SD-15

Guide for Performance Specifications

Defense Standardization Program
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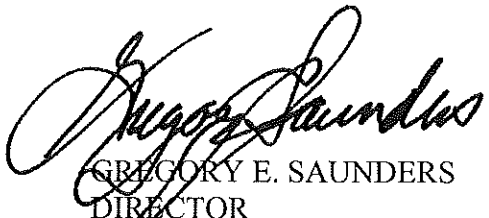
STDZ

FOREWORD

It is the policy of the Department of Defense (DoD), as required in DoD Directive 5000.01, *The Defense Acquisition System*, to state requirements in performance terms whenever possible. Part 11 of the *Federal Acquisition Regulation* also requires federal agencies to give preference to performance-oriented documents over detailed design documents when describing agency needs. To implement DoD and federal preferential policies on stating requirements in performance terms, DoD 4120.24-M, *Defense Standardization Program (DSP) Policies and Procedures*, gives preference to developing and using performance specifications over detail specifications.

The requirements for the content and format of performance specifications are in MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*. The purpose of this document is to provide additional guidance on how to write performance specifications. The guidance in this document applies to all types of materiel, including systems, subsystems, assemblies, components, parts, information technology, subsistence items, fuels, lubricants, munitions, construction material, and any other materiel used by DoD. This guide is not meant to be a "cookbook" approach to developing performance specifications, but a tool to provide direction, examples, and considerations to shape an overall thought process.

Recommended changes to this publication should be sent to the Defense Standardization Program Office, 8725 John J. Kingman Road, Stop 5100, Fort Belvoir, VA 22060-6220 or email at DSPO@dla.mil.



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CHAPTER 1:

INTRODUCTION

PURPOSE

This document provides guidance information on performance specifications focusing primarily on stating requirements in performance terms and ensuring that sufficient verification means are included in the specification to evaluate conformance. While the focus of this document is on defense specifications developed under DoD 4120.24-M, *Defense Standardization Program (DSP) Policies and Procedures*, the principles and techniques can also be applied to program-unique performance specifications, performance-based purchase descriptions, commercial item descriptions, or any other type of procurement specification. This guide is intended to supplement the format and content requirements for writing performance specifications found in MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*.

BACKGROUND

There is a widely-held belief that the DoD policy to state requirements in terms of performance, whenever possible, began with Secretary of Defense William Perry's June 29, 1994 policy memorandum on *Specifications and Standards – A New Way of Doing Business*. In fact, stating requirements in performance terms has been emphasized, whenever practicable, since the establishment of the DSP in 1952. What changed with Secretary Perry's policy memorandum was (1) a waiver was required to cite detailed military specifications as requirements in all major acquisition category (ACAT) programs as defined by DoD Instruction 5000.02, *Operation of the Defense Acquisition System* and (2) the creation of a new type of document designation, the military performance specification, or MIL-PRF.

Prior to the beginning of acquisition reform in 1994, no distinction was made between those military specifications whose requirements were stated in performance terms, detailed design terms, or more likely, a combination of both. Once Secretary Perry required waivers to cite detailed military specifications as requirements in ACAT programs, it became important to clearly distinguish between detailed military specifications and performance military specifications, since performance military specifications did not require waivers for use. It also became important to provide guidance on what constituted a performance specification and how to write performance requirements, hence the original issuance of this guide in June of 1995.

From 1994-2000, the DoD reviewed over 29,000 military specifications and standards, resulting in 6100 documents being canceled without replacement and 3500 being canceled and superseded by non-Government standards, commercial item descriptions, handbooks, and – defense performance specifications. Today, there are nearly 2600 defense performance specifications under the DSP.

On March 29, 2005, DSP Policy Memo 05-3, *Elimination of Waivers to Cite Military Specifications and Standards in Solicitations and Contracts*, was issued. The elimination of the waiver requirement was the result of the progress made in DoD towards specifying requirements in performance terms, increased use of non-Government standards and commercial item descriptions, and when conditions demanded defense specifications and standards, ensuring their proper application and tailoring of requirements.

One of the persistent misperceptions about the acquisition reform initiative of the 1990s is that all detail military specifications and standards were canceled. While thousands of these documents were canceled or replaced by non-Government standards, commercial item descriptions, or defense performance specifications, the DoD retained thousands of detail specifications that continue to play an important role in the defense acquisition process today. It is important to understand when it is most appropriate and beneficial to DoD to develop and use a performance specification. This guide helps provide some of that understanding.

Much has changed since the SD-15 was first issued in 1995. This update reflects the latest policies, procedures, and philosophy for performance specifications and captures some of the lessons learned and examples.

CATEGORIES OF SPECIFICATIONS

There are many ways to categorize specifications. They can be categorized by the entity that develops them: for example, government specifications, industry specifications, and company specifications. They can be categorized by geographic origins: for example, international specifications, regional specifications, and national specifications. They can be categorized by functional use: for example, system specifications, component specifications, software specifications, and material specifications. And, they can be categorized by the way they state requirements: for example, performance specifications and detail specifications.

Performance Specifications

A performance specification states requirements in terms of the required results and the criteria for verifying compliance, without specifically stating how the results are to be achieved. A performance specification describes the functional requirements for an item, its capabilities, the environment in which it must operate, and any interface, interoperability, or compatibility requirements. It does not present a preconceived solution to a requirement.

Detail Specifications

In contrast to a performance specification, a detail specification provides preconceived solutions to requirements and describes exactly how an item is to be produced. A detail specification identifies materials to be used, specific parts and components, and how the item is to be

fabricated and assembled. Sometimes detail specifications are referred to as "build-to-print" specifications.

PERFORMANCE VERSUS DETAIL SPECIFICATIONS

Generally, it is considered preferable to state requirements in performance terms to give contractors the flexibility to provide innovative, technologically advanced, best-value solutions to meet the customer's requirement. Detail specifications tend to lock-in a single solution to the customer's requirement. Over time, that solution may not be the best technical or cost-effective solution. It is especially important to use performance specifications when stating requirements during the pre-production phases of systems or product development in order to keep technical options open.

Performance specifications can broaden the number of potential suppliers, especially commercial suppliers, since the requirements are not built around specific solutions that only a limited number of suppliers may be able to meet. Having more potential suppliers usually means reduced costs, better product availability and support, a stronger and more reliable industrial base, and fewer obsolescence issues.

Using performance specifications also shifts the design risk to the contractor since the Government is not telling the contractor how to meet a requirement. In contrast, detail specifications places a greater risk on the government if the item fails to satisfy the required purpose because the government has specified the materials, parts, components, and fabrication and assembly processes.

Performance specifications usually require less document maintenance than do detail specifications. This is especially true in areas that experience rapid changes in products and technologies, such as electronics and information technology, where it would be difficult, expensive, and require greater resources to keep a detail specification current.

While developing and using a performance specification should be considered first, there are many examples of when it is preferable to develop and use a detail specification. There are instances where the DoD has invested substantial resources to research and develop products or technologies that are unique to the military, have no commercial potential, and due to the nature of the product, are likely to have a very few specialized suppliers, and these specifications would often be detail specifications. During the system development process, performance specifications should generally be used during product development and preliminary design. As the product baseline matures and stabilizes to a "build to" description, the specifications will likely be a mix of performance and detail specifications. Once a standard solution has been established, the DoD cannot afford the expense, resources, or time to evaluate potential alternative solutions. A few examples of where the DoD has determined that a detail specification is the optimal solution include:

- The Army's specification, MIL-DTL-11891, for track systems supporting U.S. military tracked vehicles.

- The Navy's specification, MIL-DTL-24631, for submarine camouflage paint.
- The Air Force's specification, MIL-DTL-83406, for anti-g force garments worn by fighter pilots to counteract extreme gravity forces, which is a critical safety item.

There are also situations where the nature of the requirement makes it essential to mandate a specific solution in a detail specification. For example:

- The Army Medal of Honor Decoration specification, MIL-DTL-3943/1, must provide details in terms of appearance, size, and materials so that each medal is identical.
- The National Geospatial Intelligence Agency specification for digital display of geospatial symbols, MIL-DTL-89045, must specifically define the content and format for geospatial symbols so that they have a consistent appearance of digital displays across all weapon systems and equipment.

DOCUMENTS APPLICABLE TO THIS GUIDE

The following is not intended to be a list of all of the cited documents. This guide cites many documents for illustrative purposes and as examples, which are not listed. The majority of these documents are available from the Acquisition Streamlining and Standardization Information System (ASSIST) database at http://assist.daps.dla/quicksearch/. The documents listed below are only those documents pertinent to understanding specific aspects of this guide more fully.

CJCSI 3170.01, *Joint Capabilities Integration and Development System*[1]

Defense Acquisition Guidebook[2]

DoD 4120.24-M, *Defense Standardization Program (DSP) Policies and Procedures*[3]

DoD Directive 5000.01, *The Defense Acquisition System*[4]

DoD Instruction 5000.02, *Operation of the Defense Acquisition System*[4]

Federal Acquisition Regulation[5]

Federal Standardization Manual[3]

MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*[6]

OMB Circular A-119, *Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities*[3]

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[1] Available from http://www.dtic.mil/cjcs_directives/cdata/unlimit/3170_01.pdf
[2] Available from https://akss.dau.mil/dag/DoD5000.asp?view=document
[3] Available from Library at www.dsp.dla.mil
[4] Available from http://www.dtic.mil/whs/directives/
[5] Available from http://farsite.hill.af.mil/
[6] Available from www.assistdocs.com or http://assist.daps.dla.mil

Public Law 104-113, *National Technology Transfer and Advancement Act of 1995*[3]

SD-5, *Market Research: Gathering Information about Commercial Products and Services*[6]

SD-6, *Provisions Governing Qualification: Qualified Products Lists and Qualified Manufacturers Lists*[6]

CHAPTER 2:

PERFORMANCE SPECIFICATION POLICIES

GENERAL

The documents that set forth the DoD policies and procedures for the development and use of performance specifications are:

- *Federal Acquisition Regulation*
- DoD 4120.24-M, *Defense Standardization Program Policies and Procedures*
- *Defense Acquisition Guidebook*

The document that prescribes the requirements for the content and format of performance specifications are in MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*.

All of these documents are consistent in giving preference first to the development and use of performance specifications while acknowledging that it is acceptable to use detail specifications when necessary. Given below are the relevant extracts from these documents on performance specifications. In some cases, commentary is provided to clarify policy points.

FEDERAL ACQUISITION REGULATION (FAR)

Extracted from paragraph 11.101 of the FAR:

"(a) Agencies may select from existing requirements documents, modify or combine existing requirements documents, or create new requirements documents to meet agency needs, consistent with the following order of precedence:

(1) Documents mandated for use by law.

(2) Performance-oriented documents.

(3) Detailed design-oriented documents.

(4) Standards, specifications and related publications issued by the Government outside the Defense or Federal series for the non-repetitive acquisition of items.

(b) In accordance with OMB Circular A-119, *Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities*, and Section 12(d) of

the *National Technology Transfer and Advancement Act of 1995*, Pub. L. 104-113 (15 U.S.C. 272 note), agencies must use voluntary consensus standards, when they exist, in lieu of Government-unique standards, except where inconsistent with law or otherwise impractical."

COMMENTARY: These policies in the FAR sometimes create confusion. Subparagraph 11.101(b) indicates that Public Law and OMB Circular A-119 require federal agencies to use voluntary consensus standards (i.e., non-Government standards) in lieu of Government-unique standards except where inconsistent with law or otherwise impractical. But subparagraph 11.101(a)(2) gives preference to performance-oriented documents, which would imply a preference for a performance Government specification over a detailed design non-Government standard. The clarifying point in this matter is subparagraph 11.101(a)(1), which gives as the first order of preference any document mandated for use by law. Since Pubic Law 104-113 mandates a preference to use non-Government standards in lieu of Government-unique standards, this order of preference trumps the preference for performance specifications. However, given a situation where there is a performance-oriented non-Government standard and a detailed design-oriented non-Government standard and assuming both documents satisfied the requirement, the performance-oriented non-Government standard would be preferred.

DoD 4120.24-M, DEFENSE STANDARDIZATION PROGRAM POLICIES AND PROCEDURES

The preference to state requirements in performance terms appears throughout DoD 4120.24-M. Extracted below are a few basic sentences that set the general policy.

"C3.7. PRODUCT DESCRIPTIONS

It is important to develop and use the right type of product description to satisfy the immediate technical and acquisition needs, and to support such broader and long-term acquisition objectives as logistics support, competition, quality, use of commercial products and processes, best value, and standardization. In developing the right type of product description, it is DoD policy to write it in performance terms."

"C3.8.1. General. DoD prefers performance-based specifications to detail specifications, and non-Government standards to defense and Federal specifications and standards."

DEFENSE ACQUISITION GUIDEBOOK

The following is extracted from Section 11.6, Implementing a Performance-Based Business Environment, from the *Defense Acquisition Guidebook*:

"The Department of Defense will normally use performance specifications (i.e., DoD performance specifications, commercial item descriptions, and performance-based non-Government standards) when purchasing new systems, major modifications, upgrades to current systems, and commercial items for programs in all acquisition categories. The Department of

Defense additionally will normally emphasize conversion to performance specifications for the re-procurement of existing systems where supported by a business case analysis; for programs in all acquisition categories."

"If performance specifications are not practicable, or if stating requirements in performance terms is not practicable because of essential interface or interoperability requirements, the Department of Defense may state its needs using prescriptive requirements (i.e. dimensions, materials, etc.)."

"Use performance specifications or convert to performance specifications during reprocurement of systems, subsystems, components, spares, and services beyond the initial production contract award; and during post-production support to facilitate technology insertion and modernization of operational weapons systems."

CHAPTER 3:

DEFINING REQUIREMENTS

"A hiatus exists between the inventor who knows what they could invent, if they only knew what was wanted, and the soldiers who know, or ought to know, what they want and would ask for it if they only knew how much science could do for them. You have never really bridged that gap yet."

Winston Churchill
The Great War

IDENTIFYING AND DEFINING USER NEEDS

Winston Churchill appreciated the challenge of identifying and defining the warfighter's needs and communicating those needs to the technical community for solutions. Because the warfighter is the ultimate beneficiary of acquisition and life-cycle support, it's appropriate that the warfighter define the materiel needs.

The Joint Capabilities Integration and Development System (JCIDS) is the process that defines the requirements for future defense programs. What follows below is a very brief description of that process as it relates to identifying and describing materiel requirements. See CJCSI 3170.01, *Joint Capabilities Integration and Development System,* for an in-depth description of the JCIDS process.

The JCIDS addresses capability shortfalls or gaps, as identified by combatant commanders. The JCIDS guides the development of requirements by trying to reflect the needs of all of the Military Departments and focusing on a requirements generation process that identifies needed capabilities in performance terms. A major emphasis of the JCIDS is to determine whether an operational gap requires a non-materiel solution (e.g. changes to doctrine, training, etc.), a materiel solution, or a combination of both.

The JCIDS process begins with the development of a Capabilities Based Assessment (CBA), which identifies the capabilities required, the capability gaps and associated operational risks, an assessment of the viability of a non-materiel solution, and a potential recommendation for the type of solution. The results of the CBA are documented in a joint Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel or Facilities Change Recommendation (DCR) for non-materiel solutions or an Initial Capabilities Document (ICD) for a materiel solution. The ICD identifies the capability gap or other deficiency and evaluates materiel approaches. The ICD ultimately supports the Milestone A decision whether to approve a materiel development decision and demonstrate that a proposed materiel solution is feasible.

When the technology development phase is completed, a Capability Development Document (CDD) is developed to identify the operational performance attributes of the proposed materiel solution. The CDD supports the Milestone B decision whether to begin the engineering and manufacturing development phase. Upon completion of the engineering and manufacturing development phase, a Capability Production Document (CPD) is developed to describe the actual performance of the system that will provide the required capability. The CPD supports the Milestone C decision whether to begin production and deployment. The key difference between the CPD and CDD is that the CPD reflects lessons learned during the development process that may result in changes to the thresholds of the key performance parameters. For both the CDD and the CPD, the user must state the needs in such a way that they do not unnecessarily prevent the materiel developer from pursuing the most cost-effective and technologically advanced solutions so that the procuring activity can translate these requirements into performance specifications.

The JCIDS process identifies the warfighter's requirements for systems acquisition, but many other processes exist to provide user feedback to program offices and procuring activities once a system or equipment has been deployed. The Government-Industry Data Exchange Program (GIDEP), Product Quality Deficiency Reports (PQDRs), Material Deficiency Reports (MDRs), Engineering Investigations (EIs), Acceptance Inspection Deficiency Reports (AIDRs), the Joint Deficiency Reporting System (JDRS), and Engineering Practice Studies (EPS) are just some of the mechanisms and tools used to collect and assess user feedback on deployed systems and equipment. Sometimes, this feedback results in the development or update of specifications. Where possible, user requirements should be stated in terms of capabilities or improvements needed so that the user's requirements can be captured by performance specifications.

MARKET RESEARCH AND ANALYSIS

In order to write effective performance requirements, it's important to understand the user's actual needs and the technical characteristics of the products that might meet those needs. The best way to achieve both of these ends is through a market research and analysis that involves the user in the process. Market research and analysis means collecting and analyzing information about the capabilities of the marketplace to satisfy identified user requirements.

Market research and analysis is necessary to gather information on and understand such issues as:

- the status and complexity of current technologies
- supplier capabilities
- product acceptability
- product cost or price ranges
- schedule availability
- normal contract terms and conditions.

Market research and analysis should be an integral part of every requirements definition effort. Updates to the draft performance specification are incorporated iteratively as new market data is

received and feedback from industry and users warrants changes as appropriate to develop a sound acquisition strategy recommendation. Information collected during market research can be analyzed to understand the technologies involved, the available alternatives, and the feasibility of meeting the requirements with a commercial product. A good technique is to send a draft of the performance specification out to users and industry for review and comment to ensure everyone shares the same understanding of the operational requirement and that the specification meets that requirement. Feedback from users and industry on the draft specification can help shorten acquisition cycle time, avoid unnecessary non-value-added costs, eliminate excessively complex or unnecessary requirements, and promote industry responsiveness to the subsequent solicitation package containing the final performance specification.

For more detailed guidance on market research, consult the SD-5, *Market Research: Gathering Information about Commercial Products and Services* and the Federal Acquisition Regulation, Part 10, *Market Research*.

DEVELOPING PERFORMANCE REQUIREMENTS

In developing performance requirements, describe only those aspects of the need that are essential for a supplier to provide the user with a viable, practical, and affordable solution. By articulating the needs in terms of output-oriented, measurable, operational, functional, and performance capabilities and characteristics, the needs will remain traceable throughout the systems engineering allocation, design, manufacturing, and verification functions that occur as part of the acquisition process. The following areas represent typical needs from which user requirements generally emanate:

- Command, control, communications, computers and intelligence architecture interface, protocol commonality, and interoperability
- Physical interface or interoperability with other systems, support equipment, or facilities
- Range
- Speed
- Power
- Envelope (size)
- Efficiency
- Accuracy
- Payload
- Safety
- Durability
- Acoustics
- Environmental conditions
- Nuclear, biological, and chemical effects
- Reliability
- Availability
- Maintainability
- Interchangeability

- Supportability
- Transportability
- Electromagnetic effects
- Human factor integration

The first step in developing any performance requirements is to understand the operational requirement thoroughly. Some basic questions to ask:

- Which requirements are minimum or threshold requirements?
- What is each threshold? The best way to gain this understanding is to be sure that the user is involved in developing the requirement.
- What constraints apply? All constraints governing operation or use must be addressed, such as natural and induced environments, interfaces with other systems or equipment, and operator and maintainer limits.
- Is the requirement necessary?
- Is the requirement achievable?
- Is the requirement verifiable?
- How will we verify the requirement?
- What type of testing will need to be performed?

CHAPTER 4:

TYPES OF PERFORMANCE SPECIFICATIONS

While the emphasis in this guide is primarily on defense and program-unique specifications covered by MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*, there are other types of performances specifications that will be addressed in this chapter. Although the intent, stylistic elements, format, and content of these different types of performance specifications may vary, the fundamental principles for writing a performance requirement are similar.

NON-GOVERNMENT PERFORMANCE STANDARDS

OMB Circular A-119, *Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformance Assessment Activities*, states it is the policy of the Federal Government that each "agency should give preference to performance standards when such standards may reasonably be used in lieu of prescriptive standards." It's not always easy to assess whether a non-Government standard is written in performance terms and generally requires the user to read the document to make such assessment. But there are many cases where the document title indicates it is a performance specification or standard. Some examples are:

- AIA NAS 1192, *Performance Specification for Hard Anodic Coatings on Aluminum Alloys*
- ANSI/CEA 2009, *Performance Specification for Public Alert Receivers*
- ASTM C1157, *Standard Performance Specification for Hydraulic Cement*
- IEC 60081, *Double-capped Fluorescent Lamps – Performance Specifications*
- IPC 6011, *Generic Performance Specification for Printed Boards*
- ISO 15837, *Ships and Marine Technology – Gasketed Mechanical Couplings for Use in Piping Systems – Performance Specification*
- NEMA WC 63.2, *Performance Standard for Coaxial Premise Data Communications*
- SAE AS5498, *Performance Specification for Inflight Icing Detection Systems*

Most non-Government standards are written with detailed design requirements or a combination of detailed design and performance requirements. While OMB Circular A-119 gives preference to performance non-Government standards, the Circular also gives preference to any type of non-Government standard over a Government document if the non-Government standard satisfies the Government's requirement. Non-Government standards may usually be obtained online from the standards developing organization that publishes them.

COMMERCIAL ITEM DESCRIPTIONS

While commercial item descriptions (CIDs) are not labeled as performance specifications, by their very nature, CIDs are performance-oriented documents. A CID is intended to be a short, simplified specification that describes the functional, performance, and physical interface requirements of commercially-available products that will meet the Government's needs. While there are examples of CIDs written with excessive detailed design requirements, if a CID is written following the criteria required by the General Services Administration's *Federal Standardization Manual*, it may generally be considered a performance specification. CIDs are indexed in and available online without charge from the Acquisition Streamlining and Standardization Information System (ASSIST) database at http://assist.daps.dla/quicksearch/.

DEFENSE PERFORMANCE SPECIFICATIONS

Defense performance specifications are intended to standardize on military-unique materials, parts, components, equipment, subsistence and support items, and potentially any item below the system level for items that are intended for use across multiple systems or equipment or in multiple applications. The format and content requirements for defense performance specifications are covered in MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*. These documents are often referred to as "MIL-PRFs" because the document identifier begins with the letter "MIL-PRF" (e.g., MIL-PRF-1234). Defense performance specifications are indexed in and available online without charge from the ASSIST database at http://assist.daps.dla/quicksearch/.

GUIDE SPECIFICATIONS

Guide specifications (also referred to as specification guides) identify the essential performance parameters normally associated with development of a class of like end items. Guide specifications are a standard template starting point for developing a program-unique specification for a type of system, subsystem, equipment, or assemblies. Guide specifications are not for a specific item, but cover the generic requirements for a type of product. So for example, there would be a guide specification for air systems, but there would not be a guide specification for the F-35. The guide specification for air systems would serve as a template for developing the program-unique system specification for the F-35. Guide specifications should not be used for reprocurement purposes, and generally, should not be used for the acquisition of components, parts, and materials. The format and content requirements for guide specifications are flexible, but the minimum requirements are in DoD 4120.24-M, *Defense Standardization Program Policies and Procedures*. Guide specifications are indexed in and available online without charge from the ASSIST database at http://assist.daps.dla/quicksearch/.

The guide specification identifies the performance capabilities that must be included or considered when developing the program-unique specification. Typically, specific performance

capabilities are left blank in a guide specification and then tailored to the program-specific requirements by filling in the blanks with the needed performance capabilities. The blanks can be filled in by the Government, the contractor, or a Government-contractor integrated product team to develop the needed program-unique specifications at the appropriate time in the product development process.

Guide specifications provide directions on how the blanks are to be filled in. In most cases, guidance is provided as to how to state the performance capability in terms of required end results rather than how to achieve the end result. There is much flexibility in arriving at the performance requirement, but in some cases where there is a known, required interoperability or interface requirement, the guide specification can be specific in citing the required interoperability or interface requirement.

Guide specifications include verification requirements for each performance parameter. The verification requirements generally provide a range of options that may be selected for a specific application.

Because guide specifications tend to be comprehensive documents anticipating a wide variety of possible performance capabilities that could apply for the item covered, most guide specifications include guidance for tailoring out unnecessary requirements so that only those requirements necessary for the particular program under development will be included. Guide specifications also usually highlight lessons learned from previous programs to help avoid past pitfalls.

Appendix B provides an example of the type of performance requirements that may be found in a guide specification.

PROGRAM-UNIQUE PERFORMANCE SPECIFICATIONS

Unlike defense specifications that apply to multiple programs or applications, program-unique specifications usually only apply to a single program or application. There are five types of program-unique specifications: system specification, item specification, software specification, material specification, and process specification. During system development, these different types of program-unique specifications describe the system at different levels of detail. The format and content requirements for program-unique specifications are covered in MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*. As noted above, guide specifications, if available, can be used as templates to help in the development of program-unique specifications. Copies of program-unique specifications are generally only available from the program office or prime contractor.

For a system acquisition, the Government must describe the system in terms of top-level functions, performance, and interfaces derived from the operational requirements established by the user. This system-level description is documented in a program-unique system performance specification.

The system specification requirements are then flowed down or allocated to configuration items below the system level. These item descriptions are usually captured in program-unique item performance specifications, which become the allocated baseline "design-to" requirements. Sometimes, the item descriptions are captured by defense performance specifications that are used across multiple programs or applications. Appendix C provides an example of a program-unique performance specification.

The design activity translates the item performance requirements into "build to" requirements that are documented in item detail specifications, which ultimately result in a product baseline and a Technical Data Package that can include both performance and detailed design program-unique item specifications, software specifications, process specifications, material specifications, non-Government standards, commercial item descriptions, defense specifications and standards, federal specifications and standards, drawings, technical manuals, and other types of technical documentation.

CHAPTER 5:

WRITING PERFORMANCE SPECIFICATIONS

The format and content requirements for writing defense performance specifications and program-unique performance specifications are in MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*. This information will not be repeated in this chapter. Instead, this chapter will cover how performance specifications differ from detail specifications, and will provide examples of how different DoD preparing activities rewrote detail specifications to performance specifications. The examples provided in this chapter are edited portions of text extracted from specifications as they appeared at the time of their publication. Generally shown is the last iteration of the document as a detail specification and the first iteration of the same document as a performance specification. These examples are meant to illustrate specific learning points and do not necessarily reflect the current technical requirement, the most recent document edition, or the latest format and content requirements of MIL-STD-961.

PERFORMANCE VERSUS DETAIL SPECIFICATION COMPARISON

Specification Requirements	Performance Specification	Detail Specification
Section 1 - Scope	Same for both.	
Section 2 - Applicable Documents	Performance specifications usually have fewer references. They refer to test method standards; interface drawings, standards, and specifications; and other performance specifications. However, sometimes a performance specification can have a greater number of references, especially if there are numerous test method standards to verify that performance requirements have been met. In general, performance specifications should not reference detail specifications, except when necessary to ensure interfaces, interoperability, or compatibility with other systems, equipment, components, or operating environments.	Detailed specifications usually cite a greater number of references than a performance specification since they require the use of materials and part and component specifications; manufacturing process documents; and other detail specifications as references.

Specification Requirements	Performance Specification	Detail Specification
Section 3 - Requirements	The biggest differences between performance and detail specifications are in Section 3.	
1. General	States what is required, but not how to do it. Should not limit a contractor to specific materials, processes, parts, etc., but can prohibit certain materials, processes, or parts when Government has quality, reliability, environmental, or safety concerns.	Includes "how to" and specific design requirements. Should include as many performance requirements as possible, but they must not conflict with detail requirements.
2. Material	Leaves specifics to contractor, but may require some material characteristics; e.g., corrosion resistance. May also prohibit the use of certain materials, hazardous or toxic substances, or environmentally damaging substances.	May require specific material, usually in accordance with a specification or standard.
3. Performance	States what the item or system shall do in terms of capability, function, or operation. Upper and lower performance characteristics are stated as requirements, not as goals or best efforts.	Detail specifications often have performance requirements. This can be risky, however, if other detail design requirements create a situation where it is not possible to meet the performance requirement.
4. Design	Does not apply "how to" design requirements, but should include requirement for design verification. Design verification is an integral element of performance specifications that the material and parts meet all performance requirements.	Includes "how to" and specific design requirements. Often specifies exact parts and components. Routinely states requirements in accordance with specific drawings.
5. Physical Characteristics	Gives specifics only to the extent necessary for interface, interoperability, environment in which item must operate, overall weight and envelope dimensions, or human factors.	Details weight, size, dimensions, etc. for item and component parts. Design-specific detail often exceeds what is needed for interface, etc.

Specification Requirements	Performance Specification	Detail Specification
6. Interface, Interoperability, and Compatibility Requirements	Similar for both detailed and performance specifications. Form and fit requirements are acceptable to ensure interoperability, interchangeability, and compatibility.	
7. Processes	Usually does not specify processes, but if it does, the requirement is stated as the desired outcome from a process, requires the contractor's normal commercial processes, or is provided as guidance.	Often specifies the exact processes and procedures to follow -- temperature, time, and other conditions -- to achieve a result; for example, tempering, annealing, machining and finishing, painting, welding, and soldering procedures.
8. Parts	Does not require specific parts.	States which fasteners, electronic piece parts, cables, sheet stock, etc. will be used.
9. Construction, Fabrication, and Assembly	Usually does not specify construction, fabrication, and assembly requirements.	Describes the steps involved or references procedures which must be followed; also describes how individual components are assembled.
10. Operating Characteristics	Omits, except very general descriptions in some cases.	Specifies in detail how the item shall work.
11.Workmanship	Very few requirements	Specifies steps or procedures in some cases.
12. Reliability	States reliability in quantitative terms. Must also define the conditions under which the requirements must be met. Minimum values should be stated for each requirement, e.g., mean time between failure, mean time between replacement, etc.	Often achieves reliability by requiring a known reliable design.

Specification Requirements	Performance Specification	Detail Specification
13. Maintainability	Specifies quantitative maintainability requirements such as mean and maximum downtime, mean and maximum repair time, mean time between maintenance actions, the ratio of maintenance hours to hours of operation, limits on the number of people and level of skill required for maintenance actions, or maintenance cost per hour of operation. Additionally, existing Government and commercial diagnostic equipment used in conjunction with the item must be identified. Compatibility between the item and the diagnostic equipment must be specified.	Specifies how preventive maintainability requirements shall be met; e.g., specific lubrication procedures to follow in addition to those stated under Performance. Also, often specifies exact designs to accomplish maintenance efforts.
14. Environmental Operating Requirements	Both performance and detail specifications can have requirements for humidity, temperature, shock, vibration, and other environmental operating requirements to obtain evidence of failure or mechanical damage.	
Section 4 - Verification	Both performance and detail specifications must provide a means for assuring compliance with the specification requirements.	
1. General	Similar for both performance and detailed specifications. More emphasis on functional. Comparatively more testing for performance in some cases.	Similar for both performance and detailed specifications. Additional emphasis on visual inspection for design in some cases.
2. First Article	Similar for both performance and detail. However, often greater need for first article inspection because of greater likelihood of "innovative" approaches.	Similar for both performance and detail.
3. Inspection Conditions	Same for both.	

Specification Requirements	Performance Specification	Detail Specification
4. Qualification	Very similar for both performance and detail. Because many performance specifications cover products with rapidly changing technologies, most performance specifications have a qualification provision.	Very similar for both performance and detail.
Section 5 - Packaging	Packaging information is usually contained in contracts, thus virtually no difference between performance and detail specifications. All detailed packaging requirements should be eliminated from both performance and detailed specifications and the boilerplate packaging paragraph specified in MIL-STD-961 should be used.	
Section 6 - Notes	The Notes section can be similar for both, but this is a good section in a performance specification to provide lessons learned or guidance on approaches or solutions that have worked in the past to meet a performance requirement.	

EXAMPLE 1 – COMPARISON OF SECTION 2, APPLICABLE DOCUMENTS

One characteristic that often distinguishes a detail specification from a performance specification is the number of referenced documents. Listed below are the references that were cited in detail military specification MIL-H-49078, *Handset H-250( )/U*, and after it was rewritten as a performance specification. The detail specification had 35 referenced documents that provided specific instructions to the contractor on the selection of parts, materials, and processes, how to package the handset, and how to set up the test equipment, which test equipment, and how to calibrate the test equipment. In rewriting the specification as performance, detailed "how to" requirements were replaced by functional and operational requirements, which eliminated nearly all referenced documents. The revised performance specification, MIL-PRF-49078A, cited only one referenced document for the connector plug, which is necessary for the handset and transceiver interface and interoperability. Both the detail military and revised performance specification can be viewed in their entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

REFERENCED DOCUMENTS FROM DETAIL MILITARY SPECIFICATION MIL-H-49078, *HANDSET H-250( )/U*	**REFERENCED DOCUMENTS AFTER REWRITING THIS SPECIFICATION AS A PERFORMANCE SPECIFICATION MIL-PRF-49078A, *HANDSET H-250( )/U***
SPECIFICATIONS FEDERAL T-T-871 - Twine, Fibrous Cotton NN-P-71 - Pallet, Materials-handling, Wood QQ-S-781 - Strapping, Steel, Flat and Seals PPP-B-566 - Box, Folding, Paperboard PPP-B-585 - Box, Wood, Wirebound PPP-B-601 - Boxes, Wood, Cleated-Plywood PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner PPP-B-636 - Boxes, Fiber PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple Wall PPP-B-676 - Box, Setup PPP-C-795 - Cushioning material, Plastic Film PPP-C-843 - Cushioning material, Cellulosic PPP-C-1797 - Cushioning material, Polypropylene Foam PPP-F-320 - Fiberboard, Corrugated and Solid Sheet Stock PPP-S-760 - Strapping, Nonmetallic (and Connectors) PPP-T-97 - Tape, Pressure-Sensitive Adhesive	SPECIFICATIONS DEPARTMENT OF DEFENSE MIL-C-55116/1 - Connector, Plug, Five Pin Audio, Crimp Sleeve Terminals, Wire Strain Relief, U-229

REFERENCED DOCUMENTS FROM DETAIL MILITARY SPECIFICATION MIL-H-49078, *HANDSET H-250( )/U*	**REFERENCED DOCUMENTS AFTER REWRITING THIS SPECIFICATION AS A PERFORMANCE SPECIFICATION MIL-PRF-49078A, *HANDSET H-250( )/U***
MILITARY MIL-P-116 - Preservation-packaging, Methods MIL-P-11268 - Parts, Materials, and Processes Used in Electronic Equipment MIL-M-13231 - Marking of Electronic Items MIL-F-14072 - Finishes for Ground Electronic Equipment STANDARDS MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes MIL-STD-129 - Marking for Shipment and Storage MIL-STD-147 - Palletized and Containerized Unit Loads MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts MIL-STD-252 - Wired Equipment, Classification of Visual and Mechanical Defect MIL-STD-454 - Standard General Requirements for Electronic Equipment MIL-STD-810 - Environmental Test Methods DRAWINGS ARMY ELECTRONICS COMMAND SC-GL-58877 - Gages for Connector U-182 DL-SM-B-27649 - Handset H-250( )/U SC-D-621083 - Microphone and Earphone Test Chamber NAVY SK-N-864 Simulated Gun Blast Producing Equipments	

REFERENCED DOCUMENTS FROM DETAIL MILITARY SPECIFICATION MIL-H-49078, *HANDSET H-250( )/U*	**REFERENCED DOCUMENTS AFTER REWRITING THIS SPECIFICATION AS A PERFORMANCE SPECIFICATION MIL-PRF-49078A, *HANDSET H-250( )/U***
NON-GOVERNMENT PUBLICATIONS AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) S3.7 – Coupler Calibration of Earphones S1.10 – Calibration of Microphones S1.12 – Specification for Laboratory Standard Microphones INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) 258 – Test Procedure for Close-Talking Pressure-Type Microphones	

EXAMPLE 2 – COMPARISON OF SECTION 2, APPLICABLE DOCUMENTS

As illustrated in Example 1 above, detail specifications usually have more referenced documents than performance specifications because they specify the exact materials, parts, and processes. But this is not always the case. In this example, listed below are the references that were cited in a detail military specification MIL-H-370G, *Hoses and Hose Assemblies, Nonmetallic: Elastomeric, Liquid Fuel*, and after it was rewritten as a performance specification. The detail specification had 18 referenced documents primarily related to materials, connections (such as fittings and clamps), and test method standards. In this case, the rewritten performance specification, MIL-PRF-370H, has almost as many referenced documents. However, the types of referenced documents are different in the performance specification. The performance specification eliminated the detail material specifications and it increased the number of test method standards to ensure compliance with the performance requirements. Both the detail military and revised performance specification can be viewed in their entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

REFERENCED DOCUMENTS FROM DETAIL MILITARY SPECIFICATION MIL-H-370G, *HOSES AND HOSE ASSEMBLIES, NONMETALLIC: ELASTOMERIC, LIQUID FUEL*	**REFERENCED DOCUMENTS AFTER REWRITING THIS SPECIFICATION AS A PERFORMANCE SPECIFICATION MIL-PRF-370H, *HOSES AND HOSE ASSEMBLIES, NONMETALLIC: ELASTOMERIC, LIQUID FUEL***
SPECIFICATIONS FEDERAL WW-C-440 – Clamps, Hose, (Low-Pressure). MILITARY MIL-H-775 – Hose and Assemblies; Rubber, Plastic, Fabric. Or Metal (Including Tubing); and Fittings, Nozzles, and Strainers, Packaging of. MIL-C-27487 – Coupling Halves, Quick – Disconnect, Cam-Locking Type. STANDARDS FEDERAL FED-STD-H28 – Screw-Thread Standards for Federal Services. FED-STD-H28/10 – Screw-Thread Standards for Federal Services. (Section 10 American National Hose Coupling and Fire Hose	FEDERAL COMMERCIAL ITEM DESCRIPTIONS A-A-59326 – Coupling Halves, Quick-Disconnect Cam-Locking A-A-59377 – Quick-disconnect, Sexless Couplings STANDARDS FED-STD-595 – Colors used in Government Procurement AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) ASTM D 380 – Standard Test Methods for Rubber Hose ASTM D 381 – Standard Test Method for Existent Gum in Fuels by Jet Evaporation ASTM D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers

REFERENCED DOCUMENTS FROM DETAIL MILITARY SPECIFICATION MIL-H-370G, *HOSES AND HOSE ASSEMBLIES, NONMETALLIC: ELASTOMERIC, LIQUID FUEL*	**REFERENCED DOCUMENTS AFTER REWRITING THIS SPECIFICATION AS A PERFORMANCE SPECIFICATION MIL-PRF-370H, *HOSES AND HOSE ASSEMBLIES, NONMETALLIC: ELASTOMERIC, LIQUID FUEL***
Coupling Threads.) FED-STD-595 – Colors Used in Government Procurements. MILITARY MIL-STD-105 – Sampling Procedures and Tables for Inspection by Attributes. MIL-STD-129 – Marking for Shipment and Storage. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) B 26 – Aluminum-Alloy Sand Casting. D 380 – Rubber Hose. D 381 – Existent Gum in Fuels by Jet Evaporation. D 412 – Rubber Properties in Tension. D 413 – Rubber Property – Adhesion to Flexible Substrate. D 471 – Rubber Property – Effect of Liquids. D 518 – Rubber Deterioration. D 1053 – Rubber Property – Stiffening at Low Temperature: Surface Cracking Flexible Polymers and Coated Fabrics. D 1149 – Rubber Deterioration – Surface Ozone Cracking in a Chamber (Flat Specimen). D 3951 – Standard Practice for Commercial Packaging.	ASTM D 413 – Standard Test Methods for Rubber Property - Adhesion to Flexible Substrate ASTM D 471 – Standard Test Method for Rubber Property - Effect of Liquids ASTM D 518 – Standard Test Method for Rubber Deterioration on Surface Cracking ASTM D 746 – Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact ASTM D 790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials ASTM D 1053 – Standard Test Methods for Rubber Property - Stiffening at Low Temperatures: Flexible Polymers and Coated Fabrics ASTM D 1149 – Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber ASTM D 2137 – Standard Test Methods for Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) ASME B1.20.1 – Pipe Threads, General Purpose (Inch) AMERICAN WATER WORKS ASSOCIATION (AWWA) AWWA C606 - Grooved and Shouldered Joints

EXAMPLE 3 – MATERIAL REQUIREMENTS

Usually, one of the most significant differences between a detail specification and a performance specification is that a detail specification has specific and extensive material requirements. When detail specification MIL-C-11264D, *Containers: Wood, Shipping, Reusable – for Tank Automotive Engines, Transmissions, Differentials, Transfers, Final Drives, Drive Axles, and Similar Assemblies* was rewritten as a performance specification, MIL-PRF-11264E, all of the material requirements were removed and replaced by performance-based requirements for such desired characteristics as durability, resistance to adverse environmental factors, impact survival, and ease of assembly and disassembly. Notice that even the title changed. The basic item described by the detailed specification was wood shipping containers. The performance specification deletes the word "wood" from the title since there may be other materials besides wood that could satisfy the performance requirements. Both the detail military and revised performance specification can be viewed in their entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

MIL-C-11264D, *Containers: Wood, Shipping, Reusable – for Tank Automotive Engines, Transmissions, Differentials, Transfers, Final Drives, Drive Axles, and Similar Assemblies*	**MIL-PRF-11264E, *Containers: Shipping, Reusable – for Tank Automotive Engines, Transmissions, Differentials, Transfers, Final Drives, Drive Axles, and Similar Assemblies***
3.2 Materials. Materials shall be as specified herein and in referenced specifications and standards. Materials shall be free from defects which adversely affect performance or serviceability of the finished product (see 4.6.1). 3.2.1 Use of wood groups. Any wood groups listed in MIL-STD-731 may be used for lumber for type I containers. Only the species in wood group II, III, and IV shall be used for lumber for type II through type V containers (see 4.6.1). 3.2.2 Lumber. Lumber shall be seasoned to a moisture content of not more than 19 percent nor less than 12 percent of its oven-dry weight. Pieces shall be free from defects that weaken them or interfere with the prescribed fabrication or nailing. No knot shall have a diameter exceeding one-fourth of the width of the piece. Exterior boards shall be sufficiently smooth on the outside surface to permit legible stencil markings. Lumber shall be of nominal	**The material requirements were totally deleted. The following are extracts of some of the performance requirements. The detail specification MIL-C-11264D did not contain performance requirements.** 3.3 Characteristics. 3.3.1 Performance. 3.3.1.1 Stackability. The container shall be constructed in a manner which shall safely permit stacking of loaded containers to a height of 4900 millimeters (mm) with a safety factor of 1.5. The containers shall exhibit top and bottom interfaces allowing a method to interlock them to increase stacking stability (see 4.6.2.1). 3.3.1.2 Rough handling. (see 4.6.2.2). 3.3.1.2.1 Cornerwise-drop. The container shall withstand a cornerwise-drop without damage to or shifting of its contents (see 4.6.2.2.1).

MIL-C-11264D, *Containers: Wood, Shipping, Reusable – for Tank Automotive Engines, Transmissions, Differentials, Transfers, Final Drives, Drive Axles, and Similar Assemblies*	**MIL-PRF-11264E, *Containers: Shipping, Reusable – for Tank Automotive Engines, Transmissions, Differentials, Transfers, Final Drives, Drive Axles, and Similar Assemblies***
sizes unless otherwise specified herein (see 4.6.1). 3.2.3 Nails. Cement-coated sinker nails conforming to FF-N-105 or chemically etched sinker nails shall be used. Bright nails may be used when they can be clinched no less than 1/8 inch (see 4.6.1 and 4.6.2). 3.2.4 Bolts. Standard carriage or step bolts conforming to FF-B-584 shall be used (see 4.6.1 and 4.6.2). 3.2.5 Lag bolts. Lag bolts shall conform to FF-B-561 (See 4.6.1and 4.6.2). 3.2.6 Washers. Flat washers conforming to FF-W-92 shall be used under nuts of all securing bolts (see 4.6.1 and 4.6.2). 3.2.7 Metal strapping. Metal strapping shall be 1-inch wide by 0.0625-inch thick standard punched strapping; or 1 1/2 –inch by 0.035-inch thick salvaged strapping may be used (see 4.6.1 and 4.6.2). 3.2.8 Inspection hinges. Inspection hinges shall conform to figure 1 (see 4.6.1 and 4.6.2). 3.2.9 Plywood. Plywood shall conform to A-A-55057, type C (ANSI/HPMA Hp 1983) or type A (standard interior with exterior glue) (see 4.6.1 and 4.6.2). 3.2.10 Preservative application. Nuts, lifting devices, washers, bolts, hold-down irons, and straps shall be coated with corrosion-preventive compound conforming to MIL-C-16173, grade 1 (see 4.6.1 and 4.6.2).	3.3.1.2.2 Pendulum-impact. The container shall withstand a pendulum-impact without damage to or shifting of its contents (see 4.6.2.2.2). 3.3.1.2.3 Incline-impact. The container shall withstand an incline-impact without damage to or shifting of its contents (see 4.6.2.2.3). 3.3.1.2.4 Edgewise-drop. The container shall withstand an edgewise-drop without damage to or shifting of its contents (see 4.6.2.2.4). 3.3.1.2.5 Vibration. The container shall withstand vibration without damage to or shifting of its contents (see 4.6.2.2.5). SECTIONS 3.3.2 AND 3.3.3 OMITTED FROM EXAMPLE 3.3.4 Reliability. The container shall be constructed in a manner which shall provide a minimum useful life of 20 uses under normal usage prior to needing repair. 3.3.5 Maintainability. The container shall be constructed in a manner which shall allow repair. 3.3.6 Environmental conditions. 3.3.6.1 Temperature. The container shall withstand a -55°C to +70°C temperature range without cracking, deformation or other signs of damage (see 4.6.5.1). 3.3.6.2 Humidity. The container shall withstand a 5% to 100% humidity range without cracking, swelling, deformation or other signs of damage (see 4.6.5.2).

EXAMPLE 4 – DESIGN REQUIREMENTS

Detail specifications often describe the product design by citing drawings and component specifications that must be followed. This leaves little room for the contractor to provide innovative designs or designs that reflect the latest technology. It also places a burden on the preparing activity to keep the specification and its referenced drawings and component specifications current, in order to reflect current industry practices. In detail specification MIL-L-25370E, *Valve, Pneumatic Inflator, (Life Preserver – M1-A)*, detailed design drawings are cited throughout the specification for each valve part. In the rewritten performance specification, MIL-PRF-25370F, *Valve, Pneumatic Inflator, (Life Preserver – M1-A)*, the detailed design drawings were eliminated and replaced by operational requirements and figures included in the performance specification that showed the interface alignments and dimensions. Both the detail military and revised performance specification can be viewed in their entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

MIL-L-25370E, *Valve, Pneumatic Inflator, (Life Preserver – M1-A)*	**MIL-PRF-25370F, *Valve, Pneumatic Inflator, (Life Preserver – M1-A)***
3.5 Design and construction. The dimensions and the shape of the inflating assembly shall conform to figure 1. 3.5.1 Inflating assembly housing. The inflating assembly housing shall be high pressure die-cast aluminum and shall be anodized and treated with dichromate seal. The discharge mechanism shall consist of an external lever and an internal piercing pin and shall have a seal that will prevent leakage of life preserver cell pressure with the lever in any position. The inlet of the inflating assembly shall be threaded to accept a carbon dioxide cylinder conforming to MIL-C-25369. A lock shall be provided to retain the carbon-dioxide cylinder in the inlet. An outlet shall be provided to mount the inflating assembly on a life preserver cell. Passages shall be provided for conducting gas from the punctured carbon-dioxide cylinder to the outlet when the lever is actuated. 3.5.1.1 Piercing pin. The piercing pin shall be cadmium-plated, hardened steel, having a case depth of 0.010 inch. A spring shall be provided to retract the pin immediately from the opening of a punctured cylinder. 3.5.1.2 Lever. The liner shall be 1/8 inch thick	3.6 Operation. The pneumatic inflator valve shall operate in world-wide environmental conditions expected to be encountered by aircrew personnel. The unit shall function easily by personnel wearing standard flight gear. 3.6.1 Inflator valve housing. The inflator valve shall consist of an actuator that shall be flush with the inflator valve housing in the unopened position. The actuator shall be secured in the unopened position. The inflator valve shall consist of a piercing mechanism that will retract immediately from the opening of the punctured cylinder, and have a seal that shall prevent leakage of the life preserver cell with the actuator in any position. The inlet of the inflator valve shall be threaded to accept a carbon dioxide cylinder conforming to MIL-PRF-25369. A locking mechanism shall be provided to retain the carbon dioxide cylinder in the inlet. An outlet shall be provided to mount the inflator valve on the life preserver cell valve stem as shown in figure 2. A passage shall be provided for conducting gas from the punctured carbon dioxide cylinder to the outlet when actuated. The outlet shall align with the hole in the side of the stem regardless of which side of the outlet is toward the base of the

MIL-L-25370E, *Valve, Pneumatic Inflator, (Life Preserver – M1-A)*	**MIL-PRF-25370F, *Valve, Pneumatic Inflator, (Life Preserver – M1-A)***
cadmium plated hardened steel, having a case depth of 0.010 inch. The lever shall be in position with the staked stainless steel pin in the unoperated position. The lever shall lay against the side of the inflating assembly as shown in figure 1. Thread conforming to type III, letter size E, color optional of V-T-295 shall be used for securing the lever in the unoperated position. All edges of the lever shall have a nominal radius or ten-thousandths of an inch. 3.5.1.3 Outlet. Each inflating assembly shall have an outlet for mounting on a valve stem conforming to Drawing 52A6598. The gas passages in the outlet shall align with the hole in the side of the stem regardless of which side of the outlet is toward the base of the stem. 3.5.1.4 Lock. Each inflating assembly shall have a screw-type lock to prevent loosening of an installed carbon-dioxide cylinder conforming to MIL-C-25369. The screw head shall be a slot-type and shall not extend above the inflating assembly when adjusted to tighten the carbon-dioxide cylinder. The screw head and the slot shall be rounded and free from burrs. The top of the tapped holes shall be countersunk smooth and free of burrs or sharp edges. 3.5.2 Lanyard. A lanyard conforming to Drawing 56K3881 shall be attached to the lever. 3.5.3 Gaskets. Gaskets shall be provided to seal the attachment points of the outlet and the inlet of the inflating assembly. The inlet gasket shall conform to Drawing 58A3567. The outlet gasket shall conform to Drawing 58A3568 and 58A3569. 3.5.4 Valve stem cap. A valve stem cap conforming to Drawing 52A6600 shall be provided to hold the inflating assembly in place on the valve stem.	stem. 3.6.2 Valve stem cap. A valve stem cap (see figure 2) shall be provided to hold the inflator valve in place on the valve stem.

EXAMPLE 5 – INTERFACE, INTEROPERABILITY, AND COMPATIBILITY REQUIREMENTS

Both detail and performance specifications can have interface, interoperability, and compatibility requirements. Such requirements can be expressed in different ways including physical, electronic, or electrical connections, interchangeable parts, digital interoperability, and compatibility between materials just to name a few examples. Because detail specifications require the use of specific materials, parts, and designs, there are usually inherent interface, interoperability, and compatibility requirements. One of the challenges in writing performance specifications is to identify all essential interface, interoperability, and compatibility requirements when eliminating requirements for specific materials, parts, and designs. Detail specification MIL-H-370, *Hoses and Hose Assemblies, Nonmetallic: Elastomeric, Liquid Fuel*, did not have any requirements identified as interface, interoperability, or compatibility, although such requirements were present in the specification's materials, parts, design, and construction requirements. When MIL-PRF-370J, *Hoses and Hose Assemblies, Nonmetallic: Elastomeric, Liquid Fuel*, was issued, it contained an interface requirement so that the hoses could be attached to existing equipment, and a fuel and water compatibility requirement, so that the hoses would not be degraded by liquids they were intended to transfer. Below are the interface requirements from MIL-PRF-370J. Note that several of the referenced documents are detailed military specifications. While as a rule, citing detailed specifications should be avoided in performance specifications, it is acceptable to cite detailed specifications and other documents if it is clearly for purposes of interface, interoperability, or compatibility. This performance specification can be viewed in its entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

3.4 Interface requirements.

3.4.1 Connection to existing equipment. The hose or hose assemblies defined herein are required to interface with existing equipment and hose assemblies. The interface points, end fittings, shall be controlled. Re-attachable end fittings shall be as specified herein; A-A-59326 shall be used for cam-locking fittings; A-A-52592 shall be used for grooved end fittings; and A-A-59377 shall be used for quick disconnect sexless couplings.

3.4.2 Fuel and water compatibility. Finished hoses shall be resistant to, have no deleterious effects upon, and not be degraded by water and the following kerosene-based petroleum fuels. Meeting the hose physical and chemical properties requirements with the specified test fluid shall provide sufficient evidence that the finished hoses conform to the fuel compatibility requirement.

a. MIL-DTL-83133 (JP-8) (NATO F-34).
b. MIL-DTL-5624 (JP-5) (NATO F-44).
c. A-A-52557 (Diesel-military, including NATO F-54).
d. ASTM D975 (Diesel-U.S. commercial).
e. ASTM D1655 (Jet A-1).
f. MIL-F-46162 (type I and II Referee Grade Diesel).

EXAMPLE 6 – PHYSICAL CHARACTERISTICS

Performance specifications may include physical characteristics such as dimensions, weight, or anthropomorphic data as requirements in order to ensure needed physical interface or interoperability with other systems, equipment, components, or the human form. MIL-PRF-32076, *Unitization of Ammunition*, covers unitization requirements for packaged ammunition. Shown below are the pallet dimensions, which are essential performance requirements to enable standard forklift trucks to pick up the ammunition pallets. This performance specification can be viewed in its entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

3.4.3 Pallet. The following requirements pertain to the interfacing of the pallet with existing material handling equipment in the DOD/NATO inventory. Alternatively, wood pallets conforming to ASME Part Number MH1/9-11 BW 4048P may be used in lieu of the requirements of this paragraph.

3.4.3.1 General.

3.4.3.1.1 Size. Pallet size shall be 1016 mm in length and 1219 mm in width, plus or minus 6 mm. Pallets of sizes other than 1016 mm in length and 1219 mm in width shall not be used unless first authorized by the procuring activity.

3.4.3.1.2 4-way entry. Full 4-way entry capability of the pallet shall be provided.

3.4.3.1.3 Bottom surface. The load-bearing surface in contact with the ground (pallet footprint) shall be a minimum of 40 percent of the top deck area.

3.4.3.1.4 Forklift tine opening. The forklift slots shall be a minimum of 89 mm in height and a minimum of 254 mm in width, in two places, on all four sides of the pallet.

3.4.3.1.5 Height. The pallet height shall be 140 mm maximum.

3.4.3.1.6 Flatness. When the pallet bottom is placed on a flat surface, the pallet top shall not vary more than 6 mm from the average pallet height.

3.4.3.1.7 Squareness. The difference in the length of two diagonal corners shall not exceed 19 mm.

3.4.3.1.8 Wings. Width of the wings shall not be less than 64 mm.

EXAMPLE 7 – PROCESS REQUIREMENTS

Another significant difference between a detail specification and a performance specification is that a detail specification often has specific and extensive requirements for such processes as welding, soldering, plating, cleaning, finishing, coating, painting, etc. Performance specifications usually do not specify processes, or the requirement is stated as the desired outcome from a process, requires the contractor's normal commercial processes, or is provided as guidance. All of these approaches were used when MIL-F-19004A, *Fans, Centrifugal, Fixed and Portable, Ventilation, Naval Shipboard* was rewritten as a performance specification. Both the detail military and revised performance specification can be viewed in their entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

MIL-F-19004A, *Fans, Centrifugal, Fixed and Portable, Ventilation, Naval Shipboard*	**MIL-PRF-19004B, *Fans, Centrifugal, Ventilation, Naval Shipboard***
3.5.1.2 Welded parts. Welded parts shall have all traces of flux removed before painting. This may be accomplished by brushing the welds while immersed in boiling water. For inaccessible welds, the part may be cleaned by immersion in a cold solution of 10 percent sulfuric acid for 30 minutes, or a 5 percent solution of sulfuric acid held at 150°F for 10 minutes. The acid shall contact both the inside and outside surfaces. The acid treatments shall be followed by a rinse in clean, warm water until no trace of acid is detected. Residual flux may be detected by leaching the surface with distilled water, and adding a few drops of 5 percent silver nitrate solution to the leach. A white precipitate indicates the presence of flux. 3.5.4 Painting. Exposed surfaces of fan impellers, interior surfaces of fan scrolls, exposed surfaces of all parts in the air stream and exterior surfaces of motors not previously painted shall be given a coat of zinc-chromate primer in accordance with TT-P-645, followed by a coat of phenolic varnish in accordance with TT-V-119. The exterior of all fan scrolls (except type 0 fans) and conduit boxes shall be given two coats of zinc-chromate primer. The exterior surface of type 0 fans shall be given one coat of zinc-chromate primer, followed by a finish coat of red paint in accordance with TT-E-489.	3.3 Painting and welding. 3.3.1 Factory coating. Equipment and component items shall be delivered with the manufacturer's standard finish, except as to comply with the requirements of 3.2. 3.3.2 Welding and allied processes. Surfaces of parts to be welded or brazed shall be free from rust, scale, paint, grease, and other foreign matter. Welding and allied processes shall be performed by personnel certified to American Welding Society standards. NAVSEA Technical Publication S9074-ARGIB-010/278 may be used for guidance.

EXAMPLE 8 – PROCESS REQUIREMENTS

Using the non-mandatory Section 6, Notes, in specifications to provide guidance on past solutions that may fulfill the performance requirement can be a useful approach. However, this approach should be used carefully so as not to convey an unintended message that alternative solutions will not be accepted by the Government. Also, the guidance should reflect current industry practices and technology. In the following example from detail specification MIL-S-8805D, *Switches and Switch Assemblies, Sensitive, Snap Action (Basic Limit, Push Button and Toggle Switches)*, the specific process specifications were removed from the detail specification. Possible plating and hot solder dip processes were provided as guidance in the Section 6, Notes, in the performance specification MIL-PRF-8805E. Notice that the suggested processes were updated and expanded from the former mandatory processes in the detail specification. Both the detail military and revised performance specification can be viewed in their entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

MIL-S-8805D, *Switches and Switch Assemblies, Sensitive, Snap Action (Basic, Limit, Push Button and Toggle Switches)*	**MIL-PRF-8805E, *Switches and Switch Assemblies, Sensitive, Snap Action (Basic, Limit, Push Button and Toggle Switches)***
3.5.2 Terminals. Terminals shall be as specified (see 3.1 and 6.2). 3.5.2.1 Solder terminals. Solder terminals shall be treated to facilitate soldering. Coatings such as hot solder or hot-tin dip are acceptable. Gold plating shall not be used, except when solder lug terminals are integral with gold contacts, gold plating 0.000030 inch to 0.000100 inch may be used. Silver plating shall not be used as the external coating. 3.5.2.2 Printed circuit board terminals. Printed circuit board terminals shall be tin-lead plated or solder dipped. Tin-lead plating shall be 100 microinches minimum in accordance with MIL-P-81728. Solder dip shall be 60-40 tin-lead in accordance with QQ-S-571, 100 microinches minimum thickness.	3.5.2 Terminals. Terminals shall be as specified (see 3.1 and 6.2). 3.5.2.1 Solder terminals. Solder terminals shall be treated to facilitate soldering. Coatings such as hot solder dip are acceptable. Gold plating 0.000030 inch minimum may be used and shall be over a diffusion barrier such as nickel or palladium. Silver plating shall not be used as the external coating. For additional information and guidance on plating, see 6.14. 3.5.2.2 Printed circuit board terminals. Terminals intended for direct soldering into printed circuit boards shall be metal alloy plated or solder dip. Tin-lead composition may be used. Plating shall be 100 microinches minimum. For additional information and guidance on tin-lead plating and hot solder dip see 6.14. **(THIS IS THE GUIDANCE FROM THE SECTION 6 NOTES)** 6.14 Terminal finishes and plating.

MIL-S-8805D, ***Switches and Switch Assemblies, Sensitive, Snap Action (Basic, Limit, Push Button and Toggle Switches)***	**MIL-PRF-8805E**, ***Switches and Switch Assemblies, Sensitive, Snap Action (Basic, Limit, Push Button and Toggle Switches)***
	6.14.1 Gold plating. It is recommended that SAE-AMS-2422, type II, class 1 be considered for meeting the gold plating requirements of this specification. 6.14.2 Tin lead plating. It is recommended that SAE-AMS-P-81728 be considered for meeting the tin lead plating requirements of this specification. 6.14.3 Nickel plating. It is recommended that SAE-AMS-QQ-N-290 be considered for meeting the nickel plating requirements of this specification. 6.14.4 Silver plating. It is recommended that ASTM B700 be considered for meeting the silver plating requirements of this specification. 6.14.5 Hot solder dip. It is recommended that solder dip (60-40 tin lead) in accordance with EIA/IPC J-STD-006 be considered for meeting the requirements of this specification.

EXAMPLE 9 – PROCESS REQUIREMENTS

As a general rule, performance specifications should not require specific processes, but in situations where (a) the process is truly unique to the military and the DoD developed the process for those unique applications; (b) application of the process is essential to the operational performance of the item; and (c) the manufacturer of the item would not have any expertise in the process and it is unlikely that the manufacturer could develop or propose an alternative to the process, then it is acceptable to specify an exact process in a performance specification. A good example of where a specific process can be required in a performance specification is the application of Chemical Agent Resistant Coating (CARC), which ensures that item surfaces can be easily and effectively decontaminated after exposure to chemical agents. Extracts from some of the performance specifications that require the use of CARC are as follows:

- MIL-PRF-32137, *Filter, Gas – Particulate: NBC, 100 CFM, M48A1*, paragraph 3.4.5, requires any exterior metallic surfaces of the filter's housing or canister to have CARC topcoats that meet MIL-DTL-64159, *Coating, Water Dispersible Aliphatic Polyurethane, Chemical Agent Resistant*, or MIL-C-53039, *Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant*.

- MIL-PRF-49080C, *Power Supplies, PP-2953D/U and PP-6224C/U*, paragraph 3.13.1 requires that exterior surface of the power supply be painted with Lusterless Green 383 CARC in accordance with MIL-DTL-64159, *Coating, Water Dispersible Aliphatic Polyurethane, Chemical Agent Resistant*, or MIL-C-53039, *Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant*.

- The system performance specification for the Light Weight 155MM cannon system in Appendix C, paragraph 3.2.2.6.1, requires the system to be painted in accordance with MIL-DTL-53039, *Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant*.

EXAMPLE 10 – CONSTRUCTION REQUIREMENTS

Performance specifications should not contain requirements on how the end item is to be constructed or assembled. Detailed specifications for end items often do contain lengthy and specific instruction on how an item is to be made, which does not allow for using alternative approaches that may be more cost effective or provide superior performance. Including detailed construction requirements can become a major problem if the specification is not kept current and the requirements do not reflect the latest industry practices. In the following example from detail specification MIL-L-81542A, *Life Raft, Inflatable, One-Man, Type LR-1*, the specific instructions on how to cement and stitch seams were removed and replaced with performance outcomes throughout the performance specification MIL-PRF-81542B, *Life Raft, Inflatable, Single-Place*. Some of the paragraphs from MIL-PRF-81542B related to seam performance are given below. Both the detail military and revised performance specification can be viewed in their entirety on the ASSIST database at http://assist.daps.dla/quicksearch/.

MIL-L-81542A, *Life Raft, Inflatable, One-Man, Type LR-1*	**MIL-PRF-81542B, *Life Raft, Inflatable, Single-Place***
3.4.3 Cementing of the seams, seam tapes, patches, and attachments. The construction of the seams and the cementing of the seam tapes, patches, and attachments shall use the technique and precautions in 3.4.2 so that, prior to the inspection of the assembled life raft, the adhesive shall have developed its optimum bonding properties and the adherence of all such seams, seam tapes, patches, and attachments shall comply with the requirements of this specification. All the seams, seam tapes, patches, and attachments shall be secured by the adhesive specified in the applicable drawings. The tube radial joining seams shall be covered, on the inner and outer sides, with the seam tape as specified in 67A318H2. The tube longitudinal seam shall be covered on the inner side, with the seam tape and, on the outer side, by the attachment of the floor as specified in 67A318H2. All the seam tapes shall be applied to the seams without tension, and wrinkles, and shall be applied in accordance with the applicable drawing requirements. The floor, patches, and attachments shall also be cemented to the life raft without tension or wrinkles. The internal diametral opening in the	3.19 Function/operation. The life raft shall inflate at the required pull force to its design shape in not greater than 60 seconds when tested as specified in 4.11. During the inflation, the life raft shall be observed for impediment or blockage of the flow of gas, loss of gas to the ambient air, or restriction by any component or accessory. There shall be no evidence of structural or material failure in any respect. All the sealed areas, seams, seam tapes, and attachments shall remain intact and shall show no indication of separation. The floor shall not be distorted and there shall not be a difference in the rise between the sides of the raft. The erected canopy shall withstand 35-knot winds and 52-knot gusts in open water. The life raft shall demonstrate seaworthiness and stability in an open sea condition of 17 to 27 knot winds and waves of 6 to 10 feet. The raft shall be easily boarded by a subject wearing standard aviation life support equipment including a flight suit, survival vest, inflated life preserver, and flight boots. See table I for anthropometric data. 3.20.1.1 Low temperature. The life raft shall inflate into a boardable shape within 5 minutes

MIL-L-81542A, *Life Raft, Inflatable, One-Man, Type LR-1*	**MIL-PRF-81542B, *Life Raft, Inflatable, Single-Place***
base patch, reinforcing the attachment of the oral inflation tube, shall coincide with the opening in the oral inflation tube. The adhesive shall be applied in a straight line parallel to the edges of the seam tapes, seams, patches, and attachments and shall extend from just being visible to a maximum of one inch beyond the edges of the seam tape, seam, patch, and attachment. The seam tapes, which seal circumferential seams, or where one end of the seam tape comes in contact with the other end of the same seam tapes or another seam tape, shall overlap on itself, at the ends, 3/4 , plus 1/2, minus 0, inch. The adhesive, when dry or cured, shall present a neat and uniform appearance. The adhesive shall not be allowed to remain in clots, and upon drying or curing shall not cause the cloth, seam tapes, and attachments to shrink or pucker at any point on the life raft. The life raft shall be free from congealed masses of the adhesive and spots or stains resulting from excessive adhesive. 3.4.4 Seams and stitching. No stitching shall be used in any of the life raft seams, through the cloth of any air retaining chamber, or through the life raft floor. Sewing shall only be used in the construction of the accessory parts but not in their final attachment to the life raft. All the machine stitching in the accessory parts shall be accomplished as specified in the applicable drawings. All the sewing, except for the bartacks, shall be accomplished with Stitch type 301 conforming to FED-STD-751 and shall contain 6 to 10 stitches per inch. Each row of stitching shall be straight and parallel to the seam edge. The straightness of the stitching, in any row, shall be maintained within a tolerance of plus or minus 1/32 inch. The ends of the stitching shall be backstitched, by overlapping on itself, a minimum of 1/2 inch. Thread breaks, skips, and run-offs shall be overstitched not less than one inch. The	at 0 °F when tested as specified in 4.12.1.1. Inflation shall be without any hindrance to the flow of gas or restriction by any component or accessory. All the seams, seam tapes, sealed areas and attachments shall remain perfectly intact and shall show no evidence of separation. There shall be no evidence of construction or material failure in any respect. 3.20.1.2 High temperature. The life raft shall inflate to design shape within 60 seconds at 160 °F when tested as specified in 4.12.1.2. Inflation shall be without any hindrance to the flow of gas or restriction by any component or accessory. All the seams, seam tapes, sealed areas and attachments shall remain perfectly intact and shall show no evidence of separation. There shall be no evidence of construction or material failure in any respect. 3.20.4 Accelerated aging/life cycling. The packed life raft shall withstand the effects of accelerated aging/life cycling when tested as specified in 4.12.4. The life raft shall inflate to design shape within 60 seconds when actuated as specified in 4.12.4. Inflation shall be without any hindrance to the flow of gas or restriction by any component or accessory. All the seams, seam tapes, sealed areas and attachments shall remain perfectly intact and shall show no evidence of separation. There shall be no evidence of construction or material failure in any respect. Immediately following this test, the raft shall be visually examined as specified in 4.5, and pressure/leakage tested as specified in 4.10.

MIL-L-81542A, ***Life Raft, Inflatable, One-Man, Type LR-1***	**MIL-PRF-81542B,** ***Life Raft, Inflatable, Single-Place***
thread tension shall be maintained so that there shall not be any loose or tight stitching and the lock shall be embedded in the materials sewn together. No seam shall be twisted, puckered, or pleated and no portion of the accessory parts shall be caught in an unrelated operation or seam. All the thread ends shall be trimmed to a length of 1/4 to 3/8 inch. The seam edges shall be properly forced out and shall not contain any folds. Non-lubricated thread shall be used for all stitching operations to prevent stains.	

VERIFICATION

The Government uses various verification techniques (e.g. test and evaluation, demonstration, simulation and modeling, examination, and analysis) to ensure that the systems or items being acquired meet their performance requirements and the user's needs. With detailed specifications, verification often relies more on examination and demonstration to ensure compliance with the "build-to-print" requirements for specific and extensive lists of materials and parts in the end item. Since performance specifications do not require specific materials, parts, designs, and processes, there is usually less emphasis on examination and demonstration and more emphasis on test and evaluation, simulation and modeling, and analysis. While it is often possible to verify multiple requirements for specific materials and parts in a detailed specification with a single examination or demonstration test, in a performance specification, there is usually a one-for-one correlation between requirements and verification. A useful approach illustrated in Appendix C is to have a table that matches the requirements with the verification.

The type of verification techniques used in a performance specification and the amount of test and evaluation needed depends upon various risk factors, such as whether the item is used in critical applications, whether development is required or if acceptable nondevelopmental items exist, or whether the technology is well-understood and stable or if it is a rapidly changing technology. The different types of verification for both performance and detailed specifications tend to be similar and are discussed in MIL-STD-961, *Defense and Program-Unique Specifications Format and Content*. While the distinguishing features between performance and detail specifications are primarily in the Section 3 Requirements part of the specification, care should be taken in Section 4 Verification to avoid excessive specification of the testing procedures, and wherever possible, non-Government standards should be cited for the tests. Defining verification methods and criteria are of utmost importance when establishing requirements. The program assumes unnecessary cost, schedule, and performance risks without detailed and thorough requirements compliance planning.

Although verification can take a number of forms, since performance specifications encourage ingenuity and innovation and allow for different designs and approaches, it is desirable to have a first article inspection or qualification provision to verify compliance with all of the specification requirements prior to production. All of the defense performance specifications in the ASSIST database have either a first article inspection or qualification provision.

Qualification Provisions in Defense Specifications

Qualification is a process in advance of, and independent of, an acquisition by which a manufacturer's capabilities or a manufacturer's or distributor's products are examined, tested, and approved to be in conformance with specification requirements, and subsequent approval for inclusion of products in an electronic qualified products list (QPL) or manufacturers in an electronic qualified manufacturers list (QML), which are part of the Qualified Product Database (QPD). Criteria for retention of qualification are applied on a periodic basis to ensure continued integrity of the qualification status.

The primary benefit of a qualification provision in performance specifications that cover products with rapidly changing technologies is that qualification requires continual Government monitoring of the manufacturer's production processes. So even though the manufacturer may be frequently changing materials, parts, and processes, the Government has confidence that the end item will meet the performance specification requirements because under qualification, the Government establishes a long-term relationship with the supplier to ensure continuous conformance to requirements and continuous product quality improvements. Qualification improves the availability of products and shortens the procurement process by completing long or highly complex evaluations and tests of the manufacturer's processes or products prior to award of contract. Qualification improves readiness by improving the availability of products with requisite quality, reliability, performance, and safety. Qualification can also help reduce costs by eliminating repetitive surveillance audits and tests.

For details on the DoD qualification program and the criteria and approvals that must be met before qualification can be included in a defense specification, see DoD 4120.24-M, *Defense Standardization Program Policies and Procedures*, and the SD-6, *Provisions Governing Qualification: Qualified Products Lists and Qualified Manufacturers Lists*. For format and content requirements for including qualification in a defense specification, see MIL-STD-961, *Defense and Program-Unique Specifications Format and Content.*

First Article Inspection

While a qualification provision is most frequently used to verify compliance with performance specification requirements, it is not always appropriate. Qualification provisions are appropriate in situations where long-term or specialized testing makes it impractical to conduct other types of testing because of high testing costs or acquisition delays. Qualification provisions are also appropriate for critical safety items where failure would have catastrophic ramifications. Qualification, however, also requires significant Government resources to audit and evaluate the manufacturer's production facilities, inspection systems, quality and reliability assurance programs, test facilities, processes, and materials, as well as witness or conduct the qualification testing. Qualification is a continual process that requires vigilant oversight and often, periodic requalification of manufacturers.

Because of the resources required for qualification and because most specifications do not meet the criteria specified in DoD 4120.24-M, *Defense Standardization Program Policies and Procedures*, to require qualification, most defense specifications in the ASSIST database rely on first article inspection to ensure that a manufacturer is capable of producing an item that meets the specification and all contract requirements before production begins.

Unlike qualification, which is conducted prior to and independent of an acquisition, first article inspection is called out in the contract, when required. Shown below are the conditions when Part 9 of the Federal Acquisition Regulation (FAR) recommends requiring first article inspection in the contract and when the FAR does not recommend first article inspection. Note that the FAR 9.303(c) recommends first article inspection if the product is described by a performance specification, unless there is a qualification requirement (see FAR 9.304(b)).

The following was extracted from Subpart 9.303 of the FAR:

[First article] testing and approval may be appropriate when --

(a) The contractor has not previously furnished the product to the Government;

(b) The contractor previously furnished the product to the Government, but --

(1) There have been subsequent changes in processes or specifications;

(2) Production has been discontinued for an extended period of time; or

(3) The product acquired under a previous contract developed a problem during its life;

(c) The product is described by a performance specification; or

(d) It is essential to have an approved first article to serve as a manufacturing standard.

The following was extracted from Subpart 9.304 of the FAR:

Normally, [first article] testing and approval is not required in contracts for --

(a) Research or development;

(b) Products requiring qualification before award (*e.g.*, when an applicable qualified products list exists (see Subpart 9.2));

(c) Products normally sold in the commercial market; or

(d) Products covered by complete and detailed technical specifications, unless the requirements are so novel or exacting that it is questionable whether the products would meet the requirements without testing and approval.

APPENDIX A

DEFINITIONS

The following definitions of terms used in this guide were extracted from MIL-STD-961, *Defense and Program-Unique Specifications Format and Content.*

Acquisition Streamlining and Standardization Information System (ASSIST). The official database containing information about standardization documents used in the DoD. ASSIST also provides electronic access to government documents included in the database over the Internet. ASSIST can be accessed at http://assist.daps.dla/quicksearch/ or http://assist.daps.dla.mil.

Analysis. An element of verification that uses established technical or mathematical models or simulations, algorithms, charts, graphs, circuit diagrams, or other scientific principles and procedures to provide evidence that stated requirements were met.

Defense specification. A specification developed under the consensus procedures of the Defense Standardization Program that is used on multiple programs or applications and is included in the ASSIST database.

Demonstration. An element of verification that involves the actual operation of an item to provide evidence that the required functions were accomplished under specific scenarios. The items may be instrumented and performance monitored.

Detail specification. A specification that specifies design requirements, such as materials to be used, how a requirement is to be achieved, or how an item is to be fabricated or constructed. A specification that contains both performance and detail requirements is still considered a detail specification. Both defense specifications and program-unique specifications may be designated as a detail specification.

Examination. An element of verification that is generally nondestructive and typically includes the use of sight, hearing, smell, touch, and taste; simple physical manipulation; and mechanical and electrical gauging and measurement.

Inspection. The examination and testing of supplies and services to determine whether they conform to specified requirements.

Interchangeable item. An item which possesses such functional and physical characteristics as to be equivalent in performance, reliability, and maintainability, to another item of similar or identical purposes. An interchangeable item is capable of being exchanged for the other item without selection for fit or performance, and without alteration of the items themselves or of adjoining items, except for adjustment.

Item specification. A type of program-unique specification that describes the form, fit, and function and method for acceptance of parts, components, and other items that are elements of a system.

Material specification. A type of program-unique specification that describes such raw or processed materials as metals, plastics, chemicals, synthetics, fabrics, and any other material that has not been fabricated into a finished part or item.

Non-Government standard. A national or international standardization document developed by a private sector association, organization, or technical society that plans, develops, establishes, or coordinates standards, specifications, handbooks, or related documents. The term does not include standards of individual companies. Non-Government standards adopted by the DoD are listed in the ASSIST database.

Performance specification. A specification that states requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics. Both defense specifications and program-unique specifications may be designated as a performance specification.

Process specification. A type of program-unique specification that describes the procedures for fabricating or treating materials and items.

Program-unique specification. A specification that describes a system, item, software program, process, or material developed and produced (including repetitive production and spares purchases) for use within a specific program, or as a part of a single system and for which there is judged to be little potential for use by other systems.

Qualification. A process in advance of and independent of an acquisition by which a manufacturer's capabilities, or a manufacturer’s or distributor's products are examined, tested, and approved to be in conformance with specification requirements, and subsequent approval for or listing of products on a qualified products list (QPL) or manufacturers on a qualified manufacturers list (QML).

Software specification. A type of program-unique specification that describes the requirements and verification of requirements for the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information.

Specification. A document prepared to support acquisition that describes essential technical requirements for materiel and the criteria for determining whether those requirements are met.

System specification. A type of program-unique specification that describes the requirements and verification of the requirements for a combination of elements that must function together to produce the capabilities required to fulfill a mission need, including hardware, equipment, software, or any combination thereof.

Verification. Confirmation through the provision of objective evidence that specified requirements have been fulfilled. Objective evidence may be obtained through observation, measurement, test, or other means.

APPENDIX B

EXAMPLE OF A GUIDE SPECIFICATION PERFORMANCE REQUIREMENT

The following is extracted from Joint Service Specification Guide, JSSG 2001, *Air Vehicle,* to illustrate one example of how a performance requirement can be expressed in a guide specification. This requirement is for the aerial refueling envelope. To highlight some of the characteristics common in a guide specification:

- Notice that the requirement for the aerial refueling envelope in paragraph 3.1.1.1.1 below has two blank requirements that must be determined when developing the program-unique specification.
- Guidance is provided below the requirement on how to fill in the blanks. Even though guide specifications offer much flexibility in determining the performance capability, note that in the Requirements Guidance it indicates that if it is necessary to specify procedural operations, as a minimum, NATO STANAG 3971 and Allied Tactical Publication (ATP) 56, Air-to-Air Refueling, must be specified. This is essential to ensure aerial refueling interoperability.
- Notice the Lessons Learned paragraph for this requirement.
- Notice the verification paragraph to determine compliance also has blanks for what inspections, analysis, simulation, demonstration, and test must be done; guidance for how to fill in the blanks; and direction as to which verifications must be done during System Requirements Review (SSR), System Functional Review (SFR), Preliminary Design Review (PDR), Critical Design Review (CDR), First Flight Review (FFR), and System Verification Review (SVR).

The complete JSSG 2001 can be accessed through the ASSIST database at http://assist.daps.dla/quicksearch/.

3.1.1.1.1 Aerial refueling envelope
The air vehicle shall be capable of aerial refueling operations throughout the __(1)__ envelope in accordance with __(2)__.

REQUIREMENT RATIONALE (3.1.1.1.1)
This is a safety and operational compatibility requirement. For air vehicle-to-air vehicle refueling, the tanker and receiver air vehicles must have a similar airspeed and altitude envelope in which they can operate their aerial refueling subsystem(s) to facilitate successful aerial refueling. Likewise, for ship-to-helicopter in-flight refueling (HIFR), the air vehicle and ship must have a common operating envelope in which each can function during refueling. The specific aerial refueling procedures to be used during aerial refueling operations can dictate many of the design requirements of tanker and receiver aerial refueling subsystems. As such, it is necessary to

identify the aerial refueling procedures to be employed to ensure that safe and successful aerial refueling operations can be accomplished.

REQUIREMENT GUIDANCE (3.1.1.1.1)
Blank 1. Specify the envelope in terms of airspeed range (KCAS) and altitude range (pressure altitude - feet).

Blank 2. Specify the conditions that define the interfaces between the air vehicle and the aerial refueling tankers. Reference to requirements 3.4.6.2.1 Receiver interfaces and 3.4.6.2.2 Tanker interfaces could be appropriate. If it is necessary to specify procedural operations in this paragraph, as a minimum, specify NATO STANAG 3971 and Allied Tactical Publication (ATP) 56, Air-to-Air Refueling. If other procedures are also required, ensure the procedures adequately address all factors involved in the aerial refueling operations. Procedures must address day versus night conditions (with and without night vision goggles), employment versus deployment scenarios, tanker and receiver rendezvous methods, communication techniques under various threat levels for detection or intercept, tanker and receiver formation techniques under single and multiple tanker and single or multiple receiver combinations, and tanker/receiver contact process under single/multiple receiver combinations.

REQUIREMENT LESSONS LEARNED (3.1.1.1.1)
The airspeed and altitude envelope within which existing tanker and receiver aerial refueling subsystems are able to operate varies from subsystem to subsystem. There are multi-point drogue tankers which have a wing pod subsystem with an airspeed and altitude operational envelope quite different from their centerline hose reel subsystem. Each receiver has its unique airspeed and altitude envelope within which to operate its aerial refueling subsystem(s). Whether it is a new tanker aerial refueling subsystem or a receiver aerial refueling subsystem being developed, the defined airspeed and altitude envelope for each aerial refueling subsystem should be made as broad as possible to maximize operational utility of the subsystem and mission flexibility for the air vehicle.

The U.S. Government has agreed to comply with NATO STANAG 3971 without reservation or exception. As such, all new receiver/tanker air vehicles with an aerial refueling subsystem should be able to conduct aerial refueling operations per NATO STANAG 3971 procedures. New receiver aircraft should be able to refuel using the procedures that have been established for each tanker aerial refueling subsystem on the fielded tanker. Each tanker and each tanker aerial refueling subsystem can have unique procedures associated with them. The aerial refueling procedures with USAF KC-135 tankers (boom and drogue subsystems) are provided in TO 1-1C-1-3. Aerial refueling procedures with USAF KC-10 tankers (boom and drogue subsystems) are provided in TO 1-1C-1-33. Aerial refueling procedures with USAF HC/MC-130 tankers (wing drogue subsystems) are provided in TO 1-1C-1-20. Aerial refueling procedures with US Navy/USMC tanker assets are provided in NAVAIR NATOPS 00-80T-110.

New tanker aircraft should be capable of aerial refueling fielded receiver air vehicles using procedures consistent with the receiver air vehicle’s existing aerial refueling procedures. The USAF has defined aerial refueling procedures with each receiver air vehicle. These procedures are contained within a series of TOs numbered 1-1C-1-XX (XX designates a unique number for

each receiver air vehicle, e.g., 1-1C-1-35 is for the C-17). Aerial refueling procedures for the U.S. Navy and USMC receivers are provided in the NATOPS flight manual for each air vehicle. NATO STANAG 3971 (ATP 56) contains a point of contact (POC) list for current allied tankers and receivers. When aerial refueling support is to be provided to, or obtained from, allied air vehicles, the POC should be contacted to determine if any unique changes/exceptions to the aerial refueling procedures in the document are required to be compatible with their air vehicles. An allied country may have agreed to the STANAG with reservations or concurred with the document for future air vehicles but may have taken exception for existing air vehicles at the time of coordination.

Receiver air vehicles should not require the tanker aircrew or aerial refueling subsystem to adopt special procedures. For example, the number of tanker aerial refueling pumps being used to transfer fuel should remain constant during the aerial refueling process. In the past, some receivers have required the tanker to limit the number of pumps used to initially transfer the fuel due to fuel pressure transients. Once a steady-state flow condition was obtained, the tanker was then able to increase the number of aerial refueling pumps used to transfer the fuel. Similarly, requiring the tanker to reduce the number of aerial refueling pumps being used near the end of the fuel transfer process to alleviate fuel surge pressures should be avoided.

4.1.1.1.1 Aerial refueling envelope verification

Requirement Element(s)	Measurand*	SRR/SFR	PDR	CDR	FFR	SVR
Air vehicle is capable of aerial refueling operations throughout the specified envelope	(1)	A	A	A,S		A,S,D,T,I

*Number in parentheses in the Measurand column refers to numbered blank in the requirement.
A = Analysis
D = Demonstration
I = Inspection
S = Simulation
T = Test

VERIFICATION DISCUSSION (4.1.1.1.1)
Verification of the requirements for tanker and receiver aerial refueling operations is adequately covered by verification paragraphs for 3.4.6.2.1 Receiver interfaces and 3.4.6.2.2 Tanker interfaces. The following verification discussion is limited to the approach for verifying 3.1.1.1.1 Aerial refueling envelope. Realizing the verification for 3.1.1.1 Flight envelope will precede 3.1.1.1.1 Aerial refueling envelope verification, the flight envelope precedent-setting requirements and verifications will become baselines for the ensuing aerial refueling envelope verifications. Therefore, any refueling features or characteristics that have not been inspected, analyzed, simulated, tested or demonstrated during the expanding verification of 3.1.1.1 Flight envelope should be conducted. This approach is intended to minimize or eliminate verification duplication of equivalent flight envelope characteristics. The objective of 3.1.1.1.1 Aerial refueling envelope verification is ultimately to verify the tanker and receiver air vehicles have a similar airspeed and altitude envelope within which they can successfully operate their aerial

refueling subsystem(s). This also includes employment of the refueling boom or drogue systems, or both, that may be deployed with the air vehicle during aerial refueling. Essentially, the verifications should be accomplished by integrating a series of analyses followed by simulations, tests, and demonstrations to verify the aerial refueling envelope.

Key Development Activities
Key development activities include, but are not limited to, the following:

SRR/SFR: Analysis of the air vehicle design concept indicates that comparative efforts will be conducted as a function of evolving the flight envelope as compared with the aerial refueling envelope. Analysis of the proposed aerial refueling envelope indicates that the aerial refueling envelope requirement could be met.

PDR: Analyses of the preliminary air vehicle design indicates that the required aerial refueling envelope is achievable and is compatible with the overall flight envelope requirement. Analysis defines those aerial refueling simulations that may be integrated with the overall flight envelope simulations. Analysis indicates any required modeling for aerial refueling wind tunnel testing has been determined.

CDR: Analysis of completed wind tunnel modeling tests and flight and aerial refueling simulations confirms the ability of the air vehicle to achieve the specified aerial refueling envelope.

FFR: No unique verification action occurs at this milestone.

SVR: Analysis, simulations, demonstrations, inspections, and tests confirm that the aerial refueling envelope has been successfully achieved and risks have been eliminated or are consistent with the specified requirements.

Sample Final Verification Criteria
The aerial refueling envelope shall be satisfied when __(1)__ analyses, __(2)__ simulations, __(3)__ demonstrations, and __(4)__ tests of the air vehicle aerial refueling envelope and the subsequent __(5)__ inspections confirm that the aerial refueling envelope requirements have been met.

Blank 1. Identify the type and scope of aerial refueling flight and ground analyses required to confirm that the air vehicle aerial refueling envelope has been met. Analyses should include, but are not limited to, aerodynamic and structural loading of the aerial refueling equipment and attachment structure throughout the specified airspeed and altitude. Tanker and receiver controllability analysis should be performed throughout the center of gravity (c.g.) and gross weight range. Receiver analyses should include one-engine-out refueling capability (when applicable), effect of the receiver's bow wave on the boom or drogue, and specific power of the engine(s) for closure rate and climb capability. Analyses with boom systems should include controllability of the boom while both connected and disconnected from the receiver, latch forces throughout the applicable range of temperatures and disconnect rates, latch and unlatch times, and flutter analysis throughout the operational envelope. Hose and drogue systems should

consider hose response and take-up rate, hose extension capability, drogue stability, and catenary curve. Ventilation analysis for vapor dilution should be conducted for all phases of the mission, including, but not limited to, static or low speed ground operations, high altitude/low air density, and other unique conditions.

Blank 2. Identify the type and scope of aerial refueling flight simulations required to confirm that the air vehicle aerial refueling envelope has been met.

Blank 3. Identify the type and scope of aerial refueling flight demonstrations required to confirm that the air vehicle aerial refueling envelope has been met. Demonstrations should include, but are not limited to, demonstration of tanker flying qualities and receiver handling qualities throughout the altitude, airspeed, and gross weight ranges. Boom controllability and hose and drogue stability should be assessed throughout the operating envelope including evaluation of the gross weight range of the tanker and receiver. Bow wave effects of various receivers on a boom or drogue should be evaluated. For hose and drogue systems, catenary curve and hose response should be evaluated. For boom systems, latch and unlatch times must be determined. Demonstrations of receiver engine power availability for tanker closure, including one engine-out power-level evaluations, should be performed when applicable.

Blank 4. Identify the type and scope of aerial refueling flight and ground tests required to confirm that the air vehicle aerial refueling envelope has been met. Tests should include structural load evaluation of the aerial refueling equipment such as probe and boom loads, latch forces of boom systems at all temperatures within the operating envelope and including rigid disconnects. Other tests should be discussed in the Receiver and Tanker Interfaces verification sections of this specification. For rollover type refueling receptacles, flight tests should be conducted to ensure that opening and closing times could be met. Simulated ground tests may be applicable if all flight parameters (e.g., temperature, aero loads, and aircraft structure) can be emulated.

Blank 5. Identify the type and scope of post-flight aerial refueling inspections, if any, that should be conducted relative to ensuring that the aerial refueling envelope requirement has been met. Inspections should include, but are not limited to, fluid leakage, box drainage, and general equipment health including cracks, bends, and unusual wear. Hose and drogue systems should include hose damage and wear and drogue canopy damage.

APPENDIX C

EXAMPLE OF PROGRAM-UNIQUE PERFORMANCE SPECIFICATION

PRF13018850
CAGE Code: 19200
11 October 2007

PERFORMANCE SPECIFICATION

ITEM SPECIFICATION FOR

SLING, TACTICAL

U.S. Army Armament Research, Development and Engineering Center (ARDEC)
Picatinny, NJ 07806-5000

Prepared by
ARDEC Quality Engineering and Systems Assurance (QESA)

Close Combat Team – AMSRD-AAR-QEW-C

This specification was approved by the ARDEC Performance Specification Review Panel on 11 October 2007, and is Certified as a Performance Specification in compliance with the criteria of MIL-STD-961E and applicable Army guidance by the ARDEC Standards Executive. Copies of the certification and the signatures of authorizing authorities are on file and available upon request from the Preparing Activity.

FSC 1005

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1.0 SCOPE

1.1 Scope. This specification prescribes the performance requirements and identifies verification procedures for the Sling, Tactical, hereafter referred to as the Tactical Sling or TS. The Tactical Sling allows the Warfighter's weapon to remain in a ready position while conducting non-weapon firing-related tasks.

1.2 Requirement levels. This specification lists two values for certain performance parameters. The threshold (T) is the minimum acceptable level. The objective (O) is the desired level at which performance of the Tactical Sling results in an operationally significant increase in capabilities. When only one requirement is stated, it is the threshold requirement.

2.0 APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government Documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitations or contract.

FEDERAL SPECIFICATIONS

P-C-111	Carbon Removing Compound

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-372	Cleaning Compound, Solvent (For Bore of Small Arms and Automatic Aircraft Weapons)
MIL-L-14107	Lubricating Oil, Weapons, Low Temperature
MIL-G-21164	Grease, Molybdenum Disulfide, For Low and High Temperatures, NATO Code Number G-353
MIL-L-46000	Lubricant, Semi-Fluid (Automatic Weapons)
MIL-PRF-63460	Lubricant, Cleaner, and Preservative for Weapons and Weapons Systems

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-129	Military Marking for Shipment and Storage

MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1472	Human Engineering
MIL-STD-1916	DoD Preferred Methods for Acceptance of Product

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings and publication. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ARMY FIELD MANUAL

FM 3-22	Rifle marksmanship M16A1, M16A2/3, M16A4, and M4 Carbine

(Copies of this Field Manual are available from the General Davis J. Reimer Training and Doctrine Digital Library at www.adtdl.army.mil/cgi-bin/atdl.dll/fm/2-33/fm2-33.htm).

US ARMY DEVELOPMENT TEST COMMAND

TOP 3-2-045	Automatic Weapons, Machineguns, Hand, and Shoulder Weapons

(Copies of these documents may be ordered from the US Army Developmental Test Command, ATTN: Publications, 314 longs Corner Road, Aberdeen Proving Ground, MD, 21005-5005, or online at http://www.dtc.army.mil/publications/topsindex.aspx).

2.3 Non-Government publication. The following documents form a part of this document to the extent specified herein. Unless otherwise indicated, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM B117	Standard Practice for Operation Salt Spray (Fog) Apparatus
ASTM D3951	Standard Practice for Commercial Packaging

(Copies of ASTM standards may be ordered online at http://www.astm.org/ or from the ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken PA 19428-2959.)

2.4 Order of Precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption is obtained.

3.0 REQUIREMENT

3.1 Design verification. When specified (see 6.2), a sample of the Tactical Sling shall be subjected to design verification in accordance with table I and 4.1.

3.2 First article inspection. When specified (see 6.2), a sample of the Tactical Sling shall be subjected to first article inspection in accordance with table I and 4.2.

3.3 Conformance inspection. When specified (see 6.2), a sample of the Tactical Sling shall be subjected to conformance inspection in accordance with table I and 4.3.

3.4 Operating requirements.

3.4.1 High ready position upon release. The Tactical Sling shall keep the weapon in the high ready position (see section 6.4.1) orientation when the weapon is released.

3.4.2 Low ready position upon release. The Tactical Sling shall keep the weapon in the low ready position (see section 6.4.2) orientation when the weapon is released.

3.4.3 Adjustment ability. The Tactical Sling shall enable the Warfighter to assume all fighting positions below as defined in FM 3-22 (chapters 4 and 7):

- Individual Foxhole Supported Firing Position
- Basic Prone Unsupported Firing Position
- Alternative Prone Firing Position
- Kneeling Supported Firing Position
- Kneeling Unsupported Firing Position
- Standing Firing Position
- Modified Supported Firing Position

3.5 Interface and interoperability requirements.

3.5.1 Webbing. The width of the Tactical Sling belt positioned on the shoulder of the Warfighter shall be no less than 1.0 inches and no more than 2.0 inches. The Tactical Sling belt shall be made of a soft web-like synthetic material.

3.5.2 Ambidextrous. The Tactical Sling shall allow for ambidextrous function with the M16 and M4 series rifle.

3.5.3 Quick release. The Tactical Sling shall have one-handed quick release type fastener to separate the weapon from the Warfighter. The fastener when released must allow the weapon to fully separate from the Warfighter without any further action. Loosening the sling to allow the user to remove the weapon is not considered as “fully separating” the weapon from the user.

3.5.4 Non-interference. The Tactical Sling shall not interfere with the use or function of the weapon to include but not limited to blocking the ejection port, interfering with the cartridges feeding, weapon charging and collapsing or extending the buttstock.

3.5.5 Compatibility. The Tactical Sling shall be operable and maintainable by the 5th percentile female through 95th percentile male soldiers, as specified in MIL-STD-1472, while dressed in environmentally protective clothing (MOPP IV and arctic gear without mittens).

3.5.6 Tactical sling attachment. The Tactical Sling shall attach to the M16, M16A2, M16A4 Modular Weapon System (MWS), M4, and M4 MWS without the use of tools (T). The Tactical Sling shall be capable of attaching to the previously identified weapons when they are configured with the M203 Grenade Launcher (GL) without the use of any tools (O).

3.5.7 Silent. The Tactical Sling shall not be heard at a distance of 10m(T), 5m(O) when it is opened and will remain quiet in operation when both closed and extended.

3.6 Environmental requirements.

3.6.1 Operational temperature. The Tactical Sling shall function throughout a temperature range from not less than -55 degrees Fahrenheit to not greater than +155 degrees Fahrenheit.

3.6.2 Salt spray. The Tactical Sling shall be safe to handle, be fully operable, and show no evidence of corrosion after a minimum of 48 hours of salt fog exposure.

3.6.3 Chemical compatibility testing. The Tactical Sling shall be compatible with Army standard chemicals listed below:

P-C-111	Carbon Removing Compound
MIL-PRF-372	Cleaning Compound, Solvent (For Bore of Small Arms and Automatic Aircraft Weapons)
MIL-L-14107	Lubricating Oil, Weapons, Low Temperature
MIL-G-21164	Grease, Molybdenum Disulfide, For Low and High Temperatures, NATO Code Number G-353
MIL-L-46000	Lubricant, Semi-Fluid (Automatic Weapons)
MIL-PRF-63460	Lubricant, Cleaner, and Preservative for Weapons and Weapons Systems

3.7 Support and ownership requirements.

3.7.1 Attachment. The Tactical Sling shall attach to the front swivel and buttstock attachment points (T). The Tactical Sling shall have the option to attach to multiple points on the weapon (O).

3.7.2 Color. The Tactical Sling shall be a dull non-reflective color.

3.7.3 Endurance. The Tactical Sling shall not melt, deform or become unserviceable in performance after firing a total of 1260 rounds with a M16 rifle.

3.7.4 Workmanship. Finished items and parts shall not exhibit poor material and processing such as seams, laps, laminations, cracks, visible steps, sharp edges, nicks, scratches, burrs, deformations, and missing operation which may affect serviceability, functioning, operations, appearance or safety. Fins and other extraneous metal shall be removed from cast or forged parts. Hammering to shape, salvage operations (including repair by welding) or other similar practices shall not be permitted without prior approval of contracting officer.

4.0 VERIFICATION

TABLE I. Requirement/verification cross reference matrix

METHOD OF VERIFICATION	CLASSES OF VERIFICATION
1 - Analysis	A - Design verification
2 - Demonstration	B - First article
3 - Examination	C - Conformance
4 - Test	

Section 3 Requirement		Section 4 Method	Verification Methods				Verification Class		
			1	2	3	4	A	B	C
3.1	Design verification	4.1		X	X	X	4-0-1		
3.2	First article inspection	4.2		X	X	X		4-0-1	
3.3	Conformance inspection	4.3		X	X	X			4-0-1
3.4.	Operating requirements	4.4		X	X	X	2-0-1	2-0-1	2-0-1
3.4.1	High ready position upon release	4.4.1		X	X	X	2-0-1	2-0-1	2-0-1
3.4.2	Low ready position upon release	4.4.2		X	X	X	2-0-1	2-0-1	2-0-1
3.4.3	Adjustment ability	4.4.3		X	X	X	2-0-1	2-0-1	2-0-1
3.5	Interface and interoperability	4.5		X	X	X	2-0-1	2-0-1	2-0-1
3.5.1	Webbing	4.5.1					2-0-1	2-0-1	2-0-1
3.5.2	Ambidextrous	4.5.2		X	X	X	2-0-1	2-0-1	2-0-1
3.5.3	Quick release	4.5.3				X	2-0-1	2-0-1	2-0-1
3.5.4	Non-interference	4.5.4				X	2-0-1	2-0-1	2-0-1
3.5.5	Compatibility	4.5.5				X	2-0-1	2-0-1	2-0-1
3.5.6	Tactical sling attachment	4.5.6		X	X	X	2-0-1	2-0-1	2-0-1
3.5.7	Silent	4.5.7				X	2-0-1	2-0-1	2-0-1
3.6	Environmental requirement	4.6				X	4-0-1	4-0-1	
3.6.1	Operational temperature	4.6.1				X	2-0-1	2-0-1	
3.6.2	Salt spray	4.6.2				X	1-0-1	1-0-1	
3.6.3	Chemical compatibility testing	4.6.3				X	3-0-1	3-0-1	
3.7	Support and ownership requirements	4.7		X	X	X	2-0-1	2-0-1	2-0-1
3.7.1	Attachment	4.7.1		X	X	X	2-0-1	2-0-1	2-0-1
3.7.2	Color	4.7.2		X	X		2-0-1	2-0-1	2-0-1
3.7.3	Endurance	4.7.3				X	2-0-1	2-0-1	2-0-1
3.7.4	Workmanship	4.7.4			X		2-0-1	2-0-1	2-0-1
Notes: Verification (4-0-1) Test 4, Accept with 0 Failure, and Reject with 1 Failure.									

4.1 Design verification. When specified (see 6.2), design verification shall be performed by demonstration, examination and tests of all performance requirements as specified in table I.

4.1.1 Design verification rejection. If a sample fails to meet any specified performance requirement, the design shall be rejected.

4.2 First article inspection. When specified (see 6.2), first article inspection of sample items shall be executed by demonstration, examination and tests of all performance requirements in accordance with table I.

4.2.1 First article rejection. If any sample fails to comply with the specified performance requirements, the sample shall be rejected.

4.3 Conformance verification. When specified (see 6.2), conformance inspection of lot samples shall be accomplished by examinations, demonstrations and tests in accordance with table I.

4.3.1 Lot formation. Lot formation shall be in accordance with the lot formation requirement as specified in MIL-STD-1916.

4.3.2 Lot Rejection. If any sample fails to comply with the specified performance requirements, the lot shall be rejected.

4.4 Operating Verification

4.4.1 High ready position upon release. Verified by demonstration that the Tactical Sling shall maintain the weapon orientation in the high ready position upon release. The Tactical Sling shall be mounted to the M16 and M4 along with the ancillary equipment during this verification process.

4.4.2 Low ready position upon release. Verified by demonstration that the Tactical Sling shall maintain the weapon orientation in the low ready position upon release. The Tactical Sling shall be mounted to the M16 and M4 along with the ancillary equipment during this verification process.

4.4.3 Adjustment ability. The Tactical Sling shall demonstrate that it will allow the Warfighter to adjust for multiple fighting and carrying positions as referenced in chapters 4 and 7 of the FM 3-22 manual. The Tactical Sling shall be mounted to the M16 and M4 along with the ancillary equipment during this verification process.

4.5 Interface and interoperability verifications.

4.5.1 Webbing. The width of the Tactical Sling belt shall be measured using SMTE and shall be visually inspected to ensure it is made of a soft web-like synthetic material**.**

4.5.2 Ambidextrous. The Tactical Sling shall be observed to ensure it is ambidextrous. The Tactical Sling shall be mounted to the M16 and M4 along with the ancillary equipment during this verification process.

4.5.3 Quick release. The Tactical Sling shall be demonstrated to ensure it has a one-handed quick release type fastener to separate the weapon from the fighter as described in requirement. The Tactical Sling shall be mounted to the M16 and M4 along with the ancillary equipment during this verification process.

4.5.4 Non-interference. The Tactical Sling shall be attached to a M16 and M4 series rifle and the tester shall assume various fighting positions to ensure that the Tactical Sling does not interfere with the use or function of the weapon.

4.5.5 Compatibility. The Tactical Sling shall be verified for compatibility by conducting verification 4.4.1, 4.4.2, and 4.4.3 while the operator is dressed in MOPP IV or arctic gear.

4.5.6 Weapon systems attachment. The Tactical Sling shall demonstrate it can be attached to the M4 and M16 series rifle without the use of any tools.

4.5.7 Silent. The Tactical Sling shall demonstrate it can be silent from a distant of 10m(T) and 5m(O) through user testing:

- Three testers shall be positioned 10 meters facing away from the Tactical Sling attached to a M16 series rifle.
- Operator shall carefully (while attempting to make as little noise as possible) assume and rotate through these firing positions (refer FM 3-22 manual): Standing Firing Position, Kneeling Unsupported Firing Position, and Alternative Prone Firing Position. Testers shall raise their hand if they hear the Tactical Sling during the procedure.
- Operator shall repeat the rotation of the firing positions for a total of five times.
- Tactical Sling shall pass the silent test if all three testers do not raise them hand once during each transition to the next firing position.
- Repeat Silent test with testers 5 meters away from the Tactical Sling (O).

4.6 Environmental verifications.

4.6.1 Operational temperature.

4.6.1.1 Extreme hot. Tactical Sling shall be attached to a M16 series rifle and shall be conditioned to a temperature of 155°F in accordance with MIL-STD-810 for 3 hours. 210 rounds shall be fired from the M16 series rifle. Firing shall take place no greater than 6 minutes from temperature chamber removal. If the time before firing is exceeded, the Tactical Sling with the M16 shall be reconditioned at the extreme high temperature for an additional 30 minutes before firing. The Tactical Sling shall be inspected for signs of degradation or flaws during and after firing.

4.6.1.2 Extreme cold. The Tactical Sling shall be attached to a M16 series rifle and shall be conditioned to a temperature of -55° F in accordance with MIL-STD-810 for 3 hours. 210 rounds shall be fired from the M16 series rifle. Firing shall take place no greater than 6 minutes from temperature chamber removal. If the time before firing is exceeded, the Tactical Sling with the M16 shall be reconditioned at the extreme low temperature for an additional 30 minutes before firing. The Tactical Sling shall be inspected for signs of degradation or flaws during and after firing.

4.6.2 Salt spray. The Tactical Sling shall be exposed to a 5 percent salt solution for 48 hours in accordance with ASTM B117. After exposure, the Tactical Sling shall be inspected for signs of degradation.

4.6.3 Chemical compatibility testing. Six Tactical Slings shall be used for this test. The Tactical Sling shall be sprayed or brushed with each liquid with a spray bottle or paint brush respectively. After exposure for one hour to each liquid, the Tactical Slings shall be inspected for any signs of degradation.

4.7 Support and ownership verifications.

4.7.1 Attachment. The Tactical Sling shall be tested to ensure it can attach to the front swivel and buttstock attachment points.

4.7.2 Color. The Tactical Sling shall be visually inspected to ensure it is a dull non-reflective color.

4.7.3 Endurance. The Tactical Sling shall be mounted to a M16-series rifle and be tested to ensure it does not melt, deform or become unserviceable after firing a total of 1260 rounds.

4.7.4 Workmanship. The Tactical Sling shall be visually inspected to ensure the workmanship.

5.0 PACKAGING. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service of Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6.0 NOTES.

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

6.1 Intended use. The Tactical Sling allows the Warfighter's weapon to remain in a ready position while conducting non-weapon firing-related tasks.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification, and of all reference documents cited in Section 2 and applicable documents from Section 6.
b. Requirement for design verification.
c. Requirement for first article inspection.
d. Requirement for conformance inspection.
e. Packaging requirements (see 5.0).

6.3 Additional Info. Material described by this item specification is for a commercial off the shelf (COTS) product. Supplier must have non-developmental production capability.

6.4 Ready Position.

6.4.1 High ready position. The butt of the weapon is held under the armpit, with the barrel pointed slightly up so that the top of the front sight post is just below the line of sight but still within the gunner's peripheral vision. The non-firing hand grasps the handguards toward the front sling swivel, the trigger finger is outside of the trigger well, and the thumb of the firing hand is on the selector lever. To engage a target from the high ready, the gunner pushes the weapon forward as if to bayonet the target and brings the butt stock firmly against the shoulder as it slides up the body. This technique is best suited for the lineup outside of a building, room, or bunker entrance.

6.4.2 Low ready position. The butt of the weapon is placed firmly in the pocket of the shoulder with the barrel pointed down at a 45-degree angle. The non-firing hand grasps the hand guards toward the front sling swivel, the trigger finger is outside of the trigger well, and the thumb of the firing hand is on the selector lever. To engage a target from the low ready, the gunner brings the weapon up until the proper sight picture is achieved. This technique is best suited for movement inside of building.

6.5 Subject term (key word) listing.

close quarter battle
CQB
CQB tactical sling
M4 sling
M4 tactical sling
M16 sling
M16 tactical sling
small arms
tactical sling