



Technical Writing for Engineers

An Online Continuing Education Course for Engineers

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Edward P. Brunet, Jr., P.E.

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Introduction

Most engineers during their careers are given continual responsibility for writing various kinds of communications. That can include such documents as administrative memos, letters, reports, and instructions both technical and non-technical. Each communication will address its own particular or unique need. Those needs will be determined by the nature and subject of the communication and by the special interest of the person(s) who is targeted to receive the communication.

Therefore, a key element to writing effective communications is to determine at the very onset who is going to be the receiving party of the communication. An additional consideration is to decide how much technical detail will be required for the person(s) who will be reading your communication. For example, if you are writing a technical memorandum to a group of engineers within your own field, the level and extent of technical detail may be considerable without causing the loss of your audience. However, even under those conditions, the technical detail should not be overdone but should be as simple as you can make it without sacrificing necessary content.

Language Simplification

The most effective communication is achieved when there is a meaningful flow of ideas. They should not be unduly complicated by special qualifiers, exceptions or minute details only loosely related to the subject at hand. Special qualifiers and exceptions to the subject can be handled by listing them in a separate paragraph or in a footnote. By doing this, you can ensure that the flow of ideas will not be interrupted by qualifiers and your readership will be grateful for your thoughtful consideration.

It is fair to say that the best communication is one that is written in a simple but comprehensive format. Technical writers will tell you that they can write a memo of ordinary length and it will not take very long to do that; but if you want a very concise one, it will take a lot longer. Some of the greatest political speeches of history have been the shortest ones that have been succinctly but thoughtfully crafted. One that comes to mind is Abraham Lincoln's Gettysburg address. You may not be writing political speeches but the principle of packing meaningful ideas into a short communication shares the same principle. That principle involves putting your thoughts and ideas into simply-constructed sentences that are short and to the point but not overly elaborate.

Reports and Other Technical Writing

Status reports, Progress reports, Project crisis reports, End of project reports, Status Reports

Each one of the above reports has its own individual style requirements as it relates to a particular place in the calendar timeline.

Status Reports

For example, Status Reports deal with the project's condition or status as of the moment in time established by the date of the report. In a report of this type, you would not go back and discuss events more than one month prior to the present time. Likewise, you would not discuss events

that you plan several months from now. However, you might discuss the next month's anticipated events since the proximity in time is so very near.

Progress Reports

Progress reports should cover events that occur over the established time period for the report. It could be weekly, bi-weekly, monthly, quarterly, yearly, or any time period it is desired to cover. What should be remembered is to keep the events reported upon confined to the time period established for the report.

Project Crisis Reports

A Project Crisis Report is a special report that might be required at some unpredicted time during the project's lifetime. Of course, there could be more than one crisis, which would then usually require a report for each crisis event. If things go well, there may be no crisis at all. This is what all project engineers and managers hope for. A Project Crisis Report would cover the problem that has arisen, how serious it is, and how it impacts upon the successful completion of the project. It might also cover proposed solutions to the problem, how they will be evaluated, and how much additional time and money the resolution is expected or predicted to cost.

The initial Crisis Report will be the beginning of a series of reports that follow up on the initial report. They will continue until the crisis is considered managed and contained. Project managers will always be interested in how a project crisis will affect schedule, cost, and survivability of the project. One should always be sure to address such issues in a report of this nature. You may discover that there are further aspects and ramifications of the crisis, which will need to be reported upon and discussed in the initial Crisis Report and in follow-on reports dealing with the crisis.

End of Project Report

An End of Project Report involves a historical description of the project from inception until completion. It will include project technical history accumulated throughout the development and testing phases and will continue on to the final project events until the project is completed and accepted. It may be a rather lengthy document and can be somewhat time-consuming to write. The individual most qualified to write such a report would be someone who has been responsibly involved with the project from inception to completion.

This report has potential value as both an in-house historical document and as a technical document, which can quickly answer "point in time" questions that may arise years after the product has been placed in service. There will be very few who will volunteer to write this report. A possible resolution in such a situation would be to break the report into several smaller sub-sections and assign these sections to various qualified individuals who have accurate technical knowledge and memory of the project's history. If this is done, then one person should be appointed to be responsible for organizing and editing these sub-sections into one all-inclusive final report. The final report should be reviewed and approved by the project manager when the final report is completed.

Test Procedures

Test Procedures is a type of technical document that is required during most engineering development phases. They are usually highly stylized and arranged in chronological order of how the tests will be conducted. There are exceptions to chronological order of testing since parallel testing can be conducted in order to save time. Parallel testing would probably require the use of additional identical prototypes, however. (Prototypes are exact models of the product that will be tested. For the testing to be valid, the prototypes must be identical.).

Parallel testing involves breaking down chronological tests into a separate series of tests. For example, if the chronological tests are "A + B + C + D" then this would require a single prototype to complete test A and then complete test B and then test C and finally, test D. Parallel testing could be broken down into four separate tests: A,B,C,D. This would then require four identical prototypes with each prototype completing only one test. Clearly, this would reduce the length of time for testing by a factor of 4. Alternatively, there could be variations of this by having two prototypes on hand and requiring Prototype 1 to complete tests A and B. Prototype 2 would then complete tests C and D. This would reduce the testing time by half.

All test procedures must be initially well thought out since they will be critically reviewed several times during, and even after, the test procedures have been conducted. If they are discovered to be inadequate during testing, they may have to be revised and retesting with the revised procedures may be required.

In many cases involving government-related contracts for military and many other types of government products, conformance to established government test procedures will be mandated. In such cases, your responsibility may involve interpreting the government specifications that define the test procedures.

Proper interpretation of the specifications is necessary to ensure that the detailed government test procedures you identify and write in your test procedures will satisfy the government's concerns for quality assurance. A convenient way to do this is to copy the appropriate sections of the specification verbatim from the government specifications. You are allowed to copy from government specifications and standards because they are in the public domain. Their preparation has already been paid for by the use of public funds and the information they contain are therefore available without further cost to the public.

Test Reports

Test Reports are used to describe what transpired when a product was tested by following and using the Test Procedures document. They are reportorial in nature and simply describe what happened to the product during and upon completion of the testing. Sometimes they may contain an analysis of the nature of a failure and sometimes recommendations may be made for design changes to the product as a result of the test. However, such recommendations are not necessarily required to be included in the test report.

Contracts

As an engineer, you may be required to write contracts for products or services you need to purchase for your project or for the organization you work for. Again, this is a type of document that needs to be written in relatively simple language. A contract, which is written in simple but understandable language, is easier to enforce in a court of law than one that has undue complexity. It will also minimize misunderstandings that can easily arise from a second party trying to interpret a contract written in an unnecessarily complex fashion. A good procedure to follow is to write the entire contract in non-legal terms that simply describe the goods or services you wish to purchase. Then, after you have completed that task, use the document as the basis for a final writing of the contract. Keep the language simple but adequately descriptive.

As you go through this procedure, the Contracting Officer of your organization, or the legal staff, is usually available to assist you if you have questions about any aspect of the contract. After you have completed the document, the legal staff can (and should) review the contract for its adequacy of language and for any and all legal ramifications it may have.

Remember that as an engineer, you are not expected to be a lawyer, but you are expected to adequately describe the goods or services you wish to purchase. You will also be expected to be able to define the performance or quality of that good or service. Once you have gone through the procedure of writing one or two contracts, the following ones will be much easier to write.

You may quickly develop a facility for contract writing as you realize that successful contract writing reinforces and contributes to the project control you need for successful project management. A judicious and careful use of the contract language will help you to achieve the results you want for your project.

Project-related Letters

Letters are another form of technical document that engineers will be required to write during their careers. The largest category of letters is probably those that occur between the engineer and a contracted body. This could be a manufacturer, it could be a company supplying a product or a service or it could be a governmental body, such as a city, county, state, or federal agency.

In some cases, it could be an educational institution or a research facility. Thus, it is apparent that there may be several diverse organizations that may supply a product or service to the engineer's parent organization.

In any of the above situations, the guidelines for letter writing are the same. Keep the language and sentence structure simple, but complete. Avoid undue complexity and long complicated sentences. Organize your written material in relatively short paragraphs of eight sentences or less. Ideally, each paragraph should have one or two central ideas. No paragraph should have more than three or four ideas. Shorter and less complex sentences will keep the reader's attention focused on the main thrust of the paragraph.

Too many ideas in a paragraph can dilute the thought process especially if they are not skillfully connected. Each paragraph should have a purpose that is clear to the reader. The purpose could

be to give information, to state a specific problem or a problem area, or to present a proposed course of action. There could be other essential ideas contained within a paragraph, in addition to these examples. If a purpose is not clearly apparent in a paragraph, then you should rewrite the paragraph until such time that the objective(s) become quite clear.

Specification writing

Specification writing can be a bit tedious but specifications are an extremely important part of the engineering and procurement process. They form the basis for precisely defining the kind of good or service you hope, and expect, to receive from the procurement process.

There has been a change within the US government procurement practice when it comes to specification writing. This change took place about a couple of decades ago when it was realized in government procurement circles that specifications written for performance and those written for design could produce great variance in the product which was delivered. Therefore, instructions were given to government engineers that their specifications for products had to be written as performance specifications and not as design specifications.

When contract specifications are written as performance specifications, the burden of producing a product that will meet the government's contractual expectations is placed upon the contractor. However, if a contract specification is written by the government engineer as a design specification, and the resulting product does not meet the government's expectations, the government is held in the courts to be the party who is responsible for causing the contractor to produce a sub-performance product.

In addition, if a government contract is written as a performance contract but a design specification element is included, the contractor has a legal claim in court against any sub-performance on the government's part.

Performance-based specifications are used in government and in private sector arenas but there are also performance-based specifications in the judicial system. Performance-based specifications are judged or measured; and performance-based specifications are used to determine if performance has been met. In the judicial system, the question is whether the contractor after the product is delivered is responsible for the delay in completing the contract.

Video Script Writing

At some point in your career you may be asked to write a video script to illustrate some particular aspect of a project. It may seem to be a daunting task. You can begin by describing in writing each scene. Start by describing the scene. Then, describe the estimated shoot time required for each scene. The goal is to have the estimated shoot time to equal the time required to read the written script for the scene.

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