

MILITARY SPECIFICATION

DRAWINGS, ENGINEERING AND ASSOCIATED LISTS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Purpose. This specification prescribes requirements for engineering drawings and associated lists acquired in support of Department of Defense Materiel (see 6.1).

1.2 Application. The requirements of this specification are applicable to engineering drawings and associated lists regardless of their mode of preparation (see 6.3.1), or system of measurement (see 6.2.1).

1.3 Classification. Engineering drawings and associated lists shall be acquired in one or more of three Levels.

- (a) Level 1 - Conceptual and Developmental Design
- (b) Level 2 - Production Prototype and Limited Production
- (c) Level 3 - Production

1.3.1 Levels. Levels 1, 2 and 3 provide for a natural progression of a design from its inception to production. Levels may be ordered to define a conceptual or developmental design, a production prototype or limited production design, or the highest type of engineering drawings required for quantity production of the item or system by the developer and other than the original developer. Combination of Levels may be specified in the contract or order (see 6.2.1).

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research & Development Command, ATTN: DRDAR-TST-S; Dover, New Jersey 07801 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

DRPR

DOD-D-1000B

SPECIFICATIONS

Military

MIL-D-5480 Data, Engineering and Technical, Reproduction Requirements for

MIL-M-9868 Microfilming of Engineering Documents, 35MM, Requirements for

STANDARDS

Military

MIL-STD-100 Engineering Drawing Practices

DOD-STD-1476 Metric System, Application in New Design

MANUALS

Military

5220.22-M Department of Defense Industrial Security Manual for Safeguarding Classified Information

(Copies of specifications, standards, drawings and publications required by a supplier in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Application for copies of DoD Manual 5220.22-M should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

3. REQUIREMENTS

3.1 General. The contract or order will identify the Level(s) of engineering drawings and associated lists to be acquired (see 6.2).

3.2 Existing engineering drawings and associated lists. Engineering drawings and associated lists prepared prior to the application of this specification are acceptable, if they meet the following:

(a) Are identified by name and address of design activity, FSCM (formerly known as "code identification") number, drawing nomenclature, drawing (part) number in accordance with MIL-STD-100 and contract number (see 3.11).

(b) Drawing practices and symbols used (including the use of legends/explanations for non-standard symbols) are such that their intent and interpretation are clear and unambiguous.

(c) Provide the necessary design disclosure information for the Level for which they are furnished.

(d) Have clarity and legibility in accordance with 3.9.

3.3 LEVELS

3.3.1 Level 1, Conceptual and developmental design. Engineering drawings and associated lists prepared to this Level shall, as a minimum, disclose engineering design information sufficient to evaluate an engineering concept and may provide information sufficient to fabricate developmental hardware (see 6.4.1).

3.3.1.1 Engineering drawings and associated lists prepared to this Level shall be legible and include those types most amenable to the mode of presentation. Layout drawings and combinations of types of engineering drawings may be used to convey the engineering concept in such a manner the the engineering information is understandable to cognizant Government engineers and scientists or enable fabrication by the design contractor of developmental hardware for test or experimentation.

3.3.2 Level 2, Production prototype and limited production. Engineering drawings and associated lists prepared to this Level shall disclose a design approach suitable to support the manufacture of a production prototype and limited production models (see 6.4.2).

3.3.2.1 Engineering drawing types (see 3.4) shall include, as applicable, parts list, detail and assembly drawings, interface control data, diagrams, performance characteristics, critical manufacturing limits, and details of new materials and processes. Special inspection and test requirements necessary to determine compliance with requirements for the item shall be defined on the engineering drawings or referenced to a document acceptable to the Government.

NOTE: In special circumstances and in unusual programs where usable engineering drawings need not meet the above requirements (Level 2 only), or the predicated end-use of required engineering drawings does not include a projected need for follow-on competitive procurement of the design item(s), Government organizational elements responsible for the determination of ordering Level(s) and use of engineering drawings are directed to the content of paragraphs 6.1, 6.1.1, and 6.2.1.

3.3.3 Level 3, Production. Engineering drawings and associated lists prepared to this Level shall provide engineering definition sufficiently complete to enable a competent manufacturer to produce and maintain quality control of item(s) to the degree that physical and performance characteristics interchangeable with those of the original design are obtained without resorting to additional product design effort, additional design data, or recourse to the original design activity. These engineering drawings shall:

- (a) reflect the end-product,
- (b) provide the engineering data for the support of quantity production, and
- (c) in conjunction with other related reprourement data shall provide the necessary data to permit competitive procurement (see 6.1) of items substantially identical to the original item(s) (see 6.4.3).

3.3.3.1 Engineering drawings (see 3.4) shall include details of unique processes, i.e., not published or generally available to industry, when essential to design and manufacture; performance ratings; dimensional and tolerance data; critical manufacturing assembly sequences; input and output characteristics; diagrams; mechanical and electrical connections; physical characteristics, including form and finish; details of material identification; inspection, test and evaluation criteria; necessary calibration information; and quality control data.

3.4 Types and number of engineering drawings. The complexity and engineering sophistication of the design for which engineering drawings are ordered determines the types and number of engineering drawings needed to satisfy the function and requirement of the Level ordered. MIL-STD-100 shall be used for the selection of the types of engineering drawings necessary to satisfy Level content and requirements.

3.4.1 The types and number of engineering drawings selected is predicated on sound engineering judgment. As an example: Content of a Level 3 requirement for a simple mechanical assembly might be satisfied by a few detail drawings and one assembly drawing and corresponding associated lists. On the other hand, a Level 3 requirement for a sophisticated systems design requiring the application of a variety of engineering disciplines may utilize the entire listing of types of engineering drawings in MIL-STD-100 and number into the hundreds of individual engineering drawings to satisfy the same Level content and requirements for the mechanical assembly.

3.4.2 Level 1 requirement of the simple mechanical assembly may only require a layout drawing and a diagram. However, a Level 2 requires sufficient engineering information to produce and test hardware representing production hardware. This could be satisfied by providing layout drawings supported by required detail drawings depicting required tolerances.

3.4.3 Unless otherwise specified in the contract or order (see 6.2.1), the contractor is responsible for the selection of the types and number of engineering drawings necessary to satisfy the content and requirements of the Level(s) ordered. Each Level content shall be examined on its engineering disclosure requirements in conjunction with

the engineering discipline involved and an engineering determination made as to the types or combinations of types of engineering drawings necessary to meet the requirements of the Level(s) ordered.

3.5 Preparation of engineering drawings and associated lists.

Engineering drawings and associated lists shall be prepared to meet the stated requirements of the Level(s) ordered (see 6.2), the procurement requirements (see 6.2.1) and the following requirements (see also 3.2).

(a) The requirements of MIL-STD-100 do not apply to Level 1 engineering drawings and associated lists, unless otherwise specified in the contract or order (see 6.2.1).

(b) Level 2 engineering drawings and associated lists shall be prepared in accordance with MIL-STD-100, unless otherwise specified in the contract or order (see 3.3.2.1 Note and 6.3.1).

(c) Level 3 engineering drawings and associated lists shall be prepared in accordance with MIL-STD-100.

(d) The application of the metric system in new design, or when specified in the contract or order, shall be in accordance with the requirements of DOD-STD-1476.

3.5.1 The following conditions for the preparation of engineering drawings for Levels 2 and 3 shall be governed by the contract or order (see 6.2.1):

(a) Whether a Government Design Activity or Contractor Design Activity name, Federal Supply Code for Manufacturers (FSCM) number and drawing number will be placed in the title block of the engineering drawing(s) and associated list(s).

(b) When Government Design Activity drawing numbers are to be assigned, identify the assigning activity; and, if Government drawing formats are to be supplied, identify the source.

(c) Kinds of associated lists required.

(d) Drawing assembly level at which associated lists will be prepared.

(e) Whether the mono-detail drawing system will be used.

(f) Whether parts lists shall be integral with, or separate from, the engineering drawing.

(g) Drawing format material.

3.5.2 Control drawings. Unless otherwise specified in the contract or order (see 6.2.1), a control drawing(s) as defined in MIL-STD-100 shall be prepared for commercial items approved for use in the design and not covered by Government or nationally recognized industry association specifications and standards (see 3.6, 3.7 and 3.3)

3.5.2.1 Specification control drawings. A specification control drawing (see MIL-STD-100) shall only be prepared for vendor-developed item(s) when such are advertised or cataloged as available to the trade or the public on an unrestricted basis or procurable on order from a specialized segment of industry. Specification control drawings shall not be tailored to the characteristics of a single vendor's product to the exclusion of other equally suitable products. Conversely, specification control drawings shall not be so broad as to permit acceptance of products which will not perform in the equipment under all required conditions.

3.5.2.2 Source control drawing. A source control drawing (see MIL-STD-100) shall only be prepared when:

- (a) the performance requirements can be met by one or more sources and
- (b) the item is for a critical application and
- (c) tests have demonstrated the item as meeting the stated requirements.

3.6 Items covered by Government and industry specifications and standards. Engineering drawings and company standards shall not be prepared or submitted for items that are defined by Government specifications, standards or nationally recognized industry association specifications or standards. (see MIL-STD-100).

3.7 Company standard.

3.7.1 Definition. A company standard is a document that establishes company engineering and technical limitations and applications for items, materials, processes, methods, design, and engineering practices.

3.7.2 Requirements. A company standard shall meet the following requirements (see 6.2.1):

- (a) Is identified by name and address of issuing company, FSCM number, document nomenclature and number, and contract number (see 3.11).
- (b) Does not contain limited rights in technical data (see 3.11).
- (c) Provide the necessary design disclosure information for Level of drawing for which they are furnished.

- (d) Satisfy the same procurement requirements as for a specification control drawing when it defines a vendor item.
- (e) Drawing practices and symbols used (including the use of legends/explanations for non-standard symbols) are such that their intent and interpretation are clear and unambiguous.
- (f) Have clarity and legibility in accordance with 3.9.
- (g) All documents referenced (see 3.6) in a company standard shall also be supplied and shall meet the same requirements as for a company standard.

3.8 Reference documents. Contractor documents referenced on engineering drawings are considered reference documents and shall be furnished as part of the Level(s) ordered as an integral part of the engineering drawings. When first tier references do not provide the essential technical information the contractor's subordinate reference shall be provided to the extent necessary to meet the technical disclosure requirements of the Level ordered. However, technical manuals, procedural manuals, maintenance manuals and company drafting manuals are not considered reference documents.

3.9 Clarity and legibility. Engineering drawings and associated lists (including those covered in 3.2) shall be of such clarity that when reproduced or when microfilmed, will produce copies conforming to the legibility requirements of MIL-M-9868 or MIL-D-5480, as specified. These provisions do not apply to Level 1, engineering drawings.

3.10 Safeguarding classified information. Engineering drawings and associated lists containing classified information shall be marked in accordance with provisions of the Department of Defense Industrial Security Manual for Safeguarding Classified Information, 5220.22-M.

3.11 Identification of engineering drawings and associated lists. Engineering drawings and associated lists prepared or submitted under the requirements of this specification shall be identified with the name of the contractor and the contract number. However, when the identification is applied to the first sheet of a multiple sheet drawing or list, it shall be deemed applicable to all sheets, except those continuation sheets identified with the limited rights in technical data legend (see 6.4.4) which shall be individually identified.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or order (see 6.2.1) the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the

Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure the engineering drawings and associated lists conform to prescribed requirements.

4.1.1 Contractor's engineering data quality system. Unless otherwise specified in the contract or order, the contractor shall have an effective quality system for the detailed examination and review for technical accuracy of all engineering drawings, associated lists, and reference documents to be supplied under the terms of the contract. The procedures of the quality system shall assure conformance of the engineering drawings and associated lists, with applicable contract provisions. The quality system shall be documented and subject to review by the Government representative. The quality system will be subject to the disapproval of the Government representative whenever the contractor's procedures do not accomplish their objectives.

4.2 Engineering drawing data quality control procedures. The contractor's procedures shall include but not be limited to:

4.2.1 Quantitative drawing requirements. Engineering drawing submissions shall be inspected to assure they include all the engineering drawings (and associated lists and other data when specified) necessary to make a complete set adequate for the specified Level.

4.2.2 Level content. The engineering drawings comprising each Level shall be inspected against the applicable parameters to ensure the required information is adequate for the Level specified.

4.2.3 Clarity and legibility. Engineering drawings and associated lists shall be inspected for clarity, legibility and reproducibility as specified in 3.9.

4.2.4 General inspection. For Levels 2 and 3, engineering drawings and associated lists shall be subject to the following inspections. For Level 1 only (a), (b), and (c) apply (see also 3.3.1.1).

- (a) Classified information is properly marked (see 3.10)
- (b) Rights in technical data have been properly identified (see 6.4.4).
- (c) Special inspection and test requirements are shown when required.
- (d) Drafting format materials are as specified (see MIL-STD-100).

(e) The order of precedence of specifications and standards which are applicable and referenced (see MIL-STD-100) and the specific identification of types, grades, classes, conditions, etc. (see MIL-STD-100) are correct.

(f) Engineering drawings and company standards have not been submitted, when suitable specifications, standards or engineering drawings are known to exist (see 3.6).

(g) Part identification requirements are specified when required (see MIL-STD-100).

(h) Altered or selected parts have been properly delineated (see MIL-STD-100).

4.3 Nonconforming engineering drawings, associated lists and reference documents. Failure of engineering drawings, associated lists or reference documents to conform to the requirements of this specification will result in rejection as nonconforming. Nonconforming engineering drawings, associated lists, and reference documents shall be re-examined after correction of all discrepancies. The supplier shall identify the deficiencies corrected and the action taken to prevent recurrence.

4.4 Validation of engineering drawings. In those instances where hardware has been developed or produced by the contractor, engineering drawings shall be "proved" against corresponding hardware depicted or described on the engineering drawings. Use of the engineering drawings in producing, inspecting and testing satisfactory hardware is considered acceptable evidence that the validation requirement has been met.

5. PREPARATION FOR DELIVERY

5.1 General requirements. The following requirements apply to shipment to the Government and to shipments made at the request of the Government.

5.1.1 Microfilm. When delivery of microfilm of drawings is a contractual requirement, preparation for delivery shall conform to MIL-M-9868 or as specified in the contract or order.

5.1.2 Reproducible and non-reproducible drawings including originals. When delivery of reproducible and non-reproducible copies of engineering drawings and associated lists is a contractual requirement, preparation for delivery shall conform to MIL-D-5480, except that a data list(s) conforming to MIL-STD-100 and entitled "MIL-D-5480, Shipping List(s)" may be substituted for the shipping list when it contains the information required, and all items not included in the shipment are deleted from the list. Originals, when ordered, shall be packaged in accordance with the same requirements applicable to reproducibles, or as otherwise specified in the contract or order (see 6.2.1).

6. NOTES

6.1 Acquisition of engineering drawings and associated lists.

This specification reflects Department of Defense policy of acquiring only those engineering drawings and associated lists that are needed. DoD personnel responsible for ordering engineering drawings and associated lists shall determine their needs on the basis of the use of the data with careful consideration of the immediate planned and probable future use of the system or materiel to which the engineering drawings relate. The ordering of data shall consider planned competitive procurement to avoid over or under specification of the engineering drawing requirement.

6.1.1 Special circumstances. In circumstances or programs where usable engineering drawings and associated lists exist which do not meet the requirements of this specification or the predicted end-use of the engineering drawings and associated lists does not include the need for follow-on procurement, tailoring of need by cost savings alternatives to the requirements of the Level(s) ordered, is encouraged.

6.2 Ordering data. Procurement documents will specify the following information for each item or group of items for the different Levels of engineering drawings and associated lists. Tailoring of engineering drawing and associated list requirements will be accomplished through the application of the procurement requirements of 6.2.1.

6.2.1 Procurement requirements.

- (a) Title, number and date of this specification.
- (b) The Level of the engineering drawings required for specific items, and for groups of items requiring different Levels.
- (c) Whether a Government Design Activity or Contractor Design Activity name, Federal Supply Code for Manufacturers (FSCM) number and drawing number will be placed in the title block of the engineering drawing(s) and associated list(s).
- (d) When Government Design Activity drawing numbers are to be assigned identify the assigning activity, and if Government drawing formats are to be supplied, identify the source.
- (e) Whether any parts of MIL-STD-100, shall be applied to Level 1 requirements (see 3.5).
- (f) The applicable Data Item Description (see 6.2.2).
- (g) Whether the metric system shall be used in new design (see 3.5).
- (h) Whether tailoring of needs is required.
- (i) Whether company standards shall be accepted (see 3.7).

- (j) Kinds of associated lists required.
- (k) Drawing assembly level at which associated lists will be prepared.
- (l) Identify whether the mono-detail system will be used (see MIL-STD-100).
- (m) Selection of types of engineering drawings if different than 3.4.3.
- (n) Whether control drawings in accordance with MIL-STD-100 shall be prepared (see 3.5.2).
- (o) Whether parts lists shall be integral with or separate from the engineering drawings.
- (p) Drawing format material (see MIL-STD-100).
- (q) Quantity and type of reproduction.
- (r) Whether microfilm is required.
- (s) Whether delivery of original drawings and undimensioned drawings are required.
- (t) What special packaging of originals, when ordered, is required.
- (u) Delivery schedule, and to whom the engineering drawings and supporting documents are to be delivered (see also 6.2.3).

6.2.2 Contract data requirements. Data conforming to Data Item Description (DID) DI-E-7031 shall be listed on a DD FORM 1423 included in the contract or order.

6.2.3 Acquisition of engineering drawings and associated lists. Techniques of deferred delivery and deferred ordering should be used (see ASPR, Section IX, Part 5).

6.3 Sound business principles. Application of the above does not obviate the continuing responsibility of the Procuring Activity to ensure the proper application of sound business principles to each procurement action involved with the acquisition of engineering drawings and associated lists to ensure delivery of the engineering drawings and associated lists to a DoD repository without the need for the expenditure of additional resources in the future to make them usable.

6.3.1 Engineering drawings and associated lists prepared by other than manual means (by computer, plotter, photosetter, etc.) shall provide all of the engineering information required by the particular Level. Minor variations from MIL-STD-100 to accommodate the document preparation technique involved shall be acceptable so long as these variations do not detract from the requirements relative to the information contents.

6.3.2 Cost reduction techniques. Cost reduction techniques are encouraged for the preparation of engineering drawings and associated lists when these techniques do not impair the reproducibility (including microfilm), clarity, and design disclosure requirements of the types of engineering drawings and associated lists being prepared. Specifically, cathode ray tube-interactive graphics, techniques currently identified, as photographic drafting and the use of permanently adhering non-fading, front-printed and mounted decals and paste-ons for repetitive features, as well as scissor-drafting techniques should be used to the maximum extent practicable.

6.4 Uses. The use for each Level is as follows:

6.4.1 Level 1, conceptual and developmental design.

6.4.1.1 Conceptual design. To verify preliminary design and engineering and confirm that the technology is feasible and the design concept has utility against stated military requirements in order to reduce technical uncertainty.

6.4.1.2 Developmental design. Developmental design is directed toward hardware, for test or experimentation and provide for a specific design approach. In addition, the data shall be suitable for analytical evaluation of the inherent ability of the design to attain the required performance.

6.4.2 Level 2, production prototype and limited production. Designs that approach the final form factor, employ standard parts (or non-standard parts approved by the agency concerned), take into consideration full military requirements with respect to performance, and can support limited production of models in final form and suitable for field test, deployment and logistic support.

6.4.3 Level 3, production. To provide engineering data for support of quantity production to permit competitive procurement for items substantially identical to original items. These engineering drawings reflect technical data possessing the highest level of confidence.

6.4.4 Restrictions on use. Use of engineering drawing(s) and associated list(s) identified with a limited rights in technical data legend shall be in accordance with contract provisions (see ASPR, Section II, Parts 2, 5 and 6).

6.4.5 Engineering data. Engineering data may be used for:

- (a) Logistic support.
- (b) Initial procurement, reprocurement or manufacture.
- (c) Determining price reasonableness of an offered item.
- (d) Identifying the responsible Inventory Control Point (ICP) for future management and procurement control of the item(s) and its stock quantity.
- (e) Producing a descriptive identification of the item(s) to enable:
 1. Cataloging in the Federal Supply System.
 2. Standardization of similar items.
 3. Reduction of items managed by the ICP's.
 4. Reduction of National Stock Numbers utilized to identify items.
 5. Development of the Federal Item Identification Guide (FIIG).
 6. Descriptive design screening in the Defense Integrated Data System for future items of supply.
- (f) Performing maintenance on the item, including overhaul.
- (g) Determining the most economical method for disposition of the item(s).

6.4.5.1 The above is not a complete listing. However, all listed items plan towards reducing the resources expended by the DoD.

6.5 Data base lines. Levels may define data base lines for configuration management purposes.

6.6 Terms and definitions. See MIL-STD-100.

6.7 International interest. Certain provisions of this specification (see 3.5) are the subject of international standardization agreements (ABCA Army QSTAG-253, QSTAG-323, QSTAG-275; ASCC Air Std 104/1). When amendment, revision or cancellation of this specification is proposed which affects or violates the international agreement concerned, the preparing activity will take appropriate reconciliation through international standardization channels including departmental standardization offices, as required.

DOD-D-1000B

Custodians:

Army - AR
Navy - OS
Air Force - 16

Preparing activity:

Army - AR

Review activities:

Army - AT, AV, EL, ME, MI
Navy - AS, EC, MC, SA, SH, YD
Air Force - 11
DLA - DH
NSA - NS

Project No. DRPR-0194

User activities:

Army - GL