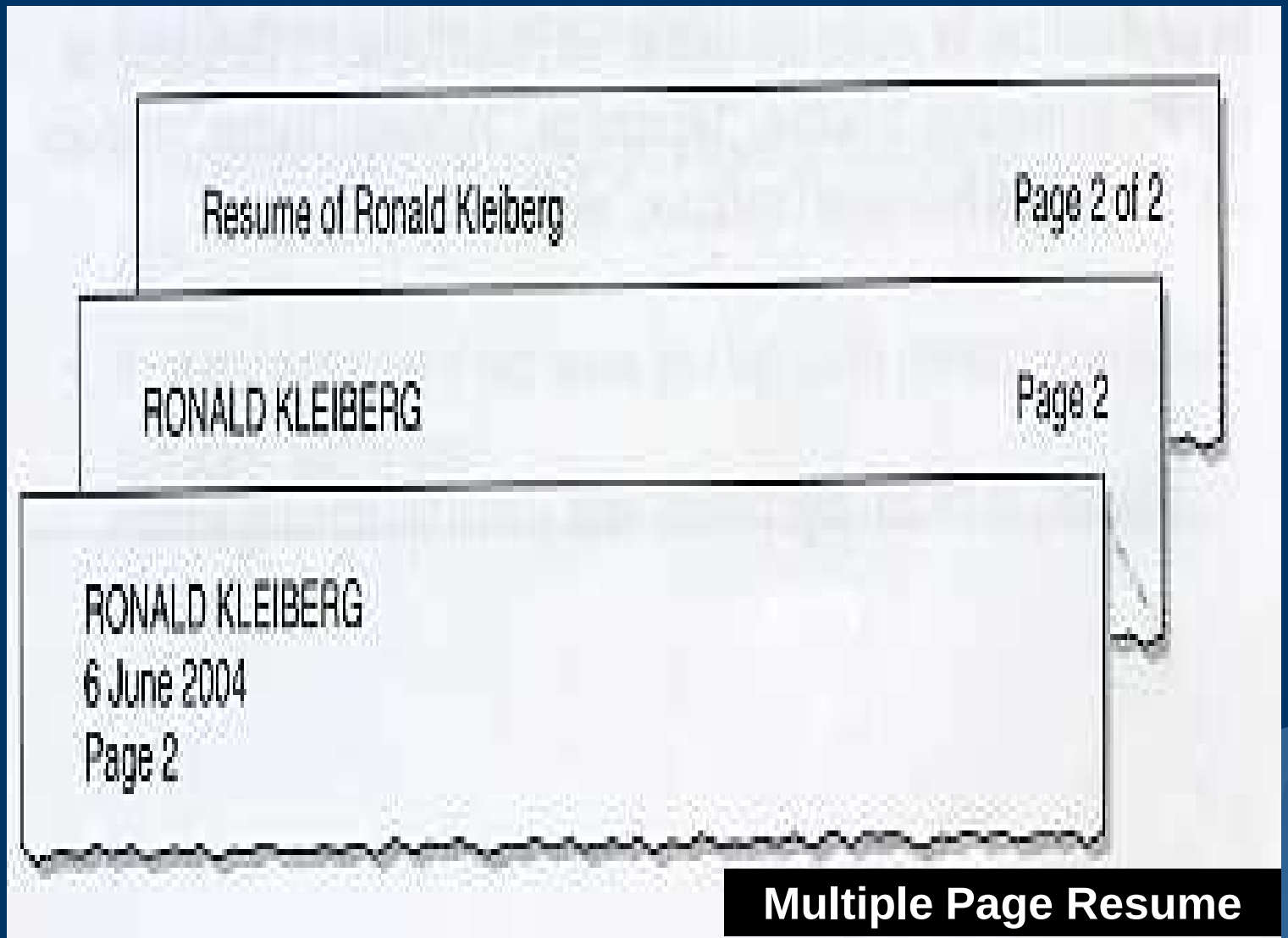
PROJECT: S&C Electric High-Voltage Test Facility (Chicago, Illinois), Bryon & Braidwood Stations, Units 1&2; Labadie Power.

Figure 10-5 Excerpts from the resume of an experienced professional engineer. Notice the use of small caps for position titles (such as "Site Project Engineer"). The headings on page 2 of this resume are "Education," "Organizations," "Professional Training," "Proficiencies," "Licenses and Professional Certification," and "References."

Writing to Get an Engineering Job
Engineering Resume – Length and Headers for Multiple Page Resume

- How long your resume should depend on how much detail there is in your background and qualifications
- It's likely that early in your career you'll have trouble filling up a single page but that is not a problem
- However the general rule is to keep the resume as short as possible, thus ensuring that prospective employers may not read them as closely as you want

Writing to Get an Engineering Job
Engineering Resume – Overall Format



Multiple Page Resume

Writing to Get an Engineering Job
Engineering Resume – Sample

Frank Funk

10 Pine Street
Hometown, YZ 00000
(000) 000-0000

ABC College, Box 000
Collegetown, XY 11111
none@abc.edu

OBJECTIVE

To obtain a job focusing in Public Relations, Consulting or Marketing.

COMPETENCIES

- Strong analytical and problem-solving skills
- Systematic and highly detail oriented

- Microsoft Office	- Network Administration	- Customer Service
- Adobe PageMaker 6.5	- Network Configuration	- Writing
- SPSS	- Data Entry	- Communication

EDUCATION

ABC College, Collegetown, XY

- Major: Political Science, Minor: Religion, GPA: 3.0
- Anticipated Graduation: June 2004
- House President & Secretary (2001-2002)
- Voting Member, ABC College Representative Council (2001-2002)
- Child Mentor – Big Brothers Big Sisters (2001-2003)
- Staff Writer – *The ABC Student* (2001-2003)

EXPERIENCE

- **Corporation, Inc.** **2001 to 2003**
  Summer Intern
  Gained valuable experience as an Intern for a team comprised of five financial advisors, managing more than $1 billion in assets. Delivered superior customer service while working exclusively with clients maintaining net worth in excess of $1 million. Created portfolios for perspective and existing clients, performed research on equities and mutual funds using PDQ and Corporation's shell system and handled client's accounts and questions while. In addition, developed and contributed new marketing ideas for the sales force.
- **Computer Consultant** **1995 to Present**
  Independent Contractor
  Taught over 30 people on how to use a variety of programs including Microsoft Office and Windows. Serviced and upgraded computers and designed and maintained computer networks for clients. Consistently saved clients money on computer purchases and repairs. Customer service measurements were extremely high.
- **Bob's Networks Inc., Hometown, YZ** **1999 to 2000**
  Technical Support Agent
  Solved residential and business problems and concerns including Internet connection, network support and configuration, DSl support and email support. Consistently received highest performance ratings.
- **Brown, Blue, & Red, LLP, Hometown, YZ** **Summer of 1998**
  Summer Clerk
  Responsibilities at this venerable law firm included reading and studying depositions involving legal cases, writing briefs about cases, performing clerical tasks and addressing client inquiries and concerns.

HOBBIES

Hiking, Soccer and Mountain Climbing

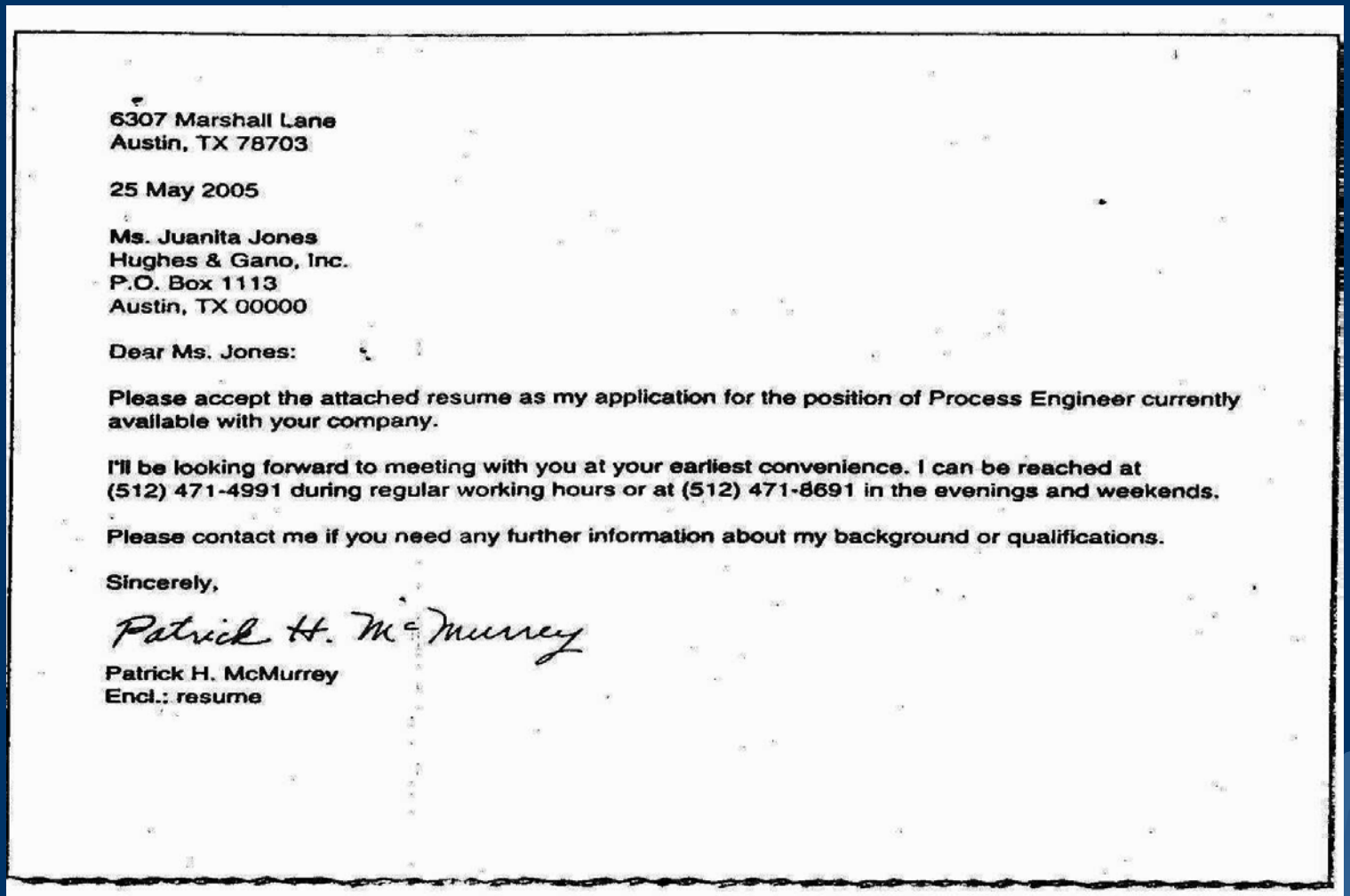
Writing to Get an Engineering Job
Writing Application/Cover Letter

- The application/cover letter often accompanies the resume. This letter is the first thing that potential employers see when they open the envelop - the application letter on top, with the attached resume beneath it

There are two types of application letters

- **Cover Letter:** You simply announce that a resume is attached, indicate that you are investigating an employment opportunity, and specify the position you seek

Writing to Get an Engineering Job
Writing Application/Cover Letter



6307 Marshall Lane
Austin, TX 78703

25 May 2005

Ms. Juanita Jones
Hughes & Gano, Inc.
P.O. Box 1113
Austin, TX 00000

Dear Ms. Jones:

Please accept the attached resume as my application for the position of Process Engineer currently available with your company.

I'll be looking forward to meeting with you at your earliest convenience. I can be reached at (512) 471-4991 during regular working hours or at (512) 471-8691 in the evenings and weekends.

Please contact me if you need any further information about my background or qualifications.

Sincerely,

Patrick H. McMurrey

Patrick H. McMurrey
Encl.: resume

Figure 10-6 Cover letter: a brief correspondence that identifies the position being sought and the purpose of the correspondence. For most job searches, use the full application letter,

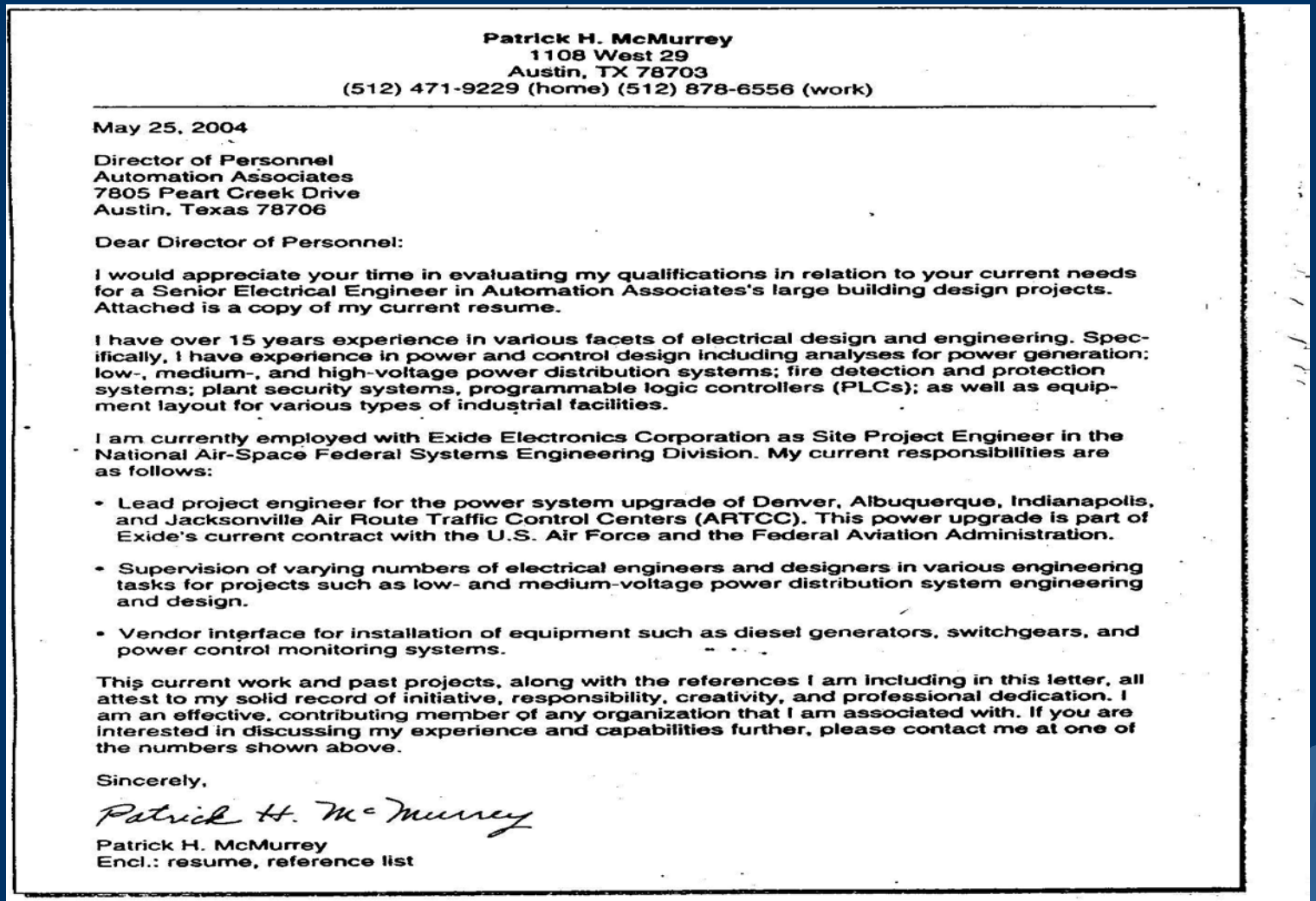
Writing to Get an Engineering Job
Writing Application/Cover Letter

- **Full Application Letter: (mostly used)** You discuss your background and qualifications as relevant to the position you are seeking
- The job of this letter is to promote your self- to highlight the reason why you are right for the position
- This letter is the focus of the rest of the slide

Writing to Get an Engineering Job
Contents / Organization of Application Letter

- **First Paragraph:** talk about the purpose of the letter, how you know about the opening position, catch the reader's attention by stating something in your qualification that makes you the best one for this position
- **Middle Paragraphs:** talk about your qualifications and experience related to the job that you are seeking. Mention that you attached your resume for more details
- **Last Paragraph:** tell the employer to keep in touch with you, try to encourage them to arrange for interview, your interest in the job, and so…

Writing to Get an Engineering Job
Contents / Organization of Application Letter



Patrick H. McMurrey
1108 West 29
Austin, TX 78703
(512) 471-9229 (home) (512) 878-6556 (work)

May 25, 2004

Director of Personnel
Automation Associates
7805 Peart Creek Drive
Austin, Texas 78706

Dear Director of Personnel:

I would appreciate your time in evaluating my qualifications in relation to your current needs for a Senior Electrical Engineer in Automation Associates's large building design projects. Attached is a copy of my current resume.

I have over 15 years experience in various facets of electrical design and engineering. Specifically, I have experience in power and control design including analyses for power generation; low-, medium-, and high-voltage power distribution systems; fire detection and protection systems; plant security systems, programmable logic controllers (PLCs); as well as equipment layout for various types of industrial facilities.

I am currently employed with Exide Electronics Corporation as Site Project Engineer in the National Air-Space Federal Systems Engineering Division. My current responsibilities are as follows:

- Lead project engineer for the power system upgrade of Denver, Albuquerque, Indianapolis, and Jacksonville Air Route Traffic Control Centers (ARTCC). This power upgrade is part of Exide's current contract with the U.S. Air Force and the Federal Aviation Administration.
- Supervision of varying numbers of electrical engineers and designers in various engineering tasks for projects such as low- and medium-voltage power distribution system engineering and design.
- Vendor interface for installation of equipment such as diesel generators, switchgears, and power control monitoring systems.

This current work and past projects, along with the references I am including in this letter, all attest to my solid record of initiative, responsibility, creativity, and professional dedication. I am an effective, contributing member of any organization that I am associated with. If you are interested in discussing my experience and capabilities further, please contact me at one of the numbers shown above.

Sincerely,

Patrick H. McMurrey

Patrick H. McMurrey
Encl.: resume, reference list

Figure 10-8 Example of an application letter. Notice how much specific detail the writer packs in concerning his experience. Notice also how the bulleted list relieves some of the

Writing to Get an Engineering Job

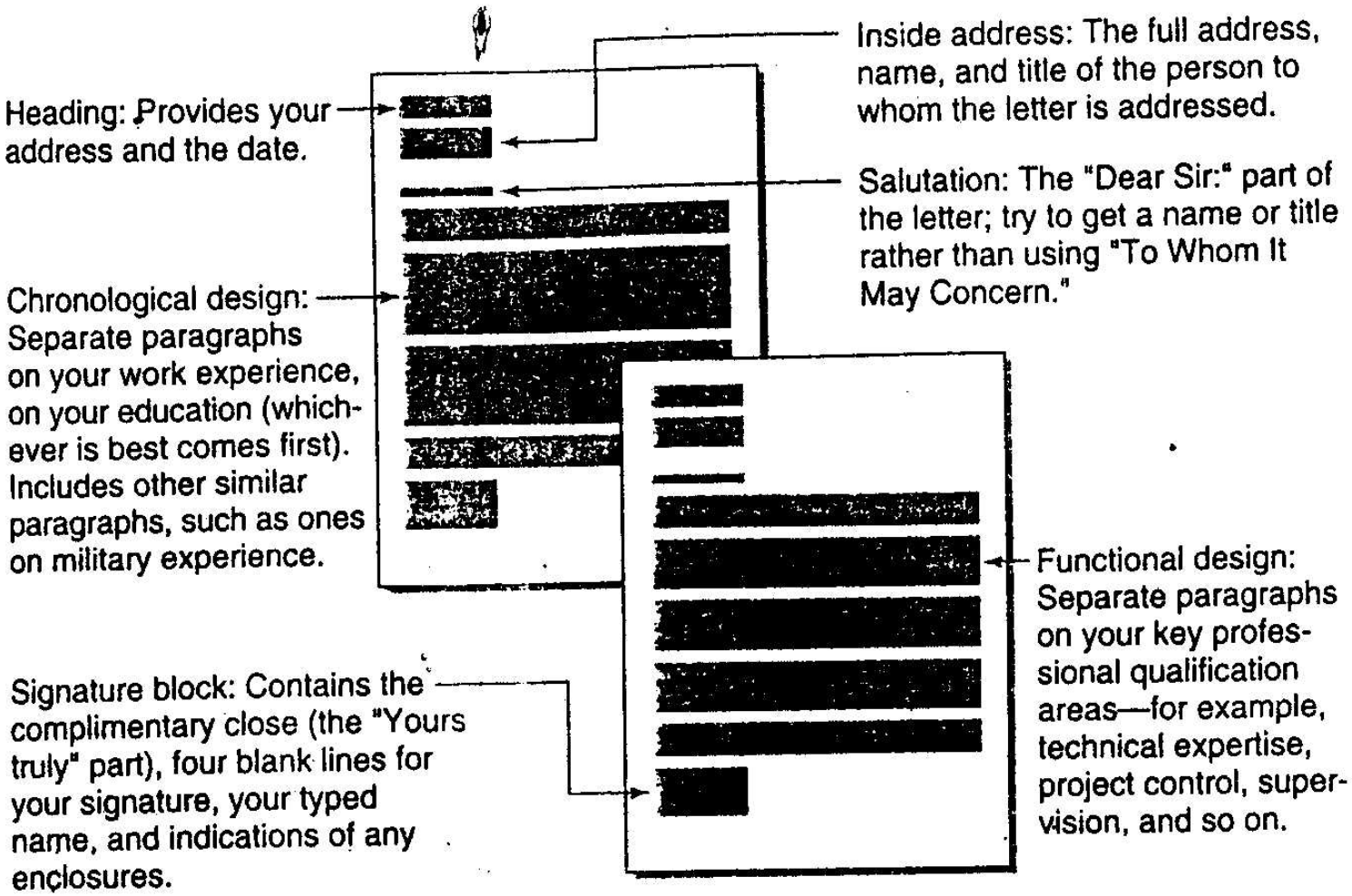
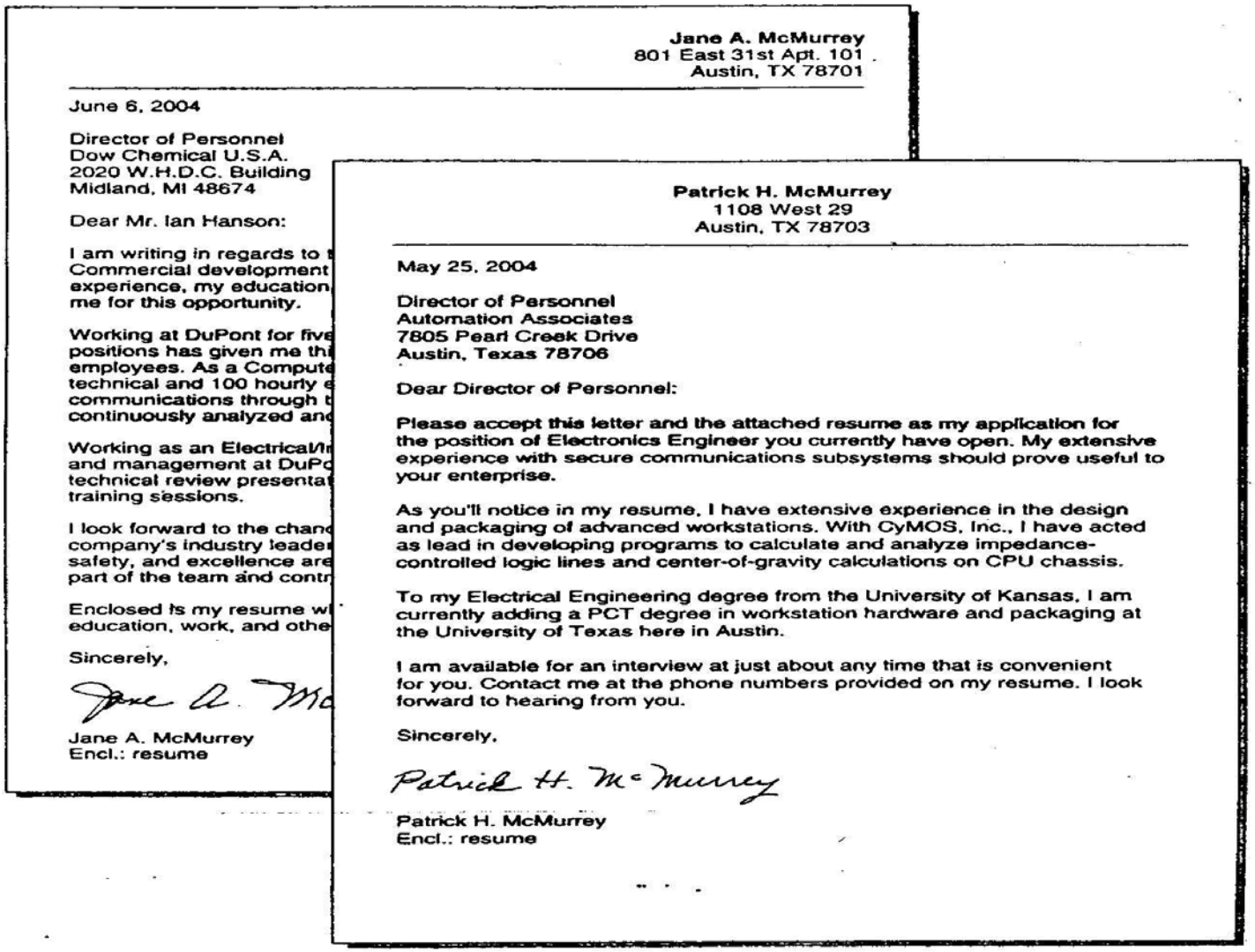


Figure 10-7 Common sections of application letters. You can organize the letter chronologically or functionally, the same as you can the resume.

Writing to Get an Engineering Job



Jane A. McMurrey
801 East 31st Apt. 101
Austin, TX 78701

June 6, 2004

Director of Personnel
Dow Chemical U.S.A.
2020 W.H.D.C. Building
Midland, MI 48674

Dear Mr. Ian Hanson:

I am writing in regards to t
Commercial development
experience, my education
me for this opportunity.

Working at DuPont for five
positions has given me thi
employees. As a Compute
technical and 100 hourly e
communications through t
continuously analyzed and

Working as an ElectricalEn
and management at DuPo
technical review presentat
training sessions.

I look forward to the chanc
company's industry leader
safety, and excellence are
part of the team and contr

Enclosed is my resume wi
education, work, and othe

Sincerely,

Jane A. McMurrey
Encl.: resume

Patrick H. McMurrey
1108 West 29
Austin, TX 78703

May 25, 2004

Director of Personnel
Automation Associates
7805 Pearl Creek Drive
Austin, Texas 78706

Dear Director of Personnel:

Please accept this letter and the attached resume as my application for the position of Electronics Engineer you currently have open. My extensive experience with secure communications subsystems should prove useful to your enterprise.

As you'll notice in my resume, I have extensive experience in the design and packaging of advanced workstations. With CyMOS, Inc., I have acted as lead in developing programs to calculate and analyze impedance-controlled logic lines and center-of-gravity calculations on CPU chassis.

To my Electrical Engineering degree from the University of Kansas, I am currently adding a PCT degree in workstation hardware and packaging at the University of Texas here in Austin.

I am available for an interview at just about any time that is convenient for you. Contact me at the phone numbers provided on my resume. I look forward to hearing from you.

Sincerely,

Patrick H. McMurrey
Encl.: resume

Figure 10-9 Examples of application letters. The first paragraph of the letter on the right identifies the position being sought and makes one strong statement about the writer's qualifications. (The fancy headings are not a requirement—just a nice, eye-catching touch.)

Writing to Get an Engineering Job
Follow-Up Letter

Usually you write this letter when you do not get any response from the employer. Also when you refuse the offer job, and so.

801 East 31st Street #101
Austin, Texas 78701

3 March 1996

Director of Personnel
Automation Associates
7805 Pearl Creek Drive
Austin, Texas 78706

Dear Director of Personnel:

On February 17, I applied for a position as manufacturing engineer with your firm. Not having heard from you in the two weeks since that time, I'm concerned that my letter may have been lost.

Attached is a copy of the original letter and resume that I sent. As you will see, they detail my work experience, my education, and my sincere interest in working for your company.

If you have already made a decision, I would appreciate hearing from you. For the moment, my availability continues. I look forward to discussing the job and my background with you in person.

Sincerely,

Jane A. McMurrey

Jane A. McMurrey
Encl.: Copy of 2-17 letter and resume

Figure 10-10 Follow-up to an application letter. Although the follow-up letter can be used for different reasons, its most important use is to inquire about the fate of an application letter and resume for which you have received no response.

Documentation in Engineering Writing

When you **borrow** materials from other sources you have to **document and reference** these materials, **otherwise** you are **plagiarizing** (copying and stealing), and in this case you might be law suited by the owner of this material.

Also, it is **plagiarism** if you are using the same words, sentences, or paragraphs of the other's writings. You should use your own words.

Documentation in Engineering Writing

Systems used for sources documentation

There are many systems used for documentation. One of these systems (which we are going to use) is the one used by the Institute of Electrical and Electronic Engineers (IEEE). There are also:

- MLA system (Modern Language Association)
- CM (Chicago Manual)
- CBE (Council of Biology Editors)
- APA(American Psychological Association)

Documentation in Engineering Writing

Documentation using IEEE

Inside the body of your text (CITATION)

- Refer to the source of the borrowed material by using consecutive numbers inside brackets at the end part of the information you borrowed. These numbers start with [1] for the first source you used. The increase in the earth temperature was found to be affected by the increase in CO2 concentration [3].
- You can inter reference number inside the sentence. The results of stress analysis in [4] show that… According to Ali [7], Salem says…

Documentation in Engineering Writing
Documentation using IEEE

- You need also to include the page numbers if you are citing from references other than books or articles. [8, pp. 27] or [11, pp. 24-28] or [5, pp. 9; 12, pp. 14-17; 15, pp. 5,11-15]. Use semicolons to separate information from many reference in the same paragraph.

- At the end of quotation mark, use the period punctuation at the end of the reference. "Poverty and technology never work together," [11,p.10].

Documentation in Engineering Writing
Documentation using IEEE

6.0 THE FUTURE OF HEVS

Knowing exactly what the future holds for HEVs is impossible. However, using what we know to be true today, we can generally extrapolate to a reasonable degree what tomorrow might bring.

6.1 Options

With technology comes options, and hybrid technology is no different. There are many different ways in which a hybrid can be configured, and since each has its own advantages, many different options will most likely be offered to the consumer. "Rather than having only one propulsion system choice when buying a future vehicle, it may be possible to select the propulsion system in the same way that one selects a 4 cylinder engine or a V 8" [10, p. 43]. One could choose from a conventional gasoline, battery only, or any number of configurations of an energy storage device and a hybrid power unit (HPU) [9, pp. 98–99].

6.2 Fuel cells

Though today's HEVs have a conventional gasoline or diesel engine combined with an electric motor, in the next five years we will most likely see the arrival of the fuel cell in hybrid vehicles [13, p. 11]. Much work—and money—is going into improving on this technology.

6.2.1 Brief overview of the fuel cell. Fuel cells generate electricity through an electrochemical reaction that combines hydrogen with air. Many different fuels can be used, but methanol is often the fuel of choice, with which the fuel cell's only emission is water vapor, making it the cleanest alternative available [1].

6.2.2 Current limitations of fuel cells. Unfortunately, fuel cells need further development in order for them to be feasible in personal automobiles. First of all, as with all new technology, the fuel cell is expensive. It will take some deflation of cost before it can match the cost of a conventional gasoline engine, and thus penetrate the market [16, pp. 14–16]. In addition, the fuel cell has not been a viable option due to its large size. However, great strides have been made in this area in the past few years, and "officials at DaimlerChrysler have pledged to have a viable, commercial fuel cell vehicle available in 2004" [16, p. 17].

(*continues*)

Figure 11-1 A section from a well-documented research paper.

Documentation in Engineering Writing
Documentation using IEEE

In order to reform fuel (change it into its useful form so it can react to create energy), the system has to be heated to a certain temperature in order for the reaction to occur [13, p. 8]. Thus, long start-up times are also holding fuel cells back from use in HEVs, yet although there are still considerable strides to be taken in fuel cell technology, these cells will definitely serve as a viable option for HEVs in the near future [1].

6.3 Future models

Only two car companies have HEVs on the market today, but in the next few years almost all car companies are likely to follow suit [9]. As they flood the market, prices will drop, and the HEV will be cost comparable to a conventional vehicle. Below are some HEV models that might be emerging in the next few years.

6.3.1 Ford P2000 LSR. One model to be introduced shortly is the Ford P2000 LSR, which was delivered by the Ford Motor Company to the U.S. Energy Department in October, 1999. The P2000 LSR will be a hybrid diesel-electric vehicle with "the passenger room, trunk space and driving acceleration of a Taurus" [17]. Ford has also designed the Ford Prodigy, a concept, diesel-electric hybrid family sedan that will get 80 miles to the gallon [18, p. 3].

Figure 11-1 (*continued*) A section from a well-documented research paper.

Documentation in Engineering Writing

Format of the reference page (IEEE System)

- List the sources in numerical order according to their appearance in the text
- The initial of the first names of the authors appears in the list. J. Lee, or A. M. Rice
- Single space between the lines of same reference and double space between different references
- List the reference just one time even if you use the same reference in your text many times

Documentation in Engineering Writing
Format of the reference page (IEEE System)

1997.

[3] N. Hart, "Mobile satellite system design." In M. J. Miller, ed., *Satellite Communications: Mobile and Fixed Services*, pp. 103–143. Boston: Kluwer Academic Publishers, 1993.

[4] D. Pearl, "FAA clears civilian airlines to use military satellite signals in navigation," *The Wall Street Journal*, p. A18, February 18, 1994.

[5] *GPS NAVSTAR User's Overview.* Los Angeles: ARINC Research Corporation, 1991.

[6] Personal interview with Dr. Francis Bostick, ECE Department, The University of Texas at Austin, November 18, 2001.

[7] F. Vizard, "In trouble? Call Ford," *Popular Mechanics*, vol. 172, p. 32, July 1995.

[8] C. Hilary and D. Mor, "The power infrastructure," http://www.cs.dartmouth.edu/2K/power-CM/ Accessed April 2, 2001.

[9] S. J. Childe, R. S. Mall, and J. Benett, "Frameworks for understanding business process re-engineering," *Int. J. Oper. Prod. Manag.*, vol. 14, no. 12, pp. 22–34, 1994.

[10] Email from Mark A. Carpenter, A98-b2 project manager, AMD, Austin, Texas, March 8, 2003.

Figure 11-2 An example of a brief references page using IEEE style.

guided by the needs of your audience; that is, provide enough information to allow your readers to go to that source if they want to.

Book

[1] B. P. Lathi, *Linear Systems and Signals.* London: Oxford University Press, 2001.

Book, Multiple Authors

[2] S. Horner, T. Zimmerman, S. Dragga, *Technical Marketing Communication.* New York: Longman, 2002.

New Edition of a Book

[3] C. Conrad and M. S. Poole, *Strategic Organizational Communication,* 5th ed. New York: Harcourt Press, 2002.

Journal Article

[4] R. F. Boehm, "Heat engineering," *Developments in the Design of Thermal Systems*, vol. 16, no. 6, pp. 190–206, June 1997.

Documentation in Engineering Writing

Format of the reference page (IEEE System)

Patent

[18] M. L. Chirinos, U.S. Patent 5 670 087, 2001. [Title of patent may be included.]

[19] M. Postol, "Method of lattice quantification which minimizes storage requirements and computational complexity," U.S. Patent 6 085 340, July 4, 2000.

Newspaper Article

[20] "Virus overwhelms global Internet systems," *The New York Times*, vol. 116, pp. A3, A8, January 27, 2003.

Government Publication

[21] *Basic Facts about Patents*. Washington D.C.: Government Printing Office, 2002.

Technical Report

[22] R. Cox and J. S. Turner, "Project Zeus: design of a broadband network and its application on a university campus," Washington Univ., Dept. of Comp. Sci., Technical Report WUCS-91-45, July 30, 1991.

[23] "TDDB results for 0.18 μm," Taiwan Semiconductor Manufacturing Co., Hsinchu, Taiwan, R.O.C., 2001.

Letter or Email

[24] Letter [or Email] from A. R. Hasan, Project Manager, Oracle, Boston, Massachusetts, Jan. 5, 2003.

Software

[25] J. McAfee, *VirusScan Version 6.0*. Computer software. Networks Associates Technology, Inc. IBM-PC, 2001.

Database/Online

[26] R. Berdan and M. Garcia, *Discourse-Sensitive Measurement of Language Development in Bilingual Children* (Los Alamitos, CA: National Center for Bilingual Research, 1982) (ERIC ED 234 636).

[27] J. Ozer, "External solutions for your expanding video library," *PC Magazine*, Jan. 27, 2003, v22, n10 p. 247(7) in Academic Index (database on UTCAT PLUS system).

World Wide Web

[28] "AT&T enters Indiana residential local phone market," http://www.att.com Accessed Jan. 26, 2003.

[29] "Nokia introduces the world's first handset for WCDMA and GSM networks," http://press.nokia.com/pr2002_3.html Accessed Jan. 27, 2003.

[30] B. L. Evans, "Brian Evans' home page," http://www.ece.utexas.edu/~bevans/ Accessed Feb. 12, 2003.

Slides and Films

[31] L. J. Mihalyi, *Landscapes of Zambai, Central Africa*. Santa Barbara, CA: Visual Education, 1975. (slides)

Documentation in Engineering Writing

Format of the reference page (IEEE System)

List 2

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Ethics in Engineering Writing

- **Copyright :** Should not copy/use the others' properties without permissions from the author
- **Playing with the results:**

- **Do not** use fictitious data in your work or research to get the results that you want
- **Do not** play with the results of your research or work

- **You should not hide improper information:**
  - Regarding harmful products
  - Wrong and dangerous design
  - Job application and resumes

Ethics in Engineering Writing

- When you write instructions or procedures, they should be clear to the readers

- Do not omit safety warnings:

like safety warnings written inside the manuals of equipments, products, designs, and so

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Ethics in Engineering Writing

Accreditation Board for Engineering and Technology

CODE OF ETHICS OF ENGINEERS

THE FUNDAMENTAL PRINCIPLES

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by

I. using their knowledge and skill for the enhancement of human welfare;
II. being honest and impartial, and serving with fidelity the public, their employers and clients;
III. striving to increase the competence and prestige of the engineering profession; and
IV. supporting the professional and technical societies of their disciplines.

THE FUNDAMENTAL CANONS

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

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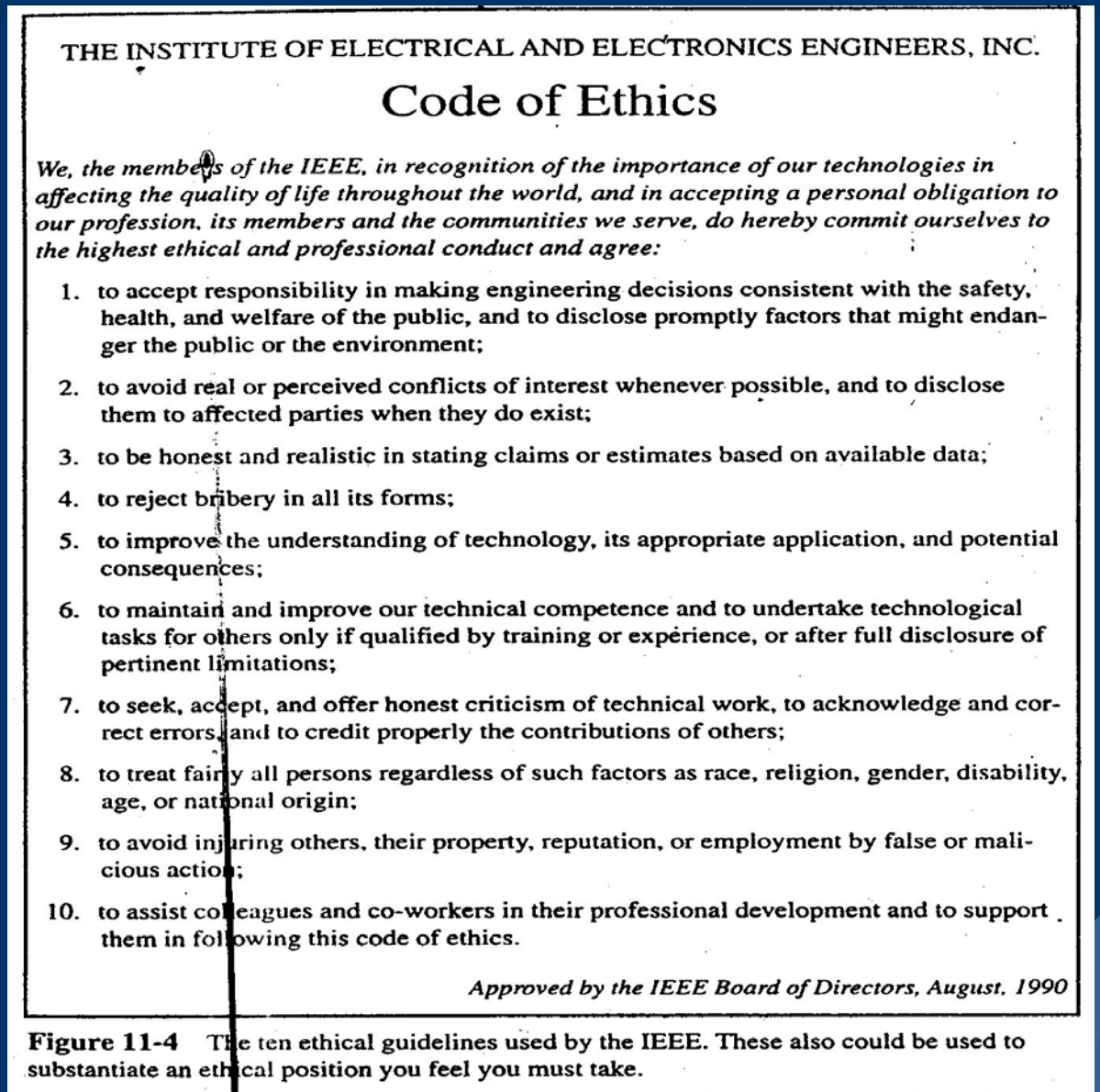
1987

Figure 11-3 A typical code of ethics for the engineering profession. You may use documents like this to support your position when faced with an ethical choice of action.

Ethics in Engineering Writing



THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making engineering decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology, its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Approved by the IEEE Board of Directors, August, 1990

Figure 11-4 The ten ethical guidelines used by the IEEE. These also could be used to substantiate an ethical position you feel you must take.