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weapon test reports preparation manual

for authors, typists, and illustrators

September 1966

Defense Atomic Support Agency
Washington, D.C. 20301

foreword

This manual is concerned with the preparation of reports required for DOD effects projects conducted in nuclear test operations. It contains guidance and instructions for authors, typists and illustrators on such matters as style and organization of written material and preparation and presentation of tables and illustrations.

All data examples reflected in the illustrations, tables and discussions contained in this manual are fictitious and are in no way associated with actual DASA testing programs or reports. The classification markings on selected illustrations are provided solely for the purpose of outlining the marking locations and do not infer that the contents of this manual or of any specific test report should bear the same marking.

This manual supersedes the manual, "Preparation of Weapon Test Reports," published in March 1958. Except for deletion of management policies and procedures concerned with submission, review and administrative processing of weapon test reports, this new edition is essentially unchanged from the 1958 version, so that report preparation work already in progress should not be unduly affected. Revised management policies and procedures for the Weapon Test Reports Program are now incorporated into pertinent DASA Circulars which are to be used in conjunction with this manual.

THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS. EACH TRANSMITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH PRIOR APPROVAL OF THE DIRECTOR, DEFENSE ATOMIC SUPPORT AGENCY

H. C. Donnelly

H. C. DONNELLY
Lt General, USAF
Director

	Chapters				
	1	2	3	4	5
authors	x	x	x	x	x
typists		x	x	x	
illustrators					x

contents

chapter 1

content

The average report will be concerned with a single subject-matter field. In general, the philosophy of organization must be to (1) introduce the problem, (2) explain how the problem was attacked, (3) present in detail what was learned, and (4) denote by discussion, conclusions, and recommendations the significance of the project.

SCOPE

At a suitable time prior to the start of a project, the agency responsible for the conduct of the project and resultant reports will be designated through Defense Atomic Support Agency (DASA) channels. The Agency Project Officer and/or authors concerned then assume the basic responsibility for the validity of the information presented in the reports.

The scope of the reports should parallel the scope of the project itself, as approved by pertinent DASA directives. This does not mean that information gathered as a by-product of the basic project activities should not be presented; however, it does indicate that the basic concern of the project, and therefore its reports, should be concentrated on those objectives which were approved during the planning stages. The mode of presentation of such byproduct information will depend on its nature—perhaps a separate report, or an appendix, or a subsection or chapter in the basic project report. The DASA Program Director should always be consulted on whether such additional material is desirable before any steps are taken toward the writing of such material.

It occasionally happens that a project fails to achieve its objectives or is only partially successful. The same series of reports is still required. Each report should thoroughly document the project activities—especially, in this case, its methods and instrumentation—and should attempt to present the reasons for failure. Such information could be invaluable to a future project concerned with the same problems. Failure to achieve objectives is no reason for writing an incomplete report.

PREFATORY MATERIAL

Certain prefatory material is appropriate for inclusion in the report, no matter how the main body might be organized. This material is as follows:

Title Page. (Required in all reports.) The format for the title page is illustrated in Figure 4.1. All information shown there is essential for proper review and handling

of the draft manuscript.

Since the Agency Project Officer is responsible for the completion of the report, whether he actually contributes directly to the writing or not, his name normally heads the list of contributors.

In the situation where a report is written by a staff or group, the authorship may appear as:

Joe M. Jones, Major, USA, Project Officer
and the staff of
U.S. Research Laboratories

Authors are encouraged to list a group of equal contributors. The order of listing is up to the authors, with the exception of the above comments relative to the Agency Project Officer.

The following clause should appear on the title page: "This document is the author(s) report to the Director, Defense Atomic Support Agency, of the results of experimentation sponsored by that agency during nuclear weapons effects testing. Accordingly, reference to this material must credit the author(s). This report is the property of the Department of Defense and, as such, may be reclassified or withdrawn from circulation as appropriate by the Defense Atomic Support Agency."

Abstract. (Required in all reports.) This section is extremely important, since it serves as a brief condensation of the main-body material. An abstract is often lifted, per se, from a report and included in a summary report or a collection of abstracts. In addition, certain readers may have time to read no more than the abstract. Therefore, it must be written carefully to avoid misleading a reader with its enforced brevity.

The abstract must include the points of major significance, including brief statements of the objectives, procedure, results, and conclusions of the project.

Preface. (Inclusion up to the author.) The preface, if it is used, has two possible functions:

First, it may be used to present introductory comments necessary to clarify the organization of the report, especially when different, but related, subject-matter fields are presented. In most cases, the format of the report will be self-explanatory, and the first and last chapters, the introduction and the conclusions, will adequately explain this.

Second, and more commonly, the preface may be used to acknowledge specific individuals or agencies for special efforts, to give special credit for theoretical material, or to illustrate the relation of the project concerned to other projects. Acknowledgments to individuals should not be made in the text proper of the report. In general, it is not good form to acknowledge the services of those whose primary duty was fulfilling the project's objectives, such as the regular staff of the project. In no case will the report include acknowledgments to DASA officers, DASA enlisted men, or DASA civilians.

Contents Page. (Required in all reports.) All titled subdivisions, all headings, subheadings, the first sentence of each figure legend, and each complete table caption should be included with their page numbers. Figures 4.2 through 4.5 show the contents format for different kinds of report organization.

MAIN BODY

It is in this part of the report that all the technical information about the project is presented in detail. The basic chapter organization detailed here should be appropriate for a report where only one field of subject matter is involved. A contents page for this basic organization is shown in Figure 4.2. Variations are permissible where the subject matter of the report is not suited to this approach. The special cases of unusually short and unusually complex reports are discussed later. However, the subject matter described in the following sections should be considered as a minimum requirement, and as such, should appear in any report, no matter how it might be organized.

Chapter 1 Introduction. The function of this chapter is to describe the project's purpose and reasons for being undertaken—the objectives, background, and theory.

The objectives must be spelled out specifically. When possible, the basic objective of the project is best presented in the same wording used in the pertinent test or planning directive. Secondary objectives or amplification of the basic objectives may be included, if appropriate.

The background section should describe previous operations, tests, and theories that illustrate why the project was undertaken. The military significance of the project may also be discussed. Published material on the subject may be referenced; however, at least a short summary of the reference material is necessary to keep the report an entity.

The theory section should describe considerations pertinent to the current project. Again, references may be made to avoid great length, but they should be summarized. If the pertinent theory is new or different from previous theory on the same subject, a presentation of its derivation is appropriate. In such cases where extreme length results, as in complex mathematical work, a summary might be presented here and the details covered in an appendix. Where appropriate, the background and theory material may be combined into one section.

Chapter 2 Procedure. This chapter should tell how the test was conducted—the operations, instrumentation, and data requirements.

Under operations, in a test report, the planned shot participation and a summary of the project activities at the test site might be included. This section should be short, unless an extensive description of test-site activities (other than actual instrumentation or data collection) is necessary for an understanding of the report.

The instrumentation section must be thorough. A complete description of the way in which instruments were used is necessary, although a physical description of the instruments themselves may be brief unless details are essential. Such physical description may be confined to a summary plus a reference, or to an appendix. Whenever applicable, information should be presented as to instrument type and quantity, location and layout at the test site, method of installation, and method of calibration. The objectives here should not be to evaluate or sell the type of instrumentation used, unless this was part of the project's objective; in some cases, separate instrumentation reports may be published within a given program (such as blast), or a special appendix may be added to the project report if the information is significant. Reference may be made, where appropriate, to other reports for details of instrumentation that are essentially identical to previously used instrumentation.

Detailed information on data requirements should be presented whenever applicable: (1) exact data required and its predicted reliability; (2) methods of recording data;

(3) methods of data reduction and correlation planned; and (4) the requirements from other projects, such as basic blast, thermal, or nuclear-radiation data.

The reasons for selecting a particular instrumentation plan, perhaps in preference to another method, may also be included. Layouts, sketches, and schematics should be used freely to avoid long word descriptions.

Chapter 3 Results. This chapter should tell the reader what happened—the formal presentation of the data.

Reduced or summarized data should be presented complete in this chapter; raw data, or examples thereof, may be presented here, or in an appendix if lengthy yet necessary to elucidate the summarized data. In presenting data, use may be made of references to instrumentation layouts perhaps already presented in the previous chapter, to avoid duplication of illustrations. Systems of coding instrumentation locations, relative to previously presented layouts, are applicable.

Illustrations of data must be referenced in the text; however, the text should not merely repeat what is already illustrated in tables and graphs. Rather, the text should be used to interpret data and direct the reader's attention to pertinent facts.

Chapter 4 Discussion. The object here is to tell the reader the significance of the data—the bridge between the data presentation and the conclusions.

If the amount of discussion is short or cannot be separated from the data without repetition, the discussion may be included with the results chapter. If it logically stands separate from the data or is excessively lengthy, it should be presented here as a separate chapter.

Regardless of where it appears, there is a minimum of material that should be presented: (1) all interpretation of the data necessary to point up its significance and support the conclusions, (2) a summary of the reliability of the data, (3) any correlations with data from previous tests, (4) an estimate of how thoroughly the objectives were satisfied, and (5) a summary of the effectiveness of the instrumentation.

Chapter 5 Conclusions and Recommendations. It is here that the reader is told what was learned—the answers to the objectives. This chapter is not the place to present arguments to support a conclusion; this is properly done in the results and discussion chapters.

If the author feels that his conclusions are not absolute or that his data was not valid or sufficient, recommendations for the mode of further study may be made.

APPENDED MATERIAL

Following the main body of the technical report, two additional types of material may be added by the author: appendixes, and a list of references.

Appendixes. These are ordinarily used to present material not essential to the technical content of the main body of the report but valuable as an aid in understanding or supporting it. For example, several formulas may have been used to reduce data; if such formulas were especially derived for that particular application, the author may wish to present such a derivation in an appendix. Similarly, an appendix may be used to present detailed material that was only summarized, due to its length or complexity, in the text proper. Another use might be the presentation of detailed information on tests performed prior to the field phase of the operation, which was important to the field test

though not formally part of it.

A common fault in technical reports, however, is the use of an appendix for one or two short tables, small figures, or notes that could properly have been included in the main body of the report. An appendix is not a desirable thing, per se, but an expedient for handling valuable material that cannot be included in the body of the report without undesirably encumbering the text.

All appendixes must be referenced somewhere in the main body of the report; if they cannot logically be so referenced, then they do not belong in the report.

References. This is a numbered list of the documents referred to in the report (for its format, see Figure 4.7). Each listing should include author, title, project number (if any), operation name (if any), short title (if any), date, preparing agency or publisher, address of preparing agency or publisher, and classification. Only documents actually mentioned in the report should be listed; the list of references should not be a bibliography or reading list.

SHORT REPORTS

In some cases, the quantity of material to be presented is so small that a chapter organization is not appropriate. For short reports, the chapter organization may be discarded and the main-body subject matter of the report merely defined by subheadings. The requirements for prefatory and appended material remain the same as for a chapter organization. In addition, the same material, subjectwise, must be covered even in very short technical reports. Figure 4.3 contains a contents page (which serves as a subject outline) for such an approach.

COMPLEX REPORTS

A long, complex report may necessitate more chapters than indicated for the basic organization outlined previously. For example, so much data may be presented that several results chapters are appropriate. In such cases, each results chapter should cover material of essentially one type: Chapter 3 Results, Structure No. 1; Chapter 4 Results, Structure No. 2; Chapter 5 Results, Structure No. 3; etc. Or, the data might be organized by shot, if there were significant differences in the participation on each shot.

Occasionally, a report that covers several different phases of a complex project may be divided into parts, particularly when the report is long. In such cases, each part should ordinarily be subdivided into chapters following the basic organization indicated previously. The individual parts may thus be considered as reports in themselves. Such an approach is indicated by a specimen contents page in Figure 4.4.

Similarly, each phase of a complex project may be covered in individual chapters, rather than parts, where each chapter could be handled by the short-report format noted previously. This is illustrated in Figure 4.5.

In any case, an introductory part or chapter and a summary part or chapter are useful devices for tying the whole report together; the relationship of the individual project phases must be clear to the reader.

COPYRIGHT MATERIAL

Avoid use of copyright material in a manuscript. Instead, identify the copyright material completely and list it in the References. If use of copyright material cannot be

avoided, all such items must be accompanied by a formal release in writing from the copyright holder. Use of copyright material in a defense publication is covered by Army Regulation 310-1, Air Force Regulation 110-8, and Navy AO Instruction 5000.8.

DOCUMENT CONTROL DATA

DD Form 1473, Document Control Data — R&D, will be completed and provided as the last page of each weapon test report. Instructions for preparation are contained on form.

chapter 2

literary composition

Although the literary style of the report is mainly the concern of the author, a brief discussion of certain standards of good writing is appropriate here. In addition, a few of the grammatical difficulties found most often in report manuscripts will be discussed. Additional treatment of this subject may be found in Reference 1, which gives in brief space the principal requirements of plain English style.

In technical-report writing, the author must precisely communicate information that is often complex and that may, in addition, be entirely new to many of the readers. This places upon the author a requirement for clarity, accuracy, and logical exposition. To achieve this, the author must always keep his readers in mind. It is best to write under the assumption that the readers are intelligent but uninformed.

Technical reports are not the place for an author to unduly display his mastery of the subject. The primary purpose of these reports is to communicate vital information quickly and clearly to busy officials and researchers.

SIMPLE LANGUAGE

Choice of Words. Other things being equal, choose: (1) a short rather than a long word; (2) a plain, familiar word rather than a fancy, unusual one; (3) a concrete word rather than an abstract one.

Elimination of Unnecessary Words. Superfluous words and indirect expressions should be eliminated. The easiest time to do this, for most writers, is during the revision of the rough draft. Some repetition is desirable in oral communication; but in report writing, it is usually unnecessary, since the reader can refer to what he has read before.

Poor:	In the light of a realistic consideration of the Jones-Smith experimental test data presented in Reference 13, the authors of this report were forced to come to the conclusion that . . . . .
Better:	Analysis of the data in Reference 13 showed that . . . . .

Sentence Structure. Simple sentence structure requiring a minimum of punctuation is desirable. Any sentence so complex that it must be read twice to ascertain its meaning is in poor technical-report style and is an unnecessary hardship on the busy readers of reports.

Voice. The simpler, more direct, and more forceful active voice is preferred. Passive voice often leads to ambiguity as to who or what is performing the action.

Weak: A number of reports have been presented.

Stronger: Several members have presented reports.

Weak: The data was reduced by IBM methods.

Stronger: IBM operators reduced the data.

Weak: This machine was employed by Ryerson in 1954 to determine the energy release per fission. During these experiments, work was being done on the development of a new testing device.

Stronger: Ryerson employed this machine in 1954. . . . . and during these experiments, he was working on the development . . . . . .

Poor: Dose-rate measurements were made by the ion chambers to provide . . . . . .

Better: Dose rate was measured by the ion chambers to provide . . . . . .

Still better (active voice): The ion chambers measured dose rate to provide . . . . . .

TERMINOLOGY

Shoptalk, Conversational Jargon, Slang. These have no place in technical reports. Though sometimes colorful, such words defeat the report's main purposes of clarity and accuracy. The author can never be certain that the readers will understand the exact connotation intended. It is far safer and wiser to rely only on standard American English and accepted technical terminology, since the reports are read by specialists in a wide range of fields—nuclear physics, electronics and instrumentation, civil engineering, medicine and biology, weapon employment, military planning and operations, materials research, aeronautics, and weapon-delivery systems, etc.

Nomenclature Consistency. It is essential to maintain consistency in the use of technical terminology and abbreviations throughout a report. When an otherwise common word is used in a particular context (such as "gust" for the dynamic-pressure wave), it should be clearly defined the first time it appears. It must then be used the same way throughout the report.

The author should never assume that the reader has a full understanding of a particular scientific terminology. Even if such is the case, the reader may have forgotten the

meaning of a term when used in a special context.

GRAMMAR

An extensive discussion of grammar is beyond the scope of this manual. The following sections mention a few examples of poor usage that experience has shown to be common in reports.

Use of Relative Pronouns. Special care should be exercised in using such words as "this," "it," "which," etc., to avoid ambiguity. The author automatically knows what is meant—but will the reader?

Vague: The data recorded by the oscillograph from the radiometer was not significant, since it was inaccurate.

What was inaccurate: The data? The oscillograph? The radiometer?

Relative pronouns are handy devices to prevent objectionable repetition of the same words and phrases and should be used freely for this purpose, as long as care is taken in sentence construction to see that the reference is clear.

Collective Nouns. Whether a collective noun (e.g., group, number, majority, pair) takes a singular or plural verb depends upon its sense. When it refers to the whole group as a unit, the collective takes a singular verb. When it refers to the separate entities that make up the group, the collective takes a plural verb. (In case of doubt, the safest form to use is usually the singular.) The following examples represent good usage:

Ten grams of the isotope was collected.
A million dollars is a lot of money.
A number of specimens were placed in the fallout area.
The number of specimens used was increased to twelve.

Meaning or emphasis is the controlling factor. In the above examples, "grams" and "dollars," though plural in form, were considered to be singular collective nouns. In the third example, "number," though singular in form, required a plural verb for best agreement.

Although the word "data" was originally defined as the plural of datum, it is now often used as a synonym for "information." In this sense it is logically singular. Thus, "data" is a collective noun, and the number of its verb may be either singular or plural, depending upon meaning.

The data were plotted on the graph point by point.
Some of them were found to be in error.

The data developed by the project is to be given in the final report. It should provide the necessary . . . . . .

Person. All reports should be written in the third person. The authors may be referred to in the text, if necessary, as authors, project officers, experimenters, etc.

Tense. Since the reports are published after the test, past tense should be used to describe what was done and what was found. Past tense should be used for most of the material in drafts written prior to the action.

Eternal truths, established physical laws, and similar material may be written in the present tense. However, care should be exercised to avoid confusing specific test information with eternal truths and established laws. The operation or design of a particular piece of instrumentation used during a specific test should not be considered as an eternal truth and, therefore, should be described in the past tense.

Dangling Modifier. This is a phrase or a clause that because of its position in a sentence appears to modify a word that it actually does not modify. The error is usually found in the use of participial phrases and gerunds:

> By specifying standard resistors, the cost of the instrumentation can be reduced.
>
> The cost of the instrumentation can be reduced by specifying standard resistors.

In both examples "specifying" wants to modify a noun or take a subject. The subject of the clause is the closest thing that could fulfill this requirement. But did "cost" specify the resistors? The three best ways of clearing up the examples are by (1) supplying a subject, (2) changing the verb form to a word that is obviously a noun and that therefore does not want to claim a subject, and (3) rewriting the sentence completely. The third method is usually the best.

> Supplying subject: By specifying standard resistors, the designer can reduce the cost of the instrumentation.
>
> Changing verb to noun: By the specification of standard resistors, the cost of the instrumentation can be reduced.
>
> Rewriting: The use of standardized resistors will reduce the cost of the instrumentation.

Restrictive and Nonrestrictive Clauses. Close attention to the phraseology and punctuation of clauses is particularly important in technical writing. Often the editor will be unable to check proper handling of such material, so the author should be especially careful in preparing his manuscript. "That" is used to introduce restrictive clauses; "which" may legitimately introduce either restrictive or nonrestrictive clauses, but confining its use to nonrestrictive clauses will help maintain clarity, and the editor will then be able to check the punctuation.

> Restrictive: The devices that were tested during Operation Redwing varied in yield. [Also] The devices tested during Operation Redwing varied in yield. [Only certain devices were tested.]

Nonrestrictive: The devices, which were tested during Operation Redwing, varied in yield. [All the devices were tested.]

Thus, clauses properly punctuated with commas take "which"; clauses without commas take "that."

Use of Prepositions. The following usage is preferred in reports as being good, literal form:

. . . during Operation Redwing	. . . at Station 23
. . . on Site Able	. . . in Figure 3.1

Proper use of a preposition with the word "shot" may depend upon the desired emphasis or the type of measurement being made. Usually a shot is thought of as encompassing a period of time, though perhaps of indefinite or short duration:

Prompt radiation was measured during Shot Cherokee.

Genitive Case. The proper use of the so-called possessive case serves where the noun-derived adjective does not—it supplies a distinction needed in technical writing. (The genitive case does not necessarily imply ownership or animation.)

The project engineers plotted the missile's path. [One missile, and its path was plotted.]

The project engineers plotted the missile path. [A path typical of missiles, or intended for missiles, was plotted. Perhaps it was used by a number of missiles.]

Form of Modifiers. Adjectives and adverbs do not have number. Except when proper names are used with initial capital letters, modifiers should resemble the singular form of nouns.

Poor:	soils studies reports-analyses group
Better:	soil studies report-analysis group

PUNCTUATION

It is beyond the scope of a guide such as this one to thoroughly cover rules for punctuation. However, there are a few elements of punctuation so commonly misunderstood that a brief explanation may serve as a guide in their use.

Comma. The basic function of a comma is to make the meaning of a sentence clear—a simple function that is often abused. In technical reports, there are some functions of the comma vital to the clarity of the text, as follows:

In a series of three or more words, phrases, or clauses, a comma should be used after each element of the series (including the element preceding the conjunction) in order to make the meaning certain in all cases:

> In a test of its structural strength, resistance to moisture, sensitivity to thermal radiation, and magnetic-flux density . . . . . .

In this sentence, if the comma before "and" is omitted the meaning would be vague. Presence of the comma indicates that four things were tested: structural strength, resistance to moisture, sensitivity to thermal radiation, and magnetic-flux density. If the comma is omitted, then it might appear that only three things were tested: structural strength, resistance to moisture, and sensitivity to both thermal radiation and magnetic-flux density. Such distinction is often vital in technical-report writing. In many cases, neither the editor, technical reviewer, nor the reader of the published document would be able to tell just what the author meant.

Set off by commas all nonrestrictive clauses or phrases. Nonrestrictive implies a sentence element added only to amplify the meaning of or add an after-thought to the main sentence thought. Conversely, do not set off with commas restrictive clauses or phrases. Restrictive implies a sentence element that is essential to or limits the main sentence thought—the distinction is often important.

> With commas: The gamma-radiation data, which was recorded to an accuracy of 10 percent, was used as a basis for . . . . . .

This sentence means that all the gamma-radiation data recorded was accurate to 10 percent—nonrestrictive.

> Without commas: The gamma-radiation data which was recorded to an accuracy of 10 percent was used as a basis for . . . . . .

This sentence means only that gamma-radiation data actually accurate to 10 percent was used—restrictive.

Thus, the presence or absence of the commas defines the meaning.

Hyphen. Use of the hyphen is restricted mainly to compounding words and unit modifiers (see section on compounding in Chapter 3). Do not use the hyphen to denote a range.

> Correct: A range of 25 to 67 msec.
>
> Incorrect: The range of 25-67 msec.

Quotation Marks. These should be used whenever a direct quotation is made in which the exact wording of another writer is used. They should not be used around a word or phrase to suggest a special meaning or connotation. The reader is not clairvoyant, and if special meaning is intended, it should be explained in words—not merely suggested by quotation marks. They should never be used as an apology for using figures of speech or slang.

chapter 3

printing style

Printing style pertains to abbreviations, symbols, numerals, capitalization, compounding of words, and spelling.

ABBREVIATIONS AND SYMBOLS

The basic philosophy behind the use of abbreviations and symbols in a report is to gain conciseness—but never to impose a hardship in understanding on the reader.

Abbreviations and symbols not mentioned in this manual can be used, but the usage should be consistent throughout the report. For example, do not use "kHz" in one chapter and "kc" in the next.

In test reports, essentially three types of shortened word forms are used: units of measure, agency names, and symbols.

Units of Measure. Table 3.1 presents a list of the abbreviations commonly used in reports. The list should be used as a guide. A period will not be used after these abbreviations. In general, units of measure less than six letters (when in the singular form) are not abbreviated in the text when used alone, e.g., foot, watt, hour, mile. However, they may be abbreviated when used in compound units, e.g., ft/sec, w-hr, mph.

No unit of measure should be abbreviated in the text except when immediately preceded by numerals, even though of more than six letters or used in a compound term.

Incorrect: The speed, in mph, was . . . . . .

Correct: The speed, in miles per hour, was found to be . . . . . .

Correct: The velocity was 530 mph . . . . . .

In tables, graphs, sketches, schematics, and similar illustrative material, abbreviations may be used freely to save space. However, in the text proper, abbreviations should be used only when denoting the dimension of a definite numerical quantity:

Tensile strength is 36,000 psi.

The irradiance was 3 cal/cm^2-sec.

When the dimension is used as a general quantity it should not be abbreviated in text:

The tensile strength was several thousand pounds
per square inch greater than . . . . . .

In text, literary terms should not be abbreviated: "See Figure 3.5." Not "See Fig. 3.5." Other examples include: reference, page, table, section, chapter, equation, appendix, etc.

Hyphens should be used when the abbreviation is used with a numeral as a unit modifier:

the 6.3-psi pressure

the 25- by 35-cm plate

the 13.4- to 14.5-msec range

When compound units are abbreviated, the slash should be used rather than the word "per": "43 gm/cm^3." Not "43 gm per cm^3."

There are a number of short units in Table 3.1 that are not abbreviated in text except when part of a compound term: "6 feet." But "21 ft/sec."

Abbreviations for units of measure should be used in the singular only: "3.3 cm." Not "3.3 cms."

If it is necessary to create an abbreviation—for use in a table or graph to save space—its meaning must be clear. In these cases, the rules given above still apply.

In every case of possible confusion to the reader, abbreviation should be avoided and the word spelled out.

Agency Names. The first time the agency name is used in both the abstract and the text proper it should be written out and followed by its proper abbreviation in parentheses. The abbreviation is given in all capital letters, with no space or periods between the letters. The abbreviation alone may then be used in the remainder of the text:

. . . . . at the Naval Radiological Defense Laboratory
(NRDL). Further work at NRDL showed that . . . . . .

This must be done in both the abstract and the text proper, since the abstract should be self sufficient, as noted in Chapter 1.

Symbols. Chemical symbols may be used freely in tables and graphical material. In general, clarity to the reader is the controlling rule with these. In text, they should be avoided when they constitute only a general reference.

Preferred: The barium compounds and the nickel
and iron alloys were . . . . . .

Not preferred: The Ba compounds and the Ni and Fe
alloys were . . . . . .

Symbols for isotopes, using superscript numerals, may be freely used in text.

Preferred: . . . . . consisting of Ba^{36} and Fe^{23}.

Not preferred: . . . . . consisting of Ba-36 and Iron-23.

Trade names, code names, or shoptalk terminology for chemical compounds and special materials should be avoided, unless the name is in general use or adequately defined in the text.

Allowed: The TNT equivalent . . . . . .

Not preferred: The GSAP was used throughout. The GSAP recorded . . . . . .

The latter statement should read:

The gun-sight-aiming-point (GSAP) camera was used throughout. The GSAP camera recorded . . . . . .

Symbols such as " for inch, ' for feet, % for percent, and # for number or pounds should not be used in either text, tables, or graphical matter. An exception is the dollar sign, $.

NUMERALS

Numerals may be freely used in tables and graphical material. In the text, spell out numbers under 10, except (1) when fractions or decimals are involved: 1.2 cm, $3\frac{1}{2}$ feet; (2) when followed by a definite unit of measure: 3 msec, 5 feet; and (3) when following a specific title: Chapter 5 or Figure 2. A sentence must not begin with a numeral—spell it out.

Spell out numbers of less than 100 preceding a compound modifier containing a figure:

The project used twenty-one 5-inch rods.

In a series of closely placed numbers, if one must be a numeral use all numerals:

The setup included 245 men, 5 trucks, and 7 tractors.

Commas should be used in numerals denoting quantities of 1,000 and up, except for dates, serial numbers, etc.

Always precede a decimal point with a zero for numbers less than one—for example, 0.647. Add zeros after a decimal point only when it is desired to show the number of significant figures involved, or the degree of accuracy—thus, 2.000 inches denotes 2 inches accurate to 0.001 inch.

A string of zeros in large, round numbers is undesirable: $4.3 million, rather than $4,300,000. The same applies to very small or very large scientific quantities: 3.2×10^{-9} mg, rather than 0.0000000032 mg; and 4.5×10^{13} dis/min, but not 45,000,000,000,000 dis/min.

CAPITALIZATION

The following are the preferred rules for capitalization in test reports:

. . . proper names, the first word of each sentence, and the first word of every complete, formal, direct quotation;

. . . first and last words, and all intervening principal words in column headings in tables, secondary subheadings, formal titles of documents, and entries in the reference list;

. . . terms such as figure, table, reference, chapter, section, curve, column, equation, appendix, station, class, etc., when these words are followed by a number of letter designation, e.g., Table 3.1, Reference 15, Curve A, Appendix C, etc.;

. . . agency abbreviations (DASA);

. . . such words as street, company, mountain, island, north, etc., only when they form part of a proper name (Elm Street, North America, etc.);

. . . the first letter only of military code names when used in reports (Operation Redwing, Site Elmer, Shot Cherokee—rather than Operation REDWING, Site ELMER, Shot CHEROKEE).

COMPOUNDING OF WORDS

The modern American style of compounding should be used as given in Reference 2. In general, avoid hyphenating permanently compounded words, e.g., nonreflective, cooperation, subbase, reinforced concrete, overall, percent, fireball, fallout, reentry, posttest, and centerline. Use the hyphen in temporary compounds and unit modifiers, e.g., depth-dose measurements, fine-grained material. The exception is with adverbs ending in "-ly", e.g., finely ground material.

Use care to hyphenate words compounded as unit modifiers to distinguish them from parallel modifiers. For instance, the following statement has two different meanings depending upon whether or not the hyphens are used:

the steel and copper tubes

the steel-and-copper tubes

The former refers to a number of steel tubes and a number of copper tubes. The latter (with the hyphens) refers to a number of tubes in which each tube is made of steel and copper. In many cases such distinction is important.

SPELLING

Generally, the simplest and most phonetic spelling for terms that have more than one widely accepted spelling are to be used in DASA reports (see Reference 2).

Preferred:	aline, analog, catalog, disk, gage, gray, mold, sulfur, toward
Not preferred:	align, analogue, catalogue, disc, gauge, grey, mould, sulphur, towards

In general, the guide for spelling of words is Reference 3.

TABLE 3.1 ABBREVIATIONS

NOTE: Dash in "Abbreviation" column indicates term should not be abbreviated in text.

acceleration, gravity	g
acre	—
-feet	acre-ft
alpha particle (text)	—
alpha particle (tabular, graphical)	α
alternating current	ac
ampere	—
-hour	amp-hr
Angstrom unit	Å
average	—
at	—
absolute	—
bel	—
bar	—
barn	—
beta particle (text)	—
beta particle (tabular, graphical)	β
British thermal unit	Btu
per hour	Btu/hr
per square foot per second	Btu/ft^2-sec
billion electron volts	Bev
candle	—
-hour	candle-hr
power	—
calorie (small)	cal
per square centimeter	cal/cm^2
per square centimeter per second	cal/cm^2-sec
per minute	cal/min
per second	cal/sec
per hour	cal/hr
Calorie (large = 1,000 cal)	kcal
centimeter	cm
-gram-second	cgs
per second	cm/sec
per second per second	cm/sec^2
circular mil	cir mil
coulomb	—
counts per minute	counts/min
cubic	—
centimeter	cm^3
foot	ft^3
inch	in^3
meter	m^3
millimeter	mm^3
mile	mi^3
kilometer	km^3
yard	yd^3
curie	—
per gram	curie/gm
cycle	—
per minute	cpm
per second	cps
day	—
decibel	—
degree (angular)	—
centigrade	C
Fahrenheit	F
Kelvin	K
Rankine	Ra
Reaumer	R
Baume'	Be'
detonation time plus X hours	H + X hours
detonation day plus X days	D + X days
diameter	—
direct current	dc
dollar	$
dozen	—
disintegrations	dis
per minute	dis/min
dyne	—
-centimeter	dyne-cm
east (text)	—
east (tabular, graphical)	E
electromagnetic unit	emu
electromotive force	emf
electron volt	ev
electrostatic unit	esu
farad	—
figure	—
foot (feet)	—
per second	ft/sec
per second per second	ft/sec^2
per minute	ft/min
-candle	ft-candle
-pound	ft-lb
-ton	ft-ton
-lambert	ft-L
frequency	—
fissions	—
per second	fis/sec
per minute	fis/min
gallon (text)	—
gallon (tabular, graphical)	gal
per day	gal/day
per hour	gal/hr
per minute	gal/min
gamma ray (text)	—
gamma ray (tabular, graphical)	γ
gauss	—
grain	—
gram	—
per square centimeter	gm/cm^2
per cubic centimeter	gm/cm^3
-calorie	gm-cal
-molecular-volume	gmv
gross	—
ground zero (text)	—
ground zero (tabular, graphical)	GZ
height	—
henry	—
high explosive	HE
horsepower	hp
-hour	hp-hr
hour	—
inch	—
per second	in/sec
-pounds	in-lb
inside	—
joule	—
kilo-	k
cycle	kc
gram	kg
gram per second	kg/sec
gram-meter	kg-m
calorie	kcal
liter	kl
megawatt	kMw
electron volt	kev
meter	km
ton	kt
volt	kv
volt-ampere	kva
watt	kw
watt-hour	kw-hr
knot	—
lambert	L
left	—
length	—
line	—
liter	—
per minute	liter/min
per hour	liter/hr
lumen	—
per watt	lumen/w
-hour	lumen-hr
magnetomotive force	mmf
mark	—

TABLE 3.1 CONTINUED.

maximum (text)	—
maximum (tabular, graphical)	max
maxwell	—
mean effective pressure	—
mega-	M
cycle	Mc
volt-ampere	Mva
watt	Mw
ton	Mt
megohm	—
meter	—
per second	m/sec
-kilogram	m-kg
micron	—
micro-	μ
ampere	μa
curie	μc
farad	μf
gram	μg
henry	μh
inch	μin
micron	μμ
second	μsec
millimeter	μmm
volt	μv
watt	μw
microfarad	μμf
mil	—
mile	—
per hour	mph
per gallon	mi/gal
per second	mi/sec
milli-	m
ampere	ma
-Angstrom	mÅ
bar	mb
barn	—
curie	mc
gram	mg
henry	mh
lambert	mL
liter	ml
meter	mm
micron	mμ
second	msec
roentgen	mr
roentgen per hour	mr/hr
roentgen per second	mr/sec
volt	mv
watt	mw
million electron volts	Mev
minimum (text)	—
minimum (tabular, graphical)	min
minute	—
modulus of elasticity	—
modulus of shear	—
month	—
nautical mile	naut mi
neutron (text)	—
neutron (tabular, graphical)	n
per square centimeter	n/cm^2
north- (text)	—
east	—
west	—
north- (tabular, graphical)	N
east	NE
west	NW
number (used alone)	—
Number (followed by a numeral)	No.
ohm	—
-centimeter	ohm-cm
ounce	—
-inch	oz-in
-foot	oz-ft
percent (text)	—
percent (tabular, graphical)	pct
per (text)	—
per (when compounding units)	/
pi	π
point	—
pound (text)	—
pound (tabular, graphical)	lb
per square foot	psf
per square inch	psi
per square inch absolute	psia
per square inch gage	psig
per cubic foot	pcf
per horsepower	lb/hp
pressure	—
page	—
paragraph	—
part	—
pint	—
quart	—
radiological	—
radius	—
radian	—
reference	—
revolutions	—
per minute	rpm
per second	rps
right	—
roentgen	r
equivalent man (mammal)	rem
equivalent physical	rep
equivalent man per hour	rem/hr
per hour	r/hr
per day	r/day
root mean square	rms
second	—
section	—
shake	—
south- (text)	—
east	—
west	—
south- (tabular, graphical)	S
east	SE
west	SW
specific gravity (text)	—
specific gravity (tabular, graphical)	sp gr
square	—
centimeter	cm^2
foot	ft^2
inch	in^2
kilometer	km^2
meter	m^2
mile	mi^2
millimeter	mm^2
yard	yd^2
standard	—
station (text)	—
station (tabular, graphical)	Sta
steradian	—
table	—
temperature	—
thermonuclear	—
trinitrotoluene	TNT
versus	—
volt	—
-ampere	v-amp
volume	—
watt	—
per candle	w/candle
-hour	w-hr
weight	—
west- (text)	—
west (tabular, graphical)	W
yard (text)	—
yard (tabular, graphical)	yd
year	—
zone of interior	—

chapter 4

format

This chapter is designed for use by both the author and his typist or editorial clerk as a guide to the mechanical preparation of the manuscript.

TYPING

Since manuscripts submitted by projects are not retyped by DASA before printing, it is important that project agency typists observe and practice the following procedures.

The text of the original manuscript should be typed at least double-spaced with wide margins (1 ½ inches minimum) on one side of standard, letter-sized, white bond paper. Single-spaced manuscripts, or those typed or printed on both sides of a page, will not be accepted for processing.

Tabular material and figure legends are the only material that may be single-spaced in the draft. Details on the format of tables are given later in this chapter; figure-legend presentation is described in Chapter 5.

Typists should check for proper syllabication of words divided between lines. Although syllabication is given in most dictionaries, Reference 4 is a better aid for finding correct wordbreaks, in addition to serving as a spelling guide. Its convenient size provides a time-saving reference source for over 19,000 words. Included are chemical, electronics, air, nuclear, automation, medical, space, and other terms in the technical vocabulary of the sciences. This publication is not available from DASA but can be obtained, at nominal cost, from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20301.

PREPARATION OF EXTRA COPIES

The number of copies of the manuscript required for review and publication processing will be made known in directives from DASA.

PAGE LAYOUT

Figure 4.1 presents the format for the title page. All information shown thereon is essential for proper handling and processing of the manuscript (see also "Title Page," in Chapter 1, for a discussion of author listing).

Figures 4.2 through 4.5 illustrate contents pages for the different approaches to main-body text organization discussed in Chapter 1: Figure 4.2 for the average test

report, Figure 4.3 for the short-form report, and Figures 4.4 and 4.5 for the complex report organized by parts and/or chapters.

Figure 4.6 presents two typical text pages designed to illustrate the typing requirements for text material.

Figure 4.7 illustrates the presentation of the reference list.

The comments which follow pertain to components of the report format.

Report Title. The title should be chosen on the basis of conciseness, tenets of good writing, and accurate description of the project's activities. The wording in the title should be UNCLASSIFIED.

Chapter Headings. For the average report, the wording used in the chapter headings should be as near as possible to that given in Figure 4.2. For more complex reports (as illustrated in Figures 4.4 and 4.5), the wording will depend on the subject matter of the chapters. In these latter cases, the chapter headings should be short and meaningful; it is not necessary to try to say everything in the heading. The following three versions of the same chapter heading illustrate this principle.

Poor:	FIELD TEST OF A NEW AND IMPROVED TECHNIQUE FOR INSTRUMENTATION OF DYNAMIC-PRESSURE INVESTIGATIONS IN THE 2- TO 4-PSI RANGE
Better:	TEST OF IMPROVED 2- TO 4-PSI DYNAMIC-PRESSURE INSTRUMENTATION
Best:	IMPROVED LOW-DYNAMIC-PRESSURE INSTRUMENTATION

The last example is sufficiently informative to lead the reader into the chapter; the rest of the wording in the first example is unnecessary, since the object of the chapter itself is to relate the details of the test. The heading need only be a clue to the content of the chapter.

Subheadings. Subheadings are a handy writing device for separating the main subject-matter areas within the chapter for the convenience of the reader. Essentially, the chapter headings and subheadings of a report should be no more and no less than a subject outline of the report—brief enough to be effective and yet complete enough to describe the subject matter. Used in this way, they are a valuable aid in making the progression of the text clear to the reader and making easy the task of looking up specific material in the contents.

Two types of subheadings may be used within a chapter: a primary subheading to indicate a major subdivision within a chapter, and a secondary subheading to indicate a major division within a primary subheading (see Figure 4.6). Further subdivisions are undesirable and cumbersome and usually only make the reader's job more difficult.

The headings should be short and informative. They should not be repetitious: In a chapter entitled "Procedure," a subheading like "Procedure of Instrumentation" is redundant, since merely "Instrumention" is enough to convey the significance of the subdivision.

An introductory paragraph or paragraphs at the beginning of the chapter need not have a subheading.

Just as a one-chapter report would be ridiculous, so is it bad practice to use only one primary subheading within a chapter, or only one secondary subheading under a primary subheading. There should be at least two such suitable subdivision points for either type of subheading.

Paragraphing. Ideally, each new area of thought should begin with a new paragraph; however, paragraphs should not run longer than about half a page when typed double-spaced. Long paragraphs, even when concerned with the same thought, make the text difficult to follow. Thus, it is good practice to start new paragraphs at likely points in the text. A short paragraph between longer ones is a valuable device for emphasis of a particular point. Paragraphs under a subheading are not numbered.

Itemization. The enumerated itemization of a series of words, phrases, clauses, sentences, or paragraphs is a writing device that is more often overused than used correctly. Because this device is used widely in government and military correspondence, directives, etc., does not mean that it is as applicable to good technical-report writing. Its real function is to emphasize a chronology or progression to the reader — no more.

Even in the case of the chapter on "Conclusions," where many short statements are often presented, arbitrary enumeration of statements is not necessary. Careful attention to the writing style (choice of words, paragraphing, sentence construction, etc.) is a more effective way of getting the point across, as well as enhancing readability.

When it is necessary to present a list of items or short statements (not appropriate to a table) within the text, the following form may be used when each item is less than a sentence in length:

> . . . . was found to have the following characteristics: (1) ease of operation, (2) low initial cost, (3) adaptability to other test situations, (4) no problems with field or organizational maintenance, and (5) an especially accurate response even when subjected to adverse weather conditions.

Use Arabic numerals in parentheses and appropriate punctuation around the items. If each item is a complete sentence, it should be initially capitalized and ended with a period. It is also important to maintain parallel grammatical construction of the items.

Footnotes. Footnotes to text may be used sparingly to clarify something in the text proper, although it is more desirable to present explanations or amplifications directly in the text. They should be avoided unless it is impracticable to present the information in any other way. Footnotes are not to be used in test reports for references.

References. All references used in the preparation of the draft manuscript should be listed on the last page of the report in the form shown in Figure 4.7. Enough information must be given to permit ease in reference. Include the author's name, document title, short title or file number, date of publication, publishing agency and address, and security classification (even if unclassified).

All documents listed must be referred to somewhere in the report, using the following form: "....(see Reference 20)" or just "....(Reference 20)" at the end of the pertinent text material; or when mentioning it within the text, "....the data presented in Reference 20 showed that...." The title or author of a reference should not be mentioned in the text itself; the reference list is the proper place for this information.

Not preferred: Jones and Smith have shown in their report on Thermal Effects that .....

Preferred: In Reference 20 it was shown.....

In most cases, the gist of the reference should be at least summarized in the text, so that the report will be as much an entity as possible for the reader.

EQUATIONS

The ordinary typewriter has no provisions for special spacing to set up mathematical equations and is usually not equipped with the Greek letters, mathematical signs, symbols, etc. that are necessary. Therefore, some of this material must be done freehand in the manuscript.

Figure 4.9 presents a sample equation and illustrates the format desired in reports; the mechanical problems of setting up the equations are illustrated on the figure. The following sections present additional information on how equation material can be best presented in the draft.

Use of Symbols, Superscripts, and Subscripts. These must be carefully chosen to insure clarity and good appearance in the published report. Because so many different scientific fields are involved in nuclear tests, it is impossible to set up a uniform series of symbols. The best that can be done is for the author to follow common sense and a principle of simplicity in selecting symbols, superscripts, and subscripts. Some of these principles are illustrated in the following paragraphs.

Avoid using capital letters in superscripts and subscripts.

Poor: $x_{AB} = T_M + a_R f^T$

Better: $x_{ab} = T_m + a_r f^t$

Best: $x_1 = T_1 + a_2 f^t$

There is seldom any need for the capital-letter sub- and superscripts; the lower-case style defines the information equally well. The best appearance for subscript material is attained through the use of numbers, rather than letters.

Do not fake Greek letters, plus signs, minus signs, and other special symbols with the ordinary typewriter; write them in freehand, unless the typewriter used for the draft is actually equipped with such symbols.

Poor: $\beta_{\mu} + \mu (w - \phi\eta) = W_{+\eta} + 1$

Better: $\beta_{\mu} + \mu(\omega - \phi\eta) = W_{+\eta} + l$

In the first example, it is difficult to be sure that beta (B), mu (u), plus (+), omega (w), minus (-), phi (ϕ), equal (=), and eta (n), are actually what are intended. Also, if a lower-case letter "l" is intended, it is especially important to write it in (l), since on an ordinary typewriter the numeral "1" is identical.

Exponential Functions. In notations involving an exponential function, both the following are correct; however, the nuclear-physics notation using "exp" is preferred, since it is an aid to composition and simplicity in the equation.

Not preferred: $W = 132 \times e^{-\frac{n}{2W + Q_Z}}$

Preferred: $W = 132 \times \exp\left(-\frac{n}{2W + Q_Z}\right)$

The "exp" notation is also best when the exponential function term must be used within the text, since it can be set on a single line.

Not preferred: The value of the term $e^{-\frac{n}{2W + Q_Z}}$ was found

Preferred: The value of the term exp (- n / (2W + Q_Z)) was found

Similarly, simple dividend-divisor quantities (within text) of any kind are best set on one line, using the style in the "Preferred" example above.

Definition of Terms. Because of the many scientific fields involved in nuclear tests, it is especially important that every term, symbol, subscript, etc., used in a given equation be thoroughly defined. Parameters as common in many different fields as density, frequency, mass, etc., have several different accepted symbols, depending on the particular scientific field involved. To avoid ambiguity, then, the writer should make careful use of the definition-of-terms format illustrated in Figure 4.9. This is also important when subscripts are used with a given term in order to give that term some special significance.

Solution of Equations. It is usually not necessary to show detailed numerical solution of equations. The exception might be where some special assumption or approximate solution was utilized that must be explicitly shown in order to prove the validity of the values obtained.

TABLES

Tabular material can be used for summarizing masses of related information and data. The design of a series of tables for a technical report is a task that should receive just as much attention as the writing of the text.

The mechanical rules for preparation of tables are covered in Figure 4.9. The following discussions are designed to amplify these rules and to present some principles designed to guide the writer in planning and organizing tabular presentations.

Preparation. Tabular matter is prepared in typewritten form. A separate sheet is used for each table. Wherever practicable, use letter-sized sheets. Larger sheets should be folded to letter-sized proportions before they are inserted in the manuscript.

The usual text margins of 1½ inches all around should be considered as a minimum for tabular work, no matter what size of sheet is used.

The typewritten originals should, of course, always be submitted as part of the ribbon, or master, copy of the text material.

In the case of a long table, it is preferable that it be typed on one large sheet, rather than stringing it out over several smaller sheets. This allows more convenient reference during review and editing, as well as saving the author's typist considerable time in repeating column headings, alining columns, etc.

NOTE

> The writer must take extreme care in preparing and checking tables. The agencies responsible for technical and editorial review have in many cases no way of telling whether or not the tabular material is correct. The author should carefully proofread each table before submitting his manuscript.

Placement in Manuscript. When the draft manuscript is assembled, the tables should be grouped at the end of the chapter to which they belong, for ease of editing and review, e.g., between the last page of a given chapter's text and the grouping of artwork. Since, as stated before, all tables—even short ones—are each typed on a separate page, no tables should appear within the text of a draft manuscript. In the short-form report (not organized by chapter) the tables should be grouped at the end of the main-body text.

Planning Tabular Presentations. There are some basic criteria that the author should keep in mind when planning a series of tables for a report. These are presented and discussed in the following paragraphs and have one objective in common: making the report easier to read, understand, and use. These discussions are concerned with principles—not rules—since the appropriateness of a given tabular presentation will vary from report to report, depending on the subject matter. The rules of format and style for tables—primarily a mechanical matter—are presented in Figure 4.9.

Use a Table to Present a Quantity of Information that Lends Itself to Itemization or Listing. A properly organized table is a more effective way of presenting data or information than, for example, listings or long word descriptions within or set out from the text—assuming, of course, that the quantity of material is sufficient to warrant a table. Appropriateness to tabular presentation is often determined by the quantity of information that must be presented, e.g., it is foolish to include a table which contains only the yield of two or three shots, or perhaps three or four data values. It is almost always possible to find a more appropriate place within the text or another table in which to present such small, isolated bits of information. In general, common sense and some thought on how the report might be used by a reader will help to indicate the best approach to a tabular series.

Concentrate Similar Tabular Material in a Single Table, Rather Than in Several Shorter Ones. A common fault in preparing tabular material is to break up similar data into several tables, the tables differing only, for instance, by shot or instrument station. Wherever possible, such similar tabular information should be concentrated in one table, even if such a table must be a few pages in length. If this is done, then comparisons of information and general utility to the reader are enhanced.

Correct Use of Notations Involving Powers of 10 Improves Numerical Listing in Tables. The notation "$\times 10^{n}$" is common enough in scientific work and usually correctly used in text material. However, care must be taken in certain applications of this notation to tabular matter, in order to avoid ambiguity or misleading impression to the reader. A typical set of columnar entries might be as follows:

Bending Moment in-lb
36,500,000
6,400,000
22,000,000
1,430,000
321,000,000

In this example, the large numerical size of the data necessitates many zeros, and makes the information harder than necessary to read. Appropriate use of powers of 10 would improve the column. One of the following notations might be used—two that are ambiguous and should be avoided, and two that are correct.

Ambiguous:	Ambiguous:	Correct:	Correct:
Bending Moment	Bending Moment	Bending Moment	Bending Moment
in-lb × 10^6	in-lb × 10^{-6}	10^6 in-lb	in-lb
36.5	36.5	36.5	3.65×10^7
6.40	6.40	6.40	6.40×10^6
22.0	22.0	22.0	2.20×10^7
1.43	1.43	1.43	1.43×10^6
321	321	321	3.21×10^8

In the first ambiguous example, the notation for the unit of measure reads, literally: "inch-pounds multiplied by one million"; does this mean that the value 36.5, for instance, has already been multiplied by one million? Or, should it be multiplied by one million? (Is the true value 0.0000365 or 36,500,000?) In the second example, the same kind of ambiguity results. In the third example, the notation for the unit of measure reads literally "millions of inch-pounds"; this means that the first value, for instance, is 36.5 "millions of inch-pounds," which is correct. This form of the notation is most applicable when it is desired to point up a comparison of the values in the columns. The fourth example shows good use of the "$\times 10^n$" notation, but should be used only when it is desired to emphasize the accuracy to which the instrument used could be read, e.g., it indicates that an instrument was used which could be read to hundredths and which had scale settings that read in millions, tens of millions, and hundreds of millions. The notation used in the third example is preferred from the standpoint of ease of composition and clean appearance of the table; the fourth example is applicable in the special case where emphasis of the instrument accuracy is the more important consideration.

Use the Text to Amplify, Discuss, and Explain the Tables, Not Just to Repeat What Appears in the Table. The function of a table is to condense and thereby efficiently present a quantity of information. Therefore, repeating such information in the text is unnecessary. Rather, the text should be the writer's medium for explaining the significance of the tabular data, calling the reader's attention to special facts, making important comparisons, etc. From this, it is obvious that each table must be referenced somewhere in the text. If a table cannot be so referenced, it really does not belong in the report. Similarly, it is usually redundant to repeat the same data in both a table and a figure. An exception to this might be when a smooth curve appears on a graph, but where the actual values of the data need to be available to the reader and are so complex as to make actually showing them on the graph physically difficult. In this case, the smooth curve and a table of the values might be appropriate. (Chapter 5 discusses the problem of presenting complex data on graphs.) Lastly, the order of reference to a series of tables must be in numerical sequence throughout a given chapter, for utmost utility to the reader, e.g., avoid making the first text reference to Table 3.6, the next to Table 3.2, etc.

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SHOT WINGER

PROJECT OFFICERS REPORT — PROJECT 0.0

EFFECTS OF THERMAL RADIATION ON FIELD MICE (U)

SAMPLE

C.F. Doe, Capt, USAF, Project Officer
P.R. Johnson

U.S. Research Laboratories
Bear Proving Ground, Oregon 00000

GROUP
(for classified report)

December 1965

[redacted]

Handle as Restricted Data in foreign di[illegible] semination. Section 144b, Atomic [illegible]gy Act of 1954.

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This document is the author(s) report to the Director, Defense Atomic Support Agency, of the results of experimentation sponsored by that agency during nuclear weapons effects testing. Accordingly, reference to this material must credit the author(s). This report is the property of the Department of Defense and, as such, may be reclassified or withdrawn from circulation as appropriate by the Defense Atomic Support Agency.

[redacted]

1

Figure 4.1 Sample title page. All information indicated is necessary for efficient processing of the draft manuscript. The report number should be inserted, as appropriate. Security-classification markings should be stamped on in accordance with applicable regulations. Note that the Project Officer's name should appear at the head of the listing of authors. If more than one agency is involved, the name of each should appear, along with complete address and ZIP code.

CONTENTS

Figure 4.2 Sample contents page illustrating a chapter organization for an average test report. More subheadings within the chapters will of course usually appear, but the basic chapter breakdown shown here should be appropriate for most reports.

[redacted]

CONTENTS

Figure 4.3 Sample contents page for the short-form report (i.e., not organized by chapters). No section numbers are necessary in such short reports; subheadings alone are sufficient. The subheading organization approximately parallels the chapter organization of Figure 4.2.

CONTENTS

FIGURES

Figure 4.4 Sample contents page for a complex report divided into parts and chapters. Each part is a separate but related report organized similar to Figure 4.2. Prefatory material (Abstract, Preface, Contents), any appendixes, and the reference list are presented to embrace the whole report—not individually for each part. If there are several parts (say, four or more), it is good practice to present an introductory part and a final summary part to tie together the report. These may be short, but should be in enough detail to present overall objectives, correlations, and general conclusions. This type of organization is appropriate, for example where the work of separate projects is related enough to be best published under one cover.

CONFIDENTIAL

CONTENTS

CONFIDENTIAL

Figure 4.5 Sample contents page for a complex report in which each chapter covers a different subject matter. An introductory chapter and a final summary chapter should be included to tie together the report. As in Figure 4.4, the prefatory and appended material must embrace the whole report and not be presented individually for the various chapters. This organization is applicable, for example, when a project has several distinctive subdivisions of effort, all necessary to satisfy the basic objectives of the project.

CHAPTER 2

PROCEDURE

The tests were so scheduled that all could be included on each of two shots, with the second shot to be used if duplication was necessary. Primary participation was on Shot Winger, with Grumpus the alternate.

2.1 OPERATIONS

Instrumented dummies were utilized as test subjects for the field phase of the project. Forty-six dummies were utilized and were of the same type utilized by Project 4.1. The dummie were utilized in groups, as noted in the following sections.

2.1.1 Thermal Protective Creams. One flashburn cream for the hands and face, water in oil (QMC 305X), was evaluated at a thickness of 1/16 inch in quadruplicate at two radiant-exposure levels: 14.5 and 24 cal/cm^2. For protection against the weather, the eight dummies used were clothed in a uniform.

2.1.2 Hot-Weather Uniform Ensembles. Two hot-weather clothing ensembles of improved design were compared with the control hot-weather uniform at 10, 14.5, and 21 cal/cm^2. Thirty-six dummies in uniform ensembles were placed in racks

and exposed at [illegible]red energy levels. The following ensembles were used: (1) hot-weather control uniform, (2) experimental hot-weather uniform with 50-percent wool underwear over tee-shirt fabric, and (3) experimental hot-weather uniform with a spacer fabric.

The control uniform was that previously tested during Operation Grundy.

This ensemble, designated as HW-C, consisted of an outer layer (cotton, poplin, 5 oz/yd^2) and an inner layer (cotton, tubular knit, 3.2 oz/yd^2). These materials are thoroughly discussed in Reference 4.

2.2 INSTRUMENTATION

The instrumentation necessary was provided by the Doakes Research Laboratory (DRL). At two stations, 6.5 and 14.5 cal/cm^2, DRL recording calorin[illegible]eters and radiometers were mounted normal to the radiation (Figure 2.1). At all five stations, DRL foils were used as passive receivers in duplicate and were selected to bracket the desired energy levels.

Table 2.1 summarizes the placement, type, range, and function of the various instruments used.

2.2.1 Damage Evaluation. Following exposure, evaluation was

1. Page Margins. Use 1½ inches minimum all around the page.

2. Security Marking. Stamp TOP SECRET, SECRET, or CONFIDENTIAL at top and bottom of each page. Stamp RESTRICTED DATA, or FORMERLY RESTRICTED DATA at the bottom only of each page if the report contains such. For official-use-only reports, stamp FOR OFFICIAL USE ONLY at the top and bottom of the title page only—no other markings are required. For unclassified reports, no stamping is required. The title page requires special treatment for classification markings (see Figure 4.1). Do not stamp photographs, or rough or final drawings in this manner (see Chapter 5 for marking artwork).

3. Text Typing. Type double spaced—never single spaced—on one side of letter-sized (about 8- by 10½-inch) white paper. Only tables, figure legends, and the Contents may be single spaced.

4. Chapter Number and Heading. Type at center, top of page in all capitals. Number chapters with Arabic numerals consecutively throughout report, even when report is divided into parts. Start each chapter on a new page.

5. Primary Subheading. Type flush left, all caps, triple-spaced below preceding text, and double-spaced above following text. Number them consecutively throughout a chapter and relative to the chapter, e.g., 3.1 the first primary subheading in Chapter 3, then 3.2 the second, 3.3 the third, etc. When a runover line is necessary, single-space it and indent it 10 spaces from the left margin.

6. Secondary Subheading. Indent 5 spaces, caps and lower case, underlined, followed by a period, and run in with following text. Number them consecutively under the primary subheading where they appear and relative to the chapter: e.g., 3.1.1 is the first secondary subheading under primary subheading 3.1 in Chapter 3, then 3.1.2 is the second, 3.1.3 the third, etc.

7. Paragraphing. Indent all paragraphs 5 spaces. There may be any number of unnumbered paragraphs under a primary or a secondary subheading, or in a chapter. In addition, a chapter need not begin with a subheading—an introductory paragraph or paragraphs at the beginning of a chapter is in the best writing style.

8. Pagination. Number the title page as Page 1, and number all succeeding pages consecutively throughout the report. Paginate each separate sheet containing artwork or tables just as they fall in the manuscript.

9. Itemization within Text. Number short items with Arabic numerals in parentheses, and run them in with the text. Do not indent or otherwise set out these short listings.

For items of paragraph length, indent the first line of each item 5 spaces. Carry runover lines out to the lefthand margin. Use only Arabic numerals followed by a period for enumerating them—further breakdowns using letters, etc., are not allowed. See Page 23 for a discussion of when such itemization is appropriate.

ADDITIONAL FORMAT RULES

Title Page. Standard format required in all reports. See Figure 4.1.

Abstract. Start on a separate page. Type ABSTRACT at the center top of the page in all caps. Use a simple paragraph organization without subheadings. Do not use tables or figures in the abstract. All other style and format rules apply (double spacing, etc.).

Preface. Same as Abstract.

Foreword. Not prepared by author—written and added by DASA.

Contents. See Figures 4.2, 4.3, 4.4, or 4.5, depending on the type of organization used in the main body of the report.

Appendixes. Same rules as for chapters, except that the chapter number is replaced by the appendix letter in noting subheadings, table numbers, figure numbers, and equation numbers: e.g., A.1 or A.1.1 for Appendix A, and B.1 or B.1.1 for Appendix B, etc. Start each appendix on a new page.

References. Start on a new page. See Figure 4.7 for format.

Short-Form Reports. In this type of organization (illustrated in Figure 4.3) the main body is divided by subheadings rather than chapters. The subheading style is the same as for chapter reports, except that numbering of the subheadings is omitted. In addition, the report title should be typed in all caps at the center top of the first page of the main-body text. Prefatory material, appended material, and other rules of format (double spacing, etc.) are the same as in the chapter report.

Reports Divided by Parts. All format rules are the same as for the ordinary chapter report, except that the part title is typed in all caps at the center top of the page which begins each new part. The part title is also entered in the Contents (see Figure 4.4).

Footnotes to Text. Avoid except when absolutely necessary. When used, number them with superscript Arabic numerals at the point of reference in the text and in front of the footnote. Type the footnote double spaced at the bottom of the page on which it appears. Separate it from the text by triple spacing and a line about 3 inches long starting at the left margin. Number consecutively throughout the chapter starting with "1" for the first footnote in each chapter or appendix. In short-form reports, number them consecutively throughout the main body, but start with footnote "1" again for each appendix. Do not use footnotes in the Abstract or Preface.

Figure 4.6 Sample text pages and rules for typing format. Note the specific requirements for at least double spacing and wide margins—single-spaced manuscripts are unacceptable.

REFERENCES

1. J. Doe and others; "Gamma Exposure Rate versus Time (U)"; Project 2.2, Operation Wing Ding, WT-9999, January 1960; U.S. Research Laboratories, Bear Proving Ground, Oregon; Secret Restricted Data.

2. R. Doakes; "Photographic Dosimetry of X- and Gamma Rays"; Handbook 9, August 1956; Page 20; U.S. Department of Space, Washington, D.C.; Unclassified.

3. "Handbook of Construction Products"; 1955; Doe Products, Inc., Doetown, Ohio; Unclassified.

4. Barner Research Laboratory, Barner, Nevada; Letter to: U.S. Research Laboratories, Bear Proving Ground, Oregon; Subject: "Earth Motion Information"; 7 January 1966; Unclassified.

5. R. Doe; "Testing for Engineers"; First Edition, 1953; John Doakes and Sons, Inc., New York, N.Y.; Unclassified.

6. R. Doakes and others; "Velocities for Particles"; Journal of Research, January 1963, Vol. 36, No. 1, Pages 6-9; American Research Society, Doeville, Virginia; Unclassified.

Figure 4.7 Sample reference list. Samples No. 1, 2, and 3 are for reports or handbooks, No. 4 is for correspondence or memorandums, No. 5 is for a formal book, No. 6 is for an article in a periodical. Include all information necessary to actually obtain the document listed and its security classification—including "Unclassified." If there are more than three authors, list the first one followed by "and others"; if there is no author, begin the reference entry with the document title. If the title of the document is itself classified, insure that the classification of such a listing is no higher than the classification of the report.

became apparent, a different analysis to more accurately determine the gust loading on the aircraft was derived:

$$\frac{G_i}{\sigma S \bar{c}} = \sum_{1}^{m} \frac{W}{\sigma S \bar{c}} \left[f_i^2 + 2 f_i \mu_{j'} + \left(\mu_{j'} \frac{W}{} \right)^2 + \frac{\mu_{j'}}{W} \left(2 f_i \mu_{j'} - \ell \mu_{j'}^2 \right)^{1/2} + \left(\mu_{j'} \sin\sigma \exp\left(- \frac{2 f_i}{\mu_{j'} \bar{c}} \right) \right) \right]^{0.32\ell} \qquad (2.2)$$

Where: G_i = generalized mass, ft-lb/sec^2, (mass center at Station i)

σ = angular deflection of control surface, degrees

m = dynamic mode

S = wing area, ft^2

$\bar{c}$ = wing mean aerodynamic chord

W = weight of aircraft, pounds

f_i = normalized deflection at Station i, inches

$\mu_{j'}$ = mass unbalance term calculated for Station j'

ℓ = chord length, inches

The equation was solved for the various conditions of effects in flight encountered during the shot, using the technique described in Reference 12.

Figure 4.8 Sample text page illustrating techniques for presenting equations in draft manuscripts. Note the ample spacing, breaking of multiple-line equations before a plus (or minus) sign, complete definition of terms, and the hand-written Greek letters and other special symbols. If the equation is numbered, the number is typed flush right and even with the last of the equation.

TABLE 3.1 SUMMARY OF PEAK LOADS, SHOT GRUMPUS

All values corrected for instrument error. NA, not available; NS, not significant.

Station	Initial Tension	Elongation	Radiant Exposure	Bending Moment	Percent of Ultimate Stress Attained[a]	
					Peak	Duration
	pounds	10^{-3} inches	cal/cm^2	10^6 in-lb	pct	msec
30-Degree Upper Suspension System[b]:						
20.034	397	NS	NS	0.2	NS	—
23.036	1,378	NA	2	1.7	NA	—
21.037	NA	—	—	—	—	—
22.001	1,487	1.5	3	2.6	11	11
24.387	1,697	0.4	4.2	22.9	15	14
45.929	321	2.0	12	24.5	5.8	19
46.857	1,623	3.5	14	31.9	13.9	26
51.928	3,921	5.3	15.5	16.5	18	31
52.367	1,265	6.5	9.9	6.65	28	14
28.267	312	8.8	0.5	0.139	27	25
35.837	NA	9.6	11	21.0	—	—
27.376	NS	11	15	110	—	—
29.367	1,927	14	3.6	134	16	4
Horizontal Center Support (14 WF @ 18.2):						
31.621	798	1.2	2	1.6	NS	—
33.542	1,563	3.3	11	22.3	14	11
34.002	1,230	6.1	8.9	5.67	27	24
35.739	1,569	0.7	3.9	21.134	17	15
37.841	462	7.5	0.7	0.989	26	23
39.597	NA	8.3	12	18.3	—	—
40.589	NS	9.7	11	21.9	—	—
41.326	1,266	6.7	9.1	6.95	31	16
42.537	1,311	1.9	4.5	23.71	19.4	13
43.986						
Main Posts (10 I @ 16.6):						
24.233	1,497	5.8	0.8	0.111	30.2	11
25.345	296	NS	NS	0.7	NS	—
26.598	NS	12	14	113.9	13.4	37
27.743	498	8.9	0.8	0.345	25	19
28.937	NA	9.4	12	22.5	—	—
29.112	NS	12	15	18.1	32.3	19
30.876	323	5.1	18	7.4	18.4	12
31.927						

[a] Basic ultimate-stress value, 88,000 psi, based on average of 10 laboratory specimens.
[b] Entire system, made of angles, rods, and webbing (see Figure 2.4) considered to act as a unit.

TABLE 3.3 ATMOSPHERIC CONDITIONS AT TIME OF SHOT

Visibility was unrestricted for all shots.

Shot	Date	Ground Zero Pressure[a]	Pressure at Flight Altitude	Temperature at Ground Zero	Temperature at Flight Altitude	Humidity at Ground Zero	Humidity at Flight Altitude
		mb	mb	°F	°F	pct	pct
Gumbo	28 May	867	602	65	27	40	61
Noodle	5 July	875	483	70	18	19	Missing
Consomme	15 July	864	593	74	38	20	13
Split-Pea	24 July	865	601	70	34	22	29

[a] Uncorrected for instrument error.

TABLE 3.3 ATMOSPHERIC CONDITIONS AT TIME OF SHOT

Visibility was unrestricted for all shots.

Shot:	Gumbo	Noodle	Consomme	Split-Pea
Date	28 May	5 July	15 July	24 July
Ground Zero Pressure[a], mb	867	875	864	865
Pressure at Flight Altitude, mb	602	483	593	601
Temperature at Ground Zero, °F	65	70	74	70
Temperature at Flight Altitude, °F	27	18	38	34
Humidity at Ground Zero, percent	40	19	20	22
Humidity at Flight Altitude, percent	61	Missing	13	29

[a] Uncorrected for instrument error

TABLE 4.1 DAMAGE TO SKIN AND ENSEMBLE

Station	Radiant Exposure	Damage to Skin	Damage to Uniform
	cal/cm^2		
58-SS-3	24	Large area 5.	Poplin destroyed, tee shirt partially destroyed and carbonized, shield destroyed.
58-SS-4	24	Flame burned large area under uniform, 2 to 3 on bare skin.	Uniform and shield totally destroyed. No uniform recovered.
75-SS-1	14.5	Background 2 on rib pattern, small area 3.	Shield destroyed, uniform intact, evidence of debris from shield being blown against pig and ensemble.

(1) Table Number and Caption. In chapter reports, number table relative to chapter or appendix in which it appears: e.g., Table 3.1 is the first table in Chapter 3, Table 3.2 the second, 3.3 the third, etc.; or, Table A.1 the first in Appendix A, A.2 the second, etc.

In short-form reports, number the main-body tables consecutively (1, 2, 3, etc.) throughout the report; however, still number the appendix tables relative to the appendix in which they appear (A.1, A.2, etc.).

Type the caption in all caps, started flush with the left margin of the table. Runover lines are indented 10 spaces from the left and single-spaced.

Table captions should be kept short, avoiding unnecessary or redundant words. The complete table caption is entered in the Contents.

(2) General Note. If used, type it single-spaced, in sentence form (initial cap and lower case), spaced between the caption and the table proper.

Do not use this device for an interpretation or discussion of the tabular material—this belongs in the text proper. It may be used to make a comment relative to the whole table (as compared with specific comments presented as footnotes), to define special abbreviations, explain the organization of the table, give references for source material, etc. It is also a handy device to keep the table captio- -used thus, it may be thought of as an explanatory sub-caption.

(3) Standard Column Headings. Type in caps and lower case, with code names or abbreviations in their standard text form. These need not be centered in the column, but may be typed flush to the left boundary of the column to allow the most efficient use of typewriter tabs.

They should be kept short. Arbitrary abbreviations should never be used unless they are defined. Column headings should not be subdivided unnecessarily, and columns should not be numbered unless numbering has a particular significance.

(4) Long Column Headings. If long column headings are necessary, they may be typed in vertically. If one must be vertical, then all should be vertical. This device should be avoided, except when there is no other way to present the information. Inverting the table, with the parameters in the left-hand column, will often solve this problem—as in sample Table 3.3, above.

(5) Ruling. For most tables it should be necessary to rule only horizontally, using the underline key of the typewriter, if a careful job of column spacing has been done. Such ruling should enclose only the column headings and the bottom of the table proper (i.e., the footnotes and general note, if any, should be outside the rules).

If the table is very c- -lex, more ruling might be necessary—readability is the most important criterion. In preparing tables, preruled sheets may be a convenience to the author—acceptable practice as long as other rules for tabular style are complied with.

(6) Units of Measure. Type at the top of the column below the rule, double-spaced above the data in the columns. Use the standard text abbreviation wherever possible.

For an inverted table, as in sample Table 3.3, the units of measure appear on line with the parameter, separated from it by a comma—never in parentheses.

See Page 44 for a discussion of the use of powers of 10 in the unit of measure to avoid bulky numerical entries in the columns.

(7) Spacing. In long tables of single-spaced numerical or symbolic matter, arbitrarily double-space every fifth or sixth item. Tables containing word statements should have each item single spaced, with double-spacing between the items. Or double-spacing may also be used if the left-hand column has natural breaks in it

(8) Internal Headings. To avoid many short tables of similar data, differing only by shot, for instance, use a single table but differentiate the material by internal headings. These are typed flush to the left margin of the table in caps and lower case. This device is desirable whenever more than one set of data must be presented which could appear under the same column headings.

(9) Column Alinement. Data of One Class. If the column contains data defined by the same unit of measure: aline on the decimal point, or align on the times sign if varying powers of 10 must appear throughout the column.

Never aline plus signs, minus signs, and the like in a column alined by decimal points.

(10) Column Alinement. Data not Related by Class. If a column contains data of different units of measure (e.g., units of measure given in the left-hand column), type the column flush left.

Do not aline any other components of the column (i.e., times signs, plus-and-minus signs, etc.) in a column aligned on the left. Word statements should be alined on the left.

(11) Footnotes. Use superscript lower-case letters for footnotes to a table, starting with "a" for the first footnote. Start with "a" again in each new table.

Type footnotes single-spaced below the bottom rule of the table, using initial caps and lower case, and sentence punctuation when applicable. Do not use footnotes to define abbreviations or symbols if they are used often in the table; i.e., if "NA" has been used to mean "Not Applicable," then do not footnote NA—define it in a general note. As with text, footnotes should be avoided as much as possible, since they are a hardship on the reader if overused.

(12) Blank Spaces. Blanks in a table should be filled by a dash (two hyphens), or a footnote, or a symbol (such as "NA" for "Not Applicable").

A dash is always interpreted as meaning, literally, nothing. Thus, if the reader should know why a given point in a table has no entry in it (e.g., because of instrumentation failure, etc.), then this should be stated by a footnote or a symbol, or by a statement in a general note (if many blanks appear, all for the same reason), or by a statement in the table proper, if space permits.

Figure 4.9 Sample tables and rules for tabular format. Tables may be typed on any convenient-sized sheet of paper, with 1½-inch-minimum margins all around. Oversized sheets may be folded into the draft manuscript. A separate sheet is used for each table. Security-classification markings must be carefully placed to avoid obscuring any part of the table.

chapter 5

figures

Clarity and conciseness, the basic objectives in any report, can often be enhanced with figures (illustrations). If instruments were positioned at varying distances from ground zero, a map or sketch representing this is much easier to prepare and understand than several paragraphs of text. Similarly, schematic diagrams of instrument functions are often better than long text description. An obvious application of line or bar graphs is the representation of data relationships. Photography is sometimes applicable where pictorial records are the best means of conveying information to the reader.

SUBMISSION IN TEST REPORTS

The mode of submission of figures depends on the type of report: Pretest Report (PR), Project Officers Interim Report (POIR), or Project Officers Report (POR).

Pretest Report. The PR should contain as many figures as can be prepared before the test. This will usually be restricted to planned instrumentation, schematics of instrument operation, and similar material that does not depend on the outcome of the test itself. The PR is not published as such; therefore, the figures included with it may be in rough-draft form.

Project Officers Interim Report. Since the POIR is published, it should contain as many figures as are necessary to complement the text matter. Glossy photographs and the originals or sharp copies of all artwork should be submitted with the originial manuscript.

Usually, the DASA Reports Section will have at the Test Site a small illustrating staff whose main function is to help authors in the preparation of their artwork. Ordinarily, the author submits his rough drawings to the test-site DASA Reports Section, where the illustration staff will review the material, discuss any need for changes in presentation, and then arrange for production of final drawings suitable for the printing process.

The author should contact the DASA Reports Section early in the field phase of the operation, to lay out a schedule for submission of rough-draft artwork and completion of final material.

The author is responsible for completion of final artwork for the POIR.

After the POIR has been printed, the Test Command, DASA, returns the camera copy and artwork to the project agency. Usable (pertinent) text material and artwork that was included in the POIR can be salvaged for the POR. Pages or galley sheets can be renumbered for inclusion in the POR.

Project Officers Report. The POR is ordinarily written at the author's home office sometime after the completion of the field phase of the operation. The author is responible for the completion of final artwork and for the submission of glossy photographs and the originals or sharp copies of all artwork with the original manuscript.

Copies of any line artwork and a complete set of prints of any photographs used—made from the original negatives—should be submitted with each review copy of the report manuscript.

All original materials will be returned to the project agency immediately after printing and distribution of the report.

BASIC TYPES OF FIGURES

In technical reports, two basic types of figures are appropriate and commonly used: line and continuous tone. Line artwork is that material made up of pure-black details on a blank (usually white, or in the case of tracing cloth, light blue) background. An example is an ordinary graph done with india ink on tracing paper.

Continuous-tone artwork is made up of tones of gray, varying from almost pure white to almost pure black. A common example of this is a photograph.

The printing problem for each is somewhat different; both the author and the illustrator should be conscious of the difference in order to most effectively and economically plan and execute the illustrations for a report.

To reproduce line artwork, the printer need only photograph directly the original artwork and then prepare the printing plate. The printed page made in this manner exactly reproduces as black on white that which appeared as black on white in the original. With this in mind, the illustrator must pay close attention to matters of basic drafting techniques—line weight, lettering size, etc. These are discussed in detail later in this chapter under "Line Artwork."

To reproduce continuous-tone artwork, the printer must prepare a halftone negative before the printing plate can be made. Essentially, a halftone is made by placing a screen, or grid, in the printer's copying camera between the continuous-tone artwork and the film, so that the image is broken up into a series of small dots (usually about 120 to the inch). The size of the dots on the exposed film then varies as the depth in shade of the continuous-tone artwork varies. The printing plate made from such a halftone negative is made up of these various-sized dots, which pick up the ink and transfer the image to the paper.

Use halftones sparingly—only when the inherent shading of color is more informative than the sharply defined detail possible with line artwork. Line artwork is preferred for technical reports wherever it will do the job. Details on the selection and preparation of continuous-tone figures will be found later in this chapter under "Continuous-Tone Artwork."

LETTERING

On original drawings, lettering should be done with a mechanical device such as Leroy or Varigraph, used with black india ink. Labels reproduced on 12-point typewriter

will be acceptable on drawings that will not be reduced more than 40 percent. Freehand lettering should not be used.

Figure 5.1 gives a general indication of the size of Leroy lettering appropriate for different sizes of original artwork (see also "Size Determination" below).

The style and format for lettering on graphs should follow the sample graphs shown in Figures 5.2 through 5.4.

On the other hand, the lettering on drawings or sketches should follow the standard style for the technical field concerned: for example, a drawing of structural-steel members should be dimensioned and lettered in the usual structural-drafting style. Similarly, a map should be lettered according to appropriate standards of cartography.

LINE ARTWORK

Line artwork normally goes through two stages of preparation: the rough draft, and the camera copy that is used for printing. Usually, the author prepares the rough drafts while he is analyzing data and writing the text material; an illustrator or draftsman then prepares the camera copy, working from the rough draft.

The rough drafts should follow as closely as possible the format and style desired for the published material. The draftsman should have to do only a minimum of revision.

Thus, the main difference in rough-draft material and camera copy is in the drawing techniques employed: The rough draft may be in pencil, with freehand lettering; the camera copy must be in a more polished form suitable for printing, e.g., done with india ink and mechanical lettering, such as Leroy, 12-point typewriter, etc.

Illustrating Technique. Whenever line-artwork camera copy is being prepared for use in the printing process, certain illustrating techniques should be followed to insure the best reproduction.

All lines must be sharp and black on a clean, white or light-blue background. The best method of achieving this is to use a high-quality india ink on tracing vellum. Tracing cloth is even better, since ink will chip off of some papers; however, tracing cloth requires more professional techniques to avoid running of inked lines. A good grade of white bond paper is acceptable if vellum or cloth unavailable.

Weak, grayish lines will not photograph well; thus, pencil work is not acceptable for camera copy. Pencil shading is especially undesirable, since it must be reproduced by the halftone process, and even then usually results in a quality inferior to ink work.

The use of Zipatone or other tone patterns is an effective way of representing shading or sectioning without requiring the halftone process—especially in construction drawings, as a background in block diagrams, and in sketches. However, if any sizable photographic reduction (more than 25 to 35 percent) will be required, a coarse screen with heavier dots and more spaces between the dots should be selected. Otherwise, the extensive photographic reduction may cause either the dot pattern to drop out completely or the space between the dots to fill in and produce a smudgy effect in the printed version. For most applications, dot-screen patterns are superior in appearance to cross-hatch patterns.

Types of Acceptable Line-Artwork Camera Copy. First choice: inked drawings. Second choice: photographic print made directly from the original, inked drawing. Third choice: printed copy, black on white, if of high quality. Fourth choice: positive copy, produced on copying machine, black on white, if sharp and clear and without gray

tones. Negative copies (white on black background) are undesirable unless the black background is wanted in the printed report.

Pasted-Up Drawings. If material must be pasted up on a line drawing, or if a line drawing is created by pasting up several components parts, an acetate-base cement is the best choice. White acetate tape may be used to affix larger pieces to the drawing, but care must be taken to insure that the tape (1) has no ragged or sticky edges to pick up dirt, (2) does not cover up lines that should appear in the drawing, (3) is pressed down firmly and kept clean and white. Clear acetate tape should never be placed over a line that is to appear in the printed copy, since some distortion will result.

Scaled Drawings. If a scale must appear on a drawing, a proportional scale, e.g., "1 inch = 100 feet," should be avoided. Line artwork is almost always reduced photographically during printing, making such a scale inapplicable. Instead, a measured scale should be used that will be true at any photographic reduction, as follows:

Size Determination. Almost all line artwork will be photographically reduced when the report is printed. The amount of the reduction is dependent on the size of the lettering, the amount of the detail that must be preserved, the overall size of the original artwork, page-layout considerations, etc.

Because of this capability for photographic reduction, the size of the original artwork is not as critical as the proportions of the figure and the weight of lines and size of lettering. Drawings that must be reduced a great amount to fit the printed page must have larger lettering and heavier lines than smaller drawings requiring only slight reductions. The proportions of the original artwork are also important, since more attractive page layouts can be made if the original art is drawn in about the same proportion as the size of the printed page.

The margin size of the printed report is 6 inches wide and $8\frac{5}{8}$ inches deep (a ratio of about 3 to 4). If the original artwork, no matter what its actual dimensions, retains a width-depth or depth-width ratio of 3 to 4, then attractive page layouts of artwork can be made when the report is prepared for the printer. Although the mechanics of making such page layouts are the concern of the Reports Section, the job is made easier if the 3- to 4-proportion is observed when the line artwork is originally prepared.

Figure 5.1 shows the important variables in sizing original artwork. The information therein is approximate and is intended as a general guide.

The best size for original art is that which will require from 10-percent to 40-percent reduction (original art from roughly 6 inches to 15 inches in maximum width or height). In this range, the illustrator can fairly well visualize what the details of the drawings will look like after reduction and can adjust his line weight and lettering to conform. At sizes greater than this, it is difficult to accurately estimate the effects of the greater, necessary photographic reduction. In addition, the common sizes of graph paper fall in this range.

Original artwork of extreme proportions (for instance, an oscillograph trace 3 inches deep and 21 inches wide) should be avoided or broken into sections for printing over two or more pages.

Units of Measure and Powers of 10. When units of measure are used in any type of artwork, either the abbreviations listed in Table 3.1 should be used or the units should be spelled out. Arbitrary, one-time abbreviations of words should be avoided.

Judicious use of powers of 10 is a valuable device in figures to avoid long strings of zeros or many decimal places; however, as was pointed out in Chapter 4, care must be exercised with this notation to avoid ambiguity. An illustration of correct application of this notation is presented in the abscissa label in Figure 5.2.

Straightforward use of powers of 10 in logarithmic scales, as illustrated in Figure 5.3, is desirable practice, especially when many zeros can thereby be eliminated.

Line Graphs. Figure 5.2 illustrates a typical linear-coordinate graph and Figure 5.3 a typical log-log-coordinate graph. Where log-linear combinations (semi-log) are used, a suitable combination of these criteria should be followed.

To achieve the best presentation, the following principles should be observed when planning one or a series of line graphs:

In abscissa and ordinate labels, indicate both the quantity measured and the unit of measure. It is not enough to label the abscissa or ordinate merely, for instance, "ft/sec" or "r/hr." The unit of measure alone is never the proper title of the parameter represented. Instead, the title should read, for example, "Velocity, ft/sec" or "Exposure Rate, r/hr."

Avoid dense background grids. Poor and good practice in the selection of background-grid density for graphs for a printed report are illustrated in Figure 5.4. Coordinate rulings should be limited in number to those necessary to guide the eye in making a reading to the desired degree of approximation. Closely spaced coordinate rulings are not appropriate for graphs intended to show observed, empirical, or theoretical relationships. In preparing rough-draft graphs, the author will often use a graph paper with fine background grids for locating and plotting data points. Such paper usually has the background grid printed in a colored ink, against which the author's black lines will stand out in good contrast; when printed, however, all the lines will be black, resulting in a mishmash of ink—confusing and difficult to interpret. Thus, when tracing such rough-draft graphs to produce the camera copy, only major grids should be ruled in. If finer subdivisions to abscissa or ordinate are needed, suitable ticks may be added between the ruled major grid lines.

Avoid placing too many curves on one graph. It is often desirable to present several curves on one graph for the sake of data comparisons. While allowable, discretion must be exercised in doing this, in order to insure readability. The different curves must at least be labeled, and if they fall close together, should be differentiated by line techniques, as is shown in Figure 5.3. In some cases, an expanded abscissa or ordinate scale may help to separate the curves enough to enhance clarity, if the shape of the curve is thereby not distorted too much.

Use care in selecting symbols for differentiating data points. Composite curves with the various sources of data represented by different data-point symbols are often valuable in a report; however, where many different symbols are required, they must be selected carefully to insure clarity after photographic reduction and printing. Figure 5.5 gives the set of symbols which should be used on curves, in order of

preference. It is most desirable to use no data points at all, if the shape of the curve itself is sufficient to convey the information. If data-point symbols are used, they must be carefully keyed on the graph itself.

Bar Graphs. A typical bar graph is illustrated in Figure 5.6. Whether the bars are horizontal or vertical, some attention should be given to the scale so that the differences in the values represented will be readily apparent.

In most cases, the bars should be filled in for emphasis. Combinations of Zipatone dot-screen patterns and solid black are appropriate. If only one shade is needed for the bars, then a medium-density Zipatone screen is best; if two shades are needed, a light and a heavy Zipatone screen should be used; if three shades are applicable (as in Figure 5.6), light and medium Zipatone, and solid black will give good contrast.

Line Sketches. A sketch of equipment, an instrument setup, or similar material is often more informative than a photograph of the same thing. In a sketch, the illustrator can select and show exactly those details that are technically significant, while a photograph can record only what the camera actually sees, with little possibility for emphasis of any given detail. In addition, sketches can, if necessary, be drawn to a particular scale, or be drawn as exploded views, sectional views, etc.

In sketches, the illustrator must give close attention to line weight, layout and the way in which details are represented. The various Zipatone screen patterns are appropriate for shading or sectioning and are preferable for these applications to laborious shading or cross-hatching done with a ruling pen. An example of poor and good sketch technique is illustrated in Figure 5.7.

Maps and Layouts. If it is necessary to present a map in the report, only that detail necessary to get the point across should be used. In almost all cases, formally printed maps of an area contain far too much detail to be appropriate for a report. The best procedure is to trace those details necessary from the detailed map, adding whatever additional data is necessary to the tracing.

Layouts of instrument locations or stations, aircraft flight patterns, fallout contours, etc., do not always need to be drawn to an exact scale; often a better technique is to make an attractive layout with significant dimensions shown. If drawing certain portions of the layout to scale is necessary for clarity, then free use should be made of break lines and similar drafting techniques, to avoid an unnecessarily large original drawing.

CONTINUOUS-TONE ARTWORK

As noted previously, continuous-tone artwork is that material made up of varying shades of grays, from almost-black to almost-white. A common type is the photograph, with airbrush and brush-shaded work also falling into this category.

Photographs. Use photographs sparingly. A technical report is designed to convey technical information, and the presence in it of many relatively uninformative photographs, although enhancing artistic appearance, lends little to the technical presentation. It is not necessary to document every step of the project's experiment with a photograph, unless a photograph is the best method of presenting the information.

Each copy of the report must contain a complete set of any photos chosen for inclusion. These may be 4- by 5-inch, glossy prints, but 8- by 10-inch glossy prints are preferred in the original manuscript.

The negatives should not be submitted with the report.

Touch up of photographs by airbrush techniques is acceptable if well done and if the photograph is improved thereby. In such a case, the original touched-up glossy should be submitted with the original manuscript. The prints inserted in the review copies may then be photographic reproductions of the touched-up print.

The photographic prints must not be trimmed and should have a white border left on them. The prints must not be folded, rolled, stapled, or paper clipped. When they are mounted on a page, as in the review copies, they should be taped down with a small piece of drafting tape at each corner.

Adding Lettering or Linework to Photographs. If lettering or other linework must be added to the photograph itself, it should be indicated on an overlay for the glossy print in the original manuscript. In the review copies, the additions can be inked on the glossy prints or lettered on white paper and then cut out and pasted on the glossy with cement.

Airbrush and Related Techniques. As noted previously, airbrush drawings, pencil-shaded drawings, brush drawings, and other continuous-tone artwork must also be handled by the halftone process. Drawings made in this manner are acceptable but should be used only when the extra work by both the illustrator and the printer is justified.

IDENTIFICATION AND PLACEMENT

Each piece of artwork must be properly identified, described by a figure legend, and referenced in the text. Marking of the security classification on artwork requires special care, as discussed later in this section.

Figure Legends. All figures must be described by an appropriate figure legend. The figure, and therefore the legend, is numbered decimally relative to the chapter or appendix in which it appears.

Thus, Figure 3.1 is the first figure in Chapter 3, and 3.2 is the second, 3.3 the third, etc. Similarly, Figure A.1 is the first figure in Appendix A, Figure A.2 the second, etc. In short-form reports not organized by chapter, the figures may be numbered consecutively throughout the main body of the report, e.g., Figure 1, 2, 3, etc.

If a legend consists of more than one statement, only the first statement should be entered on the contents page.

Figure legends should be kept brief. Only enough material should be written therein to completely identify the figure. Extensive discussion of the material in the figure should be reserved for the text proper.

The figure legend should be typewritten and should appear at the bottom of each piece of line artwork in each copy of the report. The legend should never be typed on the originals of the line artwork. The originals are merely identified, as will be described in the next section of this chapter.

For continuous-tone copy, the glossy print should be attached, as noted previously, to a sheet of paper in the original manuscript. The figure legend may then be typed on this page to which the print is affixed.

The legend for a photograph should include a parenthetic statement of source and negative number, for example: (DASA 45-03-NTS-65). The parenthetic statement

should be included on the figure page only. It should not be included in the listing of figures on the contents page.

Identification of Artwork Intended for the Printer. Each piece of original artwork (camera copy) must be identified with the figure number and the number of the report. If the report number is not known when the report is prepared, then the operation name and the project number must appear.

For line artwork, this may be written in the lower right corner of the drawing outside the drawing proper. Line artwork must not be marked on the back, since the marking may show through.

In no case should the back of any glossy print ever be written on directly with pencil, ballpoint pen, typewriter, or other hard instrument. These methods will only damage the print.

Security Markings. Within the review copies, each page containing artwork should be stamped just as the text pages of the manuscripts if the report is classified. However, the original line artwork should preferably not be stamped. Original artwork and glossy prints can be ruined by careless placement of security stamps. If artwork must be stamped, the stamp must be placed (1) for line artwork, outside the rectangular area of the drawing itself and (2) for glossies, on a piece of paper which should then be pasted to the back of the glossy (or stamped on the mounting board).

Placement in the Original Manuscript. The copies of the line artwork and the photographic prints that are part of the original manuscript should be grouped in order of figure number at the end of the chapter to which they belong, after the grouping of the tables. Each figure in the manuscript should appear on a separate sheet of paper, complete with its legend; the separate sheets are then paginated just as they fall within the manuscript.

Drawing Size *Largest Dimension Width or Height in Inches*	Lettering-Size Range *Leroy Template No., Actual Size*		Line-Weight Range *Actual Size for Original Drawing*		Reduction *Probable Percentage During Printing Process*
	Minimum	Maximum	Minimum	Maximum	
6	60	100			10
8	60	120			10 to 25
10	80	140			25 to 40
12	100	175			32 to 50
15	120	200			40 to 55
18	140	200			55
24	175	240			65
30	200	290			70

Figure 5.1 Relationship of lettering size and line weight to size of drawing. The information shown is for the average case (exceptions may be necessary, at the discretion of the illustrator), and is keyed to the largest dimension of the original drawing—whether width or height—since it is that dimension which determines the percentage of photographic reduction necessary during printing. Lettering sizes and line weights between the minimums and maximums shown may be freely used. For drawing dimensions which fall between those shown, the nearest lettering size and line weight should be used: i.e., for a 14-inch maximum dimension, use the lettering and line weight for a 15-inch drawing. The following Leroy pen sizes are preferred (somewhat finer than those ordinarily specified, but better quality printing can be achieved with these finer pens): 60 template, No. 000 pen; 80 to 140 template, No. 00 pen; 175 to 200 template, No. 0 pen; 240 template, No. 1 pen; and 290 template, No. 2 pen.

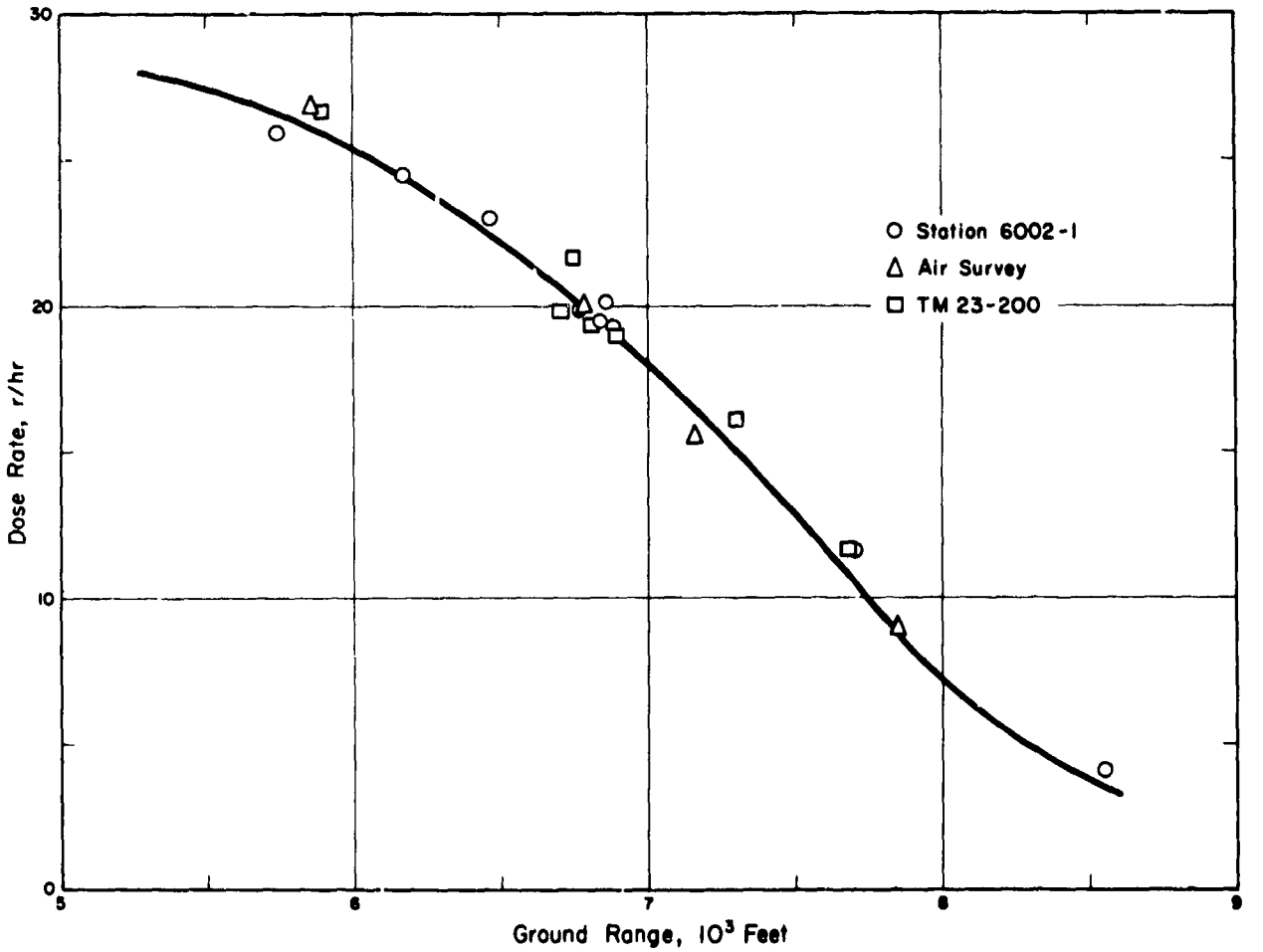


Figure 5.2 Typical linear-coordinate graph. Units of measure are written out, if short, or abbreviated, as in Table 3.1. The heaviest line is the curve, the lightest line the background grid. Symbols or special curve designations must be keyed in a note. (See Figure 5.1 for line weight and lettering sizes and Figure 5.5 for data-point symbols.) Note techniques of breaking curve and grid lines for clarity of data points.

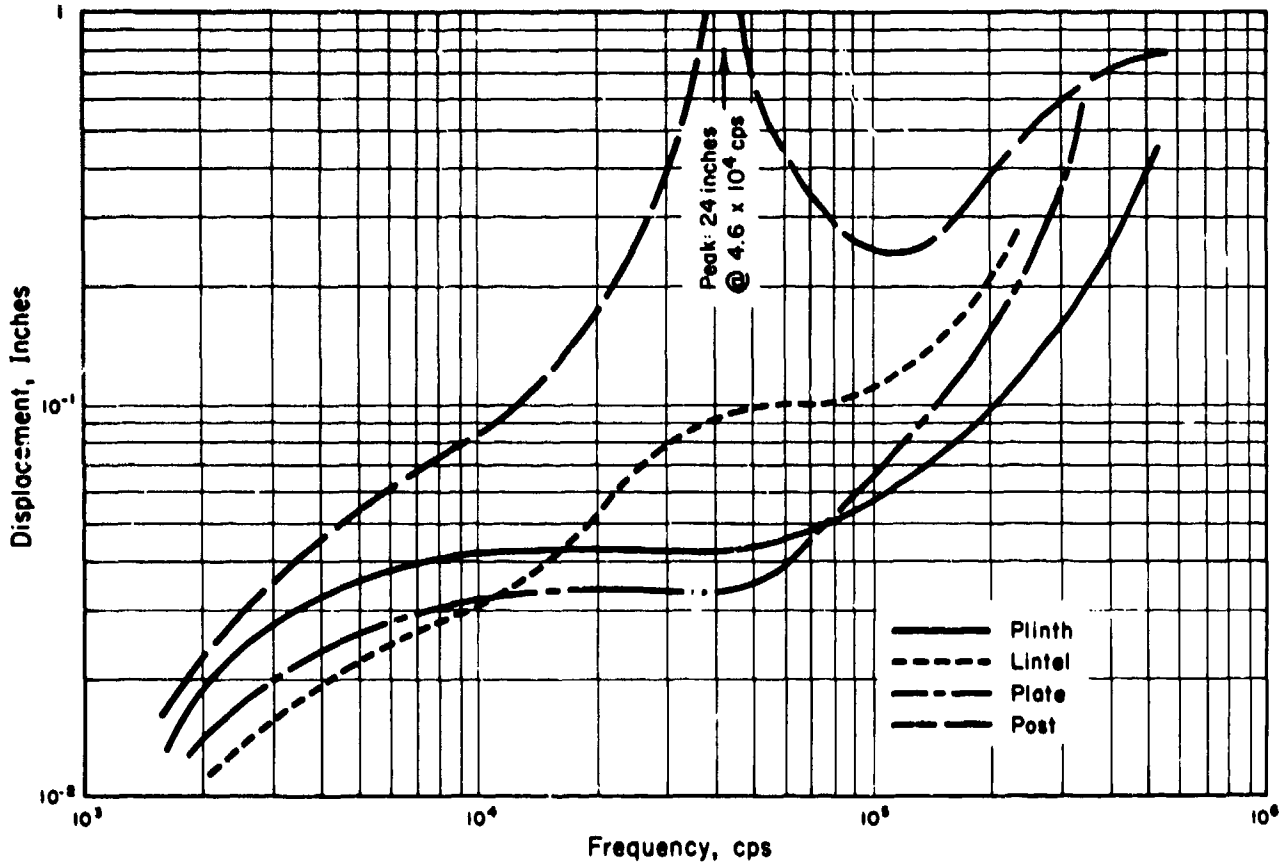
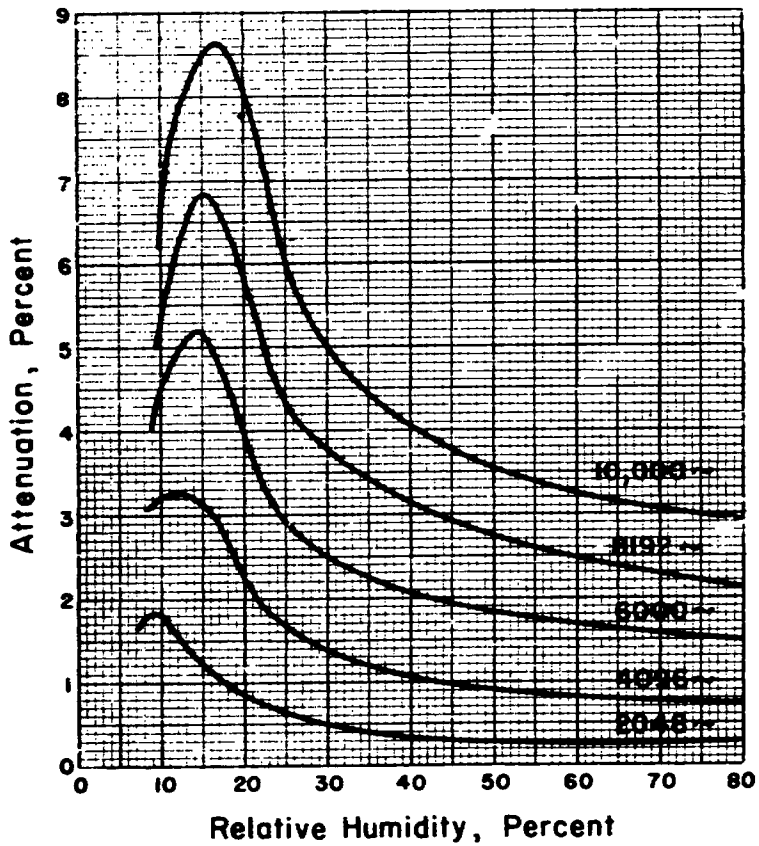


Figure 5.3 Typical log-log-coordinate graph. Only the major grid lines should be ruled in. Grid lines should be broken around legends and notes. Note technique for showing a peak value—applicable when the portion of the curve thereby eliminated has constant slope (inordinately large graphs can often be avoided in this manner).



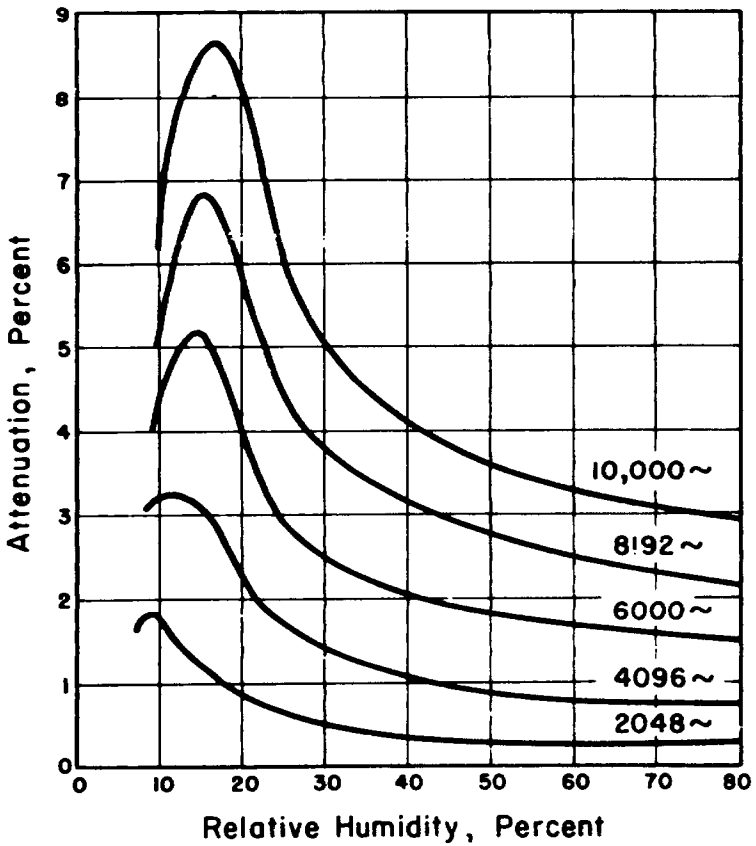


Figure 5.4 Comparison of poor and good technique in coordinate-grid ruling. The less dense ruling, as in the right-hand example, emphasizes better the relationship of the variables. When the graphs are drawn for publication, the grid should usually be ruled at least as open as the right-hand example.

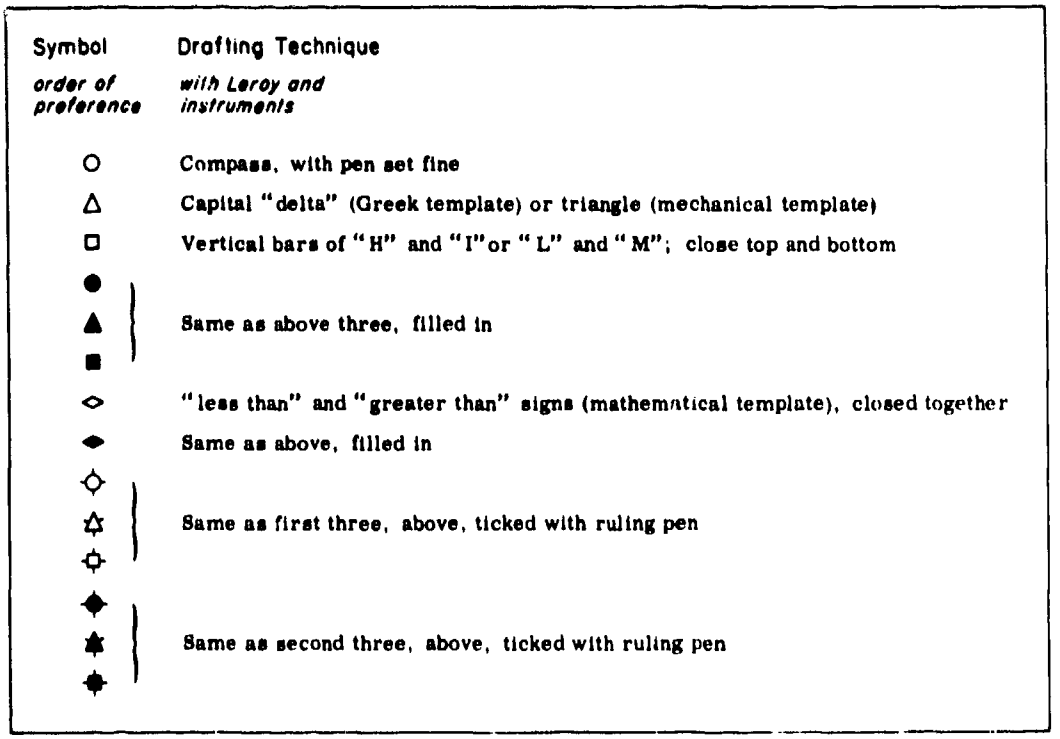


Figure 5.5 Data-point symbols, in order of preference. These symbols should be drawn large enough for clarity, but not out of proportion with the graph. A dot in the center of an open symbol — in an attempt to precisely locate the point — is poor practice, often causing it to fill in with ink during printing and appear solid. Where only one symbol is used, it need not be defined in a key; however, where two or more symbols are used, they should be keyed on the graph, not in the figure legend. For a series of several graphs in one chapter, all with the same data-point symbols, only the first graph in the series need have the symbols defined.

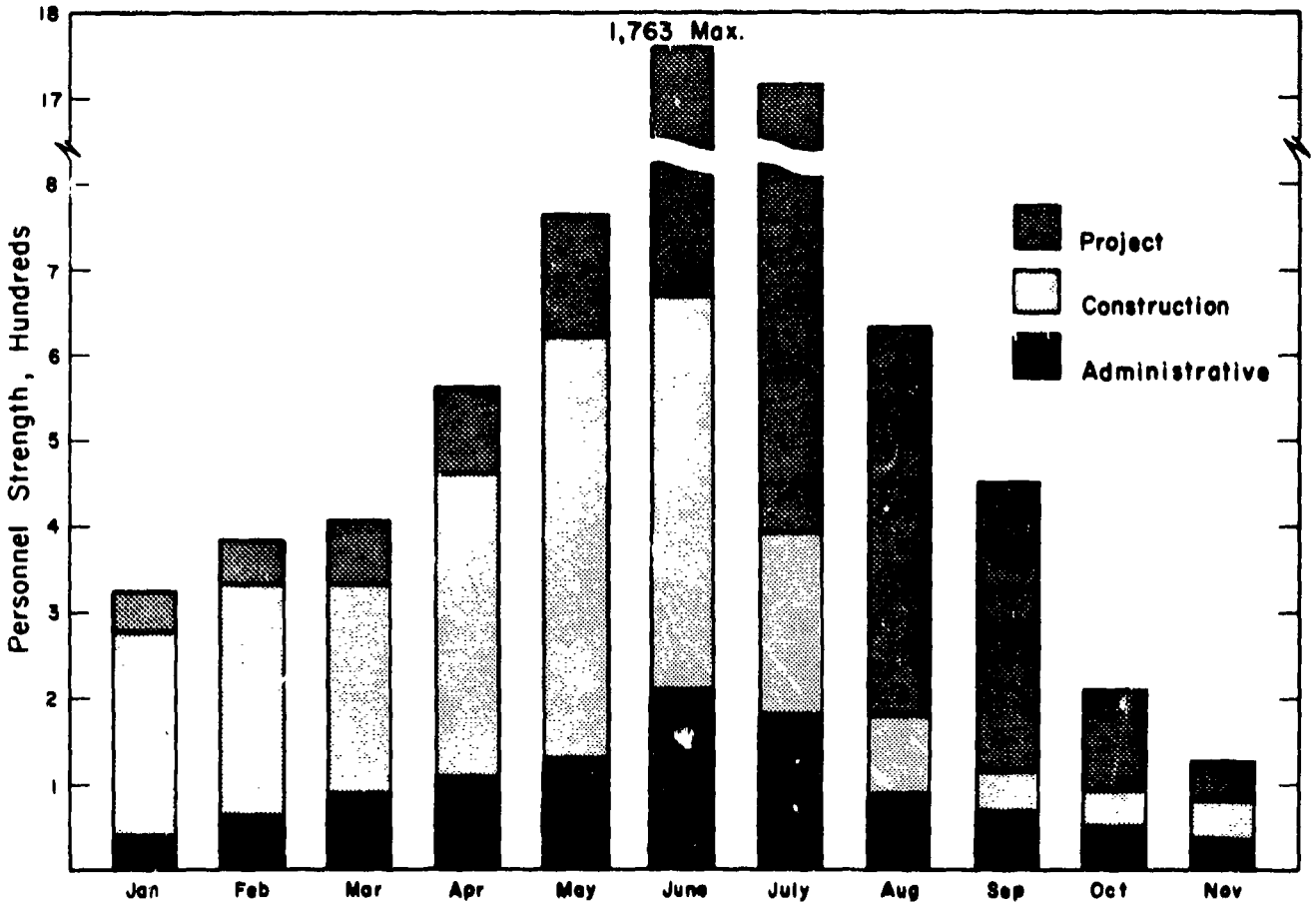


Figure 5.6 Typical bar graph. Bars are improved by shading with a Zipatone dot pattern (or solid black) or with combinations of solid black and various patterns for differentiation. Bars should be ruled in outline, even though filled in with a pattern. As with line graphs, ordinate or abscissa values need not start at zero. The ordinate and the bars may be broken when a few have relatively high peak values compared to the rest of the graph. Ticks, rather than ruled grids, should be used.

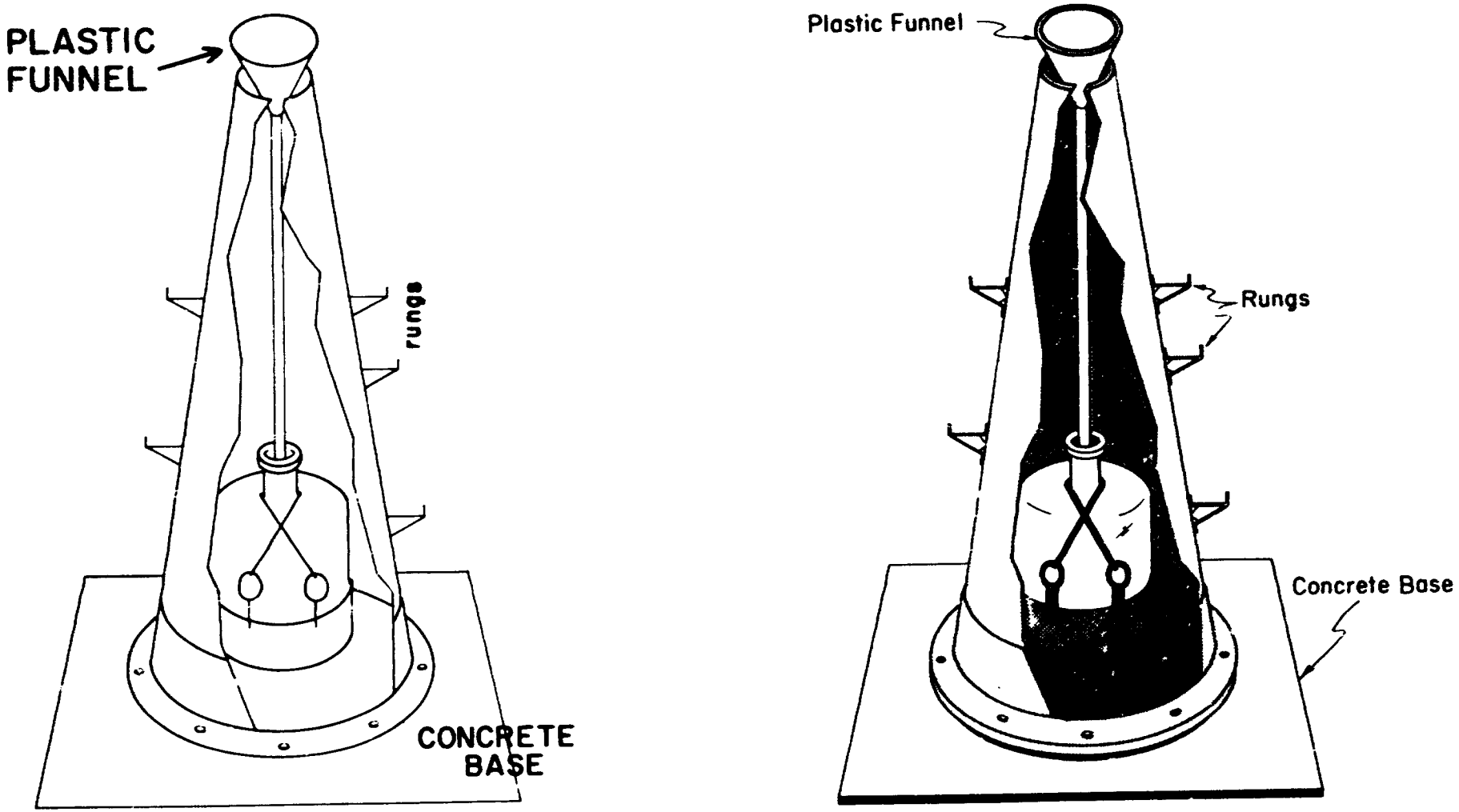


Figure 5.7 Comparison of poor and good sketch technique. Left: Little attention was paid to line weight, relative size of lettering, or shading techniques. Right: Variations in line weight, correct relation of lettering size to drawing size, and judicious use of shading techniques (in this case Zipatone) adds snap to the sketch, as well as enhancing its information value. A border around the drawing is not desirable.

references

1. William Strunk, Jr., and E. B. White; "The Elements of Style"; 1959; The Macmillan Company, New York, New York. Available in paperback edition.

2. "United States Government Printing Office Style Manual (Abridged)"; Revised Edition, 1959; Superintendent of Documents, Government Printing Office, Washington, D.C. 20301.

3. "Webster's Third New International Dictionary of the English Language"; Unabridged, 1961; G. & C. Merriam Company, Springfield, Massachusetts.

4. "Word Division"; Sixth Edition, March 1962; Superintendent of Documents, Washington, D.C., 20301. Price 50 cents.

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