ALLIED CONFIGURATION MANAGEMENT PUBLICATION

AEDP-1
(Edition 1)

ENGINEERING DOCUMENTATION

IN

MULTINATIONAL JOINT PROJECTS

FEBRUARY 1998

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NORTH ATLANTIC TREATY ORGANIZATION

MILITARY AGENCY FOR STANDARDIZATION

NATO LETTER OF PROMULGATION

February 1998

1. AEDP-1, Engineering Documentation in Multinational Joint Projects, is a NATO UNCLASSIFIED publication. The agreement of NATO nations to use this publication is recorded in STANAG 4457.

2. AEDP-1 is effective upon receipt.

A. GRØNHEIM
Major General ITAF
Chairman, MAS

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RECORD OF CHANGES

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INTRODUCTION

1.1 Referenced Documents

A. STANAG 4159 - NATO Materiel Configuration Management Policy and Procedures for Multinational Joint Projects

B. AAP-20 - Handbook on the Phase Armaments Programming System (PAPS)

C. ARMP-4 - Guidance for Writing NATO Reliability and Maintainability Requirements Documents

D. STANAG 2895 - Extreme Climatic Conditions and Derived Conditions for Use in Defining Design/Test Criteria for NATO Forces Materiel

E. STANAG 4272 - NATO Standard Methods of Preservation

F. STANAG 4280 - NATO Levels of Packaging

G. STANAG 4281 - NATO Standard Marking for Shipment and Storage

H. STANAG 4329 - NATO Standard Bar-Code Symbology

J. AAP-23 - NATO Glossary of Packaging Terms and Definitions (English and French)

K. AEPP-2 - NATO Standard Packaging for Materials Susceptible to Damage by Electrostatic Discharge

L. ALP-10 - Guidance on Integrated Logistic Support for Multinational Equipment Projects (ILS)

M. ISO 1000 - SI Units and Recommendations for the Use of Their Multiples and of Certain Other Units

N. ACodP-1 - NATO Manual on Codification Chapter V ADP for NATO Data Exchange

1.2 Scope

1.2.1 This Allied Publication provides guidance on the purpose, content and preparation of engineering documents (specifications, drawings and associated lists) associated with NATO Multinational Joint Projects.

1.2.2 This Allied Publication complements AAP-20 and describes the engineering documentation required in the NATO Phased Armaments Programming System (PAPS) phase 4 - Project Definition, phase 5 - Design and Development, and phase 6 - Production. See Figure 1-1.

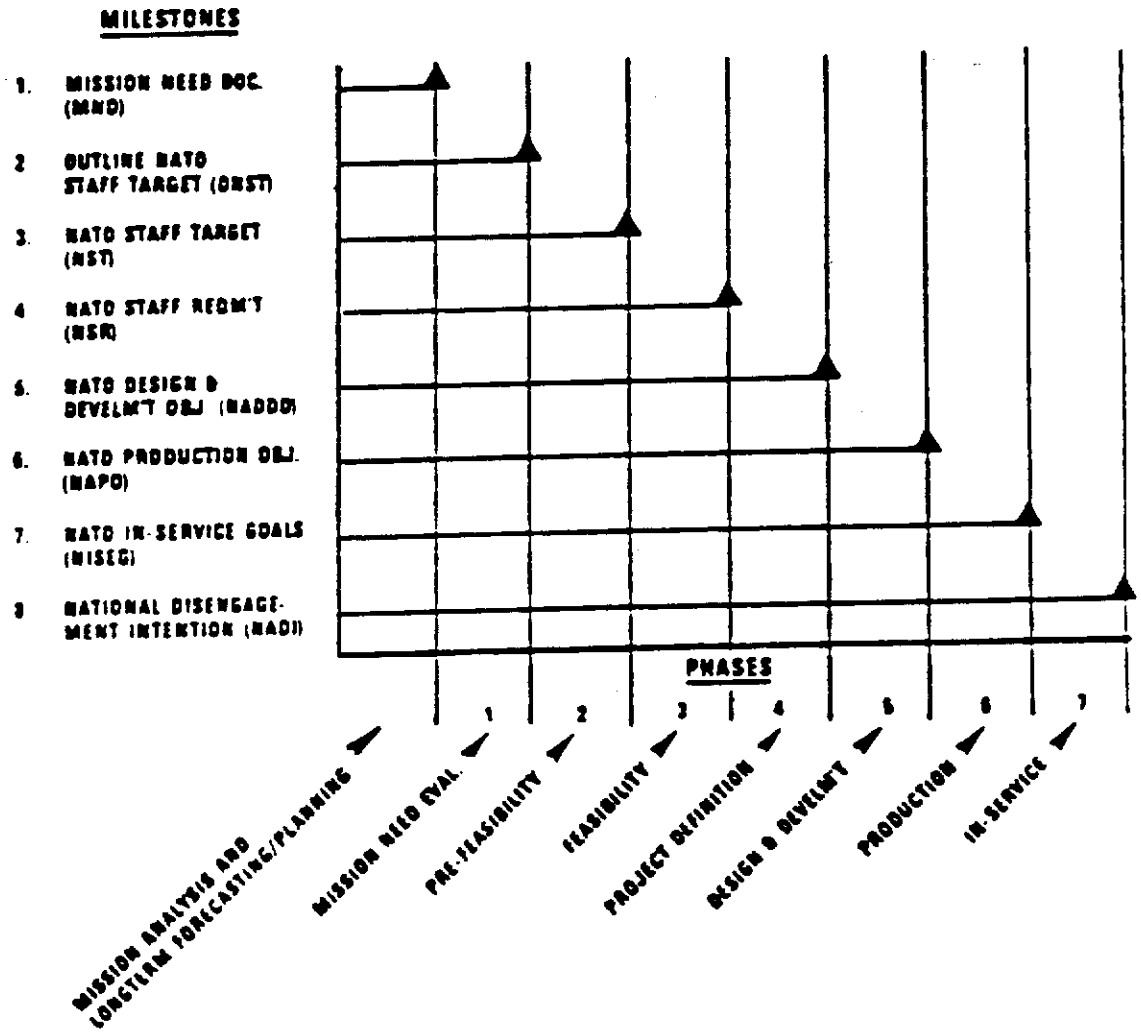

Figure 1-1

PAPS Phases - Milestones

1.2.3 This Allied Publication also complements STANAG 4159 and describes contents and format of baseline documentation. The specifications and engineering drawing requirements set forth in chapters 2 - 4 are subject to configuration management in accordance with that STANAG.

1.2.4 The detail provisions of chapters 2 - 4 are subject to tailoring in accordance with project requirements.

1.2.5 Integrated Logistic Support (ILS) is a fundamental requirement of the user. This Publication has been written so that each technical document may incorporate the ILS features appropriate for a given programme. These features should be in accordance with ILS planning documents which should be prepared as early as possible in the programme. ILS during the in-service phase is dependent upon the preparation and management of engineering documents during earlier phases. Logistic Support documentation (eg. operator manuals, maintenance manuals, spare parts lists) is not a subject of this publication.

1.3 Supersession.

This Allied Publication supersedes AQAP-8 "NATO Guide for the Preparation of Specifications for the Procurement of Defence Materiel".

1.4 Terms and Definitions.

See Annex A.

CHAPTER 2

ENGINEERING DOCUMENTATION IN THE PROJECT DEFINITION PHASE (PAPS PHASE 4)

2.1 NATO Staff Requirement (NSR).

PAPS defines the NSR as "a detailed statement of the required design parameters and operational performance of the equipment or weapon system(s)". It also suggests a format for this key document. The NSR supports the milestone decision to commence Phase 4 and includes a summary of the preliminary functional baseline documentation. This document describes the system requirements upon which project definition is based. In addition to the technical requirements, the NSR describes considerations such as mission needs, installation and operating staff levels, management, economic, standardization, Integrated Logistic Support and future intentions.

2.2 Functional Baseline (FBL) Documentation.

PAPS Phase 3 "Feasibility" terminates with an agreed technical concept which supports the milestone document NSR and constitutes the preliminary FBL documentation. Early in Phase 4, this documentation is transcribed into a system specification which constitutes the FBL. The FBL documentation plus all the technical change documentation approved during Phase 4 will develop into the final project definition which forms the basis of the milestone document NATO Design and Development Objective (NADDO) and constitutes the preliminary development baseline documentation. The FBL consists of a system specification and conceptual drawings.

2.3 System Specification.

The system specification is based on the NSR. Its purpose is to define the system requirements (that Phase 3 has recommended are feasible) in sufficient detail to initiate the design tasks required to define how the requirements will be satisfied. Design constraints included at this point may be limited to system interfaces and applicable standards. The design authority should be given maximum freedom to propose a design that satisfies the customer's requirements. The system specification should be prepared in accordance with the requirements of Annex C and as follows.

2.3.1 System Description.

The constituent parts of the system are identified and their contribution described, so allowing an educated distribution of system attributes to be made. Any elements of the system that already exist or are to be developed by other contractors should be identified so that inter-system interface requirements may be identified. The projected life cycle of the system should also be fully described. It should be broken down into all of the individual phases such as storage, transportation, handling, peacetime operation, wartime operation. The detail of performance requirements for each individual phase should be described in the functional requirements section.

Wherever possible the length of time and the frequency of occurrence of each phase should be given to allow the safety and reliability assessment of the system under various environmental conditions. For all elements of the system, consideration should be given to man-machine interaction.

2.3.2 Functional Requirements.

The functional requirements of the system shall be described as individual requirements but advice should also be included on the combination of these requirements so that the overall functional envelope may first be calculated and later demonstrated. For example, the range of an aircraft is dependent on fuel consumption. This is influenced by payload, air temperature at take off, rate of climb, cruise altitude and speed. The specification should therefore include a number of sortie patterns to allow a number of range calculations to be completed. Passive requirements such as Electromagnetic Compatibility (EMC), Radio Frequency (RF) and Infrared (IR) provision shall also be specified in maximum levels. The functions of the major sub-systems should be identified.

2.3.3 Physical Requirements.

At the system level physical characteristics are limited to those that relate to the total system. Such characteristics might therefore be overall dimensions for installation and storage, minimum internal dimensions for crew and operational purposes and those for transport and handling purposes, as weight and volume. Further detailed requirements may be discussed in the section dealing with Design Constraints and Interfaces. This is a section that is particularly applicable to hardware. Limitations on the mass of computing systems may be included here while other requirements such as power supplies, data distribution networks and heat dissipation would probably be included in other sections.

2.3.4 Design Constraints.

These might include the use of preferred materials, components and protective finishes; preferred design practices covering a range of topics such as stress calculations, EMC requirements, emergency and safety requirements; compliance with statutory requirements and the use of toxic and dangerous materials. Requirements for the use of standard components such as connections or ball hitches may be found in the sections dealing with interfaces. Constraints associated with computing requirements may include such topics as design standards, implementation languages, coding standards, the use of existing software packages and limitation of programme size.

2.3.5 Interface Requirements.

The purpose of this section is to identify and quantify the functional and physical interfaces that must be addressed during the design of the system. Occasionally it may not be possible to quantify all of the interfaces at the beginning of a project. In such circumstances their resolution should be given high priority. Typical inter-faces are:

a. those that exist between a system under development and others that exist or are proposed;

b. between the system and its proposed place of installation;

c. between the system (or elements thereof) and standard transport and storage facilities;

d. between major elements of the system that are developed by other contractors or by different departments of the Prime Contractor; and

e. those interfaces that are generated by the selection of interchangeable items for logistic purposes.

2.3.5.1 Computer Interfaces.

The need for the management of interfaces is of paramount importance for computer elements of the system. These may be considered under the following headings:

a. Man - Machine Interfaces.

A computer based system that is interactive with an operator involved in a decision-making process requires an interface to be agreed between the machine and the operator;

b. Hardware Interfaces.

Communications between elements of a computer or an Information Technology system rely on interfaces being agreed for communication parts, protocols and procedures; and

c. Software Interfaces.

These may include language interfaces to other software packages, requirements for specific operating system, database management and/or an application package.

2.3.6 Environmental Requirements.

The environmental requirements that the system is expected to experience shall be described in detail. The conditions and the limitations both natural and induced applicable to the production, transportation, installation, operation and storage of the system shall be stated. Where applicable it shall be specified whether the system will be required to meet or be protected against the specified environmental conditions. The environmental conditions and limitations shall be stated for the following as applicable:

a. climatic environmental conditions such as temperature, pressure, humidity;

b. geographical environmental conditions such as state of terrain, sea state;

c. mechanical environmental conditions such as shock, vibration;

d. electrical and magnetic environmental conditions;

e. nuclear, biological and chemical environmental conditions such as solar radiation, infestation by micro-organisms, contamination by fluids; and

f. miscellaneous environmental conditions.

It is important to state the conditions above as combinations where appropriate since in some cases the combined effect is more serious than each condition separately. The duration of exposure, cycles of environmental conditions and rates of variation (e.g. explosive decompression) are also important and should be specified where applicable. Self induced conditions are included as necessary when framing requirements for protection against specified environmental conditions. STANAG 2895 provides detailed guidance on climatic conditions affecting the design of materiel. STANAG 4370 provides guidance on environmental conditions and test procedures.

2.3.7 Interchangeability Requirements.

When this section is prepared, the service logistic support policy may not have been formulated. Requirements may therefore be limited to identifying major elements of the system which must be designed so that they are functionally and physically capable of being interchanged.

2.3.8 Human Requirements.

Human engineering is applied during development and acquisition of military systems, equipment and facilities to achieve the effective integration of personnel into the design of the system. A human engineering effort is provided to develop or improve the crew equipment/software inter-face and to achieve required effectiveness of human performance during system operation/maintenance/control and to make economical demands upon personnel resources, skills, training and costs. The human engineering effort may include active participation in the following three major interrelated areas of system development:

a. Analysis.

Starting with a mission analysis based on the NATO Staff Requirement, the functions that must be performed by the system in achieving its mission objectives are identified and described. These functions are analysed to determine the optimum utilisation of personnel, equipment, software or combinations thereof. Allocation of functions are defined for the specific tasks which must be performed to

accomplish the stated objectives. Each task is analysed to determine the human performance parameters, the system/equipment/software capabilities, and the tactical/environmental conditions under which the tasks are conducted. Task parameters shall be quantified, where possible, and in a form permitting effectiveness studies of the crew equipment/software interfaces in relation to the total system operation. The identification of human engineering high risk areas shall be initiated as part of this analysis;

b. Design and Development.

Design and development of the system equipment, software, procedures, work environments and facilities associated with the system functions requiring personnel interaction shall include a human engineering effort that will convert the mission, system and task analyses data into detail design or development requirements to create a personnel system interface that will operate within human performance capabilities, meet system functional requirements, and accomplish mission objectives. The final developed design is the culmination of all of the initial planning, system analyses, criteria and requirements application, and engineering effort. Specific design criteria for fulfilling stated human factor requirements shall be specified; and

c. Test and Evaluation.

Test and evaluation shall be conducted to verify that equipment, software, facilities and environment meets human engineering and life support criteria and is compatible with the overall system requirements.

2.3.9 Reliability, Maintainability and Testability Requirements.

Reliability, Maintainability and Testability criteria shall be specified. ARMP-4 provides guidance on the formulating of reliability and maintainability (R&M) requirements.

2.3.10 Safety Requirements.

This section shall describe requirements that the design shall satisfy to allow safe operation, handling and repair, under both normal and extreme conditions.

2.3.11 Packaging Requirements.

This section shall describe the packaging requirements for storage operations, handling and transport.

2.3.12 Training Requirements.

This section shall describe requirements such as how training shall be accomplished, the quantity of equipment needed, associated training devices etc.

2.3.13 Quality Assurance Requirements.

This section shall describe the system characteristics to be demonstrated using a range of methods. These may include mathematical modelling and laboratory, environmental, development and acceptance tests.

2.3.14 Certification Requirements.

The requirement for a contractor to produce a statement, signed by a senior director of the company, to certify the design may be needed and if so should be included in the specification. Such a statement should address each requirement detailed in this specification and state whether it has been satisfied. Any limitations on the use of the system should be included. That statutory requirements have been fully satisfied must be confirmed.

2.4 Conceptual Drawings.

This type of engineering drawing is primarily used in Phase 4 as follows:

a. to illustrate parts of the Functional Baseline, such as physical requirements and engineering descriptions;

b. to support the engineering design approach and engineering changes; and

c. to complement the final project definition and the preliminary Development Baseline documentation.

Conceptual drawings provide overall general information rather than complete design details. They need not be in accordance with drawing practice standards.

CHAPTER 3

ENGINEERING DOCUMENTATION IN THE DESIGN AND DEVELOPMENT PHASE (PAPS PHASE 5)

3.1 NATO Design and Development Objective (NADDO).

PAPS defines the NADDO as "an outline statement which covers the evaluation of design proposals in relation to the user requirement, the statement of agreed characteristics and the design and technical requirements specification". This will be achieved by reference to the system specification. The NADDO supports the milestone decision to commence Phase 5 and summarises the preliminary development baseline documentation.

3.2 Development (Allocated) Baseline (DBL) Documentation.

Early in Phase 5 selected documentation prepared during Phase 4 is designated the DBL. The DBL documentation provides the basis for the preparation of all of the documents that are used in the generation of developmental items including prototypes and then to support the milestone document, NATO Production Objective (NAPO). The DBL consists of :

3.2.1 Development Specification.

This will evolve from the system specification.

3.2.2 Sub-System Performance Specification(s).

This specification is derived from the development specification as follows:

a. Purpose.

The purpose of the sub-system performance specification is to define the requirements in sufficient detail to allow the full development of the sub-system to proceed. The total sub-system requirements must not be less than the System Requirements; and

b. Contents.

The sub-system specification is prepared in accordance with the requirements of Annex C and as follows:

(1) Description.

The specification shall include a description of the function that the

sub-system has to satisfy, its relationship with other sub- systems and its physical location within the total system;

(2) Functional Requirements.

The functional requirements of each sub-system shall be specified. These requirements shall include those found in the development specification and also those that are necessary for the interaction of sub-systems. The passive requirements discussed in the development specification shall also be included in so far as they are applicable. The functional requirements for the computing elements of the system define the transformation which the software and hardware components should perform. The functional elements for the software may be seen as having three components: the transformations of inputs to outputs; the requirements for sequencing and parallelism and aspects of the requirement that are outside the mainstream of the normal system behaviour. In order that these functions can be defined the data to be processed needs to be defined, and this also has three categories: inputs and outputs, stored data and transient data;

(3) Physical Requirements.

The physical requirements of the sub-system in terms of overall weight, dimensions and Centre of Gravity shall be defined. These requirements will be further influenced by the interface requirements between sub-system and others, by interchangeability and maintainability requirements and also the logistic requirements that will define how the sub-system may have to be divided into lower level Configuration Items (CIs); and

(4) Other Requirements.

The development specification may include other requirements that have to be transmitted to the sub-system designers such as reliability, maintainability, testability, safety, packaging, training.

3.2.3 Interface Documentation.

Functional and physical interfaces shall be documented in sufficient detail to satisfy all interchangeability and interoperability requirements using either specifications or drawings. Interface Specifications should be prepared in accordance with the general requirements of Annex C.

3.2.4 Special Test Equipment Specification.

There are two types of special test equipment whose configuration require specification:

a. Special To Type Test Equipment; and

b. Built In Test Equipment

The specification should identify the item(s) to be tested and the equipment to be used. It should define the tests to be conducted, associated test levels and their tolerances, and the test order. Where necessary, the environment in which the tests are to be conducted should be defined and also the axial arrangement of the item under test. When the tests or measurements require the equipment to provide power or stimulus to the item, the accuracy and quality of such inputs must be defined. The operating range should be specified together with the desired accuracy at the measurement point. If the test readings are to be automatically recorded such equipment must be considered to form part of the Test Equipment. This documentation should also include a full set of drawings, illustrations, catalogues for standard items and operation instructions. It should also include instructions on the method and frequency of calibration. This specification should be prepared in accordance with the general requirements of Annex C.

3.2.5 Developmental Drawings.

This type of engineering drawings is primarily used in Phase 5:

a. to illustrate parts of the DBL such as sub-system specifications;

b. to support the engineering design and engineering changes;

c. to facilitate the fabrication of prototype hardware for experimental purposes and/or development testing; and

d. to complement the preliminary Product Baseline documentation.

When used to illustrate the DBL, developmental drawings may still exhibit the characteristics of conceptual drawings and need not be in accordance with drawing practice standards. Whenever developmental drawings address the engineering design of prototype hardware or finished product they shall comply with recognized drawing practice standards.

CHAPTER 4

ENGINEERING DOCUMENTATION IN THE PRODUCTION PHASE (PAPS PHASE 6)

4.1 NATO Production Objective (NAPO).

PAPS defines the NAPO as "an outline statement of the manufacturing processes, manpower and facilities required for production of the equipment, including an outline production programme based on cost plans, quality control requirements, and the stated production specification". It also provides guidance on the format of this key document. The NAPO supports the milestone decision to commence Phase 6 and includes a summary of the preliminary product baseline.

4.2 Product Baseline (PBL) Documentation.

Early in Phase 6, documentation prepared during Phase 5 is designated the PBL. The PBL consists of:

4.2.1 Product Specifications.

Product specifications describe essential technical requirements for purchasing materiel, the primary requirements being derived from the development and sub-systems specifications (para. 3.2). Product specifications shall describe the item in a manner which will encourage maximum competition. In so far as practicable, requirements shall be in terms of performance. Requirements shall be detailed only to the degree necessary to ensure the acquisition of items adequate for the purpose to be covered. When other than form, fit, and function requirements are necessary to ensure interchangeability with respect to repairable items, it is permissible to specify details of design such as dimensions, materials, composition, and physical and chemical requirements to the extent necessary to ensure interchangeability of replacement parts. Product specifications should be prepared in accordance with Annex C and the following:

a. Requirements.

A product specification shall contain a requirements section that states the necessary requirements for obtaining the product for which the specification is prepared. The requirements shall represent actual essential needs for satisfying the intended use and application. Care shall be exercised to ensure that the stated essential needs result in acquisition of acceptable quality products at the least life cycle cost. Requirements shall be described in a manner to encourage competition and to avoid restrictive features which would limit acceptance to one or a relatively few contractors. Requirements shall be so worded as to provide a definite basis for rejection when testing and examination of product reveals the product does not meet

the specification requirements. Unrealistic or ambiguous requirements and those which conflict with referenced documents shall not be used. In addition, the following are applicable:

(1) specifications containing references to toxic products and formulations shall require compliance with the requirements of the applicable regulations of the participating nations;

(2) specifications that describe products containing hazardous materials shall include requirements for handling, transportation, storage and disposal or shall make reference to a document containing such information; and

(3) copyright or patent materiel shall not be included in a specification without the prior consent of the copyright or patent owner. When such consent is obtained, a credit line, if requested by the copyright or patent owner, shall be placed in the specification close to the materiel involved.

b. Quality Assurance Requirements.

Product specifications shall include a section detailing all testing that must be performed in order to determine compliance with the stated requirements. Inspection methods, such as conformance inspection, qualification, first article and standard sample, shall be conducted in accordance with recognized standards.

c. Packaging.

The requirements for preservation, packing, marking and unitization shall be included in product specifications. Requirements may be included by reference to other STANAGs, specifications and standards or, where these do not exist or are not applicable, by detailed instructions. AAP-23 provides terms and definitions for packaging. The levels of preservation and packing shall be specified in accordance with STANAG 4280. The requirements shall be specifically related to each required level of packaging in a manner which will leave no doubt regarding requirements applicable to such level. The packaging specified shall be adequate, but not greater than necessary, to fully meet the criteria of protection required. Materiel susceptible to damage by electrostatic discharge shall be packed in accordance with AEPP-2. Commercial packaging/trade packages, identified as such, may be used when something less than military levels are acceptable. Detailed packaging requirements shall be covered so far as practicable in the following basic categories:

(1) Preservation

The requirements shall be in accordance with STANAG 4272. The

processes required to adequately prevent deterioration or misidentification of the items (disassembly, cleaning, drying, preserving, wrapping, cushioning, unit packs, blocking, bracing, intermediate containers, and identification marking up to but not including the exterior packs) shall be included in the specification.

(2) Packing.

The requirements shall cover the exterior shipping container, the assembly of items or packs therein, necessary blocking, bracing, and cushioning. Container selection for packing shall provide for use of containers of minimum weight and dimensions consistent with anticipated storage and shipment hazards. The applicable levels of packing shall be included in the specification.

(3) Marking.

Marking for military levels of protection shall be in accordance with STANAG 4281 and applicable national standards. Commercial packaging/ trade packages shall be marked as prescribed. Other markings shall be applied as required by international statutes and regulations. Anti-counterfeiting considerations shall be addressed where appropriate, including the company logo as an acceptable method of identification. Bar-code symbology shall be in accordance with STANAG 4329.

(4) Unitization.

When applicable, unitized loads will be used when items or packs being shipped are compatible and will result in overall economy or when required by procuring activity.

d. Part Numbers.

A product specification which covers more than one part, item, or material that is subject to assignment of NATO or National Stock Number, shall describe the part numbering system to be used. Part Numbers shall not exceed 32 characters.

4.2.2 Process Specifications.

Process specifications shall be prepared where the manufacturing process is critical to the achievement of performance requirements. Such specifications must describe the process in sufficient detail that it can be repeated with consistent results. Any special purpose tools must also be listed together with their identification number. These specifications form part of the product

baseline. It should be noted that within this category may be specifications that include proprietary data and therefore are not for general release. In such cases they may not be transferable to other manufacturers except by special release. These specifications should be prepared in accordance with the general requirements of Annex C.

4.2.3 Material Specifications.

Material specifications as a minimum shall address the actual minimum functional, physical, chemical, electrical and mechanical requirements of the material, and shall be complete to the level of detail necessary to reproduce the same material without recourse to the original manufacturer. Material specifications as a minimum shall include:

a. a statement of the technical coverage of this specification and a general use of the material;

b. designation of types, classes, grades, sizes, compositions, or alpha/numeric designators for alternative materials covered by the specification, and the definitive characteristics applicable to such designation;

c. qualitative values with upper and lower limits for material and each component of the material;

d. specific conditions and properties such as colour, protective coating, waviness, surface finish, dimensions, and weight;

e. requirements such as composition, concentration, hardness, tensile strength, elongation, thermal expansion, electrical and resistivity;

f. a description of both induced and natural environmental conditions which the materials must withstand. These conditions and their effects on the material shall be stated in measurable quantitative terms with limits;

g. requirements for material stability such as shelf and ageing;

h. date concerning effects on the health and safety of the user and include adequate safety provisions where applicable;

j. requirements for the use of colour such as function or identification coding, for stamping or imprinting information on the material;

k. requirements for workmanship which are incidental to the manufacture or processing of the material. Although general in nature, the requirements stated herein relate to the fineness of manufacture processing that should be provided by

the craftsman or by the manufacturing process. Requirements stated herein generally cover features that can be verified by visual examination;

m. Quality Assurance provisions commensurate with the stated requirements including: responsibility for inspection, special tests and examinations, conformance inspection, test methods, packaging, packing and transportation requirements; and

n. preservation, packaging, marking, unitization and transportation requirements.

These specifications should be prepared in accordance with the general requirements of Annex C.

4.2.4 Product Drawings.

Complexity of design will influence type, and quantity of drawings required to communicate an engineering concept or enable production of hardware. This type of engineering drawing is primarily used in Phase 6 as part of the PBL to provide for competitive procurement and to facilitate full scale production. The type of product drawing used shall comply with recognized drawing practice standards and as previously agreed by the NATO Project Manager. Annex F provides a list of ISO standards associated with drawing practices.

4.2.4.1 Drawing Content.

Product drawings shall document directly, or through referenced publications (for example product specifications, and standards), the following as required:

a. graphics/diagrams;

b. details of unique processes, i.e. not published or generally available to industry when essential to design and manufacture;

c. performance ratings;

d. dimensional and tolerance data;

e. critical manufacturing processes and assembly sequences;

f. tolerance input and output characteristics;

g. mechanical and electrical connections;

h. physical characteristics, including form and finish;

j. details of material identification, including heat treatment and protective coatings;

k. inspection, test and evaluation criteria;

m. necessary calibration information;

n. quality assurance provisions;

p. part marking requirements;

q. environmental requirements and testing;

r. vibration and temperature cycling requirements; and

s. packaging data.

4.2.4.2 Source Control Drawings.

A source control drawing discloses sufficient information to ensure identification and re-procurement of acceptable items. It has the following characteristics:

a. it is used to provide:

(1) a means of establishing engineering requirements for the selection, qualification and acquisition of an item from commercial sources;

(2) identification of the items/sources qualified to meet the stated requirements for the specific applications;

(3) documentation to assure interchangeability of specified items, in the stated application, each time acquired; and

(4) coverage of source controlled items developed at private expense where the design is controlled by the originating design activity.

b. it shall include:

(1) the manufacturer and item identification for each item that has been qualified and approved for use listed under the heading APPROVED SOURCES OF SUPPLY;

(2) identification of the specific application for which the item is approved;

(3) the following notes:

(a) ONLY ITEMS DESCRIBED ON THIS DRAWING ARE APPROVED FOR USE IN THE APPLICATIONS SPECIFIED HERE ON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY THE DESIGN ACTIVITY; and

(b) IDENTIFICATION OF THE APPROVED ITEMS HERE ON IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUED AVAILABILITY; and

(4) the notation SOURCE CONTROL DRAWING placed adjacent to the drawing title block.

4.2.4.3 Drawing Notes.

Drawing notes are pertinent data given in word form and used to complement the delineation of other data. For further details see Annex D.

4.2.4.4 Drawing Format:

Figure 4-1 illustrates the format of a typical drawing sheet. Lettering size and style used on a drawing sheet shall be in accordance with recognised standards on "Line Conventions and Lettering". Information contained in the identified blocks is as follows:

a. Title Block:

(1) Design Activity: enter the name and address or the logo of the Design Activity;

(2) Title: the drawing title shall be the name by which the part or item will be known and shall consist of a basic name, type designator, if applicable, and sufficient modifiers to differentiate like-items in the same major assembly. References to next assembly/major item shall not be shown unless part of the drawing title. Titles for drawings requiring modifiers shall be in two parts. The first part shall be the name. The second part shall consist of those additional modifiers and type designators necessary to complete the identification of the item. The drawing title shall be shown in upper-case letters. Drawing titles shall be structured consistent with ACodP-3. Abbreviations shall be in accordance with recognized standards;

(3) Size: drawing size shall be in accordance with recognised standards on

Drawing Sheet Size;

(4) NSCM: enter the NATO Supply Code for Manufacturer (NSCM) (See ACodP-1 Chapter V);

(5) Drawing Number: the drawing number consists of letters, numbers or combination of letters and numbers, which may or may not be separated by dashes. The number is assigned to a particular drawing for identification purposes by the design activity. The drawing number shall be assigned from a block of numbers provided by the Design Activity. Package content, all kit drawings and vehicle top assemblies may require selected identification numbers as determined by the Design Activity. The drawing number shall not exceed 32 characters. Blank spaces are not permitted. Symbols such as parenthesis, asterisks, and degree shall not be used. The NSCM, drawing sheet size, and drawing revision letter are not considered part of the drawing numbers;

(6) Rev (optional block): enter the revision letter that reflects the revision status of that sheet;

(7) Scale: all drawings should be drawn to full scale. Where this is not practicable, scale shall be indicated by a fractional expression, eg 1/2, 1/4, 4/1. In case of diagrams, isometrics, perspectives, "NONE" should be indicated after scale; and

(8) Sheet: first sheet shall indicate "1 of (total)". Remaining sheets shall indicate sheet number;

b. Signature Block: with the exception of a date entry other signature block entries are optional subject to contract conditions, examples are as follows:

(1) Date: the dating of engineering drawings serves to establish the original date for historical record purposes. The original date shall be retained for the life of the drawing. The method of specifying the original date shall be numerical by year-month-day and shall be entered in the DATE block. For example 10th June 1986 would be "86-06-10" or "860610" (ISO practice). The original date shall be retained on redrawn drawings (same number). On multiple sheet drawings, all sheets have the same original date as on sheet 1; and

(2) Approval: all drawings shall be subject to a verification, approval or authorization system. The system used should require names or signature of responsible individuals in designated blocks for verification of drawing

conformance to technical requirements and contractual provisions. An example of a suitable signature block is shown in Figure 4-1;

c. Tolerance Block: general tolerances as applicable shall be indicated;

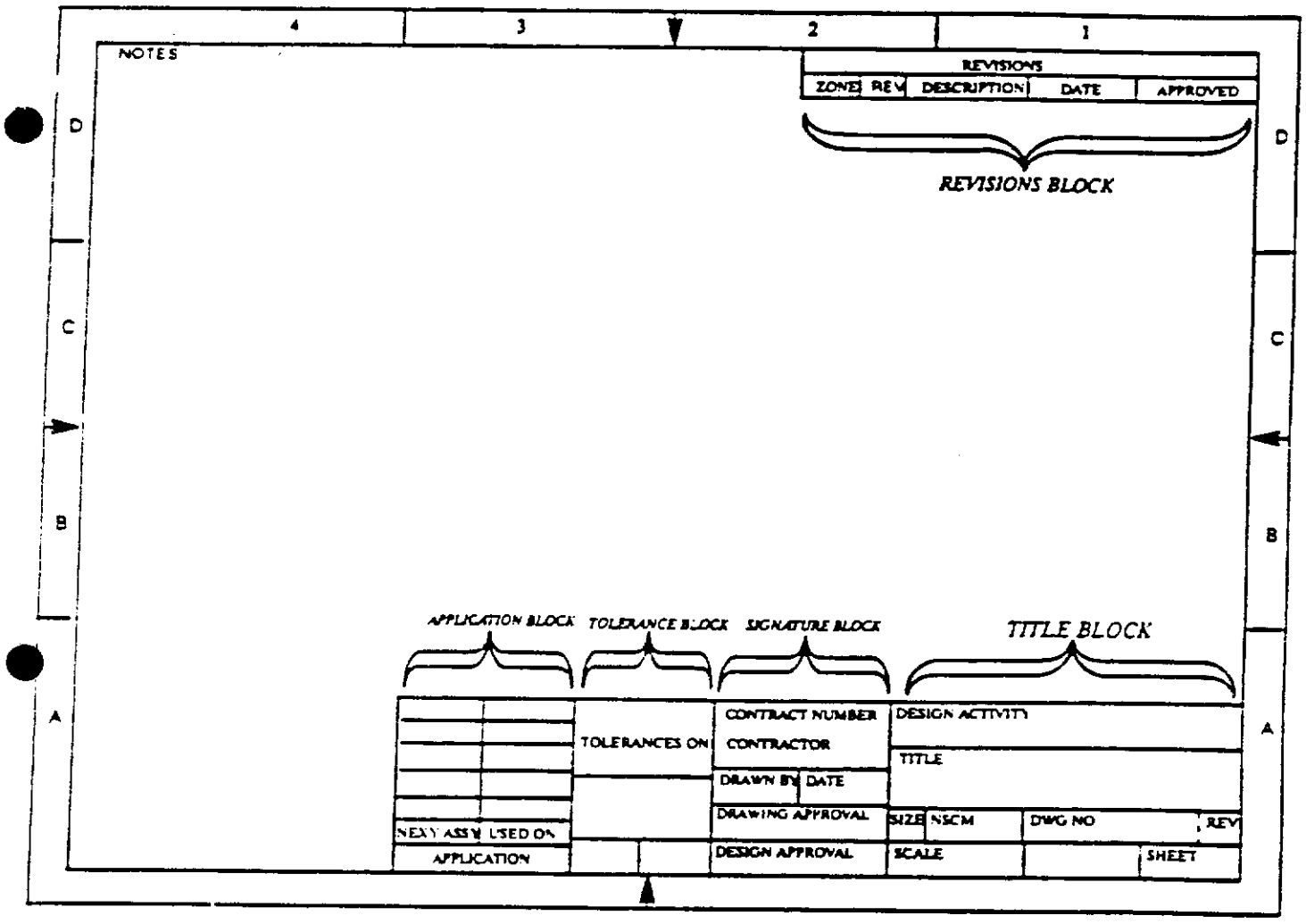

Figure 4-1

Drawing Format

d. Application Block:

(1) Next Assy: this column shall identify the drawing(s) on which the detail or assembly pertains; and

(2) Used On: this column shall identify the nomenclature of the system to which the items pertain;

NOTE: When application data is on a separate document a note shall be included on the drawing, preferably in the application block, indicating application date location.

e. Revisions Block: once the product baseline is established the revision of product drawings shall be in accordance with procedures approved by the NATO Project Manager. Suitable procedures for completing this block are illustrated at Annex E.

4.2.5 Associated Lists.

Associated Lists serve as a tabulation of pertinent engineering information relating to an item depicted on an engineering drawing or on a set of engineering drawings. Lists content and format shall be in accordance with standards previously agreed by the NATO Project Manager. Lists may be prepared manually or derived from electronically generated data. Associated Lists shall be of the following types:

4.2.5.1 Parts Lists (PL):

a. Preparation. Parts lists shall be prepared for each assembly level and may be prepared for other drawing levels. Parts lists are prepared integral to or separate from actual drawing graphics;

b. Integral Parts List. As a minimum shall require:

(1) heading "PARTS LIST";

(2) NSCM (See ACodP-3P-1 Chapter V);

(3) quantity required;

(4) find number and/or part identifying number;

(5) description; and

(6) critical/special items and processes notations eg Hardness Critical Item/Electrostatic Discharge Sensitive Device; and

c. Separate Parts List. When separate parts lists are used, the engineering drawing with which the parts list is associated shall contain a cross reference note. The recommended wording of the note is "SEE SEPARATE PARTS LIST". In addition to the elements required for integral parts lists, separate parts lists as a minimum shall include the following management information:

(1) design activity identification;

(2) PL prefixed plus drawing number and title;

(3) issue status and date;

(4) revision authorization document identification number;

(5) NSCM; and

(6) number of sheets.

4.2.5.2 Data Lists (DL). All Data Lists, as a minimum shall require the following:

a. heading "DATA LIST";

b. design activity identification;

c. list identification number prefixed by "DL" and list title;

d. issue status and date;

e. revision authorization document identification;

f. NSCM;

g. number of sheets; and

h. title or nomenclature of each document listed.

4.2.5.3 Index Lists (IL). All Index Lists, as a minimum shall require the following:

a. heading "INDEX LIST";

b design activity identification;

c. list identification number prefixed by "IL" and list title;

d. issue status and date;

e. revision authorization document identification;

f. title of each list;

g. NSCM;

h. number of sheets; and

j. identification of ILs listed (including revision level).

TERMS AND DEFINITIONS

A.1 **Acceptance**. The act of an authorized representative of the government by which the government assumes for itself, or as an agent of another, ownership of existing and identified supplies tendered, or approves specific services rendered, as partial or complete performance of the contract on the part of the contractor.

A.2 **Assembly.** A number of parts or subassemblies or any combination thereof joined together to perform a specific function. (Examples: power shovel-front, fan assembly, audio frequency amplifier).

A.3 **Associated list**. A tabulation of pertinent engineering information pertaining to an item depicted on an engineering drawing or on a set of engineering drawings.

A.4 **Configuration Baseline**. The configuration documentation formally designated at a specific point in the Configuration Item life-cycle. For NATO Configuration Management there are three baselines, Functional, Developmental (Allocated) and Product.

A.5 **Commercial item**. A commercial item is a term which includes both supplies and services of a class or kind which (a) regularly is used for other than government purposes, (b) is sold or traded in the course of conducting normal business operations and (c) an item not developed at a governments expense.

A.6 **Commercial Packaging**. The methods and materials employed by the supplier to satisfy the requirements of the suppliers distribution system.

A.7 **Configuration Identification**. The process of identifying and documenting the functional and physical characteristics of Configuration items.

A.8 **Configuration Item (CI)**. An item designated for configuration management.

A.9 **Data list (DL).** A tabulation of all engineering drawings, documents referenced there on (except in-house documents referenced parenthetically) associated lists, specifications, and subordinate data lists pertaining to the item to which the data list applies;

A.10 **Design Activity (DA).** An organization having responsibility for the design of an item. The organization may be a government activity or a contractor, vendor, or others.

A.11 **Document.** Document applies to the specifications, drawings, lists, standards, pamphlets, reports, and printed, typewritten or other information, relating to the design, procurement, manufacture, test, or inspection of items or services under the contract.

A.12 **Duplicate original**. An engineering drawing or data file created to serve as the official record of the item when the original has been lost.

A.13 **End-product (end-item).** An end-product is an item, either an individual part or assembly, in its final or completed state.

A.14 **Engineering data.** Engineering documents such as drawings, associated lists, accompanying documents, manufacturer specifications, and standards, or other information prepared by a design activity and relating to the design, manufacture, procurement, test, or inspection of items or services.

A.15 **Engineering Drawings**. Engineering drawings define, record and communicate concepts, and design and production requirements in a concise, graphic form utilising standard symbols, abbreviations and text on drawings and associated lists.

A.16 **Find number or item number.** A reference number assigned to an item in lieu of the item's identifying number on the field of a drawing and entered as a cross reference to the line of the parts lists where the actual item name and identification number are given.

A.17 **Firmware.** Software Object Code or Logic Object Code implanted in non-volatile hardware devices (ie Firmware = Device plus Software or Logic).

A.18 **Firmware Device**. An Electrically Programmable Device that can be implanted with Logic or Software Object Code.

A.19 **Index List (IL).** A tabulation of data list and subordinate index lists pertaining to the item to which the index list applies.

A.20 **Item.** A non-specific term used to denote any unit or product including materials, parts, assemblies, equipment, accessories, and attachments.

A.21 **Military packaging**. Materials, methods or procedures prescribed in NATO and nationally authorised documents such as standards, specifications and drawings, that are designed to provide the level of packaging necessary to prevent damage and deterioration during required distribution and storage.

A.22 **Manufacturer.** Manufacturer is a person or firm who makes a product.

A.23 **Original.** The design activity's full size reproducible drawing or digital data file(s) on which is kept the revision record recognised as official.

A.24 **Part.** One piece, or two or more pieces joined together, which are not normally subject to disassembly without destruction or impairment of designed use. (Examples: outer front wheel bearing of 3/4 ton truck, electron tubes, composition resistor, screw, gear, mica capacitor, audio transformer, milling cutter.)

A.25 **Parts List (PL).** A tabulation of all parts and bulk materials (except those materials that support a process) used in the item. Reference documents may also be tabulated on parts lists. Items listed on a subordinate assembly parts list or specific in a referenced document are not repeated in the using assembly parts list unless it is necessary to limit options permitted by the subordinate document;

A.26 **Production.** The process of converting raw materials by fabrication into required material. It includes functions of production scheduling, inspection, quality control, and related processes.

A.27 **Qualification**. The formal process by which a manufacturer's product is examined for compliance with the requirements of a source control drawing or product specification, for the purpose of approving the manufacturer as a source of supply. Qualification is conducted prior to and independent of any procurement action.

A.28 **Revision**. The term revision refers to any change to an original document after that document has been released for use.

A.29 **Revision symbol.** A revision symbol is an identifying letter or number or combination thereof used to identify changes to base line documents after official initial release.

A.30 **Specification.** A document prepared to support the acquisition of an identified materiel item or service. It clearly and accurately describes the totality of technical requirements and also the procedures necessary to determine that the requirements have been met.

A.31 **System**. A composite of equipment, skills, and techniques capable of performing or supporting an operational role, or both. A complete system includes all equipment, related facilities, material, software, services and personnel required for its operation and support to the degree that it can be considered a self-sufficient unit in its intended operational environment.

A.32 **Vendor.** A non-governmental Design Activity, manufacturer, seller, wholesaler, or agent from whom are acquired items or services in the performance of the contract.

ORDER OF PREFERENCE (SELECTION) OF STANDARDS AND PRECEDENCE OF DOCUMENTS

B.1 Preference (selection) of Standards.

During PAPS Phases 4, 5 and possibly 6, standards from different sources may be identified that are equally suitable for application. In such instances it is essential that a preferred determined order of selection be followed. For example:

a. NATO Standardization Agreements;

b. ISO/IEC Standards;

c. Regional or other international Standards;

d. National Standards;

e. National military Standards; and

f. Industry Standards/Project Standards.

B.2 Precedence of Documents.

During PAPs Phases 4, 5 and 6 two or more applicable documents may be found to be correct but slightly inconsistent in interpretation. In such cases the contractor should refer to the order of precedence published by the project manager. This order may change from one project phase to another and even within project phases. For the production phase when such occasions are most likely to occur the following order is suggested:

a. Product Drawings;

b. Product Specifications;

c. Lists;

d. Quality Assurance documentation; and

e. Procedures.

THE PREPARATION OF SPECIFICATIONS

C.1 The practice of creating a new specification is to be avoided when drawings and an existing specification can be applied or adapted for technical definition of the required product. Identification and review of existing specifications which may be suitable should be completed before initiating development of a new specification.

C.2 Text.

Specifications must be phrased in language free from ambiguity and in such terms that contractual implications are clear and enforceable. Consistency of terminology and organization of material are particularly important. Short concise sentences and a minimum of punctuation aid reading and prevent misreading. All mandatory and contractually binding requirements shall be identified. They should be precisely defined in the specification for the product. Optional variations of the requirements should also be clearly defined including precise limitations. Any advisory information contained in the specification must include an introductory statement clearly explaining that this information does not constitute authorization for non-compliance with any of the essential requirements. If departure from one or more specified essential requirement is acceptable for special applications, it must be authorized by instruction in the "contract" document issued for the product procurement. It is recommended that any information on "aim" or "recommendation" or "guidance" should not be written in the basic requirements section of the specification but can be attached in a supplemental information annex or section of the document.

C.3 Specifications should exercise a reasonable measure of constraint in favour of the use of engineering standards consistent with product efficiency since standardization is important in the creation of a coordinated NATO Defence Force. To this end the specifications should embody suitable clauses to the effect that the choice of parts (assemblies, components, spare parts and materials) should be such as to provide for the service user the recognized advantages of standardization.

C.3.1 Commonly used words and phrases.

Certain words and phrases are frequently used in a product specification. The following rules shall be applied:

a. referenced documents shall be cited thus:

(1) "conforming to ...";

(2) "as specified in ..."; and

(3) "in accordance with ...";

b. "unless otherwise specified" shall be used to indicate an alternative course of action. The phrase shall always come at the beginning of the sentence. This phrase shall only be used when it is possible to clarify its meaning in the contract or by reference to another paragraph in the specification;

c. when making reference to a requirement in the specification and the requirement referenced is rather obvious or not difficult to locate, the simple phrase "as specified herein" is sufficient and may be used;

d. in stating limitation, the phrase shall be stated thus: "the diameter shall be no greater than..." for maximum limit, or "the diameter shall be not less than ..." for minimum limit;

e. capitalize the words "drawing" and 'bulletin" only when they immediately precede the document identifier. However, specifications, standards, and handbooks shall be identified in the text only by their document identifier;

f. use the following prepositional phrases when referencing figure and table information: "on figure" and "in table";

g. "shall", the emphatic form of the verb, shall be used throughout product specifications whenever a requirement is intended to express a provision that is binding;

h. "will" may be used to express a declaration of purpose on the part of the Government. It may be necessary to "will" to indicate simple futurity;

j. use "would" and "may" whenever it is necessary to express non-mandatory provisions; and

k. indefinite terms, such as "and/or", "suitable", "adequate", "first rate", and "best possible" shall not be used. Use of "eg" and "ie" should be avoided and "etc" should never be used.

C.3.2 Terms and Abbreviations.

As far as possible only common terms and abbreviations should be used in the text of specifications. Preference should be given to terms defined in the NATO glossaries. Uncommon terms and those with a specialized meaning should be explained in the text or in a footnote and/or included in the list of definitions (see paragraph C.4.8). The first time an abbreviation is used in the text it should be placed in parenthesis following the word(s) or term(s) written in full. Symbols should be avoided in the text as far as possible but may be used in equations and tables. The

International System of Units as established by the International Standardization organization (ISO), and documented in ISO 1000, shall be used as far as possible.

C.3.3 Symbols.

Symbols, including graphic and mathematical symbols shall be in accordance with nationally recognized standards.

C.3.4 Equations, figures and tables.

Equations should be numbered consecutively as should figures (illustrations and graphs) or tables. Figures shall be clearly related to, and consistent with the text of the applicable paragraph. Each figure or table should be placed following or within the paragraph containing a reference to it. If tables or figures are numerous and their location within the text would cause difficulty in interpretation they should be placed in numerical sequence at the end of the specification. A table shall be used when information can be presented more clearly than as text. Elaborate or complicated tables shall be avoided. References in the text shall be sufficient detailed to make the purpose of the table clear. The table shall be restricted to information pertinent to the associated text. If space does not permit, the table may be placed on the following page. Large tables may be given on separate pages with appropriate reference made in the related text. Information included in tables shall not be repeated in the text. Tables shall be numbered consecutively throughout the document in the order of their reference in the text and shall be titled.

C.3.4.1 Footnotes to tables.

Footnotes may contain mandatory information that cannot be presented as data within a table. Number footnotes separately for each table as they appear in the table. Footnote symbols such as "1/" and "2/" shall be used and shall be placed immediately following a word and preceding a numeral requiring the footnote. Numbered footnotes are listed in order immediately below the table. Where numerals will lead to ambiguity (for example in connection with a chemical formula), superior letters, daggers, and other symbols may be used.

C.3.4.2 Footnotes to text.

Footnotes to the text should be avoided. Their purposes is to convey additional information that is not properly a part of the text. However, when the use thereof is essential, footnotes to the text shall be placed at the bottom of the page containing the reference to it. Footnotes shall be consecutively numbered throughout a specification.

C.3.5 References to other documents.

Referencing is the approved method for including requirements in specifications where this eliminates the repetition of requirements and tests that are adequately set forth elsewhere.

References shall be restricted to documents that are specifically and clearly applicable to the specification, that are current, and in the case of military specifications, standards, or handbooks, are readily available to all government activities and contractors. The extent to which each referenced document is applicable shall be indicated in a positive manner in a specification. The specification shall also include any special details, such as type or class, called for by the referenced document. Reference to paragraph number in other documents shall not be made. The reference shall be to a title, method number, specifically identified requirement, or other definitive designation. A document shall not be referenced that has been cancelled or superseded.

C.3.6 Metric practices.

Metric practices used within specifications shall be as defined by the NATO Project Manager.

C.3.7 Proprietary names.

Trade names, copyrighted names, or other proprietary names applying exclusively to the product of one company shall not be used unless the item(s) cannot be adequately described because of the technical involvement, construction, or composition. In such instances, one, and if possible, several commercial products shall be included, followed by the words "or equal" and a description of required salient features or particular characteristics to ensure wider competition and that bidding will not be limited to the particular make specified. The same applied to manufacturer's part numbers or drawing numbers for minor parts when it is impracticable to specify the exact requirements in the specification. The salient features or particular characteristics required to define "or equal" shall be included. The use of "brand name or equal" is discouraged but, when determined to be necessary, shall be supported by written justification and retained in the permanent document file.

C.4 Structure - List of subject which may be required in a specification.

As it is desirable that uniformity of material presentation should be achieved, the following list of section and paragraph headings have been drawn up on as wide a basis as possible in relation to technical specifications. For NATO use, the main section headings shown should always appear in the sequence indicated. For national use the sequence may be varied but the contents should remain essentially the same. Examples of paragraph headings are shown under each section. For more details of paragraph contents see paragraph C.4.3 to C.4.8.

TITLE Page

CONTENTS/INDEX Page

SECTION (1) INTRODUCTION

Scope
Classification into Categories
Reference Documents

SECTION (2) TECHNICAL REQUIREMENTS

Description and use
Functional characteristics (Performance)
Physical and other characteristics
Design and construction
Environmental conditions
Interchangeability/Interfaces
Compatibility/Interfaces
Reliability
Maintainability
Production Processes
Components and systems
Materials

SECTION (3) QUALITY ASSURANCE REQUIREMENTS

Development tests
Conformance inspection
Qualification
First article
Standard sample

SECTION (4) PACKAGING

Preservation
Packing
Marking
Utilization

SECTION (5) MISCELLANEOUS

Supporting services

Handling and storage
Other considerations

SECTION (6) DEFINITIONS OF TERMS, ABBREVIATIONS AND SYMBOLS

If necessary additional sub-headings may be introduced, eg in Section (2): "availability", "functional area requirements", etc and in Section (3): "responsibility for inspection", "qualification" etc.

C.4.1 Title Page.

This page shall contain the following information:

C.4.1.1 Title.

The title of a specification should be chosen so that no ambiguity can arise and so that it reflects the nature of the contents of the specification. Where a specification deals with physical items, the item name should be in accordance with the national index of approved item names. If it is not possible to identify an item by reference to ACodP-3, the title should be comprised of the item name which should be given in the form of a noun followed by descriptive words, eg Generator, Alternating Current, etc.

C.4.1.2 NATO Stock Number.

When the item is codified the NATO stock number should be added to the title page, if national usage is not to include it in the contract.

C.4.1.3 Authority For Preparation.

The title page should carry the names of the Authority responsible for the preparation of the specification and of the Issuing Authority. It should also carry the military security classification, and any security requirements should be clearly indicated in accordance with the appropriate regulations.

C.4.1.4 Proprietary Rights.

If compliance with the specification requirements will, by reference thereto, require the use of or access to proprietary data or material item involving copyrights or patents for trade marks, published data, design, inventions, manufacturing processes or other proprietary data or materiel approval should be obtained prior to issuance of the specification. When proprietary rights are involved any technical restriction should be indicated if national usage is not to include them in the contract.

C.4.1.5 Document Identifiers.

Specification must be both serially and issue numbered and dated so that there is no confusion with previous or subsequent issues or with other specifications; details should be given of previous issues which are superseded. Amendments, notices and supplements etc. should be numbered and titled in the same way as the main specification and indicate date of issue and provide technical detail and clarify language to the extent required for accurately communicating the intent (changes, additions or deletions).

C.4.2 Contents/Index Page.

As an aid to the use of the specification, an index or contents list should be provided following the title page if justified by the length of the document.

C.4.3 Section (1) INTRODUCTION.

The introduction should provide, when appropriate, relevant background information and should not be used to state technical requirements all of which should be included in the later sections.

C.4.3.1 Scope.

The "Scope" paragraph is primarily intended to identify for its users or potential users the extent and limitations of the subject matter covered by the specification. It should consist of a clear concise description of the subject covered and, if applicable, any restrictions or exclusions. It should also contain brief information describing the intended use of the product. In the case of items having a range of possible uses or applications, the particular uses intended should be specified (eg the combat roles for an aircraft). If appropriate, data on the main units and sub-units forming part of the item and/or the system in which the item itself is used should be provided. The content of the paragraph headed "Scope" should be sufficiently complete and comprehensive to describe in a broad way the item covered in terms that may be easily interpreted by manufacturers or others familiar with applicable terminology and trade practices.

C.4.3.2 Classification into Categories.

Designation of classification such as types, grades and classes, when applicable, shall be listed under this heading and shall be in accordance with accepted industry practice. The same designation shall be used throughout a specification. When more than one type, grade, class or other classification is listed, each shall be briefly defined. When only the classification is covered, a statement to this effect shall be included in the scope paragraph, and the classification paragraph omitted. The classification shall remain constant from revision to revision of the specification unless a change is necessitated by a valid reason such as a change in industry practice. Where the characteristics of an item change enough to affect interchangeability, delete the original designation

and add a new classification. Whenever it becomes necessary to change the designation without changing the characteristics of the item, a cross reference shall be included in the same specification indicating the relationship between the old and new designations. If the terms, types, grades and classes do not serve accurately to classify the differences as indicated above, other terms such as colour, form, weight, size, power supply, temperature rating, condition, unit enclosure, rating, duty, insulation, kind, and variety are suitable.

C.4.3.3 Reference documents.

Product specifications shall contain a listing of documents (but only those documents) referenced in those sections addressing "requirements", "Quality Assurance", and "Packaging". The listing of documents shall be by document title and basic identifier, excluding revision levels and related amendments or Notices. The documents listed should be restricted to those to which reference is made in the text. The referencing of a particular document should automatically be assumed to invoke other documents that it calls up unless specifically stated to the contrary. The source of supply of all referenced documents must be indicated. A clause should be introduced to the effect that in the event of conflict between the Specification requirements and any related or referenced document the Specification shall take precedence. A similar clause should be introduced giving the precedence in the event of conflict between referenced documents.

C.4.4 Section (2) TECHNICAL REQUIREMENTS.

The requirements should be described in such detail as may be required for the item and the type of specification. The requirement section should include technical data, as precise as practicable, of the design tolerances and performance requirements for all essential physical and functional characteristics which the item must meet to be considered for acceptance. Only those requirements shall be specified that are necessary for the product to achieve the operational performance required for the planned applications. When developing the technical requirements, the specification preparers should give consideration to available technology, manufacturing capabilities, economic impact, interoperability impact, safety, government control regulations, and logistics requirements. All functional and physical interchangeability and interoperability interface requirements must be clearly defined. For details of technical requirements see Chapters 2, 3 and 4 of this Publication.

C.4.5 Section (3) QUALITY ASSURANCE REQUIREMENTS.

This section shall include all testing that must be performed in order to determine compliance with the stated requirements. Inspection methods, such as conformance inspection, qualification, first article and standard sample, shall be conducted in accordance with recognized standards. The mandatory test and inspection requirements should be defined or referred to in the specification. They must be adequate to demonstrate that the item complies with the specified technical characteristics and should include such features as the test equipment, power source

requirements and environmental conditions. The extent of official Quality Assurance activity should be indicated in the specification or in the contract if this is in accordance with national practice. Where applicable, specifications should state the need for the provision of detailed test specifications/ standards/methods/procedures. These documents should include reference to or set out clearly the test methods and procedures to be adopted, including any correction factors to be used. Test methods and procedures should preferably be officially recognized ones. Where this is not possible the methods and procedures used by the manufacturer should be subject to approval by the purchaser, such powers of approval being delegated, if appropriate, to the National Quality Assurance Authority.

C.4.6 Section (4) PACKAGING.

The requirements for preservation, packing, marking, and utilization shall be included in product specifications. Requirements may be included by reference to other STANAGs, specifications, and standards, or, where these do not exist or are not applicable, by detailed instructions. The levels of preservation and packing shall be specified in accordance with STANAG 4280. The requirements shall be specifically related to each required level of packaging in a manner which will leave no doubt regarding requirements applicable to such level. The packaging specified shall be adequate, but not greater than necessary, to fully meet the criteria of protection required. Materiel susceptible to damage by electrostatic discharge shall be packaged in accordance with AEPP-2. Commercial packaging/trade packages, identified as such, may be used when something less than military levels is acceptable. Detail packaging requirements shall be covered so far as practicable in the following categories:

C.4.6.1 Preservation.

The requirements shall be in accordance with STANAG 4272. The processes required to adequately prevent deterioration or misidentification of the items (disassembly, cleaning, drying, preserving, wrapping, cushioning, unit packs, blocking, bracing, intermediate containers, and identification marking up to but not including the exterior packs) shall be included with appropriate headings as required. The applicable levels of preservation shall be included in the specification.

C.4.6.2 Packing.

The requirements shall cover the exterior transporting container, the assembly of items, or packs, therein, necessary blocking, bracing and cushioning. Container selection for packing shall provide for use of containers of minimum weight and cube consistent with anticipated shipment and storage hazards. The applicable levels or packing shall be included in the specification.

C.4.6.3 Marking.

Marking for military levels of protection shall be in accordance with STANAG 4281 and applicable national standards. Commercial packaging/trade packages shall be marked as prescribed. Other markings shall be applied as required by documentation governing specific commodities, as well as international statutes and regulations. Anti-counterfeiting considerations shall be addressed where appropriate, including the company logo as an acceptable method of identification.

C.4.6.4 Utilization.

When applicable, unitized loads will be used when the items or packs being shipped are compatible and will result in overall economy or when required by the procuring activity.

C.4.7 Section (5) MISCELLANEOUS.

This section is used for information with respect to considerations not included in other sections for example information concerning supporting services or handling and storage.

C.4.8 Section (6) DEFINITIONS OF TERMS, ABBREVIATIONS AND SYMBOLS.

The definitions of all uncommon terms, abbreviations and symbols and all those with specialized meaning may be collected together for reference if desired.

C.5 Contractual and administrative requirements.

Specifications shall not include contractual requirements that are properly a part of the contract, such as cost, quantity required, time or place of delivery, methods of payment, liquidated damages, rework, repair, re-submittal, requirements for preparation, submission, delivery, approval, and distribution of data, record keeping, and actions to be taken by a government for accepting nonconforming material. Contractual, administrative, and warranty provisions shall not be made part of the requirements in a specification. Parts control programs, calibration systems, and quality program and inspection systems requirements shall not be included in a specification. Specifications shall not prescribe mandatory requirements or instructions for a contract administration office. These include directions relating to quality assurance functions such as inspections, audits, reviews, certifications, and technical approvals.

C.6 Classified material.

Specifications are working documents and shall be designed to avoid unnecessary restrictions in their dissemination. Specifications containing classified information shall be appropriately marked and handled in accordance with national security regulations. The titles of

specifications shall not be classified. Care should be taken to ensure that classified data related to equipment other than the subject of the specification should be excluded.

C.7 Type Designators.

If appropriate and a definite need has been established, type designators may be used to supplement basic item names in titles of specifications. When used, they shall be standardized for a category of equipment, such as communication, electronic, photographic, aeronautical support, aircraft, missiles, engines (rocket, reciprocating, aircraft), and trucks. Only one type designator shall be assigned for items or equipment physically and functionally interchangeable. Type designators shall not be used for the purpose of assigning Part Numbers to components and parts. They shall be used for designating the class, grade, or type of an item or equipment for specification purposes only.

THE USE OF NOTES IN PRODUCT DRAWINGS

D.1 General.

This Annex provides guidance on the use, location and content of notes.

D.1.1 Location.

For the fullest extent practicable, the location of notes shall be consistent for a set of drawings.

D.1.2 Local notes.

Local notes should be avoided. Local notes should only be used to clarify requirements when a general note will not suffice. Local notes shall not utilize reference documents.

D.1.3 Note contents.

Drawing notes are pertinent data given in word form and used to compliment the delineation of other given data. The arrangement of the notes shall not be interpreted as an order of precedence or sequence in manufacturing, or assembly, unless so specified on the drawing. The following shall be applicable in the preparation/use of notes:

a. notes shall be numbered consecutively starting with Note 1 at the top of the column;

b. after product baseline release, when a note is deleted (crossed out or removed) from a drawing, the note number shall not be deleted nor will notes be renumbered.

c. reference shall be made to applicable specifications and standards by basic identifier but excluding revision level or existing notices or amendments;

d. if tabulation is used, different materials may be specified within a table or by notes;

e. geometric symbols, shall be placed around the note number when the note is referenced in the field of the drawing;

f. notes shall not duplicate information specified elsewhere on the drawing;

g. a single note shall communicate a single requirement; multiple requirements shall necessitate the use of the applicable number of notes;

h. information conveyed by notes shall be accurate and complete, and not subject to interpretation;

j. parts and assemblies associated with "Critical Safety Items" (CSI) shall be identified by CSI symbols in accordance with applicable standards. The CSI symbol used, eg, CSI, shall be associated with drawing notes that provide the basis for the CSI requirement or make reference to documentation that provides the necessary detail;

k. for electrostatic discharge sensitive devices, the following shall be included in the notes and the note number identified with applicable devices on the field of the drawing:

"ELECTROSTATIC CONTROL PROGRAM FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES AND EQUIPMENT SHALL BE IN ACCORDANCE WITH (Insert applicable specification or standard)";

m. on drawings containing interface dimensioning the following shall be in the general notes:

"INT = INTERFACE DIMENSIONS"; and

n. parts and assemblies associated with nuclear Hardness Critical Items (HCI) and nuclear Hardness Critical Processes (HCP) shall be identified with the HCI or HCP symbols in accordance with applicable standards. HCI or HCP symbols shall be associated with drawing notes that provide critical information in the HCI or HCP. The critical information shall identify the nuclear environment(s) which is (are) the basis of the HCI or HCP. HCI notes shall make reference to documentation (ie, specification, standard or drawing) required for procurement. Both HCI and HCP notes shall make reference to documentation that provides design and analysis criteria for the depicted HCIs and HCPs. HCI and HCP notes can be applicable to individual parts when the requirement is so delineated or to an entire drawing when the HCI or HCP requirement has total drawing applicability. When drawing has space limitations or there exist numerous HCI or HCP components on the field of the drawing (but HCP and/or HCP symbol is not applicable to the entire drawing) the HCI and/or HCP symbol may appear within or near the title block and the applicable components may then be listed in a drawing note.

THE REVISION OF PRODUCT DRAWINGS

E.1 General.

This section covers methods for revising product baseline drawings and for identifying and recording revisions on original drawings.

E.2 Revision methods.

Revisions shall be made by erasure, crossing out, or by redrawing.

E.3 Change in dimensions.

In general, any change in a dimension of a part should also be made to scale on the affected portion of the delineation; however, it is permissible to leave the delineation unchanged when the new proportion of the part is not noticeably different from the original one. When it is necessary or desirable to indicate that a particular feature is not to scale, the dimension shall be underlined with a straight thick line. If the drawing is redrawn, delineation shall be made to scale.

E.4 Identifying revision locations.

The location of revisions on the drawing shall be identified in the Revisions Block by one of the following methods as directed by the design activity:

a. description in the description column;

b. zone in the zone column;

c. revision authorization document referenced in the description column;

d. revision symbols on the field of the drawing; and

e. combinations of a, b, c and d as required for clarity.

E.5 Revisions Block.

Revisions Block format shall conform to recognized standards. Figure E-1 may be used as a guide and typical format.

E.6 Required revision.

Any change to a drawing requires advancing the revision level. When security classification is changed on a drawing, this will constitute a revision to the drawing.

E.7 Revision letters.

The use of upper case letters is preferred. Letters shall be used in alphabetical sequence. The letters "I", "O", "Q", "S", "X" and "Z" shall not be used. When revisions are numerous enough to exhaust the alphabet, the revision following "Y" shall be "AA", and the next "AB", then "AC" etc. Should "AA" to "AY" be exhausted, the next sequence shall be "BA", "BB", etc. Revision letters shall not exceed two characters. Release (initial issue) of a drawing does not constitute need for a revision letter. The identifying letter pertaining to the particular revision being recorded shall be entered in the "Rev" column. Note that all changes to a drawing incorporated at one time shall be identified by the same revision letter.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	C	This sheet added DCN W6A2235 760116	760318	-

Figure E-1.

Example of a Revisions Block with Notation

E.8 Description.

A brief description of the change, or reference to the identity of the revision authorization document describing the change, shall be entered in the description column.

E.9 Approval.

Certification of revision shall be entered in the approval column, and date entered in the date column.

E.10 Zoning.

When changes are recorded by zoning, the zone in which each change is made shall be entered in the zone column on the same line as the description change.

E.11 Revision date.

The date sequence shown in the Revisions Block shall be YR-MO-DA or YRMODA.

E.12 Additions.

When a multiple sheet drawing is revised to add a new sheet(s), the following note, "THIS SHEET ADDED", shall be placed in the description column of the applicable Revisions Block, in addition to other notations. See Figure E-1.

E.13 Change in rights to technical data.

A change in rights to a drawing shall require the advancing of the revision level of that drawing. The change in rights shall be indicated in the description column of the Revisions Block, along with entry of the contract number under which the change in rights was approved. See Figure E-2.

NOTE: Reference to only a revision authorization document is not acceptable in this case.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	DCN W5A2678 760118	760318	-
	B	DCN W6A2317 761221	761230	-
	C	PROPRIETARY RIGHTS EXPIRED CONTRACT No. DAA-- DCN W7A2456 770815	771013	-

Figure E-2.

Example of Revisions Block Notation
for Changes in Drawings Rights

E.14 Preparation of duplicate original.

Duplicate originals shall not be prepared for the purpose of maintaining duplicate records. Their application is limited to replacing missing original drawings.

E.15 Redrawn or replaced drawings.

E.15.1 Redrawn drawings.

Redrawn drawings with same number shall conform to the following:

a. Superseding (new) drawing. The original date, contract number and Title Block names (signatures if available) of the old drawing shall apply to the new drawing. The Revisions Block of the new drawing shall contain notation as shown in Figure E-3. All previous revision symbols, cross-outs and revision notations shall be omitted from the superseding drawing;

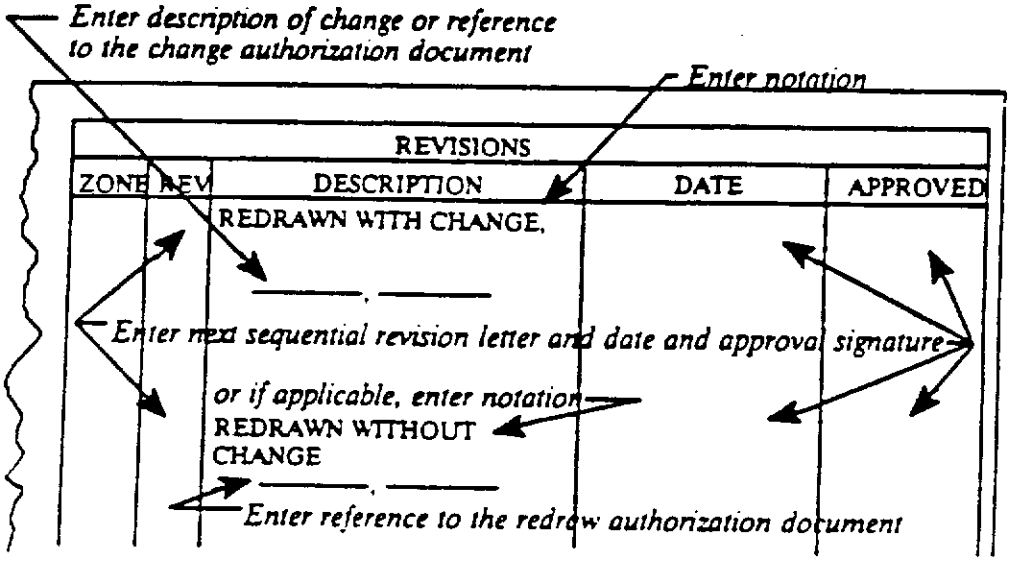

Figure E-3

Superseding (new) Drawing Notations
Redrawn with Same Number

b. Superseded (old) drawing. Where the database of original drawing is to be maintained, notation as shown in Figure E-4 shall be entered in the Revisions Block of the superseded drawing. The word "SUPERSEDED" shall be added just above the Title Block; and

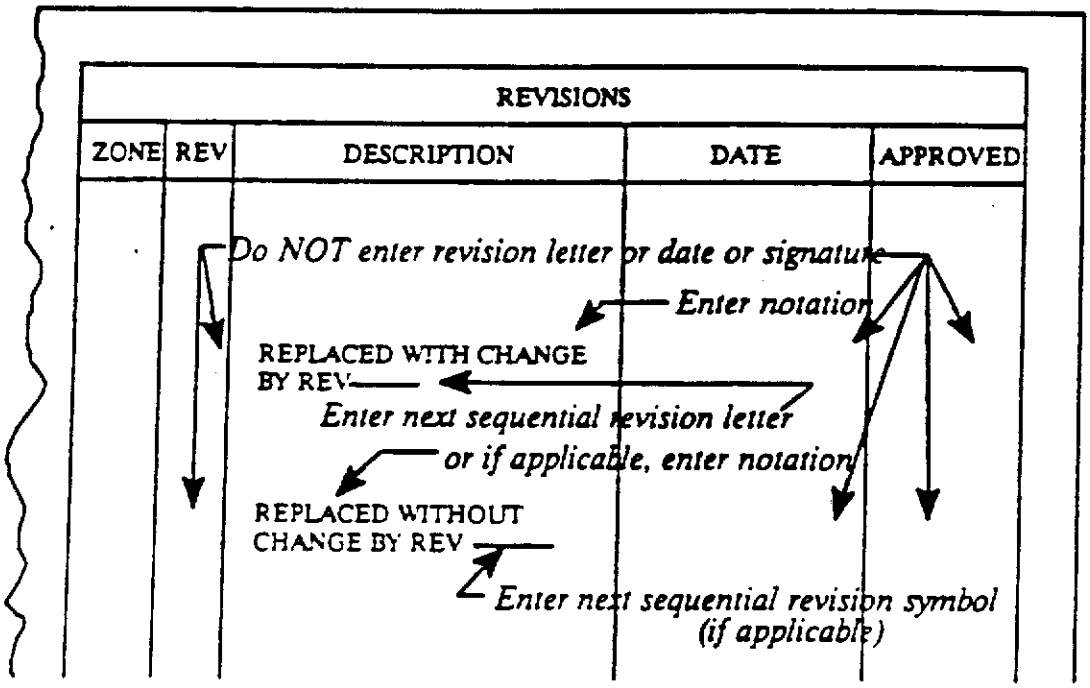

Figure E-4

Superseded (old) Drawing Notations
Redrawn with Same Number

c. Computer generated drawings. Hard copies of drawings generated, maintained and controlled by a computer system shall not be considered redraws and shall be marked in accordance with paragraph E.19. New duplicate production masters (hard copy) of drawings from a computer system that are not maintained and controlled by the computer system shall be considered redraws.

E.15.2 Replacing drawings. Replacing drawings with a different number shall conform to the following:

a. Superseding (new) drawing. Notation as shown in Figure E-5 shall be entered in the Revisions Block of the superseding drawing. The drawing shall contain an original date different than the superseded drawing; and

b. Superseded (old) drawing. Where the data base of original drawing is to be maintained, notation as shown in Figure E-6 shall be entered in the Revisions Block of the superseded drawing. The word "SUPERSEDED" shall be added just above the Title Block.

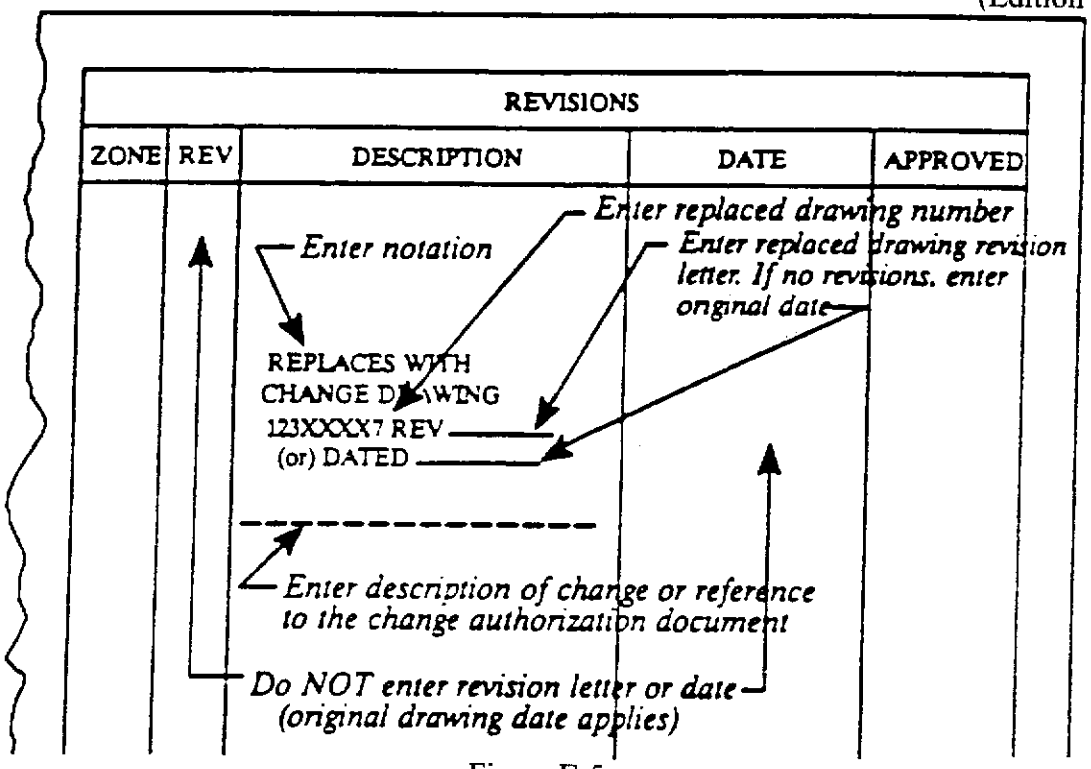

Figure E-5

Superseded (new) Drawing Notations Replacing Drawing with Different Number

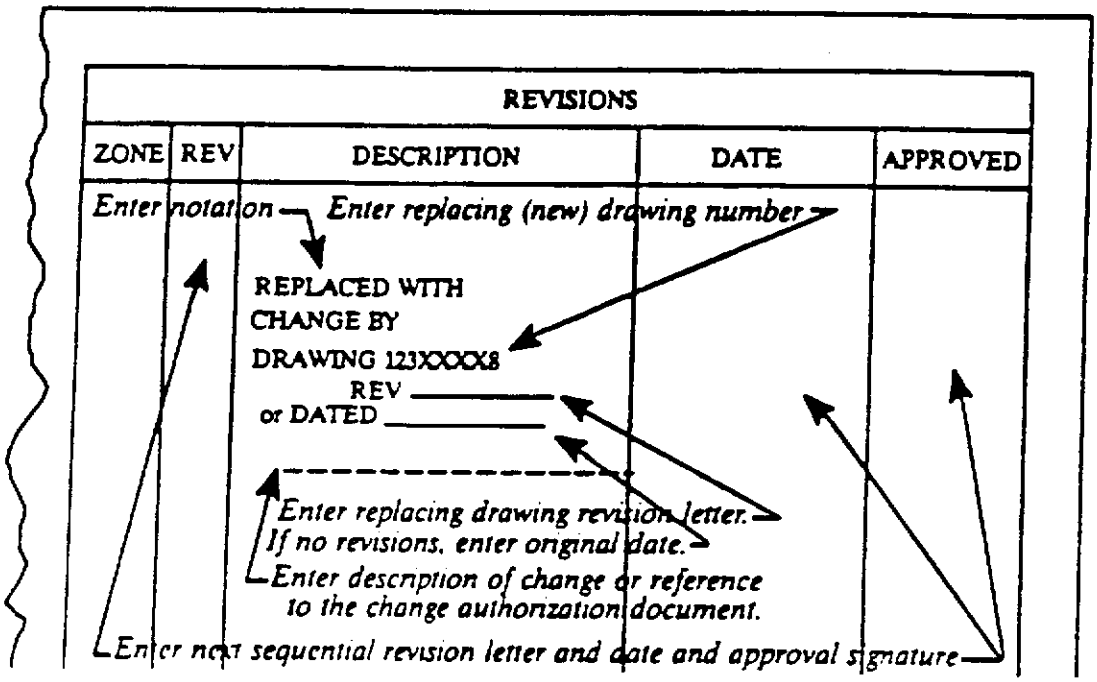

Figure E-6

Superseded (old) Drawing Notations Replaced by Drawing with Different Number

E.16 Reinstating a replaced/superseded/obsolete drawing.

The applicable "obsolete" or "superseded" notations shall be removed from the drawing. This action constitutes change; therefore, Revisions Block entries are required. The next sequential revision letter shall be entered. The reason for reinstating the drawing shall be described in an appropriate authorization document cited in the Revisions Block.

E.17 Associated list(s) revisions.

Associated lists shall be revised as necessary for compatibility with related drawing changes.

E.18 Product baseline.

Drawings that mature during full scale development to become part of the Product Baseline can be identified in the Revisions Block as in Figure E-7.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	C	PRODUCT BASELINE ERR FOMK2650	790210	-

Figure E-7

Example of Revisions Block Notation for Product Baseline

E.19 Revisions to production master drawings.

Revisions to production master drawings shall be made to the original art work master or computer file. Duplicate masters reproduced from the original art work master or computer file shall be marked in accordance with the following notation entered beneath the last entry of the Revisions Block area:

"THIS DRAWING HAS BEEN GENERATED AND IS MAINTAINED BY A COMPUTER SYSTEM . CHANGES SHALL ONLY BE INCORPORATED AS DIRECTED BY THE DESIGN AUTHORITY"

ANNEX F to AEDP-1
(Edition 1)

INTERNATIONAL STANDARDIZATION ORGANIZATION STANDARDS FOR DRAWING PRACTICES

ISO NUMBER	TITLE
31-11	Mathematical Signs and Symbols for use in the Physical Sciences and Technology - Bilingual Edition
128	Technical Drawings - General Principles of Presentation
129	Engineering Drawings - Dimensioning - General Principles
286-1	ISO System of Limits and Fits - Part 1: Bases of Tolerances and Deviations and Fits
286-2	ISO System of Limits and Fits - Part 2: Tables of Standard Tolerance Grades and Limit for Holes and Shafts
370	Tolerance Dimensions - Conversion From Inches into Millimetres and Vice Versa
406	Technical Drawings - Tolerancing of Linear and Angular Dimensions
468	Surface Roughness - Parameters, Their Values and General Rules for Specifying Requirements
1101	Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location and Run-out - Generalities, Definitions, Symbols, Indications on Drawings
1219	Fluid Power Systems and Components - Graphic Symbols. Bilingual Edition
1302	Technical Drawings - Method of Indicating Surface Texture on Drawings
1328	Parallel Involute Gears - ISO System of Accuracy
1660	Technical Drawings - Dimensioning and Tolerancing of Profiles
2162	Technical Drawings - Representation of Springs
2203	Technical Drawings - Conventional Representation of Gears

INTERNATIONAL STANDARDIZATION ORGANIZATION STANDARDS FOR DRAWING PRACTICES

ISO NUMBER	TITLE
2553	Welds - Symbolic Representation on Drawings
3040	Technical Drawings - Dimensioning and Tolerancing of Cones
3098-1	Technical Drawings - Lettering - Part I: Currently Used Characters
3511-1	Process Measurement Control Functions and Instrumentation - Symbolic Representation - Part 1: Basic Requirements
3511-2	Process Measurement Control Functions and Instrumentation - Symbolic Representation - Part 2: Extension of Basic Requirements
3511-3	Process Measurement Control Functions and Instrumentation - Symbolic Representation - Part 3: Detailed Symbols for Instrumentation Interconnection Diagrams
3952-1	Kinematic Diagrams - Graphical Symbols - Part 1: Trilingual Edition
3952-2	Kinematic Diagrams - Graphical Symbols - Part 2: Trilingual Edition
3952-3	Kinematic Diagrams - Graphical Symbols - Part 3: Trilingual Edition
4063	Welding, Brazing, Braze Welding and Soldering of Metals - Nomenclature of Processes and Reference Number for Symbolic Representation on Drawings. Bilingual Edition
4067-1	Technical Drawings - Installations - Part 1: Graphical Symbols for Plumbing, Heating, Ventilation and Ducting