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MILITARY SPECIFICATION

WEAPONS, BIOLOGICAL AND CHEMICAL GENERAL DESIGN SPECIFICATION FOR

This specification has been approved by the Naval Air Systems Commands Department of the Navy.

1. SCOPE

1.1 This specification establishes general design requirements for all U. S. Navy biological and chemical weapons and prescribes uniform methods for qualification and evaluation testing to assure soundness of design, ability to withstand environmental extremes, adequate shelf life and safety in handling, transportation and storage. This specification. is intended for use by weapon design and developing activities. It covers the philosophy of design and the general design objectives for biological and chemical weapons.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Military

MIL-A-8591	Airborne Stores and Associated Suspension Equipment; General Design Criteria for
MIL-C-5015	Connectors; Electrical, "AN" Type
MIL-C-26482	Connectors, Electric, Circular, Miniature, Quick Disconnect
MIL-D-1000	Drawings, Engineering and

MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for
MIL-H-5474	Handbooks, and Breakdowns; General Preparation of
MIL-M-81273	Manuals, Technical, General Specifications for
MIL-P-15024	Plates, Identification -- Information and Marking for Identification of Electrical, Electronic and Mechanical Equipment
MIL-P-24014	Preclusion of Hazards from Electromagnetic Radiation to Ordnance, Requirements for
MIL-R-22713	Rocket Motors, Forty Foot Drop Test
MIL-S-901	Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for

STANDARDS

Military

MIL-STD-130	Identification Marking of U. S. Military Property
MIL-STD-167	Mechanical Vibrations of Shipboard Equipment
MIL-STD-210	Climatic Extremes for Military Equipment
MIL-STD-331	Fuze and Fuze Components, Environmental and Performance Tests for
MIL-STD-470	Maintainability Program Requirements (For Systems and Equipments)
MIL-STD-471	Maintainability Demonstration
MIL-STD-709	Ammunition Color Coding

MIL-STD-721	Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors and Safety.
MIL-STD-756	Reliability Prediction
MIL-STD-757	Reliability Evaluation From Demonstration Data
MIL-STD-810	Environmental Test Methods for Aerospace and Ground Equipment
MIL-STD-785	Requirements for Reliability Program (For Systems and Equipment)
MIIJ-STD-1303	Painting of Naval Ordnance Equipment

PUBLICATIONS

Department of Defense

M 200B	Standardization Policies, Procedures and Instructions

Bureau of Naval Weapons

OP 400	General Specification for the Design, Manufacture, and Inspection of Naval Ordnance Equipment
WR-11	Design and Test of Packaging, Packing, Shipping, and Handling Equipment for Weapon System Components
WR-43	Preparation of Quality Assurance Provisions
WR-48	Preparation of Weapon System Performance and Compatibility Requirements (P&CR) for use in Container and Handling Equipment Design
WR-50	Warhead Safety Tests, Minimum for Air, Surface and Underwater Launched Weapons

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

Army Materiel Command Regulation 385-101 Safe Shipping Criterial for Etiologic Agents and Biological Materials

(Application for copies should be addressed to the Army Material Command, Department of the Army, Washington, D. C. 20315)

CG 187 (Grey Book) Explosives or other Dangerous Articles on Board Vessels

(Application for copies should be addressed to the U. S. Coast Guard, Treasury Department, 13 and E. Streets, Northwest, Washington, D. C. 20005)

Edgewood Arsenal Regulation 385-2 Control of Emergency Incidents

(Application for copies should be addressed to Edgewood Arsenal, Edgewood Arsenal, Maryland 21010)

ICC Regulations Agent T. C. George's Tarrif No. 19,

Transportation of Explosives and other Dangerous Articles by Land and Water in Rail Freight Service and by Motor Vehicle (Highway) and Water including Specifications for Shipping Containers

(Application for copies should be addressed to T. C. George, Agent, 63 Vesey Street, New York, N.Y. 10007)

T.O. 00-85-13 U. S. Air Force, "Transportation Packaging and Handling of Dangerous Materials for Military Aircraft"

(Application for copies should be addressed to Officer in Charge, U. S. Naval Air Technical Services Facility, 700 Robins Avenue, Philadelphia, PA. 19111)

2.3 Forms

DD 1423	Contractor Data Requirements List,
NAVWEPS Form 4200/25	Engineering Drawings and Associated Data Requirements

2.4 Precedence of specifications and standards. precedence of specifications, standards, other publications and drawings shall be in the order stated in the detail specification.

3* REQUIREMENTS

3.1 Detail specification. The individual item requirements shall be as specified herein and in accordance with the detail specifications. No data are required by this specification, or by applicable documents referenced in Section 2 unless specified in the contract or order (See 6.2)

3.2 Classification of requirements. The requirements for biological and chemical weapons are classified herein as follows:

Requirement	Paragraph
Safety	3.4
Human Engineering	3.6.1
Materials	3.7
Design and Construction	3.8
Environmental Limits	3.9
Performance Characteristics	3.10
Reliability	3.11
Maintainability	3.12
Supportability	3.13
Standardization	3.14
Development Sequence	3.15
PERT	3.16
Standard Samples	3.17
Dimensions	3.18
Weight	3.19
Nameplates or Product Markings	3.20
Government Furnished Property	3.21
Government Loaned Property	3.22
Cartridges for Cartridge Actuated Devices	3.23
Explosive Components	3.24
Fuzes	3.25

3.3 General description. The chemical and biological weapons covered by this specification include heavy walled projectiles, bombs and warheads: thin walled bombs, thin walled airborne line source disseminators and spray tanks, and thin walled warheads for missiles, drones, etc.; land and sea mines: dispensers such as GLADEYE, SADEYE and the XMC-1; generators and dispersers: grenades; bomblets; and miscellaneous deck-mounted disseminators. Fuzes and explosive components are an integral part of the design and must be considered, Dissemination on the target may be achieved explosively as from bombs, bomblets, or projectiles; by compressed gas from line source disseminators; by pyrotechnic devices; or by ground impact and rupture as from bomblets. The weapon fill may be lethal or incapacitating, persistent or non-persistent, liquid or solid. Generally the agents are not detectable by any of the human senses. In general, chemical ordnance items which are not designed for anti-personnel use, e.g., smokes, illuminants, markers, incendiaries, etc., are not covered by this specification.

3.4 Safety requirements. The final weapon design shall be safe to handle, transport, store, maintain and employ operationally. To this end the designer shall give full consideration to the following weapon attributes:

a. Leak tight integrity of the weapon.

b. Minimum susceptibility to damage resulting from handling or personnel error.

c. Minimum susceptibility to tampering.

d. Minimum field assembly, disassembly and maintenance.

e. "Fail-safe" characteristics where technically feasible.

f. Series devices to assure low probability of critical hazards.

g. Safe separation distance to assure protection for launching ship or aircraft in event of intentional or inadvertent functioning.

h. Dissemination characteristics which preclude contamination of launching ship or aircraft.

i. Documented safety procedures.

3.5 Technical effort order of preference. Technical effort toward the achievement of safety shall be applied in the following order of preference.

a. Design for minimum hazard - Every reasonable effort shall be made, commencing in the early stages of development, to achieve a high degree of inherent safety through the selection of appropriate design features and operating principles. The objective of this requirement is to achieve safety through simplification, when this can be done without jeopardizing military effectiveness, in lieu of adding corrective or protective features which make the system more complex.

b. Provision of safety devices - Hazards which cannot be eliminated through optimum design within the current state of the art shall be eliminated, if possible, through the provision of appropriate safety devices, either as a part of the hazardous component or as a part of the weapon system. Safety devices shall conform to the applicable detail requirements prescribed elsewhere in this document.

c. Provision of warning devices - In cases where it is not possible through system design or through the provision of safety devices to preclude the occurrence of a hazardous condition, suitable devices shall be provided for the detection of the hazardous situation and the generation of a warning signal.

d. Special procedures - In cases where it is impossible to eliminate certain hazards through the application of design effort and where there exist special operating procedures which, if followed, will effectively eliminate the hazards, it shall be the responsibility of the design activity to identify the hazards. The design activity shall submit detailed recommendations to the developing activity as to the minimum procedural requirements necessary to assure an acceptable level of safety.

3.6 Special engineering considerations

3.6.1 Human engineering. The designer shall analyze weapon design for man-machine interface problems and take diligent action to assure that a weapon system is achieved which can be effectively operated by service personnel. The following are illustrative of the human engineering factors which must be considered:

a. Level of training and skill requirements.

b. Physical and morale degradation resulting from protective clothing and devices.

c. Psychophysical limitations on the operator.

d. Space limitations for maintenance and operation

3.6.2 Value engineering. All aspects of the weapon and associated equipment design shall be reviewed for value engineering.

3.7 Materials. Materials shall conform to specifications approved by the developing activity. The selection of materials shall be made with special attention being given to the stringent requirements of temperature, temperature gradients, thermal conductivity, vibrations, loads, resistance to puncture or rupture and light weight construction. When necessary to use other than approved materials the designer shall furnish the reasons why approved materials cannot be used and submit evidence (test reports, etc.; see 6.2) to demonstrate that the replacement material has performance characteristics satisfactory for the intended application and acceptable to the developing activity.

3.7.1 Material compatibility. Materials in intimate contact shall be mutually compatible. There shall be no significant degradation of agent payload or of material physical characteristics. Material chemical or physical reactions shall not result "in increased hazards such as the development of internal pressure, weakening of materials or absorption of agent.

3.7.2 Service life. Unless otherwise stated in the detail specification the loaded or filled weapon shall be safe to handle and to employ operationally after five years of storage with a minimum of maintenance. Reusable weapons shall have a minimum shelf life, filled, of one year.

3.7.3 Electrolytic corrosion of metal parts. The use of dissimilar metals in intimate contact which will tend to accelerate electrolytic corrosion in the presence of moisture shall be avoided. Where the use of such metals in immediate contact cannot be avoided, proper protection or insulation of such parts shall be provided.

3.7.4 Stress corrosion. Materials, techniques and processes shall be selected and employed with regard to heat treatment procedures, corrosion protection, finish and assembly and installation such that sustained and residual surface tensile stresses, stress concentrations and the hazards of stress corrosion cracking and hydrogen embrittlement are minimized.

3.7.5 Moisture and fungus resistance. Materials shall be used which will resist damage from moisture and fungus. Protective coatings will not be acceptable as moisture and fungus preventatives on parts which will lose the coating during the normal course of inspection, maintenance and periodic tests. Unless otherwise specified, moisture shall be considered as containing salt from marine atmospheres.

3.7.6 Elastomeric materials. Elastomeric components shall be fabricated from materials having maximum practicable ozone and aging resistance consistent with performance requirements and applicable specifications.

3.7.7 Critical and strategic materials. Materials shall be selected on the basis of suitability and relative availability, taking into account the additional restrictions created during time of national emergency. Subject to satisfactory operation of the particular weapon, the design shall incorporate the least critical and least strategic materials.

3.8 Design and construction. Design shall be in accordance with OP 400, General Instructions for the Design, Manufacture and Inspection of Naval Ordnance Equipment.

3.8.1 Pressure vessels. (For the purpose of this specification, all agent containers are classified as pressure vessels). All pressure vessels shall be of seamless design (where practicable), designed and constructed in accordance with the best engineering practices to meet the requirements of the specific application with a minimum design pressure of 1.5 times the maximum normal operating pressure.

3.8.1.1 Leak tight integrity. The completely assembled primary agent container shall have a leakage rate no greater than the equivalent of 1×10^{-6} cubic centimeters of standard temperature pressure helium per second (cc of STP He/sec) for liquid agent and the equivalent of 1×10^{-4} cc of STP He/see for dry agent at a pressure differential of 150 percent of the maximum pressure expected during a normal logistic cycle and in no case less than one atmosphere. The aprimary container of a binary weapon shall have a leakage rate no greater than the equivalent of 1 x 10-4 cc of STP He/see at a pressure differential of 150 percent of the maximum pressure expected during the normal logistic cycle.

3.8.2 Electrical wiring. Electrical wiring shall be protected from moisture, fungi and spray. All electrical material shall conform to government specifications or shall be approved by the contracting officer. Electrical connectors shall conform to MIL-C-5015 or MIL-C-26482. It shall be possible to flex conductors without damage at a temperature of -65°F.

3.8.3 Design for compatibility with B/C agent characteristics

3.8.3,1 Temperature conditioning. Agent characteristics which require temperature control shall be considered. Where applicable, provisions for temperature conditioning shall be included in the detail specifications.

3.8.3.2 Agent agitation. Agent characteristics which require agitation shall be considered. Where applicable, provisions for agent agitation shall be included in the weapon design.

3.8.4 Anti-corrosion and anti-contamination provisions. Particular attention shall be given to avoiding construction in weapons which promotes corrosion or contamination by the admission and holding of liquids or dry particles. Crevices, hollows, pockets, etc., which may collect and hold liquids or particles shall be avoided. The design of components shall provide for airtight closure by welding or other positive sealing. Materials subject to gross agent absorption shall not be used unless their use would tend to enhance the overall design effectiveness and are approved by the developing agency.

3.8.5 All-up design. Consistent with requirements for safety, the weapon shall be designed for all-up stowage if required by the detail specifications. External connections required for arming, loading, launching, firing, etc. shall be quick operating. The design shall be integrated with the design and operation of the rack, launcher, gun, etc. in accordance with the detail specification.

3.8.6 Servicing and testing. The weapon shall be designed for a minimum of servicing or testing. For such testing as is essential, the design shall provide for simple positive testing procedures. "Go" or "No-Go" tests should be used where possible. External connections for checkout shall be kept to a minimum. The design for servicing shall be based, wherever practical, on the practice of correcting troubles by replacing easily removable and replaceable units without major disassembly and assembly of the weapon. Accessibility shall be such as to permit location of faults and ready removal and replacement of components. It shall be possible to service, test and ready the weapon without removal from its shipping container unless otherwise specified by the procuring activity.

3.8.7 Access. Suitable access doors, hatches, “covers or fairings shall be provided and located for servicing operations such as inspecting, testing, fuzing, filling, draining, lubricating, arming and installing and removing safety pins. Access openings shall be of a sufficient size to permit performance of the required operations with adequate visibility while wearing protective gloves. The doors or covers shall be externally flush, easily opened and held securely closed by approved fasteners. When applicable they shall be so designed that the action of the slip stream will tend to keep them closed in flight. Screws used as fasteners for access openings shall be of identical length and diameter for all openings insofar as practical. When screws of different lengths are required, a suitable method of differentiation (such as a different diameter for each length of screw) shall be used.

3.8.8 Lubricants. The design shall provide for a minimum of lubrication. Standard lubricants shall be used unless a justifiable requirement exists for a special lubricant. The number of different lubricants shall be kept to a minimum.

3.8.9 Physical references. When applicable, physical references shall be provided for structural alignments weighing, lifting, assembling, etc.

3.8.10 Handling. When applicable, the weapon design shall be coordinated with the design of a weapon container. The container will serve as a vapor tight vault in which the weapon will remain from stockpile to the latest possible point in the logistic cycle. Unless otherwise specified by the developing activity, it shall be possible to service, test and ready the weapon for operational employment without removal from its storage container. The weapon design shall be coordinated with the design of shipboard, aircraft, or land--based handling equipment to assure ease of handling without the requirement for special equipment. The weapon and container shall be clearly marked showing the proper location of support when the weapon or weapon section is placed on supports such as dollies, or slings to prevent damage to fragile sections or components. Protuberances from the weapon which would increase the likelihood of rupture in a handling accident shall be minimized. Where protuberances are unavoidable, additional strength shall be provided at the root joint or other means provided to prevent rupture in the event of shock loading. The design for handling shall include provisions for towing, hoisting, lifting, retrieving and similar operations as required.

3.8.11 Hoisting. Provision shall be made to permit hoisting and handling the complete weapon or weapon sections as required.

3.8.12 Finishes. The type of finish or surface protection to be applied to biological or chemical weapons, assemblies components and parts shall be as specified in the detail specification. The developing activity shall consider the use of leak detector paints in its choice.

3.8,13 Surface texture. The exposed surface shall present a degree of finish consistent with requirements for performance, resistance to agent penetration and ease of decontamination. It shall be free from dents, buckles, scratches, projections, rough area, cracks and crevices.

3.8.14 Identification, color coding and marking. Marking for identification shall comply with MIL-STD-130, MIL-P-15024 and MIL-STD-1303. Color coding shall comply with MIL-STD-709.

3.8.15 Standard and commercial parts. The number of different types and sizes of standard hardware and fittings shall be kept to a practical minimum. Specific parts shall be selected from those which are in common use or are readily available. The requirements of Defense Standardization Manual M 200B shall apply.

3.8.16 Seals and gaskets. The materials and construction of seals and gaskets in intimate contact with chemical or biological agent shall be approved by the developing activity.

3.9 Environmental limits. The weapon and all components shall be capable of withstanding the environmental extremes for operational use, storage, standby, transportation, strike-down, strike-up, launching, flight, and submergence as required without degradation of performance, life and safety below established limits. Environmental limits shall be as specified in MIL-STD-210, MIL-E-5272, MIL-STD-167, MIL-A-8591, MIL-P-24014 and other applicable military specifications and standards until better information as to actual environments is obtained, at which time the detailed specification shall apply.

3.9.1 Transportation, storage and handling, The weapon shall be capable of transportation, storage and handling without impairment of safety or performance capabilities from the effects of climatic extremes, transportation vibration, shipboard vibration, acceleration, shock , noise, and blast from local gunfire.

3.9.2 Operational employment, The weapon shall be capable of meeting the specified performance within its total operational environment.

3.9.2,1 Extreme pressure. The weapon shall operate satisfactorily over the range of pressures experienced in its operational environment as specified in the detail specification. Such pressures may result from sub-surface or high altitude operations. The weapon shall be so designed that satisfactory operation will be possible after long periods in surface, sub-surface and high altitude transit, as applicable. The effect of cycling over the pressure range forms a part of this requirement.

3.9.2.2 Acceleration, shock, noise and vibration. The weapon, weapon sections and all components shall be capable of withstanding without damage the acceleration, shock, noise and vibrations that occur in normal handling, launching and flight conditions as specified in the detail specification. Design control shall be exercised over the weapon configuration and over structural and equipment design so as to obtain compatibility between estimated vibrations of structure and equipment and tolerable levels of vibration for these items. The noise environment shall be specifically considered as a source of vibration. Realistic, rational estimates of natural and induced environments which result in vibratory loading of

[1]Design parameters for shipboard high impact shock of the weapon in the as stored configuration should include a peak deceleration force of 150 ± 15 accelerations of gravity (g) at a peak velocity change of 10 ± 1 feet per second, for a pulse duration of 4 ± 1 milliseconds.

structures and equipment during carriage, launch and flight as specified in the detail specification shall apply to the design of the weapon and components. The environment covered shall include vessel and aircraft transmitted vibrations, structural vibration, radiated and pseudo noise and oscillatory pressures associated with engine jet effluxes, boundary layers and wakes, and other similar sources.

3.9.2.3 Temperature and temperature shock. The weapon, weapon sections and all components shall be capable of withstanding without damage or deterioration in safety or performance the prolonged temperature extremes or temperature shocks encountered in the handling, stowage, shipment and operational environments as specified in the detail specification. Such temperatures may result from prolonged storage in tropical or arctic regions, from shorter term stowage in the open in tropical or arctic regions, from rapid environmental changes in operational employment and from aerodynamic heating.

3.9.2.4 Humidity. The weapon or any component thereof which may be stowed or handled separately shall be capable of withstanding without damage or deterioration prolonged storage under moist tropic conditions as set forth in MIL-STD-210 and as required in the detail specification-

3.9.2.5 Salt spray. The weapon shall be capable of withstanding the effects of salt spray without deterioration in performance, safety or shelf life.

3.9.2.6 Sunshine. The weapon or any component thereof which may be stowed or handled separately shall be capable of withstanding the effects of solar radiant energy without deterioration in performance, safety or shelf life.

3.9.2.7 Rain. The weapon or any component thereof which may be stowed or handled separately shall be capable of withstanding heavy rainfall without deterioration in performance, safety or shelf life.

3.9.2.8 Sand and dust. The weapon or any component thereof which may be stowed or handled separately shall be capable of withstanding sand and dust, as might be encountered in desert stowage, without deterioration in performance, safety or shelf life.

3.9.2.9 Fungus. The weapon or any component thereof which may be. stowed or handled separately shall be resistant to fungus growth as might be encountered in a warm moist climate without deterioration in performances safety or shelf life.

3.9.2.10 Electromagnetic radiation. The weapon or any component thereof which may be stowed or handled separately in the fleet shall be safe for use in environmental electromagnetic fields in the frequency range of 10 kilocycles to 40 gigacycles per second in accordance with MIL-P-24014.

3.9.2.11 Other environments, For specific weapons there may be other pertinent environments not listed here, for example, reentry phenomena. It shall be the developing activities responsibility to assure that the detail specification has included all environmental conditions for the specific weapon and that the weapon is compatible with the environments without deterioration in performance, safety and shelf life.

3.9.2.12 Combined environments. The weapon shall be designed to withstand environments which occur in combination, such as temperatures and vibration, temperature and pressure, temperature and humidity, etc., without deterioration in performance, safety or shelf life as required by the detail specification.

3.9.3 Safe separation. Design of the weapon shall be such that it will not endanger the launching vehicle.

3.9.4 Contaminating liquids. The weapon shall be capable of being sprayed with water or liquid chemicals (e.g., decontaminating solutions, solvents and petroleum products) as called out in the detail specification without penetration to the interior of the weapon and without damage to the weapon except to the exterior surface coating.

3.10 Performance characteristics. Specific performance requirements shall be called out in the detail specification. In general, each weapon shall be designed to produce the optimum particle size range, contamination density and area coverage for intended application. Any deviation from specified requirements shall be supported by a technical justification (see 6.2.2) and approved by the developing activity.

3.11 Reliability. Quantitative reliability and confidence levels shall be called out in the detail specification. Terms shall be in accordance with MIL-STD-721. Predictions shall be in accordance with MIL-STD-756. The evaluation shall be in accordance with MIL-STD-757, The assurance program shall be in accordance with MIL-STD-785. In general, high reliability at a high confidence level on a statistical basis is not economically feasible during engineering development and qualification. Design reliability is, however, feasible, and can serve as a basis for predicting reliability in accordance with MIL-STD-756. Confidence levels can be achieved during production and service use.

3.12 Maintainability. Quantitative maintainability shall be called out in the detail specification. Terms shall be in accordance with MIL-STD-721. Predictions, demonstration, and program shall be in accordance with MIL-STD-470 and MIL-STD-471. The product design shall comply with the following principles:

a. Minimize the complexity of maintenance tasks so that the maintenance skills and training needed to develop adequate maintenance proficiency are realistic for service personnel.

b. Provide for rapid and positive recognition of failures, malfunctions or marginal performance.

c. Provide optimum accessibility for inspection, removal and replacement of modular components.

d. Minimize the types, quantity and complexity of tools and test equipment needed to perform maintenance.

e. provide for maximum retention of reliability of the weapon and safety to the personnel involved in the performance of maintenance.

f. Minimize the type and quantity of spare parts needed for maintenance of the weapon.

g. Provide timely and well planned technical data for maintenance.

h. Provide for optimum ease of maintenance at the lowest maintenance echelon.

3.13 Supportability. The detail specification shall set forth specific requirements associated with support of the weapon in the field. The following principles apply:

a. To the greatest extent possible, the weapon shall be compatible with existing maintenance and storage facilities.

b. Repair parts shall be kept to a minimum.

c. To the greatest extent possible, the weapon shall be compatible with existing handling equipment, test equipment, and calibration equipment.

d. Technical data and information required by logistic personnel for the life of the weapon shall be provided on a timely basis.

e. It is the designer's responsibility to make known any anticipated factors which could affect replenishment processes related to the weapon system in port, at sea or at advanced bases.

f. It is the designer's responsibility to indicate special requirements for storage facilities.

g. There shall be no requirements for contractor technical services during the life cycle of the weapon system.

3.14 Standardization. To the maximum extent possible, biological and chemical weapons developed under this specification shall employ standard material, components, equipment and processes approved for use by the armed forces. Standard engineering practices and procedures shall be used.

3.15 Development sequence. For significant biological and chemical weapon developments, the normal sequence of events shall be a feasibility study with fabrication and evaluation of breadboard models; advanced development and evaluation, with developmental models; engineering development and evaluation, with fabrication and evaluation of prototype models and preparation of the design data package suitable for unlimited production under competitive bidding.

3.16 PERT. Program Evaluation and Review Technique (PERT) Time and PERT Cost Management Information Systems shall be prepared for biological and chemical weapon systems when the programmed cost is one million dollars or more or as otherwise specified in the detail specification.

3.17 Standard samples. Standard samples shall be specified in the detail specification. Such samples shall be limited to the purpose of determining those characteristics which cannot be determined by design, inspection, quality control and non-destructive testing. For example, standard samples shall be specified fox safety, performance and environmental testing.

3.18 Dimensions. Dimensions shall be considered from the overall size standpoint and from the component dimension and tolerance standpoint,

3.18.1 Weapon size. Dimensions shall be called out in the detail specification, For all weapons developed under this specification, the setting of dimensions shall be compatible with existing handling equipment, magazines, elevators, doors, passageways, handling rooms, etc., as well as delivery aircraft, launcher, missile warhead compartment, gun tube, etc. as applicable.

3.18.2 Weapon component dimensions and tolerances. Component dimensions and tolerances shall be developed by the developing agency or contractors Such dimensions shall be consistent with the requirements for interchangeability leaktight integrity, and weapon functioning. Tolerances shall not be tighter than required for the given function.

3.19 Weight. Weight shall be called out in the detail specification. For all weapons developed under this specification, weight requirements shall be compatible with delivery aircraft, launcher, missile, gun tube, etc. as well as handling equipment, elevators, stands, etc. as applicable.

3.20 Nameplates or product markings. The detail specification shall indicate the serial numbers to be assigned to each weapon, the official designation for the weapon and each component for which designation is required. Marking shall be in accordance with MIL-STD-130 and as required by the detail specification. Whenever practicable, all marking which would tend to disclose vital information to the enemy shall be of such a nature as to be readily removable.

3.21 Government furnished property. Government furnished property shall be listed in the detail specification. Such items shall be listed and numbered and the quantity of each indicated. Government furnished property shall not be modified by the contractor without specific permission of the developing activity.

3.22 Government loaned property. Government loaned property shall be listed in the detail specification.

3.23 Cartridges for cartridge actuated devices. Cartridges for use in cartridge actuated devices shall meet the requirements of MIL-D-21625.

3.24 Explosive components. Explosive components shall meet the requirements of WR-50.

3.25 Fuzes.

3.25.1 Fuzing device requirements. Fuzing device requirements are divided into two categories - weapon fuzingt and bomblet fuzing. The types of weapon fuzing are defined by the utilization of the fuzing device:

a. to control the release of bomblets from a dispenser,

b. to control initiation of an explosive charge, or

c. to control actuation of a release system of a spray tank.

Bomblet fuzing refers to the fuzing device of individual munitions carried within a dispenser or other delivery vehicle.

3.25.2 Requirements for weapon fuzing device.

a. The device shall be designed "fail safe".

b. Two arming mechanisms shall be employed within the device, each requiring an independent source of energy. One of these mechanisms shall derive its energy from an environmental condition after release of the weapon from the aircraft. In combination, these shall have a failure rate of no greater than one in one million.

c. The device shall indicate its own condition (safe or armed) prior to installation. In addition, it shall be possible to positively identify the safe or armed condition of the device when it is installed in the weapon.

d. Protection shall be provided to prevent mechanical damage to exposed parts of the fuze assembly during stowage and handling.

e. Means shall be provided to limit the accessibility of exposed fuze components to a degree which will discourage tampering.

f. The energy train of the device shall incorporate a mechanical barrier to prevent the transfer of energy along the train should the train be initiated while the device is in the safe condition. All explosives more sensitive than tetryl shall be isolated from subsequent elements of the train by the mechanical barrier.

(1) Removal of this barrier shall occur automatically as a function of the arming sequence after separation of the weapon from the launching vehicle and at a predetermined safe arming distance.

(2) When the device is in the safe condition, the electrical circuit serving the initiating element shall be open, and there shall be an open circuit on all other electro-explosive devices.

(3) Prior to the initial action to commence the arming sequence, the energy train barrier shall be positively locked in the safe position.

g. The device shall not function as a safing device for any other aspect of the weapon such that the effectiveness of the device is compromised.

h. There shall be no stored energy in the device which tends to arm the device.

i. No electrical testing of the device shall be required when the device is installed in the weapon warhead or when the booster is attached.

3.25.3 Requirements for bomblet fuzing.

a. The fuzing of the bomblet shall be completely independent of the weapon fuzing system.

b. The bomblet fuze shall require a post-launch environment for arming.

c. The bomblet fuze shall provide a positive indication of its safe or armed condition prior to loading in the weapon.

d. The bomblet fuze shall not be readily accessible to tampering after loading in the weapon.

e. The bomblet fuze shall incorporate a mechanical barrier in the explosive train. All explosives more sensitive then tetryl must be isolated from subsequent elements of the train by the mechanical barrier.

f. There shall be no stored energy in any device which tends to arm the bomblet fuze.

g. No electrical testing of the bomblet fuze shall be required when installed in an agent-filled bomblet.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of examinations and tests. The examinations and tests required to assure conformance of those items or lots of items to be offered for acceptance are classified as specified in Table 1.

4.3 Environmental test procedures. Detailed test procedures to fulfill the requirements of this specification shall be prescribed by the developing activity. The test procedures offered herein shall be used as guidelines by the developing activity in preparation of the detailed test procedures. Detailed test procedures that simulate the most strenuous environments to which the weapon may be exposed shall be selected.

4.3.1 Pressure test procedures. Test procedures described in MIL-E-5272, Procedure VI, shall constitute minimum requirements for low pressure tests. For weapons which may be subjected to greater than standard atmospheric pressures internal test chamber pressure and temperature shall be 110 per cent of the expected pressure.

Passing Criteria. The criteria by which the units shall be judged to withstand the tests are that (1) no thermal reaction, actuation of explosive devices, structural damage such as loosening or breaking of component parts or fatigue failures shall have occurred, (2) the potential hazard of the unit shall not have been increased, (3) the safety device shall have remained functionable and in the safe position, and (4) the leakage rate shall be no greater than the equivalent 1×10^{-4} cc of STP He/sec at 150 per cent of the maximum pressure expected during a normal logistic cycle.

TABLE 1

EXAMINATIONS AND TESTS

Tests	Requirement	Test Method
Quality Conformance Inspections	4	4.7
Environmental Tests		
Pressure	3.9.2.1	4.3.1
Acceleration, Shock, Noise and Vibration	3.9.2.2	4.3.2
Temperature and Temperature Shock	3.9.2.3	4.3.3
Humidity	3.9.2.4	4.3.4
Salt Spray	3.9.2.5	4.3.5
Sunshine	3.9.2.6	4.3.6
Rain	3.9.2.7	4.3.7
Sand and Dust	3.9.2.8	4.3.8
Fungus	3.9.2.9	4.3.9
Accelerated Age	3.7.2	4.3.10
Electromagnetic Radiation	3.9.2.10	4.3.11
Other Environments	3.9.2.11	-
Combined Environments	3.9.2.12	-
Performance Tests	3.10	4.4
Safety Tests	3.4	4.5
Reliability	3.11	-
Maintainability	3.12	-

4.3.2 Acceleration, shock, noise and vibration test procedures. Where applicable the following test procedures shall be considered as minimum.

a. Acceleration tests - MIL-E-5272 Procedure I

b. Shock tests - MIL-STD-810 Method 516.1 Procedure IV.
MIL-S-901
Shipboard high impact shock of the weapon in the as stored configuration should include a peak deceleration force of 150 ± 15 accelerations of gravity (g) at a peak velocity change of 10 ± 1 feet per second, for a pulse duration of 4 ± 1 milliseconds,

c. Noise tests - MIL-STD-810 Method 515

d. Vibration tests - MIL-STD-167 Type I;
MIL-STD-331 Test 104 Procedure I;
MIL-E-5272 Procedure XII

except that the resonance survey and subsequent investigation of resonant frequencies shall be conducted in the 5-2000 cycles per second (cps) frequency spectrum. The cycling test shall follow Procedure XII except that the frequency range shall be 5-2000 cps and the time shall be 30 minutes. The applied acceleration level shall be 5 g in the 5-499 cps frequency range and 3 g in the 500-2000 cps frequency range.

e. Vibration and slosh tests - MIL-V-7173

Passing criteria. The criteria for passing these tests shall be the same as those for 4.3.1.

4.3.3 Temperatures shock test procedures. Temperature and temperature shock test procedures shall be in accordance with MIL-E-5272 high temperature test Procedure II, low temperature test Procedure II, and temperature shock test Procedure I; probable hot thermal extremes and probable cold thermal extremes as specified in MIL-STD-21O; and MIL-STD-331 Test 105.

Passing criteria. The criteria for passing these tests shall be the same as those for 4.3.1.

4.3 Humidity test procedures. MIL-E-5272 Procedure I and probable high humidity extremes as specified in MIL-STD-210.

Passing criteria. “The criteria for passing these tests shall be the same as those for 4.3.1.

4.3.5 Salt spray test procedures. MIL-E-5272 Procedure I.

Passing criteria. The criteria for passing these tests shall be the same as those for 4.3.1.

4.3.6 Sunshine test procedures. MIL-E-5272 Procedure I.

Passing criteria. The criteria for passing these tests shall be the same as those for 4.3.1.

4,3.7 Rain test procedures. MIL-E-5272 Procedure II.

Passing criteria. The criteria for passing these tests shall be the same as those for 4.3.1.

4.3.8 Sand and dust test procedures.

MIL-E-5272 Procedure I.

Passing criteria. The criteria for passing these tests shall be the same as those for 4.3.1.

4.3.9 Fungus test procedures. MIL-E-5272 Procedure I.

Passing criteria. The criteria for passing these tests shall be the same as those for 4.3.1.

4.3.10 Accelerated age test procedures. This test shall consist of maintaining the assembled weapon at an elevated temperature for a pre-determined period of time. The temperature selected shall be such that one months storage, at that temperature, will produce aging effects equivalent to one year's storage under ambient conditions. In general, these parameter values shall be six (6) months and 160°F; however, requirements called out in the detail specification take precedence.

Passing criteria, The criteria for passing these tests shall be those of 4.3.1. Additionally, the weapon shall have remained operationally effective.

4.3.11 Hazards of electromagnetic radiation to ordnance (HERO) test procedures. HERO test procedures as specified in MIL-P-24014.

Passing criteria. The criteria for passing these tests shall be those specified in MIL-P-24014.

4.4 Performance tests, procedures and requirements. The performance tests specified herein shall be used as guidelines by the developing activity in preparation of the detailed specification. Detailed test procedures and passing criteria shall be specified by the developing activity. Operational tests shall be conducted to determine the following:

a. Physical form of the agent on the target.
b. Initiating element reliability.
c. Disseminating element reliability.
d. Launching vehicle contamination or decontamination.

Where practicable, sampling assay results should be obtained in conjunction with all operational tests to obtain data on average coverage in terms of agent density.

4.5 Safety test procedures and requirements. The developing activity shall review the following test procedures and requirements with respect to the developmental item in question. The primary object of this review shall be to recommend exclusions or additions based on the peculiarity of the specific end-item. This section describes tests which assess the hazards involved in extreme situations that may occur during the logistic cycle of the weapon. The specified criteria are considered minimum and might not eliminate the hazards but will end to reduce them. The test results shall be submitted to the Commander, Naval Air Systems Command or his designated representative for technical evaluation. Acceptance or rejection of the weapon based on this technical evaluation is the prerogative of the Commander, Naval Air Systems Command.

4.5.1 Forty-foot drop test. This test shall consist of three forty (40) foot drops of a weapon at ambient temperature onto a flat steel plate imbedded in reinforced concrete. The weapon shall be pressurized to 150 percent of maximum operating pressure. Drops shall be made in three attitudes (Reference MIL-R-22713).

Criteria. The weapon shall present no explosive hazard incident to disposal. No explosive reaction shall occur. The fuzing device shall remain in the safe condition.

4.5.2 Ten-foot drop test. This test shall consist of three ten (10) foot drops of a weapon at ambient temperature onto a flat steel plate imbedded in reinforced concrete. The weapon shall be pressurized to 150 percent of maximum operating pressure. Drops shall be made in three attitudes.

Criteria. Leakage from the weapon shall not exceed the equivalent of 10^{-4} cc of STP He/sec. The weapon shall be safe to handle incident to disposal. No explosive reaction shall occur. The fuzing device shall remain in the safe condition.

4.5.3 Separation from aircraft test (airborne weapons only).

The weapon shall be subjected to conditions simulating weapon pull-off or release on arrested landing or catapult take-off. The weapon shall be pressurized to 150 percent of maximum operating pressure. The test procedure shall conform to MIL-STD-331 Test 203, 206, and 209.

Criteria. The fuze device shall remain in the safe condition. No explosive reaction shall occur. The weapon shall present no explosive hazard incident to disposal.

4.5.4 Captive flight test (supersonic carry only). This test shall subject the weapon to simulated and actual captive flight conditions to determine the effects of prolonged and repeated carry at speeds above MACH 1, as required by aircraft usage.

4.5.5 Slow cook-off test. This test shall be used to evaluate the hazard that would exist under conditions of a temperature rise without direct flame impingement. The test shall consist of subjecting the all-up weapon to controlled heating at the rate of 6°F air temperature rise per hour until rupture occurs.

Criteria. (1) The safety devices shall have prevented operation of explosive actuated devices. (2) No dissemination of the agent and no deterioration which would affect the safety of handling of the weapon shall occur at a temperature less than 300°F, measured at the skin of the weapon.

4.5.6 Fast cook-off test. This test shall be used to evaluate the hazard that would exist in a fire which envelops the all-up weapon. The test shall be accomplished by the procedure described in WR-50.

Criteria. (1) The safety system shall have prevented operation of explosive actuated devices. (2) No dissemination of the agent and no deterioration which would affect the safety of handling the weapon shall occur at a temperature less than 300°F, measured at the skin of the weapon.

4.5.7 Bullet sensitivity test. This test shall assess the hazard presented should the all-up weapon be impacted by a fragment. The test shall consist of impacting the all-up weapon at the most vulnerable point or points with a .50 caliber M-2, armor piercing projectile.

Criteria. No explosive dissemination of agent shall occur.

4.6 Container tests information.

In addition to the requirements set forth in WR-11, the container will meet the following leak test requirements:

(1) Before environmental testing, the shipping container will be tested for leakage at a differential pressure of one atmosphere, Leakage will not exceed the equivalent of 10^{-4} cc of STP He/sec.

(2} After each environmental test or series of tests specified in WR-11, the shipping container, with its normal load, will be tested for leakage at a differential pressure of one atmosphere, Leakage will not exceed the equivalent of 10^{-4} cc of STP He/sec.

(3) The 40-foot drop test of 4.5.1 shall be repeated with the weapon in its shipping container. In addition to the criteria listed in 4.5.1, the following shall apply: Leakage from the combined unit shall not exceed the equivalent of 10-4 cc of STP He/sec.

4.7 Quality control. The contractor or developing agency shall establish and conduct a quality control program to demonstrate that dimensions and tolerances can be maintained in conformance with drawing requirements and that the tolerances are adequate for the intended purposes on the basis of the test program in 4.4.

5. PREPARATION FOR DELIVERY

Preservation and packaging do not comprise a part of this specification as such. Requirements for preservation and packaging data are contained in 6.3.8. Special packaging requirements are specified in:

a. Edgewood Arsenal Regulation No. 385-2.

b. Army Materiel Command Regulation 385-101.

c. ICC Regulations Agent T. C. George's Tariff No. 19, Transportation of Explosives and other Dangerous Articles by Land and Water in Rail Freight Service and by Motor Vehicle (Highway) and Water including Specifications for Shipping Containers.

d. CG 187 (Grey Book) Explosives or other Dangerous Articles on board vessels.

e. T. O. 00-85-13 U. S. Air Forces, "Transportation Packaging and Handling of Dangerous Materials for Military Aircraft".

6. NOTES

6.1 Intended use. This specification is intended to prescribe essential design requirements and establish adequate evaluation test procedures to be followed in designing and testing biological and chemical weapons. Weapon design and development activities shall use this document in the preparation of the detailed specification for the item to be designed.

6.2 Definitions.

6.2.1 Approval by developing activity. For purposes of this specification approval by the developing activity is defined as release or approval by the Government technical activity having cognizance of or jurisdiction over a particular weapon design.

6.2.2 Data. Data includes information in any form which the designer or contracts required to submit to the Government or developing activity or to retain in his possession for record purposes.

6.3 Data requirements. For the information of developing activities, contractors and contracting officers, any of the data specified in, (a) subparagraphs below, (b) applicable documents listed in Section 2 of the specification or, (c) referenced lower tier documents, need not be prepared for the Government and shall not be furnished to the Government unless specified in the contract or contract order. The data to be furnished shall be listed on DD Form 1423 (Contractor Data Requirements List), which shall be attached to and made a part of the contract or order. NAVWEPS Form 4200/25 (Engineering Drawings and Associated Data Requirements) shall be attached where applicable.

6.3.1 Technical justification. During the development sequence, the designer shall provide technical justification for all significant design concepts, deviations from specified requirements, new fabrication processes and new materials. To the extent possible, the developing activity shall indicate requirements for technical justification in the contract or contract order.

6.3,2 Engineering drawings. The developing activity shall prescribe the Intended Use Category and Form of drawings, in accordance with MIL-D-1000, to be furnished by the designer during the different phases of the development sequence. Final engineering drawings shall be Form 1 for all use categories required.

6.3.3 Specifications. The developing activity shall provide for the preparation of production and acceptance specifications in accordance with M-200B.

6.3.4 Ordnance pamphlet or weapon handbook. The developing activity shall provide for the preparation of an ordnance pamphlet in accordance with MIL-M-81273 or a weapon handbook in accordance with MIL-H-5474. These publications shall include an illustrated parts breakdown; instructions for handling, storage, maintenance, operation, safety, etc. as specified.

6.3.5 Classification of defects. The documentation package shall, in each case, include a carefully prepared classification of defects in accordance with WR-43. Considering the hazardous nature of chemical and biological weapons, the importance of adequately defining critical defects is self-evident. Every product characteristic which is defined as critical shall be inspected 100 percent if this involves a non-destructive test.

6.3.6 In process review of documentation. The designer shall present documentation to the reviewing authority in a timely and orderly manner to permit completion of review well before project completion. Drawings should be submitted in groups of approximately 50 representing successive parts of a sub-assembly, a complete sub-assembly, or a complete sub-assembly and successive parts of the next sub-assembly. The designer may submit such drawings to the reviewing authority or permit the reviewing authority to conduct the review in his (the designer's) plant.

6.3.7 Logistic and maintenance data. The developing activity shall include in the detail specification requirements for logistic and maintenance data. These data must be available in advance of the introduction of the weapon into the fleet.

6.3.8 Preservation, packaging, and handling. The developing activity or contractor shall include in the detail specification the requirement to submit to the Commander, Naval Air Systems Command the pertinent data required to develop preservation, packaging, and handling equipment in accordance with WR-48, "Preparation of Weapon System Performance and Compatibility Requirements (P&CR) for Use in Container and Handling Equipment Design". To ensure that (1) packaging and handling equipment will be developed concurrently with the development of the weapon and (2) packaging (containers) and handling equipments are available when production weapons are being delivered, the P&CR must be submitted as soon as the required design data requested in WR-48 are available.

6.4 Prototype production for evaluation. Early in the development sequence the developing activity shall determine and provide for the number of prototype production weapons required for evaluation. The following is an approximate minimum number of expendable weapons required:

a. Operational Evaluation	50
b. Aircraft Compatibility	50
c. Packaging Tests	10
d. Shipboard Compatibility	5
e. Handling Equipment Compatibility	10
f. Training Schools	2
g. Explosive Ordnance Disposal	2

6.5 Contractor responsibility. When equipment is to be manufactured from drawings, sketches, or other material furnished by the developing activity or patterned after prototype or other equipment furnished by the procuring activity as a model, the furnishing of any such item does not constitute a waiver to any requirements of this or related specifications. It shall be the responsibility of the bidder or contractor to determine whether or not the use of such material conflicts in any manner with the requirements of the applicable specifications, and to notify the developing activity in writing of any changes that are considered to be necessary in either materials or specifications.

ALPHABETICAL INDEX

(Numbers Refer to Paragraphs)

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

MIL-W-81560(AS) WEAPONS, BIOLOGICAL AND CHEMICAL: GENERAL DESIGN SPECIFICATION FOR

ORGANIZATION *(Of submitter)*	CITY AND STATE

CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*	DATE

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