Report Writing for Engineers

An Online Continuing Education Course for Engineers

Course Number: PD-3005

Credit: 3 Hours / 3 PDH / 3 CPD

Report Writing for Engineers

Preface

Nearly every project, development, or study calls for concluding paperwork; some sort of a report. There have been many reminders and cartoons saying that “the job is not finished until the paperwork is done”. But often there is reluctance on the part of those involved to pursue the task of preparing a report. This course explains why some of the reluctance appears, suggests a technology-based approach to writing, provides ideas and concepts that assist writers in creating and presenting material, and illustrates key methods in accomplishing the objectives of a report.

This orientation, then, can assist engineers with:

– Personally preparing a report and improving writing techniques.
– Directing the preparation of a report written by others.
– Mentoring engineers and other technologists in the improvement of writing skills.

This course is not a detailed lesson in English usage. It is rather a set of guidelines and recommendations that are intended to assist engineers in the creation of written reports by reviewing fundamentals and by describing an engineering approach to writing.

Loering M. Johnson, P.E.(Ret.)

I. DEFINITIONS

The following definitions of key terms used in the text provide the sense of the terms as they are used in this course.

Abbreviation – a shortened form of a word or phrase.

Acronym – A pronounceable word formed from the initial letters of a compound term, e.g. RAdio Detection And Ranging – RADAR.

Contraction – A word with one or more letters missing and replaced by an apostrophe.

Datum (plural, Data) – something given or admitted upon which an inference is based.

Diagramming – A shorthand representation of the relationship of the parts of a sentence to one another.

Grammar – The manner of writing or speaking with reference to grammatical rules.

Idiom – An accepted phase that violates usual grammatical construction, e.g. “getting up in years.”

Initialism – A group of characters formed to represent the initial letters or words in a compound

term, but not forming a pronounceable word, e.g. E2L - English as Second Language.

Paragraph – A group of related statements (sentences) that a writer regards as a unit in the development of a topic.

Report – A written presentation of selected, coordinated, and discussed facts and data for information, recommendation, and reference.

Sentence – A group of words so related as to convey a completed thought with the force of asserting something or of asking, commanding, or wishing and marked at the close by a period, question mark, or exclamation mark.

Syntax – Sentence structure; the due arrangement of word forms to show their mutual arrangement in a sentence.

Verbal – Associated with words (does not specify whether written or oral).

II. INTRODUCTION

A. **The need for reports**

Communication, frequently in terms of a report, about the status of a task, project, or study is an important part of the performance on a project. Large or lengthy activities may require interim reports. Major needs of these reports are to –

1. Document what was done or is being done for record purposes or for informing those who need to know. This documentation may include facts and data from laboratory or field research, investigation, observation, or inspection.

2. Establish bases for future activities. The accomplishment of activity reported may be a step in a larger or continuing effort and future work needs to have the information about the current status in order to properly proceed. Or the reported results may need to be independently verified and details of the work need to be presented in order for verification to be accomplished. Or perhaps more funding is required and needs to be explained and justified.

3. Confirm compliance with contractual or legal requirements that are involved.

B. **The Effort of Writing**

Writing is work. If it is regarded as a disagreeable task, it becomes harder. Many of those in scientific disciplines have acquired a distaste for English as it is normally taught. After editing, and assisting with, the writing of technologists for nearly 60 years, this writer feels that the major problems are neither with the grammar (language writing and speaking) nor with the scientifically-oriented students, but rather with the way that the English grammar is presented.

As it is normally taught, English principles and usage do not involve the application of mathematical rigor or the structured effects of formula. The variability and variety in grammatical application may

not seem nearly as satisfying as the more ordered approaches of physics, chemistry, and engineering courses. Is there a way to relate grammatical construction to the scientific method? This writer believes that there is.

III. AN ENGINEERING APPROACH TO WRITING

It would be helpful to regard English usage, in this case the preparation of a written report, as being analogous to the development of a mechanical, electrical, or chemical product or the building of a bridge or other structure. There are requirements to be met, materials to be selected, components to be fabricated, assembly and testing to be done, and finishing touches to be applied. These analogies can be extended to whatever field the writer is in, even such fields as biological systems, art, and music. With this analogous approach, writing can take on an entirely different aspect and a technical writer may be able to create a better product.

By looking at the letters of the alphabet as basic material (ore, elements, chemicals, yarn, etc.), the analogies can be started. These basic materials can be assembled to form words which could be considered similar to refined or processed materials such as bars, sheets, wire, substrates, or other uniform substances. Fortunately for writers, much of this basic and refining work has already been done. The letters of the alphabet have been established and accepted. Thousands of words have been developed and are available in ready references (dictionaries) which are the "parts bins" for writers.

A writer must select words to assemble into sentences just as processed materials might be fabricated to form useable parts. Consider that words have characteristics that are analogous; strength, hardness, durability, resistance, inductance, capacitance, and so on. Will each word perform its necessary function adequately? Are the words properly related so that they work together suitably? Is a combination of words sufficient to enable a sentence (which may be considered analogous to a component) to perform its required action, the presentation of a thought, suitably? Are there more words than are necessary? Just as one would avoid using materials that are inadequate for a hardware product, proper words should be selected for a report. In a similar way, using too few or too many parts or words would not be good design practice.

Sentences in turn are grouped into paragraphs which might be regarded as sub-assemblies which are capable of performing a function. Here a similar evaluation can be made. Do the sentences relate properly to one another? Do they enable the assembly to perform the desired function; to have the desired effect? In the chosen arrangement, do the sentences perform efficiently and effectively? Would another arrangement be more effective?

Paragraphs are assembled into chapters or sections which might be considered assemblies or major parts of a final product. Just as with a structure, a bulldozer, or a transformer each part from the initial material to the final protective coating has a function to perform and has requirements to meet in order that the final product can perform suitably in its intended capacity.

By viewing a report in this manner, a technologist may discover a more satisfying approach to writing. With this kind of an approach, some of the technical tools can be applied. Do the words

selected have suitable properties for the tasks they are to perform? Do they properly match the other words to which they will be joined? Can their properties introduce undesirable consequences (be misinterpreted)? Are they necessary or superfluous?

In a similar way, sentences and paragraphs can be examined (tested) to see if they are suitable and will perform the tasks for which they have been selected. To evaluate the writing, one can even use basic Value Engineering tools such as –

- how well will this report, as planned, accomplish the desired goal?
- how much time (and cost) will this approach take to write?
- how else could this information be presented in writing?
- would this rewrite be preferable? More readable? More effective?
- how much time (and cost) would be involved in a rewrite?

With a view of writing as a design problem/challenge, some of the techniques used in English classes come into better focus. Sentence diagramming (see Figure 1), which to many students oriented in technology seemed to be a waste of time, can be regarded as analogous to mechanical assembly diagrams (Figure 2), circuit diagrams (Figure 3), formula, or even sheets of music. These mechanical and electrical diagrams or formula are vital in their respective technologies in showing the proper relation and location of parts of the system such as components, sub-assemblies or musical notes. In the same manner, a sentence diagram can show the proper relation of words in a sentence to help construct the most effective presentation of a thought.

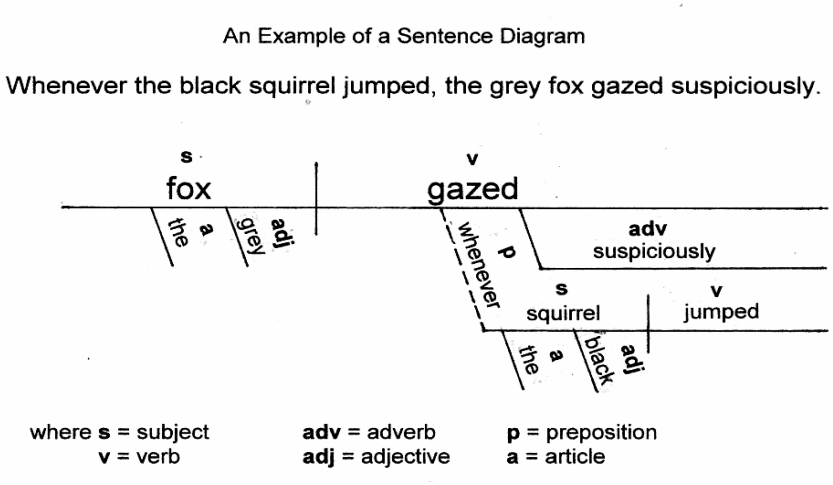

Figure 1

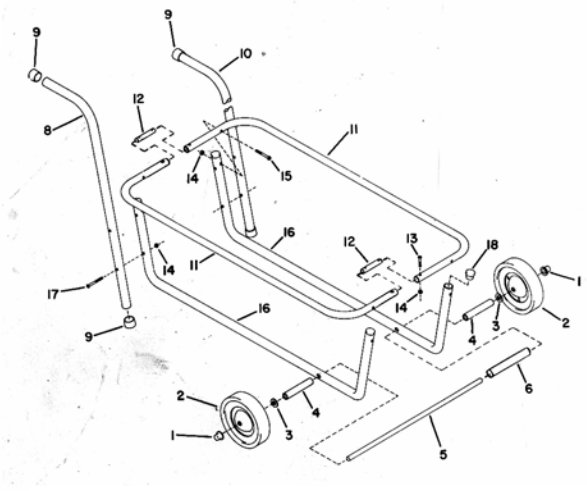

Figure 2

In producing hardware, it is necessary to procure basic material at a cost and to work this material, also at a cost, to produce a component. In writing, the basic material, the alphabet, has been developed and is available to a writer at no cost. In like manner, the alphabetical letters have been combined into words which express concepts or meanings. Lists of developed words have been prepared (dictionaries) and are also available at no cost (except for the cost of a dictionary). A writer, then, is fortunate in having basic material and components readily available

When viewed as the selection, processing, and assembly of basic materials into components, assemblies, and products, writing can be exciting. Techniques used in hardware production, such as timelines, flow diagrams, control diagrams, can be applied and be helpful. Selection of words can be an interesting procedure. Words and sentences have some of the characteristics of hardware. They may have strength, flexibility, hardness, or energy. They may connect items, effect a power output (stimulate), act as a conduit to channel the flow of effort (ideas), add decorative effects, evoke beauty, or induce a direction of thought. They may be considered to have mass, resilience, inertia, and capacitance. Looking at them this way may help in word selection to assure that, in combination, they will perform the desired function. And, as in a hardware product, the final evaluation is whether the written report will accomplish the desired result. A challenge for a writer is to prepare a report in such a way that a reader might be led to think "This is interesting – I hadn't thought of it [this matter] this way!"

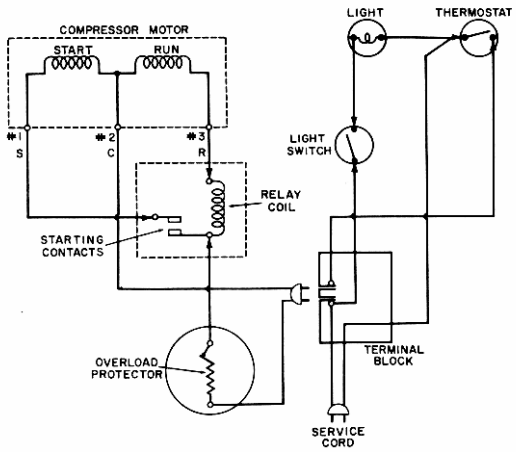

Figure 3

IV. THE WRITING PROCESS

A. **Design of Verbal Messages**

Reports can be considered as products. Products are designed to perform functions. Whether they are buildings, cell phones, or space explorers, they are designed with an end in mind. In a similar manner, reports should be designed to perform intended functions. The required function of a report may be to •

- summarize the work on a completed project
- describe the accomplishments and status of an ongoing project
- demonstrate compliance with applicable requirements, regulations, or laws
- satisfy an inquiry
- archive information for historical record or for future use
- present information for others to use

Considering preparation of a report as a design effort, a writer's task is to select words, construct sentences, and assemble paragraphs to convey information in a way to accomplish the report function. Acceptance and value of a hardware product depend upon its users. In a similar way, acceptance and value of a report depend upon its readers. In order to satisfy readers, there are some basic rules to be observed.

B. **Rules for Report Writing**

RULE number 1

Write for the reader(s).

This is very important! Writers should develop an ability to try to anticipate •

- who will be the readers/users of the report
- what degree of familiarity do these readers/user have with the content of the report
- what is it that these readers/users would like to know or need to be informed of
- what languages are primary for the readers/users. This is especially important in world-wide commerce, e.g. a report on compliance with a European Union Directive.

RULE number 2

Write to Be Readable.

One of the most frequent complaints by those who read and must use them is that the reports are poorly written. They do not state what they are intended to accomplish. Rob write merely to be understood. Writ How does one write in this way?

Engineering is larg can be defined as the requirement to com) in an appropriate way, the problem should s, however, is essential. And with the increas on of these elements has become more difficu he English language was the standard for glob

> "Electronic comm ct, language in three ways. First they they have created a need for global la will influence the future of other language peak."

As many reports may a constraint on report writers to use proper g English will be able to produce translations th ed message clearly, and cannot be misunderstood.