GENERAL QUALITY ASSURANCE PROVISIONS

CONTENTS

***** This QAP-APPENDIX-WVA supersedes QAP-APPENDIX-WVA, dated 3 June 1996. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to this **new address**:**

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GLOSSARY

ABBREVIATIONS

ACC	Accept
AISI	American Iron and Steel Institute
AMS	Aerospace Material Specification
AQL	Acceptable Quality Level
ASME	American Society of Mechanical Engineers
ASQC	American Society of Quality Control
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CAGE	Commercial and Government Entity Code
CDRL	Contract Data Requirements List
CN	Control Number
COC	Certificate Of Conformance
CTR	Certified Test Report
ECP	Engineering Change Proposal
EG	For Example
FA	First Article
GFE	Government Furnished Equipment
GTIS	Gun Tube Inspection Station
IAW	In Accordance With
INSP	Inspected
ISO	International Organization for Standardization
MFR	Manufacturer
MS	Military Standard
NAS	National Aerospace Standard
NDT	Nondestructive Testing
QAP	Quality Assurance Provision
REJ	Reject
SAE	Society of Automotive Engineers
SIE	Special Inspection Equipment
SME	Special Measuring Equipment
SMTE	Special Measuring Test Equipment
SQAP	Supplementary Quality Assurance Provision
SP	Special Process
SPC	Statistical Process Control
SPI	Special Packaging Instruction
SPP	Special Process Procedure
STE	Special Test Equipment
STM	Special Test Method

FORMS

DD Form 250	Material Inspection and Receiving Report
DD Form 1155	Record of Treatment and Test
DD Form 1222	Request For and Results of Tests
DD Form 1423	Contract Data Requirements List
DD Form 1692	Engineering Change Proposal
DD Form 1694	Request For Deviation/Waiver
SARWV Form 2005	Inspection Statement Of Findings For Contract Sample Requirements

1. **SCOPE**. This document, by reference in the contract, is applicable for the inspection of all materiel. It establishes general quality assurance provisions used in addition to the specific quality assurance provisions or verifications contained in a specification or an item QAP. When a SQAP is referenced in any document, it is synonymous with QAP. In addition, wherever QAP-APPX-WVA is referenced, it is synonymous with this document.

2. **APPLICABLE DOCUMENTS**. The following are referenced in this document:

ANSI Z540-1	**General Requirements for Calibration Laboratories & Measuring & Test Equipment**
ANSI/AWS D1.1	**Structural Welding Code**
ANSI/AWS A2.4	**Symbols for Welding and Nondestructive Testing**
ANSI/AWS A3.0	**Welding Terms and Definitions**
ANSI/SAE J423	**Method of Measuring Case Depth, Recommended Practice**
ASME B46.1	**Surface Texture (Surface Roughness, Waviness, and Lay)**
ASTM E8	**Method of Tension Testing of Metallic Materials**
ASTM E10	**Method of Tests for Brinell Hardness of Metallic Materials**
ASTM E18	**Method of Tests for Rockwell Superficial Hardness of Metallic Materials**
ASTM E23	**Notched Bar Impact Testing of Metallic Materials**
ASTM B117	**Method of Salt Spray (Fog) Testing**
ASTM E380	**Use of International Systems Units (SI) Modernized Metric System Practice for**
ASTM E1077	**Standard Test Methods for Estimating the Depth of Decarburization of Steel Specimens**
ASTM E1444	**Standard Practice for Magnetic Particle Examination**
ASTM E1742	**Standard Practice for Radiographic Examination**
ISO 10012-PT 1	**Quality Assurance Requirements for Measuring Equipment**
NAS 410	**Certification & Qualification Of Nondestructive Test Personnel**

ANSI copies are available from 1430 Broadway, New York, NY 10018-3308. ASME copies are available from 345 East 47th Street, New York, NY 10017. ASTM copies are available from 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. NAS copies are available from 1250 Eye Street N.W., Washington, D.C. 20005. ISO copies are available from 1 rue de Varembé, Case postale 56, CH-1211, Genève 20, Switzerland.

2.1 **ORDER OF PRECEDENCE**. Unless otherwise specified in the contract, the following is the order of precedence for inspection requirements: contract, product drawing, specification, item QAP, and this document. This precedence shall only be used in case of conflict between inspection requirements. The contractor shall request clarification from the procuring activity of what is required when there are conflicts, missing data (including tolerances), or other drawing or quality requirement ambiguities.

3. **CONTRACTOR REQUIREMENTS**. The contractor shall be responsible for ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract, drawing, specification, item QAP and this document. The Government reserves the right to perform any inspections, including inspection of equipment, that are deemed necessary to assure that supplies and services conform to prescribed requirements. In addition, the Government can disapprove of any facility that is not suitable for the performance of inspection requirements.

4. **INSPECTION PROVISIONS**.

4.1 **IN-PROCESS CONTROL**. The inspection requirements shall be applied at the earliest practical point in manufacture at which it is feasible to inspect for acceptance without risk of change in the characteristic by subsequent operations. The contractor shall establish in-process inspection at strategically located points throughout the manufacturing processes to assure continuous control of product quality. The contractor's inspection system shall provide for inspection and approval of the first piece at each operation, and/or the finished part, before quantity production. In addition, the contractor shall provide and maintain work gages and other measuring and testing devices necessary to accomplish inspection and to control quality during the manufacturing processes.

4.2 **QUALITY CONFORMANCE INSPECTION**. Wherever an item QAP is referenced in the contract, the inspection provisions of the QAP are the minimum quality conformance requirements for those parts and assemblies to which the QAP pertains. Classification of characteristics used in an item QAP are critical, major or minor. The Department of Defense no longer recognizes the use of AQL(s) as an attribute sampling plan for inspection. Sample sizes are now required. Any item QAP, prepared by Watervliet Arsenal, that does not reflect a sample size or references an AQL is to be converted as follows:

TABLE I - INSPECTION REQUIREMENTS
MAXIMUM LOT SIZE IS 50 UNITS, ACCEPT ON ZERO DEFECTS

When the AQL is	<.25	.40	.65	1.0	1.5	>2.5
Use sample sizes of	50	32	20	13	8	5

a. The quantity of the lot size may be manufactured per the discretion of the contractor, but the maximum lot size of units submitted for sampling inspection is 50. Sampling to lot sizes greater than 50 is permissible only with prior approval of the procuring activity. The following applies to lot sizes:

(1) Where the number of units manufactured is less than 50, the number of units sampled shall be equal to all of the units or the stated sample size, whichever is less.

(2) Where the number of units manufactured is greater than any multiple of 50, the number of units sampled from that remaining quantity shall be equal to all of that quantity or the stated sample size, whichever is less.

(3) For example, the contract quantity is 112 units and all units are manufactured as one batch (lot). The inspection requirement for an AQL of 1.0 is 13 units per lot size of 50 units. Therefore, the sample size will be 38 units (e.g., 13 out of 50, plus 13 out of 50, plus 12).

b. Accept on zero defects means if any characteristic (including any unlisted defects) of any sample unit for the lot size inspected is found to be defective, each unit in the lot will be inspected for the nonconforming characteristic.

c. If a characteristic is not identified as critical or major in an item QAP (other than nondestructive testing), it is classified as minor. The contractor's Quality Plan shall address the frequency and the type of process control used for inspection of minor characteristics. Frequency and process control, as required in the contractor's Quality Plan, are defined as the time and quantity of sampling inspection and the equipment and/or method used.

d. If an item QAP is not referenced in the contract, the contractor's Quality Plan shall address the frequency and the type of process control used for inspection of all drawing characteristics. The Quality Plan shall be available for review, when requested, and is subject to approval of the procuring activity.

e. Variable sampling plans for quality conformance inspection of characteristics listed in an item QAP may be permitted. Before implementation of variable sampling plans, the contractor shall secure the written concurrence of the procuring activity. All approved variable sampling plans shall be incorporated into the contractor's inspection system. Reduced inspection may be allowed when the manufacturing equipment, methods, and tool control are in process control and controlled by highly repeatable manufacturing techniques. Examples of types of manufacturing that should be considered for this includes: die forgings, die stamping, extrusions, investment castings, numerically-controlled machining processes. Tightened inspection (original sampling plan) shall be used for the re-inspection of those characteristics which are found to be nonconforming.

f. The contractor may request permanent changes to the engineering drawing by submitting an ECP. Where the contractor finds it necessary or desirable to deliver parts which do not comply with the drawing requirements, permission may be granted on submittal of a deviation or waiver. Where the request is submitted prior to manufacturing, a deviation is requested. When submitted after manufacturing, a waiver is requested. Request for changes may be made on DD Form 1692 and/or DD Form 1694. MIL-STD-973, "Configuration Management", may be used for guidance in preparing forms. Request for changes shall be submitted for approval to the procuring activity.

4.3 **NONCONFORMING MATERIAL**. The acceptance of nonconforming material units, per a waiver, is a prerogative of, and shall be as prescribed by, the procuring activity. All nonconforming units shall be positively identified to prevent unauthorized use, shipment and intermingling with conforming units. Holding areas or procedures for identification, segregation, and disposition, mutually agreeable to the contractor and the procuring activity, shall be provided by the contractor. The contractor may scrap an item, when it is cost-effective, without prior approval. Requests for waiver, accompanied by a recommended repair procedure, shall be submitted for nonconforming units which the contractor considers repairable.

4.4 **MANUFACTURING PROCESSES**. The contractor is required to request authorization from the procuring activity before changing to any unspecified material, welding, heat treatment, plating and/or coating operations, nondestructive testing methods, or fabrication methods. The procuring activity will make a determination whether the change is significant enough to warrant reevaluation and testing/verification of production or initial production component(s). The contract, per the CDRL or a contract clause, shall specify when a requirement for a special manufacturing process procedure must be submitted to the procuring activity. The contractor shall assure that acceptable manufacturing processes and treatments are being used to prevent the hazards of stress corrosion cracking, hydrogen embrittlement, or other deteriorating conditions.

4.5 **INSPECTION RECORDS**. The contractor's records of inspection shall be accurate, complete and documented on a suitable format. The contractor shall make available the records of qualifications of operators and equipment. This shall apply whether manufacturing processes are performed at the sub-contractor's facility or at the contractor's plant. All inspection records shall be maintained on file, and made readily availably to the procuring activity, upon request. After the life of the contract, unless otherwise specified by the procuring activity, records for components that are serialized shall be maintained for a minimum of three years and nonserialized components shall be maintained for a minimum of one year. The inspection record shall provide, as a minimum, the following:

a. Contract number, nomenclature of units, drawing number with revision and date, lot size, lot number, sample size (number of units inspected), the method of inspection, identification of the inspector, the date of the inspection, the results of the inspection, and each characteristic inspected including any specified tolerance of the contract and/or drawing. Specify item QAP characteristic number (if applicable).

b. When a commercial gage, functional gage, go/no-go type gage, visual, manual, and/or a certification is the inspection method, the use of OK, check marks, "X's" or ACC may be used to document acceptance. Use REJ to document nonacceptance. SMTE that gives actual dimensional readings is the preferred method of reporting and/or recording inspection results. When inspection records are required to be delivered to the procuring activity, the contractor may summarize and report the range (minimum and maximum) values recorded for each characteristic inspected in the lot. Inspection, testing, and inspection records will be documented and/or recorded IAW the specified unit of measure as specified on a drawing or in an item QAP. ASTM E380, Method B, shall govern all metric requirements, measurement, and testing equipment conversion procedures.

c. The raw data produced by computer controlled electronic special inspection equipment (e.g.,GTIS, Gymnasticators) shall be maintained in its original format as a part of inspection records. The data shall be recorded on Government acceptable media and be made available to the Government upon request for the duration of the contract. At the completion of the contract, the media shall be appropriately packaged, marked, and provided to the procuring activity.

4.6 **CERTIFICATIONS**. The method of submittal, for certification requirements, is a CTR or a COC. The CDRL, DD Form 1423, will specify as and when a CTR and/or a COC is to be submitted to the Government. The method of submittal shall be IAW the procuring activity's CDRL. The following applies to a CTR and/or COC:

a. A CTR shall contain actual results of tests for the chemical analysis, heat treatment, and/or mechanical properties of the drawing and/or specification. Include in the report the number of specimens tested, grade and/or type of material (if applicable). A COC is to cite compliance to the specific data for which the COC is presented for acceptance(e.g., personnel qualification; procedure or process compliance to a specification and/or standard; material compliance to acceptance criteria, standard, composition, type, etc.).

b. A COC and/or a CTR must be specifically identifiable to and provided with each DD Form 250 and/or DD Form 1155 submitted. A COC or a CTR shall not be used as the sole basis for Government acceptance of contract item(s) unless approved by the procuring activity. A COC or a CTR is in addition to, and not in lieu of, any rights of the Government under the contract or law.

c. As a minimum a CTR and/or a COC shall contain the following: name of company and date, contract or purchase order number, drawing number, the quantity in each lot or shipment, complete nomenclature of the supplies together with the lot number or other identification, and a statement, with the signature and title of certifying official from the contractor, certifying that the supplies meet all requirements of the contract.

d. For contracts consisting of multiple shipments, the contractor shall submit for the first production shipment, all COCs and/or CTRs required. After the initial submittal, the contractor is permitted to submit a COC that shall only have to specify the following: the initial shipment contract or purchase order number, certification that no manufacturing process has changed from the initial shipment and the original COC paperwork, and include data as stated above. This type of COC does not apply to nondestructive testing requirements, CTR(s), or inspection records. These requirements cannot be summarized.

e. The procuring activity will determine if a COC or CTR is required for MS items, critical fasteners and commercial items.

f. A COC or a CTR addressing material requirements should specifically state, AItem was not made from castings, merchant quality, leaded, resulphurized or rephosphorized steels', unless otherwise specified on a drawing or in the contract. The following applies to certifications for material:

(1) When the drawing specifies a generalized material note for steel, the steel selected must conform to one standard wrought AISI grade of the proper carbon content and series designation. The plain carbon steels are nonresulfurized with a maximum manganese content of 1.00 percent. Note that steels of merchant quality, leaded, resulfurized, rephosphorized, or combinations thereof, are not acceptable. Unless otherwise specified, castings are also not acceptable.

(2) Certified test reports identifiable with the material may, at the option of the Government be accepted in lieu of tests. When the identity or quality of the material is in doubt and valid and acceptable data is absent, tests shall be conducted within the material as required by the Government representative to determine the identity and quality. If proven to be unacceptable, the material shall be rejected.

(3) When a COC is required for material, the supporting data (chemical analysis or certification from the raw material producer or processor), shall be available for examination upon request by the Government representative even though it does not have to be submitted with the COC.

4.7 **IDENTIFICATION AND TRACEABILITY**. Parts and assemblies shall be clearly and legibly marked IAW requirements of the applicable drawing and/or contract. The contractor shall establish and maintain documented procedures for traceability and identification of individual components from receipt and/or start of manufacture, during storage and handling, and all successive stages of production, acceptance, delivery and/or installation. Tags, bags, travelers, and/or bar coding may be used for traceability of identified components. For source accepted material, documentation shall be reviewed by the Government representative, and confirmed by the inspector's stamp next to the transferred number on the material. For destination accepted material the documentation shall be subjected to Government review. The following also applies:

a. MS, commercial or special design components received from vendors in support of in-house manufacture or assembly shall be identified to the individual contractor and contract number from the time received until used in manufacture or assembly. Components shall be issued from a single vendor lot until that lot is exhausted. Lots shall not be mixed.

b. Major items such as guns, tubes, evacuator chambers, muzzle brakes, blast deflectors, breech rings, breech bushings, breech couplings, breechblocks, nozzle assemblies of recoilless rifles and guns, and base caps of mortars shall carry positive identification (heat, forging, or casting numbers) through all processes so that it is possible to determine the original source of the finish part.

c. If it is necessary to transfer the numbers to another area during machining, such transfer shall be documented. This record shall include the name of the producer (or CAGE code number), and pertinent procedure data on the heat, ingot, lot, and other processing numbers. The contractor shall maintain a cross-reference record of heat or forging numbers, shop numbers if applied, and final serial numbers. Where shop numbers are assigned, inspection records shall identify which shop numbers are assembled with the item serial number.

4.8 **WORKMANSHIP**. All finished surfaces shall be protected against foreign material and damage during manufacture and storage prior to delivery. Material shall not be treated or touched up in any manner to conceal defects and shall be free from defects which adversely affect the performance or longevity of the item. Salvaging operations (e.g., hammering to shape, straightness, bending), welding or other means for the repair of defects in materials shall not be performed unless specifically authorized by the procuring activity. Evidence of poor workmanship include the following: scratches in excess of drawing and specification requirements, burrs, corrosion and non specified oxidation, tool scores, gouges, deformations, knife edges, fins, excess metal, and missing or damaged protective finish. Unless otherwise allowed per the drawing, finished parts shall not have seams, laps, laminations, cracks, visible steps, or sharp edges and corners. These conditions may affect serviceability, functioning, appearance or safety.

4.9 **PROTECTIVE FINISHES AND COATINGS**. The protective finish and/or coating shall be visually examined for completeness, uniformity in appearance and color, and for freedom from pits, corrosion, scratches, and worn or bare spots. Touch up may be used with the approval of the procuring activity, in lieu of refinishing with the original finish, for restoration of small areas of finish as long as form, fit, and function are not effected. Dimensional requirements and tolerances shall apply prior to the application of organic coatings (e.g., paint, varnish, lacquers), phosphate coatings, and solid film lubricant. Dimensional requirements apply after the application of non-organic coatings such as black oxide, metallic plating substances (e.g., chromium, cadmium) and anodic coatings.

4.10 **LATENT MATERIAL DEFECT**. When the contractor certifies that the material delivered for source accepted material (e.g., castings and forgings) is IAW the applicable specification, the procuring activity may perform a physical/chemical analysis of the material to assure conformance to the specification requirement. Failure of the material to meet the physical/chemical requirements will be a cause for rejection as a latent material defect and will necessitate replacement of the material at the contractor's expense when so directed by the procuring activity.

5. **INSPECTION METHODS**. An assembly shall be visually examined for completeness, security, and conformance to specified requirements. When possible, the functioning of an assembly shall be inspected by manual operation. The assembly shall be checked manually for tightness, protrusion, operation or similar condition, as applicable. For surface roughness values, a comparison conforming to ASME B46.1 or surface measuring equipment (e.g., profilometer) shall be used.

a. When SMTE, also identified as SME or STE, is specified as the method of inspection, the contractor may use any type of industry-developed, commercially available, multi-usage equipment. The contractor is responsible for utilizing SMTE that will assure full form for the entire surface of the specified characteristic. When STM is specified as the method of inspection, the methods and procedures shall be as specified in the applicable item QAP. SIE applies prior to the application of phosphate protective finish.

b. When SIE is specified and provided as GFE to the contractor as the inspection method, the contractor shall use the GFE. When SIE is not provided, not available, or unserviceable, the contractor shall document and describe in writing the inspection method to be used, in lieu of the SIE specified, and submit the written inspection method to the procuring activity prior to applying an alternate inspection method. An alternate inspection method is a method which equals or exceeds the specified accuracy and provides, as a minimum, the quality assurance requirements in the contractual documents. The contractor must receive approval prior to applying an alternate inspection method. The procuring activity will determine if the alternate method is acceptable and provide written approval or disapproval. The contractor may be authorize to use SMTE, another inspection method or be required to fabricate the SIE IAW the Government drawing.

6. **INSPECTION AND TEST EQUIPMENT**. Acquisition, modification, maintenance, surveillance, calibration, identification, control, disposition and replacement of both commercial and government designed inspection and test equipment shall be IAW ANSI Z540-1 and ISO 10012-PART 1 and the following:

a. Inspection equipment used shall be capable of repeatable measurements by various experienced inspection/test personnel, to an accuracy of 10% of the total tolerance of the characteristic being inspected. In the event the contractor desires relief from this requirement for electrical testing, a technically supported request for relief or waiver shall be submitted to the procuring activity.

b. If applicable, Government designed inspection and test equipment shall be as specified in the contract. The method of restoration and returning Government owned equipment will be determined on an individual basis by the procuring activity. Restoration is meant to include the repair or replacement of Government owned equipment found to be unserviceable from contractor use. When a Government representative desires to use contractor or Government furnished inspection equipment for contract related purposes, such use shall be permitted without charge.

c. An inspection standard shall be utilized for those characteristics requiring inspection decisions by visual (eyesight) means. Items selected as a visual comparison standard shall be mutually agreed to by the contractor and the Government, within drawing and specification requirements, and shall be used to assist in determining configuration and minimum acceptance criteria. The visual comparison standard selected shall be subject to approval by the responsible procuring activity. Each comparison or inspection standard shall be kept under the control of the contractor's inspection element and shall be positively identified as to the characteristic or condition the standard represents, date established as the standard, number of the standard, and identity of the contractor and the Government inspection personnel establishing the standard.

d. The contractor is responsible for providing all SMTE required. Design responsibility (other than GFE) for all other inspection equipment is assigned to the contractor. Such designs may include commercial equipment which the contractor proposes to use. Contractor designs shall include appropriate operating instructions, calibration procedures, and maintenance procedures. Designs which provide variable measurements instead of attributes data are preferred in order to maximize the benefits of utilizing SPC.

7. **TEST METHODS**.

7.1 **CORROSION PREVENTION AND CONTROL**. Salt spray tests shall be performed IAW ASTM B117.

7.2 **SCREW THREADS**. Threads shall conform to the requirements of the applicable thread form standard. Threads shall be inspected for type, form, size, and class of thread specified. Threads shall be chamfered or countersunk to eliminate any protrusion or any sharp edge formed by the incomplete thread. The countersink shall not exceed the major diameter of an internal thread. The chamfer shall not exceed the minor diameter of an external thread.

7.3 **WELDING**. Written process procedures for welding shall be made available to the procuring activity upon request. Welding is only permitted as specified on applicable engineering drawings unless written approval is obtained from the procuring activity. The welding terms and symbols used on drawings shall be IAW ANSI/AWS A3.0 & ANSI/AWS A2.4. Wherever referenced, unless otherwise specified, ANSI/AWS D1.1 is to be used in lieu of MIL-STD-1261. The preparation for welding specified on a drawing may be modified subject to approval of the responsible procuring activity. Weldments that are not machined after welding shall not be distorted beyond the dimensional limits specified on the individual part detail drawings or weldment drawing. Spatter and similar excess shall be removed. Unless otherwise specified on the drawing, contours of deposited metal in joints shall not be altered.

7.4 **TORQUE**. The contractor shall furnish written notice to the Government representative of the time, date, and location of the torque operation testing, so that the Government representative may witness the testing on a sufficient number of units. The aforementioned requirement for witnessing application of torque does not relieve the contractor of actually conducting torque tests.

7.5 **FIT TESTING OF COVERS AND CASES**. Sample(s) selected will be tested IAW the test method designated in the item QAP. SIE shall be used when designated by the procuring activity. The procuring activity reserves the right to randomly select units for inspection. When this is a requirement, randomly selected units will be submitted with a DD Form 1222 to the procuring activity. The representative production units will not be delivered until the contractor receives approval by the procuring activity.

7.6 **SOLDERING & BRAZING**. All soldering and brazing related operations shall be performed IAW a process plan to be developed and maintained by the contractor as part of the documentation supporting the inspection system. The plan shall include the procedures to be used. As a minimum, each procedure shall include the process, tools, equipment, materials and acceptance criteria used for the operation. The process control plan shall be made available to the Government representative upon request.

7.7 **ELECTRICAL TESTS FOR ELECTRICAL/ELECTRONIC ASSEMBLIES/SUBASSEMBLIES**. Continuity, dielectric withstanding voltage, isolation and/or insulation resistance tests shall be performed IAW the criteria specified in the contract, drawing, specification and/or item QAP.

7.8 **TENSILE TEST**. The tensile examinations and tests shall be conducted with testing equipment certified annually to ASTM E8 IAW the specified requirements of the applicable drawing.

7.9 **CHARPY IMPACT TEST**. The charpy impact examinations and tests shall be conducted with testing equipment certified annually to ASTM E23 IAW the specified requirements of the applicable drawing.

7.10 **MACRO-ETCH EXAMINATION**. Macro-etch results shall contain the examination and test performed, and shall include the material data on each specimen or sample. In no instance shall a sample face deformed by shearing or exhibiting flowed metal be selected or inspected for macro acceptance.

7.11 **HARDNESS TEST**. Brinell hardness testing shall be performed IAW ASTM E10. Rockwell hardness tests shall be performed IAW ASTM E18. The following applies to forgings and/or castings:

a. A minimum of two hardness tests shall be conducted. One test for the thinnest cross-section and one test for the thickest cross section, if possible. Surface decarburization or any form of superficial hardening shall be removed, prior to hardness testing, by grinding or other suitable means. Material removal is .12 maximum for forgings and .03 maximum for castings. Preparation shall be carried out in such a way that any alteration of the surface hardness (e.g., heat or cold-working) is minimized. Care should be taken to avoid over-heating or cold-working the surface. The tested work piece surface must be representative of the material. ASTM E1077 may be used as a reference for decarburization.

b. Dimensions do not apply in areas tested for hardness. All hardness readings shall conform to the requirements of the drawing and conversions to HRC values will include rounding up (xx.5 or higher) or down (xx.4 or lower), if applicable.

7.12 **CASE HARDNESS DEPTH**. "Case depth" identified on a drawing is usually "total case depth." The recommended practice of measuring depth of case hardness is IAW ANSI/SAE J423. When case depths are specified on the drawing, the contractor shall record and maintain certified test reports of the case depth tests conducted and retain the tested specimens from each heat treat batch. The test reports shall contain, as a minimum case depth test data as follows:

a. Test specimen identification, material, item nomenclature, heat treat batch number, drawing number and/or specification with revision symbol, date of drawing and/or specification.

b. Test method, test conditions, characteristic measured, number of specimens tested, and specific test results obtained.

7.13 **STAKING**. When staking is required by a drawing and the method is not specified, screws (excluding flat head slotted), bolts, nuts and precision pins shall be staked in three places, approximately equally spaced. Flat headed slotted screws shall be staked by displacing the base metal into both ends of the slot (two places only).

7.14 **RIVETING**. Machine driven, pressure method is the riveting process of choice, and shall be employed whenever practical. Rivets shall completely fill the holes, effect firm contact between the joined surfaces and shall have full formed heads concentric with the body. Steel rivets over 3/16 inch in diameter shall be driven hot; 3/16 inch and smaller in diameter may be driven cold. Rivets shall be examined visually for full formed heads concentric with the body. Rivets shall also be inspected to establish evidence of completely filled holes and firm contact between the joined surfaces. This inspection, which will certify the production process, will be accomplished by destructively sectioning a prototype rivet joint assembly to determine that the rivets completely fill the holes and effect firm contact between the joined surfaces. The sectioned joint shall be subject to verification by the Government representative. Failure to comply with requirements specified in this document shall be cause for rejection.

8. **PACKAGING INSPECTION**. Inspection to determine compliance with cleaning, preservation, testing, packaging, packing, and marking requirements of the applicable packaging documentation, shall be IAW the specification and/or SPI specified in the contract. Cannon, cannon components, and repair parts which are to be stored for a minimum of one year from the date of packaging shall receive protection for the period of storage time. Periodic inspections shall be performed. Repackaging shall be accomplished IAW applicable SPI.

8.1 **MARKING INSPECTION**. Parts and assemblies shall be clearly and legible identified IAW the requirements of the applicable drawing and/or specification.

9. **NONDESTRUCTIVE TESTING**. NDT shall be conducted IAW the criteria specified in the contract, drawing, specification and/or item QAP. Written inspection procedures shall be made available to the Government representative upon request. Personnel performing NDT shall be qualified IAW NAS 410 or as specified in the contract.

9.1 **MAGNETIC PARTICLE INSPECTION**. For final acceptance, seventy-two (72) hours must pass before magnetic particle inspection shall be conducted on ferromagnetic materials, that are heat treated with a liquid quenching process. Magnetic particle indications shall be defined as lineal discontinuities. The standard practice for magnetic particle examination is outlined in ASTM E1444.

9.2 **RADIOGRAPHIC SAMPLE PLAN**. The standard practice for radiographic examination is outlined in ASTM E1742. When radiography is specified and no sampling plan is provided, Table II below shall apply to each heat of castings. Sample castings shall be randomly selected from each heat.

TABLE II - RADIOGRAPHIC SAMPLING PLAN

CASTINGS PER HEAT	1-8	9-25	26-50	OVER 50
SAMPLE SIZE	ALL	8	13	13 PLUS 20% OF THE CASTINGS OVER 50, ROUNDED TO THE NEXT HIGHER INTEGER

a. The castings may be radiographed prior to heat treatment providing that liquid penetrant or magnetic particle inspection is performed after heat treatment.

b. The castings of each heat and the radiographic sample from that heat shall be marked with a permanent identification (engraving, stamping or raised letters) which will relate the sample to the heat. The related radiographic film data shall be identifiable to the sample and heat.

c. If any casting in the sample fails to meet the specified radiographic requirements, then all castings comprising the heat shall be subjected to 100% radiographic inspection in the area(s) where the rejection was located. Each casting that fails the radiographic inspection shall be rejected.

10. **FIRST ARTICLE REQUIREMENTS**. The FA produced must be representative of the manufacturing processes to be used during production. "FA Testing" means testing and evaluating the FA for conformance with specified contract requirements before, or in the initial state of, production. Unless otherwise specified by the procuring activity, it is required that the FA sample(s) meet all technical requirements of the procurement package. Approved or conditionally approved FA sample(s) will not serve as a manufacturing standard unless so required in the specification and/or item QAP. The approved FA may be delivered as part of the contract quantity. Previous production items or parts will not be used to meet FA requirements. Destructive testing, when required to be performed by the contractor, may be witnessed by the Government representative. The following applies to First Article requirements:

a. The contractor will provide advance notification to the Government representative of intent to perform part or all of FA inspection and test requirements so that the Government representative may participate in performing and/or witnessing inspection and/or testing.

b. The contractor shall provide to the Government representative and the procuring activity, at the destination specified in the contract, the FA sample(s), all certifications, test reports, and inspection records or documents attesting to conformance to requirements as follows:

(1) Each characteristic and the results of the inspection and/or testing performed by the contractor and Government representative will be annotated on SARWV Form 2005 or any other method approved by the procuring activity. SARWV Form 2005 (see attached form) is a requirement on Watervliet Arsenal's CDRL for FA.

(2) Two copies of DD Form 1222, completed through Section A, will be submitted with the inspection record form. The procuring activity will provide approval, conditional approval, or disapproval based upon the data submitted and final inspection of all requirements.

(3) The quantity and configuration of the FA shall be as specified in the contract. The FA shall be inspected and tested by the contractor for all requirements of the drawing, specification and/or item QAP referenced in the contract, except for:

(a) Inspection and test contained in a material specification, provided that the required inspection and test have been performed previously and a certification of conformance is submitted with the FA test report.

(b) Inspections and tests for MS components and parts provided that inspection and tests have been performed previously and certifications for the components and parts are submitted with the FA test report.

11. **SPECIAL PROCESS PROCEDURE**. The following applies:

a. A Special Process (SP) is a process where the results of the process cannot be fully verified by subsequent inspection **and** where deficiencies may become apparent **only** after the product is in use. To ensure that the specific requirements are met, a Special Process shall require continuous monitoring and control of the process variables or parameters. This will require a Special Process Procedure (SPP).

b. A Special Process Procedure (SPP) is a written documented set of instructions for a Special Process (SP). The item QAP shall identify the need for a SPP.

c. The SPP may include requirements for personnel or equipment, as appropriate, is a deliverable item and is part of the first article when required by the specific item QAP. The contractor is responsible for preparing the SPP.

d. The Government representative will perform onsite audits of an SPP in accordance with the Government's established audit plans and/or procedures.

e. The SPP shall be acceptable when the First Article is approved. The contractor shall not deviate from the approved SPP. The contractor shall notify the Government, in writing, prior to implementing any changes to the approved SPP so that a determination can be made regarding the need for recertification of the manufacturing process (First Article inspection or onsite audit).

f. The SPP format shall include:

1. **APPLICATION BLOCKS**. At the top of the first page and at the bottom of each page. The application block at the top shall provide component information. The bottom block shall provide information about the SPP (title and the date prepared).

2. **SCOPE**. State process involved.

3. **APPLICABLE DOCUMENTS**. List all applicable document numbers and document titles. (If none, so state)

4. **REQUIREMENTS**. (All requirements specified below are mandatory - if none, so state)

4.1 **APPROVED EQUIPMENT & EXPENDABLE SUPPLIES**. List all approved equipment and expendable supplies required by the SPP and their minimum requirements.

4.2 **MATERIAL**. List all of the components/materials that are used in the procedure. (As defined in the technical data package)

4.3 **PROCEDURE IN SEQUENCE**. List, in sequence, all steps, operations, inspections, warnings and cautions for control of the process.

4.4. **CONTROL OF NONCOMFORMING PRODUCT**. State the procedure to be followed if parts are noncomforming.

4.5 **CORRECTIVE ACTION**. State the procedure to be followed to eliminate causes of nonconformities.

4.6 **CONTROL OF INSPECTION, MEASURING & TEST EQUIPMENT**. State the procedure that assures that measurement uncertainty is known.

4.7 **CERTIFICATION**. List all material certification and operator certification requirements required by the process.

4.8 **QUALITY ASSURANCE PROVISIONS**. (If none, so state). Provide any inspection and testing in accordance with the technical data requirements.

4.9 **STATISTICAL PROCESS CONTROL**. (If none, so state). State the procedure for identifying how statistical techniques are implemented for control of the process.

4.10 **HANDLING, STORAGE, PACKAGING, PRESERVATION & DELIVERY**. State the procedures used to: (a) assess and prevent product from damage/deterioration; (b) control packing, packaging and marking; and (c) assure preservation when product is in the supplier’s control.

4.11 **NOTES/ADDITIONAL INFORMATION**. Provide any additional information pertinent to the procedure.

4.12 **SIGNATURE PAGE**. The last page of the SPP shall include dates and signatures of the author and all approving officials.

SHEET_____ OF_____

INSPECTION STATEMENT OF FINDINGS FOR CONTRACT SAMPLE REQUIREMENT
(WVAR 742-16)

CONTRACTOR	CONTRACT NUMBER	DRAWING NUMBER	REV	SAMPLE SIZE	

LIST BELOW EACH CHARACTERISTIC INCLUDING ANY SPECIFIED TOLERANCE OF THE CONTRACT, DRAWING(S) AND SPECIFICATION WHICH MUST BE MEASURED, TESTED OR VERIFIED.	RESULTS WILL INDICATE THE ACTUAL RANGE OF FINDINGS SPANNING ALL PIECES IN SAMPLE. INSPECTION METHODS WILL BE IDENTIFIED PER QAP-Appendix-WVA NOTES WILL BE IDENTIFIED TO INDIVIDUAL CHARACTERISTICS.				
	CONTRACTOR'S RESULTS OF INSPECTION	METHOD OF INSP.	GOV'T REP'S RESULTS OF INSPECTION	Procuring Activity RESULTS OF INSP.	METHOD OF INSP.
AUTHORIZED SIGNATURES & DATES:					

NOTES:

SARWV Form 2005, 18 Mar 77 Replaces SARWV Form 217, 7 Sep 73

DEFINITIONS

Attribute Inspection - A method of inspection whereby either the unit of product is classified simply as "defective" or "nondefective", or the number of nonconforming characteristics (defects) in the unit of product is counted with respect to a given requirements or set of requirements.

Commercial Equipment - Unmodified equipment which is cataloged and available for purchase by the general public.

Commercial Items - Those items which are industry-developed and manufactured and are available off-the-shelf to industry, the Government, and the general public.

Critical - Any feature, which if found to be nonconforming or missing, would cause the failure or malfunction of the item.

Full Form - The term used to indicate that a characteristic feature shall be within specified geometric form, size, and orientation (if applicable) wherever the characteristic is defined. Orientation is controlled by geometric dimensioning and tolerancing.

Heat - All the castings produced from one batch of melted alloy (furnace charge), and poured under the same foundry practices within a brief and continuous production run.

Inspection - The term "inspection" incorporates the meaning of examination, inspection and testing or measurements, depending on its context.

Lot size - A homogeneous collection of units of product from which a representative sample is drawn.

Defect - Any nonconformance of a characteristic with specified requirements.

Foreign Matter - Substances on an item which include but are not limited to dirt, corrosion, grease, and chips.

Major - Any feature, other than critical, that could result in a failure, or materially reduce the useability of the unit for its intended purpose.

Minor - Any feature that does not materially reduce the useability of the unit for its intended purpose.

Nonconforming Material Conditions - Any deviation from the contract, contract modifications, drawing, specification and/or item QAP requirement.

Unlisted Defects - Not listed in the specified inspection characteristics.

Variable Inspection - A method of inspection whereby a measurement is made to determine and record the numerical magnitude of a characteristic under consideration. This involves reading a scale of some kind and recording the measurement on the units desired e.g., pounds, inches, seconds, ohms, degrees Fahrenheit, percent chemical content, etc.).