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MILITARY HANDBOOK

REVIEW AND ACCEPTANCE OF ENGINEERING DRAWING PACKAGES



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FOREWORD

1. This military handbook is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding General (PSE), Marine Corps Research, Development and Acquisition Command, Washington, D.C. 20380-0001, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. This handbook supplements DoD-STD-100, and other applicable documents. It provides information and a recommended procedure for reviewing and accepting or rejecting engineering drawing packages (EDP's). This handbook is not designed to supersede the requirements contained in other specifications or standards, nor is it an attempt to combine all of the requirements from the individual specifications or standards.

4. The EDP is an important and costly part of the military equipment.

a. A substantial percentage of contract dollars is spent on technical data. The EDP, as the major component of the Technical Data Package (TDP), is one of the most expensive data items purchased in the course of a system's acquisition. The EDP is used to evaluate and validate a design concept, to maintain proper configuration control, to support quality assurance functions, to provide technical data for competitive reprourement of spares and end items, and as the major source of technical information for logistics support throughout a system's life cycle. The EDP, supplemented by equipment specifications and quality assurance procedures, should contain enough information to allow any competent manufacturer to purchase materials and components, manufacture, test, inspect, and deliver articles identical to or interchangeable with those delivered by any other manufacturer using the same EDP. The EDP should not require any additional data, instructions, manuals or company standards to fulfill its intended purpose.

b. Discrepancies in the EDP, or limitations placed on its use, can lead to the procurement of unusable spare parts, unreliable or inoperative equipment, or multiple configurations of the same item. A poor EDP can also prevent competitive reprourement of spares and end items due to technical difficulties and high cost. It is imperative that EDP's procured in support of DoD materiel acquisitions be reviewed and audited for accuracy, adequacy, and completeness. An EDP is validated by using it in the manufacture, inspection, and test of the items it depicts. Unless otherwise specified in the procurement contract, the manufacturer validates the data furnished to the Government. An EDP is verified by Government monitoring during draw-

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ing preparation, technical reviews of completed drawings, and configuration audits. Verifications are normally performed by the Government to ensure compliance with contract data requirements.

5. This handbook details procedures to be followed in monitoring and reviewing EDP preparation, and provides guidance to the drawing reviewer concerning what to look for when reviewing an EDP. This handbook also provides a method for documenting and reporting the discrepancies discovered during EDP reviews.

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1. SCOPE

1.1 Purpose. The purpose of this handbook is to provide guidance on the review of engineering drawing packages (EDP's).

1.2 Scope. This handbook provides a method to review and document the review of EDP's.

1.3 Applicability. The information contained in Section 5 is intended to be selectively applied to the review of specific EDP's.

1.4 Application guidance. The contents of this handbook guide the user in reviewing developmental design and product engineering drawings of military equipment. The Government or an authorized representative shall review EDP's during the full-scale engineering development and production/deployment phases of system acquisitions. When tailoring the methods and information in this handbook to the review of specific EDP's, follow these principles:

- a. Every system is different, and so is every EDP. The number and types of drawings in an EDP vary according to the system they depict. Thus, the number and types of drawings to be reviewed vary from one system acquisition to another.
- b. The techniques and standards used to review an EDP must be tailored to the type of design an EDP depicts. For example, the review of a wiring diagram requires a completely different approach than the review of an assembly drawing of a mechanical system. Section 5 is written with this in mind.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, and are referenced for guidance only.

SPECIFICATIONS

MILITARY

- | | |
|-------------|---|
| MIL-D-5480 | - Data, Engineering and Technical: Reproduction Requirements for |
| MIL-D-8510 | - Drawing, Undimensioned Reproducibles, Photographic and Contact: Preparation of |
| MIL-M-9868 | - Microfilming of Engineering Documents, 35mm, Requirements for |
| MIL-C-9877 | - Cards, Aperture |
| MIL-M-13231 | - Marking of Electronic Items |
| MIL-T-31000 | - Technical Data Package, General Specification for |
| MIL-M-38761 | - Microfilming and Photographing of Engineering/Technical Data and Related Documents: PCAM Card Preparation, Engineering Data Micro-Reproduction System, General Requirements for, Preparation of |

STANDARDS

MILITARY

- | | |
|-------------|---|
| MIL-STD-12 | - Abbreviations for use on Drawings, and in Specifications, Standards and Technical Documents |
| DoD-STD-100 | - Engineering Drawing Practices |
| MIL-STD-130 | - Identification Marking of U.S. Military Property |

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- MIL-STD-275 - Printed Wiring for Electronic Equipment
- MIL-STD-804 - Format and Coding of Aperture, Copy and Tabulating Cards for Engineering Data Micro-Reproduction Systems

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those in effect on the date of this Military Handbook and are identified for guidance only.

- H6 - Federal Item Name Directory for Supply Cataloging
- DoD 5220.22 - Industrial Security Manual for Safeguarding Classified Information

(Cataloging Handbook H6 is available from Commander, Defense Logistics Services Center, Battle Creek, MI 49017-3084.)

(DoD Directive 5220.22 is available from the Naval Publications and Forms Center, (ATTN: Code 1052), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS and in effect on the date of the Military Handbook and are identified for guidance only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI B1.20.1 - Pipe Threads, General Purpose (Inch)
- ANSI B1.20.3 - Dryseal Threads (Inch)
- ANSI Y14.1 - Drawing Sheet Size and Format
- ANSI Y14.2 - Line Conventions and Lettering
- ANSI Y14.3 - Multi and Sectional View Drawings
- ANSI Y14.5 - Dimensioning and Tolerancing
- ANSI Y14.6 - Screw Thread Representation

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- ANSI Y14.7.1 - Gear Drawing Standards: Part 1 for Spur, Helical, Double Helical and Rack
- ANSI Y14.7.2 - Gear and Spline Drawing Standards Part 2 - Bevel and Hypoid Gears
- ANSI Y14.13 - Mechanical Spring Representation
- ANSI Y14.15 - Electrical and Electronic Diagrams
- ANSI Y14.34 - Parts Lists, Data Lists and Index Lists
- ANSI/IPC-D-350 - Printed Board Description in Digital Form

(Applications for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018-3308.)

- IEEE STD 91 - Standard Graphic Symbols for Logic Functions
- IEEE STD 315 - Standard Graphic Symbols for Electrical and Electronics Diagrams

(Applications for copies should be addressed to the Institute of Electrical and Electronic Engineers, 345 East 47th Street, New York, NY 10017.)

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3. DEFINITIONS

3.1 Definition of terms.

3.1.1 Altered item drawing. An engineering drawing which depicts the alteration of an existing item from its original configuration. An altered item drawing depicts complete details of the alteration.

3.1.2 Assembly drawing. An engineering drawing that depicts a number of parts or subassemblies joined together to perform a specific function. An assembly drawing depicts the details of how the parts or subassemblies are joined and interact.

3.1.3 Associated list. A tabulation of pertinent engineering information pertaining to an item depicted on an engineering drawing or a set of engineering drawings. Examples include parts lists, index lists, and data lists.

3.1.4 Commercial item. An article regularly used for other than Government purposes, which is advertised or catalogued as available on an unrestricted basis for sale or traded in the course of normal business operation.

3.1.5 Contract data requirements list (CDRL), DD Form 1423. A list of data requirements that are authorized to be acquired for a specific acquisition, which is made a part of the contract.

3.1.6 Contracting officer. Any person granted the authority to enter into and administer contracts on behalf of a Government agency. The term includes any individual who is delegated such authority.

3.1.7 Contractor. Any individual, partnership, public or private organization or other entity which is a party to a contract.

3.1.8 Data item description (DID), DD Form 1664. A completed form that defines the data required of a contractor. The form specifically defines the data content, preparation instructions, format and intended use.

3.1.9 Design activity. A Government activity or a contractor which is responsible for the design of an item and future maintenance (change control) of the master documentation.

3.1.10 Detail drawing. An engineering drawing which depicts complete details of an item or assembly.

3.1.11 Engineering drawing. A document which provides sufficient information to manufacture an acceptable part; assemble a group of parts or describe the desired parameters required to purchase an existing part. This information can be provided in text or graphic form or a combination of both.

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3.1.12 Engineering drawing package (EDP). A collection of product related engineering drawings and associated list in accordance with MIL-T-31000 and relating to design, manufacture, test and inspection of an item or system.

3.1.13 Engineering study (ES). A document prepared by the reviewing activity that documents discrepancies noted during an in-process or final review of an EDP.

3.1.14 Existing item. An item in-being and operational prior to the time of need.

3.1.15 Monodetail drawing. A monodetail drawing delineates a single part.

3.1.16 Multidetail drawing. A multidetail drawing depicts two or more uniquely identified parts.

3.1.17 Reviewing activity. The Government activity assigned to perform in-process or final technical reviews of EDP's.

3.1.18 Selected item drawing. An engineering drawing that depicts an existing standard, or design, or vendor activity item upon which further required selection or restriction for fit, tolerance, performance or reliability is placed. (See DoD-STD-100 for complete requirements.)

3.1.19 Source control drawing. An engineering drawing that depicts an existing commercial or vendor item which exclusively provides the performance, installation, and interchangeable characteristics required for one or more specific critical applications. (See DoD-STD-100 for complete requirements.)

3.1.20 Specification control drawing. An engineering drawing that depicts an existing commercial vendor-developed item advertised or catalogued as available on an unrestricted basis on order as an off-the-shelf item; or an item, while not commercially available, is procurable on order from a specialized segment of industry. (See DoD-STD-100 for complete requirements.)

3.1.21 Technical data package (TDP). A collection of product related engineering data comprised of the EDP and non-EDP data related to the design and manufacture of the item or system. The EDP contains all the descriptive documentation needed to ensure the competitive reprourement of an item or system. The non-EDP consists of data such as system and development specifications, product specifications, concurrent repair parts list, packaging data sheets, special production tool data, acceptance inspection equipment data, military specifications and standards, repair manuals, supplementary quality assurance provisions, preparation for delivery requirements and other data as required.

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3.2 Acronyms used in this handbook. The acronyms used are defined as follows:

- a. ADPS - Automatic Data Processing System.
- b. AR - As Required.
- c. CDRL - Contract Data Requirements List.
- d. DCAS - Defense Contract Administrative Service.
- e. DFARS - DoD Federal Acquisition Regulation Supplement.
- f. DID - Data Item Description.
- g. DL - Data List.
- h. DoD - Department of Defense
- i. DoDD - DoD Directive.
- j. DoDISS - DoD Index of Specifications and Standards.
- k. EDP - Engineering Drawing Package.
- l. ES - Engineering Study
- m. IL - Index List.
- n. PL - Parts List.
- o. SCD - Specification Control Drawings.
- p. SOCD - Source Control Drawings.
- q. TDBD - Top-Down-Break-Down.
- r. TDP - Technical Data Package.

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4. GENERAL REQUIREMENTS

4.1 EDP. If not already in existence, some form of engineering drawing will be prepared by the manufacturer or system developer at the start of a program. During the concept/exploration and demonstration/validation stages of system development, the drawing package may contain only enough detail to permit design evaluations and cost projections. As the design progresses and the program moves through full scale engineering development and finally into production, the drawings become more and more detailed. The types of drawings described in MIL-T-31000 enable the EDP to follow this progression from design concept to production. They are:

- a. Conceptual design drawings and associated lists.
- b. Developmental design drawings and associated lists.
- c. Product drawings and associated lists.

4.2 Reviewing the EDP. From its inception to its disposal, the EDP is a dynamic set of documents. As a program progresses, design changes are made, manufacturing difficulties are encountered, technology changes, and drawing errors are located. All of these events require the design activity to change the EDP. Regardless of the reason for changes, the EDP must be continuously reviewed to ensure that it accurately depicts the article in its current configuration.

4.3 Principal phases of EDP reviews. The principal phases of the review process for EDP's are:

- a. Selection of reviewing activity and review of contract requirements.
- b. Contractor indoctrination.
- c. Technical reviews.
- d. Documenting contractually deficient engineering data.
- e. Final review.
- f. Recommending acceptance or rejection of the EDP.

4.4 Reviewing activity.

4.4.1 Familiarity with requirements. Everyone who reviews EDP's should become thoroughly familiar with the drawing requirements in applicable Government specifications and standards. This handbook aids in performing EDP reviews by reminding the reviewer of some of the more important requirements to be reviewed on the most frequently encountered drawings. EDP's should be reviewed by experts in the type of item or assembly depicted.

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4.4.2 Reviewing the CDRL. The contract is the most important document controlling the EDP. Each requirement for the EDP is prepared in the form of a Data Item Description (DID), DD Form 1664. The DID's are listed on a Contract Data Requirements List (CDRL), DD Form 1423, which is appended to the contract. It is essential that the DID's and the CDRL's adequately and accurately describe the requirements for the EDP, including the type of drawings, tailoring requirements, associated lists, formats, and delivery schedules. The persons assigned to review an EDP should be familiar with all contract requirements that affect the EDP. This includes such provisions as rights-in-data clauses, data warranty clauses and parts control requirements, as well as design specifications.

4.5 Contractor indoctrination. Government personnel assigned to perform the technical review of the EDP must understand the contract, and the contractor must agree with them on what is required for each deliverable. Both parties should meet as early in the contract period as possible and review contract requirements together. Any disagreement over the interpretation of the contract should immediately be brought to the attention of the procuring activity's program office for resolution. This indoctrination may not be needed when follow-on contracts are awarded to the same contractor, or when the contractor is already working on more than one project for the same Government procuring activity. The reviewing activity and the contractor should discuss the following topics when they meet:

- a. The contractor's drafting practices and drawing formats.
- b. The contractor's quality assurance and configuration management procedures for preparing, checking, controlling and revising EDP's.
- c. Types of lists (index, data, wire, and parts) to be furnished.
- d. Approximate number of drawings to be furnished.
- e. Security classification of drawings or data.
- f. Contractor proprietary rights over any drawing or associated document in the EDP. The contract must specify the extent of contractor rights-in-data.
- g. Whether the contractor plans to use existing drawings or data as part of the EDP. If so, ensure that they are acceptable to the Government.
- h. Types of drawings to be furnished by the contractor for off-the-shelf items.
- i. Under what conditions specification and source control drawings shall be used and will be accepted.

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- j. If wire harness drawings will be furnished under the contract. If so, consider using them as templates for making wire harnesses, in order to reduce manufacturing costs.
- k. Types of drawings to be used for documenting printed circuits and requirements for master pattern drawings.
- l. The use of Government and industry standard parts whenever possible.
- m. Contractor provisions for test specifications in the EDP.
- n. Procedures for incorporating approved engineering changes in the EDP.
- o. Whether the EDP will be used as supplementary provisioning technical documentation.
- p. Flow-down of drawing requirements to subcontractors and lower tier contractors. The prime contractors must ensure that all drawings conform to contract requirements, including those prepared by subcontractors and lower tier contractors.
- q. Government procedures for reviewing the EDP and documenting deficiencies.
- r. Contractor procedures and time limit to respond to Government comments and correct deficiencies in the EDP.
- s. Contractor's procedures for ensuring traceability of drawing requirements to production and related media (process sheets, route sheets, tooling, jigs, etc.).

4.6 Technical reviews of the EDP. Government agencies conduct in-process technical reviews to monitor the preparation of EDP's and to evaluate the technical content of individual drawings or entire EDP's.

4.6.1 Surveillance of drawing preparation. It is essential that the Defense Contract Administrative Service (DCAS) or other Government reviewing activity monitor drawing preparation. An active drawing surveillance program brings technical or managerial problems to light early in the acquisition program, thus avoiding potentially costly and time-consuming errors. The surveillance program should include inspections of procurement, manufacturing, and test facilities to ensure that the drawings, or documents developed from the drawings, are used in the functions for which they are prepared.

4.6.2 Reviewing for technical content. Technical reviews of engineering drawings vary according to the type of drawings and the system or item they depict. Section 5 contains guidance for reviewing the most frequently encountered types of engineering drawings

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and associated lists. Each reviewing activity should establish its own sampling level for EDP reviews. Normally, a detailed review of 15 percent to 20 percent of the total package is sufficient to reveal the types of deficiencies to be found throughout. However, reviewing activities may elect to conduct more extensive reviews of smaller or extremely complex drawing packages. All drawings should be reviewed for compliance with rights-in-data clauses of the contract. Any drawings found to be noncompliant shall be rejected. Before reviewing an entire EDP or all the drawings for an entire assembly, first conduct a completeness review to ensure that all required drawings and supporting data have been furnished. See 4.8.2 for instructions on how to conduct a completeness review.

4.6.3 Follow-on review. The Government reviewing activity should meet with the contractor as needed to discuss, explain, and resolve the discrepancies noted in the ES (see 4.7). The contractor shall revise the drawings as required and submit corrected drawings to the Government for review. The Government reviewing activity shall conduct follow-on reviews of new or corrected engineering drawings to ensure that they are acceptable. Additional engineering studies should be prepared as needed to document discrepancies noted in follow-on reviews. Any discrepancies that cannot be resolved should immediately be brought to the attention of the project manager of the procuring activity. During this review cycle, the reviewing activity should coordinate with the activity performing or witnessing configuration audits to ensure that all drawing discrepancies noted during the audits are corrected.

4.7 ES. The Government reviewing activity shall prepare an ES to document the results of the technical review. The ES lists discrepancies discovered during the technical review. The ES is not intended to be a stand alone document and although the comments shall be written in a clear and complete manner, there will be occasions when the engineering drawings must be viewed in order to completely understand the ES.

4.8 Final review. The final review is conducted on the contractor's final deliverable under the contract. The final deliverable, which may be in the form of original drawings, microfilm/aperture cards, nonreproducible hardcopies, digital data, or any combination thereof, should not be submitted to the Government until the technical reviews have been completed and the drawings found technically acceptable. The final review should ensure the following:

- a. Previously documented discrepancies have been corrected,
- b. The final deliverable is a complete package, and
- c. The media on which the final deliverable is submitted conforms to the contractual requirements.

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4.8.1 Review of previously documented discrepancies. A sampling of the final deliverable should be reviewed to ensure that previously documented discrepancies, which the contractor had agreed to correct, were in fact corrected. ES's from previous technical reviews should be used as guides to verify the correction of previously noted discrepancies.

4.8.2. Review for completeness. Also known as a top-down-breakdown (TDBD), the completeness review is performed to ensure that the EDP contains all the documents necessary to produce the system or items depicted. The TDBD is begun by examining the engineering drawing which depicts the entire assembly, end item, or system. This first-tier, or top drawing, lists second-order documents such as detail drawings, parts lists, and specifications. These second-tier, documents may be listed in drawing notes, parts lists, material blocks, or anywhere else on the face of the drawing. Therefore, a review of parts lists alone is not sufficient to complete a TDBD. Each lower tier document may in turn list additional drawings, lists, or specifications. Each must be reviewed in the same manner, until all documents belonging to the EDP have been examined. An index list, data list, or indentured (used on) list can be helpful in performing the TDBD. If none of these lists are available, a list can be hand-generated to keep track of all cross-references. All documents cited in a drawing or associated list shall be furnished as part of the EDP except for industry specifications and standards, military specifications and standards, or documents referenced parenthetically. The drawing package is not complete unless this requirement is met. The EDP should also be checked against the requirements of the CDRL and the standardization documents cited in each applicable DID. This review is not conducted for technical substance, but rather to identify and locate all documents required by the contract.

4.8.3 Review of drawing media. This review is conducted to ensure that the media materials, legibility, and reproductive quality conform to the applicable contract requirements and specifications.

4.8.3.1 Original drawings. If the contract specifies original drawings as the final deliverable, a sampling of the package should be examined for compliance with MIL-D-5480, MIL-D-8510 and DoD-STD-100. Particular attention should be paid to the legibility of lines, numbers, letters and character data, and to the reproducibility of the drawings. The reviewing activity should also ensure that when original drawings are ordered, original drawings are received. Duplicate originals shall not be delivered to the Government (see DoD-STD-100).

4.8.3.2 Master pattern drawings. When the contract requires master patterns to be delivered as part of the drawing package, they should be reviewed for compliance with DoD-STD-100 and MIL-STD-275.

4.8.3.3 Microfilm/aperture cards. If the contract specifies a final deliverable in the form of microfilm copies of the drawing

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package mounted in aperture cards, the media should be reviewed for compliance with MIL-M-9868, MIL-C-9877, MIL-M-38761, and MIL-STD-804. A sampling of the microfilm should be examined to ensure that the type, class, and kind (if applicable) are in accordance with MIL-M-9868 as contractually imposed. The entire microfilm package should be reviewed for quality, density, and resolution. Aperture cards should be reviewed to ensure that they are of the correct type, class, and kind; that the microfilm is mounted correctly; that the header information printed on the cards reflects the drawing depicted on the microfilm; and that the information punched on the card agrees with the header information.

4.9 Recommending acceptance or rejection.

4.9.1 Acceptance of the EDP. The Government procuring activity shall ensure that all reviews of the EDP have been completed before recommending acceptance. If the reviewing activity determines that the EDP meets contract and specification requirements, a letter indicating technical approval is sent to the contractor via the contracting officer for notification of technical approval. The accepting activity which is listed as the first addressee in block 14 of the CDRL, will provide the final acceptance signature on the DD Form 250 after data delivery from the contractor.

4.9.2 Rejection of the EDP. The EDP should be rejected if in-process, technical, or final reviews reveal noncompliance with contractual and specification requirements. If the reviewing activity recommends rejection, it shall notify the designated accepting activity by letter, with a copy of the ES to justify its recommendation. When the reviewing activity recommends rejection, the contracting officer may elect to invoke the withholding of payment clause in the contract. The contracting officer shall notify the contractor by letter that the EDP has been rejected, and attach a copy of the ES as justification. In any event, the contractor should be allowed a reasonable period, specified in the CDRL, to correct the EDP and resubmit it for Government review/acceptance.

4.10 General guidance for reviewing EDP's. The following items should be reviewed on all developmental design and production drawings:

<u>Topic</u>	<u>Controlling Document</u>
a. Drawing size and format	ANSI Y14.1
b. Drawing title (nomenclature)	DoD-STD-100 H6
c. Drawing number	DoD-STD-100
d. Drafting, approval and release record	ANSI Y14.1

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e. Scale	DoD-STD-100
f. Contract number on the face of the drawing	MIL-T-31000
g. Contract	ANSI Y14.1
h. Sheet numbering	DoD-STD-100 ANSI Y14.1
i. Zoning	ANSI Y14.1
j. Security classification	DoD 5220.22
k. Lettering/spelling	ANSI Y14.2
l. Legibility	MIL-D-5480 MIL-M-9868
m. Dimensions and tolerances	ANSI Y14.5
n. Graphic symbols	DoD-STD-100
o. Abbreviations	MIL-STD-12
p. Items covered by Government or industry standards	DoD-STD-100
q. Identification of rights in data (limited rights legends)	DFARS 252.227
r. Reference dimensions	ANSI Y14.5
s. Existing drawings, use and submission	MIL-T-31000
t. Part numbers	DoD-STD-100
u. Part marking	MIL-STD-130 MIL-M-13231
v. Company standard documents	MIL-T-31000
w. Reference documents	MIL-T-31000
x. Revision block	ANSI Y14.1
y. Distribution statement marking	DoDD 5230.24

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5. DETAILED REQUIREMENTS

5.1 Reviewing for correct material and mechanical specifications.5.1.1 Material specifications. See DoD-STD-100.

- a. Make sure that material specifications are listed on the drawing.
- b. Check material specifications. Ensure requirements such as class, grade, and type are specified. Ensure active specifications are used.
- c. Ensure that the material specification correctly identifies the shape required, such as bar, sheet, rod, or tubing.
- d. The tolerance and surface finishes given on specifications for commercial items must agree with those shown on the drawing for nonmachined dimensions.
- e. Evaluate qualities in regards to plating, painting, welding and hardening.
- f. Industry standard stock materials must be specified, when practical.
- g. Ensure that proper material is used on die formed parts. Some heat treated materials are not practical for die forming. Other materials are suitable and aging will meet hardness requirements.
- h. Ensure that material has been specified in the proper condition to facilitate machining operations.
- i. Check the type of raw material for compatibility with processing and machining techniques, stress requirements, and direct contact with dissimilar materials.
- j. Check the drawing notes for heat treatment and hardness specifications and requirements.

5.1.2 Castings and forgings. Check the following items:

- a. Ensure that there are separate drawings of a rough casting or forging and the finished part.
- b. Make sure that the drawings specify the type of forging or casting to be used.
- c. Ensure the drawings specify draft allowance.

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- d. Specified tolerances must be compatible with the type of casting or forging and its intended use.
- e. Datum planes must be specified.
- f. Ensure that the location and dimensions of tooling points are specified.
- g. Dimensions of draft surfaces must be taken from mold lines.
- h. Duplicate dimensions should not be shown on both the rough and finished part drawing unless one of the dimensions is shown as reference.
- i. Ensure that the grain direction of forging is indicated on the drawing.
- j. Ensure that all materials, including alloys, are properly specified. See DoD-STD-100.
- k. Ensure that drawings specify the parting lines of castings.
- l. Ensure that the drawings show the location and dimensions of test coupons on forgings or castings.
- m. Ensure that inspection procedures are specified for the castings or forgings shown on the drawings.

5.1.3 Mechanical specifications. See DoD-STD-100.

5.1.3.1 General requirements.

- a. Check fits between all mating parts to ensure that maximum tolerance build-ups will allow parts to assemble and operate without interference.
- b. Check to ensure that any feature or dimensions requiring special tooling are so identified and that the special tooling is defined in the EDP.
- c. All machining requirements such as chamfers, countersinks, counterbores, and radii must be properly defined and specified.
- d. Check to ensure that all mating holes for connecting hardware such as rivets and bolts are within tolerance limits.

5.1.3.2 Thread data. In addition to the specified requirements of ANSI Y14.6, check thread data for the following:

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- a. Ensure that general purpose pipe threads are not used as pressure seals. General purpose pipe threads require a sealing compound. Dryseal pipe threads do not require a sealant. See ANSI B1.20.3 and ANSI B1.20.1.
- b. Ensure adequate thread engagement. Bolts must be long enough to provide sufficient thread engagement for washers, nuts, and safety wire, as appropriate.
- c. Thread designation, appropriateness of selected thread tolerance class, and resulting class of fit with threads of mating part, use of thread inserts and thread insert installation notes.
- d. Ensure the first thread is countersunk or chamfered.
- e. Check uniformity in depth of tap drills and thread depth for greater efficiency in production. Blind tap holes should be avoided, if possible.
- f. Ensure that tread nomenclature format is correct.

5.1.3.3 Spring data. In addition to the specific requirements of ANSI Y14.13, check spring data for the following information:

- a. Ensure that the drawings specify the type of springs to be used.
- b. Wherever possible, springs that conform to an accepted Government or industry specification or standard should be used.
- c. Where nonstandard springs are used, ensure that the drawings depict their wire diameter, mean spring diameter, spring rate, unstressed length, stressed length, and finish.

5.1.3.4 Gear data. In addition to the specific requirements of ANSI Y14.7.1 and ANSI Y14.7.2, check gear data for the following:

- a. Ensure that drawings specify the type of gears to be used.
- b. Wherever possible, gears that conform to an accepted Government or industry specification or standard should be used.
- c. Where nonstandard gears are used, ensure that the drawings depict their pitch, pitch diameter, helix angle, pressure angle, shaft diameter, thickness, material used, finish, and any special lubrication requirements.

5.1.3.5 Bearing data. Check bearing data for the following information:

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- a. Ensure that the drawings describe the types of bearing to be used and their rated life.
- b. Wherever possible, bearings that conform to an accepted Government or industry standard or specification should be used.
- c. Where nonstandard bearings are used, ensure that the drawings describe their dimensions, load rating, life rating, material requirements, speed and lubrication requirements.

5.1.4 Sheet metal data. Check for the minimum bend allowance and dimensions of parts formed from sheet metal. Drawings should show dimensions from outside mold lines. To eliminate the need for calculations, drawings should show the true dimensions of bend allowances instead of angle dimensions. See ANSI Y14.5. Complicated sheet metal and weldment parts should be replaced with die and investment castings wherever practical. Evaluate stamping, extruding or fabricating in lieu of casting and forgings. Ensure that welding requirements conform to applicable standards.

5.1.5 Plating and finishing data. Check plating and finishing requirements for the following:

- a. Ensure that tolerance and thickness are in accordance with the applicable plating specification.
- b. The drawings must specify the dimensions, surface finish, waviness and lay requirements of plated parts.
- c. Precious metal plating requirements should be eliminated where practical to reduce cost.
- d. Avoid plating only selected portions of parts wherever possible.
- e. Drawings must specify if metal parts will be deoxidized, anodized, chemically filmed, barrier coated, sacrificial coated, or treated in some other manner. If more than one treatment method is specified, ensure that the treatments are applied in the proper order.
- f. Check drawing notes to make sure that magnetic inspection is required for high stress heat treated parts and low microfinish parts prior to grinding.
- g. The drawing must indicate if dimensions apply before or after the plating is applied.

5.2 Reviewing assembly drawings. Check the following:

- a. Ensure that the locations of name plates are shown.

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- b. Assembly drawings must show all peculiar assembly or adjustment instructions.
- c. Ensure that the assembly drawings refer to all associated documents and drawings.
- d. There must be sufficient views to show the relationship between each part.
- e. Assembly part numbers must be properly marked.
- f. Assembly drawings must show power input and output values and the applicable tolerance thereto.
- g. Ensure that inspection and test requirements are specified for items depicted in the drawing.
- h. Assembly drawings must identify inseparable assemblies.
- i. Ensure that assembly drawings identify and depict attaching hardware such as nuts, bolts, and rivets.
- j. Location and orientation of parts must be shown.
- k. Ensure that tolerance build-ups do not cause interference during assembly, disassembly and operation.
- l. Ensure that required quantities are correct.
- m. Assembly drawings must depict correct assembly and reference dimensions.
- n. Ensure that the reference designators used on the assembly drawing are used consistently on all associated drawings and related lists.
- o. The identification and quantity of parts shown on the assembly drawing must agree with the parts lists.

5.3 Reviewing detailed drawings. See ANSI Y14.3. Check the following:

- a. Detailed drawings must completely depict the entire part or assembly shown.
- b. Ensure that there are sufficient views to adequately define the item.
- c. Ensure that all dimensions are taken from physical features. See ANSI Y14.5.
- d. Detail drawings should not show the dimensions of hidden lines. See ANSI Y14.5.

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e. Ensure that datum planes are properly defined. See ANSI Y14.5.

f. Ensure that monodetail drawings depict only one item.

5.4 Reviewing drawings of electrical and electronic systems.

5.4.1 General. See DoD-STD-100 and ANSI Y14.15. Review all drawings of electrical and electronic systems for the following information:

- a. Ensure that wires are properly identified by size, specifications, and coding.
- b. Sleeving must be properly identified. Sleeving should be over connections to ensure adequate protection where a possibility of shorting exists.
- c. Check notes for correct soldering specifications.
- d. Check that floating connectors are used only where necessary.
- e. Check for conformal coating, where required, to provide adequate resistance to leakage.
- f. Check that the drawings show the polarity of diodes and crystals.
- g. The orientation of transistors and other parts must be specified with respect to a fixed reference point.
- h. Check for hermetic sealing of connectors, where required.
- i. Check to see that requirements for lacing, sleeving or wrapping are identified.
- j. Analyze and evaluate assembly drawings, wiring diagrams, printed wiring board drawings, and schematic diagrams for compatibility. Each drawing or diagram should refer to all related drawings or diagrams. All reference designators must be consistent.
- k. Analyze and evaluate the service rating on all connectors. Ensure that all connectors are compatible.
- l. Analyze and evaluate all components for safety.
- m. Ensure that adequate test requirements are provided for all levels of electrical or electronic assembly drawings.

5.4.2 Wiring diagrams and wiring harness drawings. Check the following:

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- a. Wiring diagrams and wiring harness drawings should be used where appropriate. See DoD-STD-100.
- b. The physical arrangement of wire routing components should be consistent with their layout in associated drawings.
- c. Ensure that component terminals are identified in wiring diagrams. Drawings must conform to ANSI Y14.15.
- d. Ensure that the use of reference designators is consistent with related drawings.
- e. Ensure that wiring diagrams identify all input and output signals.
- f. Ensure that wiring diagrams identify the functions of all test points.
- g. Ensure that the drawing identifies grounds and shows their location.
- h. Wiring diagrams must refer to associated assembly and schematic drawings.
- i. Make sure that the drawings detail the use of wire numbers or color codes, and that their use is consistent with that of related drawings and associated lists.

5.4.3 Schematic, logic and interconnection diagrams. Check the following:

- a. Ensure that diagrams are prepared for each subunit.
- b. Diagrams must identify inputs and outputs and show applicable tolerances.
- c. Ensure that parts are shielded where grounded.
- d. Ensure that diagrams show the directional alignment of all components, and that it is consistent with what is shown on associated documents. This is especially important for components which are affected by polarity, such as batteries, diodes, and rectifiers.
- e. Separately replaceable assemblies must be identified by an appropriate reference designator.
- f. Ensure that all components are identified by reference designator and type number per IEEE STD 315.
- g. Ensure that schematic drawings show the capacity ratings of safety devices such as fuses and circuit breakers.

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- h. Values, ratings, and tolerances must be shown for all components.
- i. Ensure that schematic drawings identify the functions of test points.
- j. Logic symbols must be in accordance with IEEE STD 91.
- k. Ensure that electronic symbols are used per IEEE STD 315.
- l. Ensure that schematic drawings refer to associated drawings.
- m. Ensure that terminals of relays, plugs, and other connections are identified.

5.4.4 Printed wiring board drawings. Check the following:

- a. Analyze and evaluate the printed wiring design for conformity to applicable specifications.
- b. Printed wiring fabrications must conform to applicable specifications.
- c. Ensure that drawings depict wiring boards in detail, and identify all components. Drawings must conform to Section 4 of MIL-STD-275.
- d. Drawings must be laid out on a grid system.
- e. Both sides of a wiring board, including reduction dimensions, must be shown on the same wiring board drawing. Ensure that front-to-back registration points are defined, precisely located, and adequately controlled.
- f. Ensure that marking information depicted on the wiring board drawing is consistent with what is shown on associated drawings.
- g. Ensure that the wiring board drawing makes reference to the corresponding assembly drawing.
- h. The board and assembly number must be the same as the numbers shown on the corresponding assembly drawing.
- i. The drawing must specify and depict conformal coating, when required.
- j. Reference designators shown on the board drawing must be consistent with those shown on the assembly drawing and associated lists.

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- k. Ensure that wiring board drawing notes include the subunit prefix.
- l. Wiring board drawings should not contain subunit numbers.
- m. Ensure that masking is not used as a guide for hole locations.
- n. Make sure that the dimensions and tolerances of all holes are shown. See DoD-STD-100.
- o. Ensure that the master pattern drawing is laid out per DoD-STD-100.
- p. When wiring board drawings are produced in digital form, ensure that their description and format are in accordance with ANSI/IPC-D-350.
- q. Separate views must be shown for double sided and multi-layered boards.
- r. Ensure that wiring board drawings include adequate quality assurance (QA) provisions for the manufacture of the items they depict (test coupons must be shown on the master drawing, artwork, and production master).
- s. Ensure that the circuitry pattern agrees with the schematic drawing.
- t. Ensure that fixed points on printed wiring boards are used as references to define the locations, width, and dimensions of conductors.
- u. Ensure that jumper wires are eliminated on production drawings.
- v. Ensure that master patterns contain the note "For manufacturing purposes this drawing shall not be reproduced to or from a reproducible that is made from other than a stable base material".

5.5 Reviewing control drawings.

5.5.1 Specification control drawings (SCD).

5.5.1.1 Criteria for designation. To qualify as a SCD, the item depicted must meet the following criteria:

- a. It must be of an unmodified commercial type, available to both Government and industry on an unrestricted basis.
- b. The item must not have been developed for use in the equipment represented by the drawing package under review.

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- c. The manufacturer's names, addresses, identification codes, and item identification numbers must be shown on the SCD.
- d. The drawing must list two or more known sources, unless after a search of vendor data it is determined that there is only one source of supply.
- e. Ensure no restrictive markings such as limited rights, copyright legends, etc. are shown on SCD.

5.5.1.2 Reviewing SCD's. Analyze SCD's for the following information:

- a. They shall disclose, as applicable, item configuration, dimensions of envelope, mounting and mating dimensions, interface dimensional characteristics, and their limits.
- b. The SCD must show inspection and acceptance test requirements, performance, reliability, maintainability, environmental and other functional requirements, as necessary to ensure identification and adequate competitive reprourement of an interchangeable item.
- c. If an electrical, electronic, or other engineering circuit is involved, a schematic, connector or other appropriate drawing shall be included or referred to by the drawing to provide sufficient information to mark external connections.
- d. SCD numbers are administrative control numbers and shall not be marked on the part. The SCD numbers are used to identify the item on other drawings or documents.
- e. Qualification testing of items in advance of procurement action is not a prerequisite for including an item on an SCD.
- f. If a decision cannot be made from the information available, the manufacturer of the item or activity submitting the drawing should be contacted to verify that the item meets the criteria for a SCD.
- g. All sources of supply should be checked to verify that the part numbers listed on the drawing meet the requirements of the SCD, and that the items are currently available.
- h. The manufacturer's part number becomes the item's identification number.
- i. The notations "SPECIFICATION CONTROL DRAWING" and "IDENTIFICATION OF SUGGESTED SOURCES OF SUPPLY ..." must appear on the drawing per DoD-STD-100.

5.5.2 Source control drawings (SOCD).

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5.5.2.1 Criteria for designation. A SOCD defines an item which is procurable only from certain vendors for reasons such as the following:

- a. A vendor has a special technique, product, or material which will make his product work in a system where others will not. The key elements must be identifiable.
- b. There is a specific, critical application, and substitute vendors shall not be used without prior testing, evaluation, and approval. Critical factors may include performance, installation, interchangeability or reliability, and must be spelled out on the drawing.

5.5.2.2 Reviewing SOCD's. SOCD requirements are identical to those for SCD's except for the following differences:

- a. Items must be tested and prequalified for inclusion in SOCD's.
- b. The drawing shall include the following notes:

"Only the item described on this drawing, when procured from the vendor(s) listed hereon, is approved by (name and address of cognizant design activity) for use in the application(s) specified hereon. A substitute item shall not be used without prior approval by (name of cognizant design activity) or by (name of Government procuring activity)

Identification of the approved source(s) of supply hereon is not to be construed as a guarantee of present or continued availability as a source of supply for the item described on the drawing".

- c. The drawing shall list the heading "APPROVED SOURCES OF SUPPLY", the manufacturer's name, address, and identification code, and the part number of each item that has been tested and approved for use in the specific applications stated on the drawing.
- d. Whenever another vendor's item is tested and qualified for the stated applications or when a new critical application is found and all vendor items that are cited on the drawings are approved for use in the new critical application, the drawing may be revised to show the new vendor or application. Each new vendor added must be approved for all stated applications.
- e. SOCD's become the part identification numbers and are subsequently used to identify the item on other drawings or documents. When more than one vendor is listed on an SOCD for items that are repairable and the repair parts are not inter-

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changeable between one vendor's item and another, each vendor's item shall be assigned a unique suffix of the SOCD number.

- f. Ensure that "SOCD" and the drawing number are marked on the part. The SOCD number becomes the item's part number. See DoD-STD-100.
- g. The drawing shall include the notation "SOURCE CONTROL DRAWING". See DoD-STD-100.
- h. The drawing must list the quality conformance inspection and approval procedures for new items/additional sources.

5.5.3 Selected item drawings. Selected item drawing disclosure requirements are identical to those of SCD's except for the differences listed below:

- a. The drawing must contain the notation "SELECTED ITEM DRAWING". See DoD-STD-100.
- b. Complete details of the selection criteria shall be described, such as fit, tolerance, performance and reliability.
- c. The selected item drawing shall contain sufficient information to identify that item before selection.
- d. The part number, and the manufacturer's name, address and identification number shall be included in the drawing package.
- e. The original part number must be obliterated and the selected item identification number shall become the part number of the selected item itself. See DoD-STD-100. (This is not considered a part alteration.)

5.5.4 Altered item drawings. Altered item disclosure requirements are identical to those of SCD's and selected item drawings except for the differences listed below:

- a. The drawing shall include information necessary to identify the item prior to its alteration, including the original part number and the name and address of the original source. The name and address of the source need not be furnished if the original part is a Government or industry standard item.
- b. When a vendor activity document is referred to, the vendor data shall be submitted along with the altered item drawing. If the vendor or original design data is unobtainable, the

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altered item drawing shall contain sufficient information to identify that item prior to its alteration.

- c. The notation "ALTERED ITEM DRAWING" must appear on the drawing. See DoD-STD-100.
- d. The original part number must be obliterated.
- e. Altered item identification numbers shall become the part numbers of the altered items. See DoD-STD-100.

5.6 Reviewing list associated with the EDP.

5.6.1 Parts list (PL's). See DoD-STD-100. Check the following:

- a. If separate PL's are used, make sure their format is correct.
- b. If separate PL's are used, ensure that PL numbers are correct.
- c. If an integral PL is used, ensure that the format is correct. Refer to ANSI Y14.34.
- d. Ensure that part or identifying numbers are correct (including items controlled by military specifications).
- e. "Find numbers" or "reference designators" used on the PL must be consistent with those shown on associated drawings.
- f. PL's may be revised only in accordance with DoD-STD-100.
- g. PL's must specify quantities on all items not identified by as required (AR).
- h. Bulk items must be identified by a discrete identifier instead of quantity and a unit of measure must be specified.
- i. Ensure that "as required" (AR) quantities are used only where appropriate.
- j. Items that are not adequately defined by a Government or industry specification must be depicted on a drawing.
- k. Ensure that parts depicted on specification control, source control, altered item, and selected item drawings are properly identified per DoD-STD-100.
- l. When PL's are produced on an automatic data processing system (ADPS), ensure that they are in the format specified by DoD-STD-100.

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- m. Ensure that every item on a drawing is called out on a PL.
- n. Verify that military and industry standard part numbers correctly identify the parts being used.
- o. Ensure that PL nomenclature is consistent with that used on higher assemblies.

5.6.2 Data lists (DL's). See DoD-STD-100. Check the following:

- a. Ensure that the format is correct.
- b. Ensure that the DL contains all applicable drawings, documents, and associated lists.
- c. Ensure that DL numbers are correct.
- d. Ensure that the DL is revised per DoD-STD-100.
- e. Ensure that documents are sequenced per DoD-STD-100.
- f. Ensure that DL's are prepared for each major assembly, sub-assembly, or unit as required.
- g. Ensure that DL nomenclature is consistent with that used on the assembly drawing.

5.6.3 Index lists (IL's). See DoD-STD-100. Check the following:

- a. Ensure that the format is correct.
- b. Ensure that IL numbering is correct per DoD-STD-100.
- c. Ensure that documents are sequenced per DoD-STD-100.
- d. IL's must be prepared for each major assembly or system as required by the contractual instrument in effect.
- e. Ensure that each IL contains all applicable DL's and IL's.
- f. Ensure that the nomenclatures on IL's agree with those on the assembly drawing.

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6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The information contained in this handbook provides guidance to drawing review personnel. The data in this handbook is not intended to be a check list for non-experienced review personnel to check drawings with.

6.2 Subject term (key word) listing.

- Assembly
- Associated list
- Diagrams
- Drawings
- Source control
- Specification control

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APPENDIX

PREPARING AN ENGINEERING STUDY

10. GENERAL

10.1 Scope. This appendix details a method for documenting discrepancies within the EDP.

20. Applicable Documents. This section is not applicable to this appendix.

30.1 Cover sheet. The first page of the ES contains the following information (see figure 1):

- a. Equipment nomenclature, contract number, contractor, ES volume number, and date prepared are centered on the cover sheet.
- b. The name of the Government reviewing activity, address, and telephone number are located in the lower left corner of the sheet.

30.2 Table of Contents. The table of contents for the ES must list the sections of the ES against the left margin and the page numbers of the sections against the right margin. The title "TABLE OF CONTENTS" will be placed at the top center of the page with the heading "PAGE" under the title and against the right margin (see figure 2).

30.3 Introduction. The ES introduction contains the following information (see figure 3):

- a. Authority for performing the review.
- b. System nomenclature.
- c. Contractor.
- d. Contract number.
- e. CDRL drawing requirements.
- f. Purpose of the technical review.
- g. Statements indicating that comments concerning discrepant findings may also apply to documents that were not inspected during the review and that the contractor is responsible to inspect the entire EDP and correct similar deficiencies.

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- h. The scheme by which discrepancies are presented in the ES (TDBD order, numerical sequence, etc.).

30.4 List of general comments. Comments of a repetitive nature, which pertain to three or more drawings, should be written only once as general comments. The general comments list will precede the general comments section and identify all general comments generated during the review. The title "List of General Comments" is placed at the top of the sheet, and columns entitled "General Comment Letter" and "Title" will follow. Each general comment shall be assigned a letter in sequence (see figure 4).

30.5 General comments. This section fully describes each discrepancy, citing references and examples. If annotated drawings are to be returned to the contractor, the discrepant portion of each drawing or associated document shall be annotated by the letter of the appropriate general comment squared in red. General comment sheets shall contain the following information (see figure 5):

- a. The title "General Comment X" (X representing the appropriate letter) shall be centered at the top of the page, along with the title of the comment.
- b. A narrative describing the discrepancy and citing the specification, standard or Contract Data Requirements List which has been violated shall follow the title.
- c. The phrase, "The following documents are examples of this problem" shall follow the narrative, along with a list of drawing numbers to which the comment applies.

30.6 A list of reviewed drawings to which only general comments apply. This page shall consist of the following (see figure 6):

- a. The title "List of Reviewed Drawings to Which Only General Comments Apply" is centered at the top of the page, followed by columns titled "Drawing Number," "Revision," "Drawing Title," and "General Comment Letter(s)."
- b. Drawings should be listed in alpha-numeric order.

30.7 Specific comments. Specific comments shall be prepared for discrepancies which are not covered by the general comments. The comments are listed as follows (see figure 7):

- a. The drawing title shall be listed in the upper left corner of the section.
- b. The drawing number shall be listed in the upper right corner of the section.

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- c. The drawing revision letter shall be listed directly under the drawing number.
- d. The specific comments are listed consecutively on the left margin by number.
- e. The specific comments should clearly state the problem or question and cite the specifications or standards which have been violated.
- f. If the drawing contains general comment discrepancies, the general comment letters shall be listed after the specific comments.
- g. The drawings are listed in alpha-numeric order.
- h. If the comments are continued on additional pages, at the top of the continuation page in the upper left corner, list the applicable drawing title and the abbreviation "con't" and in the upper right hand corner, list the drawing number along with the revision.

30.8 List of missing drawings. This list cites all drawings that are required as part of the EDP but which were not furnished by the contractor. The list is generated as a result of the TDBD (see 4.8.2). This section shall consist of the following (see figure 8):

- a. The title "List of Missing Drawings" is centered at the top of the page, with columns titled "Document Number," "CAGE," "Drawing Title," "Referenced on," and "Location" listed below. The "Referenced on" column indicates what document cites the missing document, and the "Location" column indicates where the missing document was cited (find number, note, or material block).
- b. Missing drawings should be listed in alpha-numeric sequence.

30.9 DL/IL/PL discrepancies. Discrepancies against DL's, IL's, and PL's shall be listed corresponding to the drawing number for which they apply (see figure 7).

30.10 Distribution of the ES. The ES should be sent to the program office responsible for the procurement of the system under review. The program office shall forward the ES to the contractor via the contracting officer. The reviewing activity should retain a copy of the ES and a copy of the annotated drawings until the final delivery of the EDP is accepted by the Government.

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ENGINEERING STUDY

(EQUIPMENT NOMENCLATURE)

CONTRACT XXXXXX-XX-X-XXXX

(CONTRACTOR)

ENGINEERING STUDY VOLUME XX

(DATE PREPARED)

PREPARED BY:

(Government Review Activity Name)

(Address)

(Address)

TELEPHONE (XXX) XXX-XXXX

FIGURE 1. Sample Format of an Engineering Study Cover Sheet.

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T A B L E O F C O N T E N T S

	<u>PAGE</u>
INTRODUCTION	2
LIST OF GENERAL COMMENTS	3
GENERAL COMMENT A	4
GENERAL COMMENT B	5
GENERAL COMMENT C	6
GENERAL COMMENT D	7
GENERAL COMMENT E	8
LIST OF REVIEWED DRAWINGS TO WHICH ONLY GENERAL COMMENTS APPLY	9
LIST OF REVIEWED DRAWINGS FOR WHICH SPECIFIC COMMENTS APPLY	10
LIST OF MISSING DRAWINGS	14

FIGURE 2. Sample Format of a Table of Contents.

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INTRODUCTION

(Government Procuring Activity or Program Office) has assigned the (Review Activity) the responsibility to review the Engineering Drawings and Associated Lists submitted for the (equipment nomenclature). These drawings and lists were submitted by (Contractor) under contract XXXXXX-XX-X-XXXX as a (developmental design or production drawing) package in accordance with the requirements of MIL-T-31000.

The review was conducted to evaluate the technical content of the engineering drawings and their compliance with the contract requirements. The comments in this engineering study are intended to point out deficiencies found in the engineering drawings. The listed discrepancies might be found throughout the drawing package. The contractor is requested to make corrections throughout the entire package before resubmitting the drawings. The contractor is only required to resubmit new or corrected drawings for review.

This report is presented in the format of General Comments and Specific Comments. General Comments are repetitive in nature and are applicable to many drawings. Letters are used to designate repetitive comments and a list of General Comments is presented at the beginning of this study. Specific Comments apply to individual drawings, are designated by numbers, and are presented for the applicable drawing reviewed.

FIGURE 3. Sample Format of an Introduction to an Engineering Study.

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LIST OF GENERAL COMMENTS

<u>GENERAL COMMENT LETTER</u>	<u>TITLE</u>
A	Specification Error MIL-P-23377
B	Specification Error MIL-F-14072
C	Specification Error TT-E-485
D	Specification Error QQ-A-200
E	Removal of Proprietary Statements

FIGURE 4. Sample Format of a List of General Comments.

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GENERAL COMMENT A

SPECIFICATION ERROR MIL-P-23377

Prime Finish is specified as MIL-P-23377, Class 2 on the drawing, but no Class 2 is listed in MIL-P-23377. MIL-P-23377 requires that Type and Component be specified for epoxy-polyamide primer coatings. Please rectify.

The following documents are examples of this problem:

<u>Drawing Number</u>	<u>Rev</u>	<u>Title</u>
130533	A	Mount
130534	C	Adapter
130535	F	Panel
130536	-	Fender
130537	B	Skid

FIGURE 5. Sample Format of a General Comment, Engineering Study.

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LIST OF REVIEWED DRAWINGS TO WHICH ONLY
GENERAL COMMENTS APPLY

<u>DRAWING NUMBER</u>	<u>REVISION</u>	<u>DRAWING TITLE</u>	<u>COMMENT LETTER(S)</u>
130566	B	Adapter	A, B & C
130570	-	Conductor Assy	A & B
130595	-	Clamp, Bolt	A & B
130634	F	Outer Cover	A, B & C
130697	G	Mount	A, B & D
130710	A	Back Panel	A & B
139418	C	Pivot	A & B

FIGURE 6. Sample Format of a List of Reviewed Drawings to Which Only General Comments Apply.

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SCREW, CAP, HEXAGON HEAD

82A009A0002

Rev -

1. This item has been altered and as such should be identified as an altered item drawing (reference DoD-STD-100, paragraph 201.4.4).

General Comment E applies.

FIGURE 7. Sample Format of Specific Comments.

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LIST OF MISSING DRAWINGS

<u>DOCUMENT NO.</u>	<u>CAGE</u>	<u>DRAWING TITLE</u>	<u>REFERENCE ON</u>	<u>LOCATION</u>
149632	80372	Bolt	PL 126100	F/N 6
165300	95011	Unknown	126100	Item 49
166320	67802	Test Procedure	142200	Item 5
179990	33575	Casting	145422	Note 9
190456	48111	Unknown	146334	Note 12

FIGURE 8. Sample Format of a List of Missing Drawings.

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CONCLUDING MATERIAL

Custodians:

Army - AR

Navy - MC

Air Force - 16

Preparing activity:

Navy - MC

(Project DRPR-0305)

Review activities:

Army - AV, EA, ER, ET, ME, MI, TM

Navy - YD, OS, SH

Air Force - 11, 13, 14, 17, 18, 19, 99

DLA - ES

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER

MIL-HDBK-288B(MC)

2. DOCUMENT DATE (YYMMDD)

14 January 1991

3. DOCUMENT TITLE

MILITARY HANDBOOK: REVIEW AND ACCEPTANCE OF ENGINEERING DRAWING PRACTICES

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

7. DATE SUBMITTED

(1) Commercial

(YYMMDD)

(2) AUTOVON

(If applicable)

8. PREPARING ACTIVITY

a. NAME

Commanding General, Marine Corps Research,
Development, and Acquisition Command (PSE-C)

b. TELEPHONE (Include Area Code)

(1) Commercial

(2) AUTOVON

(202) 696-1186/87/88

226-1186/87/88

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