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**NATO REQUIREMENTS
FOR AN INDUSTRIAL QUALITY
CONTROL SYSTEM**

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NATO
REQUIREMENTS FOR AN INDUSTRIAL
QUALITY CONTROL SYSTEM

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MAY 1984

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NATO LETTER OF PROMULGATION

May 1984

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P.J. MITCHELL
Major-General, CAAR
Chairman

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RECORD OF CHANGES AND AMENDMENTS

Identification of Change or Amendment and Req. No. (if any) and date	Date Entered	NATO Effective Date	By whom entered (Signature, Rank, Grade or Rate, Name of Command)

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NATO REQUIREMENTS FOR AN INDUSTRIAL
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CHAPTER 1

GENERAL

101. INTRODUCTION

- (a) Modern industry is characterized by advancing technology and correspondingly increasing complexity and is subject to regulatory requirements, all of which can combine to impact costs. In this environment it is essential that the materiel and services be designed, manufactured and provided so as to conform to the requirements of the purchasers and that the activities involved be effected as economically as practicable.
- (b) New concepts and disciplines continue to emerge to facilitate the achievement of these objectives. Significant among these is one that is collectively identified in most countries as quality control.
- (c) Such modern quality control is based on a few basic concepts.
 - (1) The quality of materiel and services depends on the contractor's control of the design, manufacture, inspection and other operations which affect quality. Accordingly contractors must be prepared to institute such control of quality as is necessary to ensure that materiel and services conform to the purchaser's contractual requirements.
 - (2) Contractors should be prepared, not only to deliver materiel and services on schedule at an agreed price, but in addition, to substantiate by objective evidence, that they have maintained control over the design, development and manufacturing operations and have performed inspection which demonstrates the acceptability of materiel and services.

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- (d) The purchaser should assure that his requirements in the contract are complete and clear. He should also stipulate the assurance required to ascertain that the contractor has control over the operations to be carried out and will ensure that materiel and services are properly produced and inspected.
- (1) The purchaser may achieve this by stipulating in the contract those functions which must be controlled.
- (2) For his protection the purchaser will exercise such quality assurance as is necessary to assure himself that the contractor has achieved the required quality. Such quality assurance will extend to sub-contractors when appropriate. The extent of the quality assurance performed by the purchaser will be a function of the demonstrated effectiveness of the contractor's quality control system to meet contract requirements and of the demonstrated quality of materiel and services. The purchaser, or his authorized representative, will have reason to discontinue the verification or acceptance of materiel or services pending action by the contractor to correct any deficiency in his quality control system that could result in delivery of non-conforming materiel or services.

102. SCOPE

This document establishes requirements for quality control system elements to be designed, established and maintained by the contractor for the purpose of ensuring that materiel and services conform to contract requirements and for the furnishing of objective evidence.

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103. APPLICABILITY

This document when referenced in a contract or purchase order applies to all materiel or services identified therein. If any inconsistency exists between the contract requirements and this document, the contract requirements shall prevail.

104. APPLICABLE DOCUMENTS

The following NATO document forms a part of this document.

AQAP-6, "NATO Measurement and Calibration System Requirements for Industry".

The applicable issue shall be the issue in effect at the date of invitation for bids unless otherwise stated in the invitation.

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CHAPTER 2

REQUIREMENTS

201. GENERAL

The contractor shall establish, document and maintain an effective and economical quality control system, herein referred to as the System, planned and developed in conjunction with other contractor functions necessary to satisfy the contract requirements. The System shall be acceptable to the authority designated in the contract of its authorized representative, herein referred to as the Quality Assurance Representative (QAR). The contract requirements shall be met by the establishment and implementation of procedures to ensure that only acceptable materiel is presented to the QAR. The contractor shall demonstrate in the System recognition of the quality requirements of the contract and an organized approach to satisfy these requirements. The contractor shall ensure that quality requirements are identified and satisfied throughout all phases of contract performance, including as applicable, design, development, purchasing, manufacture, inspection, preservation, packing, shipping, storage and installation. The System shall provide for the early and prompt detection of deficiencies, trends and conditions which could result in unsatisfactory quality, and for timely and effective corrective action. Objective evidence that the System is effective shall be readily available to the QAR.

202. ORGANIZATION

The contractor shall prescribe in writing his organization for the management of the System. Personnel assigned to quality management functions shall have the responsibility and authority to identify and evaluate quality problems and to initiate, recommend and provide solutions during all phases of the contract.

The contractor shall appoint in writing a management representative with the necessary authority and organizational freedom to resolve matters pertaining to quality.

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203. QUALITY CONTROL SYSTEM REVIEW

Contractor management shall conduct periodic and systematic reviews to demonstrate the effectiveness of the System. Review procedures shall be established to detail the method and frequency of review, the records to be maintained, responsibility for analysis of the review data, and the use to be made of the data for corrective action. The contractor shall correct promptly deficiencies detected during reviews and notify the QAR of any major deficiencies and the revisions required in the System to correct them. System review results shall be available to the QAR.

204. PLANNING

The contractor shall conduct, at the earliest stage of contract performance, a sufficiently extensive review of contract requirements to ensure during all phases: (1) the adequate and documented control of design, development and manufacturing activities; (2) the timely identification of the material characteristics and manufacturing processes to be inspected and tested and acquisition of inspection and test equipment, fixtures, tooling and skills that may be needed to ensure product quality; (3) the updating of inspection and testing techniques including the development of new instrumentation; and (4) the compatibility of manufacturing and inspection and test procedures, and applicable documentation before manufacture begins.

205. QUALITY CONTROL DOCUMENTATION

(a) Procedures

The contractor shall develop and maintain adequate documented procedures for controlling the operating elements of the System.

(b) Work Instructions

The contractor shall develop and maintain adequate documented instructions appropriate to the circumstances for work affecting the quality of materiel and services. Work instructions shall be of a type appropriate to the contract and shall be compatible with technical requirements and include, where applicable, acceptable criteria for workmanship.

(c) Inspection and Test Instructions

The contractor shall develop and maintain instructions for the conduct of inspections and test(s) of materials, work in progress and the finished product to ensure that the specified quality is achieved.

(d) Records

The contractor shall develop and maintain records that demonstrate the effective operation of the System. These records shall be analysed and used by the contractor in managing the System. Pertinent sub-contractor records are an element of this data. Records shall as appropriate include explicit identification of the material, part, sub-assembly, assembly, equipment, sub-system or system; the nature and number of observations made, the number and type of deficiencies found, the quantities approved or rejected, and the nature of the corrective action taken. Records shall be made available to the QAR.

206. CORRECTIVE ACTION

The contractor shall establish and maintain procedures designed to detect and correct deficiencies and conditions that adversely affect quality, and, where appropriate their causes, in operations pertaining to design, purchasing, manufacturing, inspecting or other elements of contract performance. The contractor shall provide for: (1) a continuing analysis of materiel scrapped or reworked to determine the cause and corrective action needed; (2) a continuing analysis of processes and work operations to detect and eliminate potential causes of non-conforming materiel; (3) corrective action to be responsive to evidence provided by the purchaser; and (4) effective management to ensure that corrective actions, either in his own or in his sub-contractor's operations, accomplish their intended purpose.

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207. DESIGN AND DEVELOPMENT CONTROL

The contractor shall establish and maintain control of design and development functions wherever performed including the identification and control of their interfaces with other functions. Such a control shall include, but is not limited to, the provision where necessary of a design and development programme, a code of design practice and procedures, and be applied to the investigation of new techniques; the preparation and maintenance of drawings and specifications, including control of physical and functional tolerances to avoid the use of irrational limits and to ensure interchangeability; the specification of manufacturing processes; the evaluation of new materiel under appropriate environmental conditions; reliability and maintainability tasks; value engineering tasks, the establishment of design review procedures to ensure progress towards the achievement of the design and development programme objectives through the timely identification of problem areas; the use of defect data feedback from previous designs when appropriate; the transition from the design and development phase to the manufacturing phase. Before release the engineering data developed for purchasing, manufacturing, inspection, installation purposes, etc., shall be verified for accuracy, stage of completeness and conformance to contract requirements.

208. DOCUMENTATION CONTROL AND CHANGE CONTROL

(a) Documentation Control

The contractor shall establish and maintain control of all documentation essential to the accomplishment of work. The contractor's responsibility shall include where appropriate the documentation from his sub-contractors. Complete and correct issue drawings, technical requirements, contract change information, work instructions and inspection and test instructions shall be available as applicable at the time and place of manufacture and inspection and test. The contractor shall ensure that the implementation point of changes is recorded. The correct issues of the contractor's applicable procedures shall be available at locations where operations essential to the effective functioning of the System are performed. Provisions shall be made to preclude use of obsolete documents.

(b) Change Control

All changes to contractor documentation shall be in writing and processed in a manner which will ensure prompt action at the specified implementation point. The contractor shall maintain a record of changes as they are made. The contractor's procedures shall specify the extent of change and the number of changes permitted before a document is reissued. Written notations on documents are not acceptable unless they are part of a formal change procedure and are supported by properly authorized change notices.

209. CONTROL OF INSPECTION, MEASURING AND TEST EQUIPMENT

The contractor is responsible for providing, controlling, calibrating and maintaining inspection, measuring and test equipment including ancillary computer software suitable to demonstrate conformance of materiel with contract requirements. Sub-contractor-owned devices shall be subject to surveillance by the contractor to ensure their suitability for intended use, proper calibration and maintenance. Equipment shall be used in a manner to ensure measurements whose uncertainty is known and is consistent with the required measurement capability. The measurement and calibration system shall be in accordance with AQAP-6.

Jigs, fixtures, templates, patterns or other devices used as media of inspection shall be proven capable of verifying the acceptability of materiel prior to release for use during manufacture. Jigs, fixtures and tooling masters shall be reproven at established periods. The contractor shall establish the extent and frequency of such trials and maintain records as evidence of control. Design data for tools and gauges and performance data for measuring and test equipment shall be made available when required by the QAR, for verification that the devices are functionally adequate. The contractor shall identify and report to the QAR any measurement requirement involving measurement capability that exceeds the known state of the art or any new measurement capability needed to inspect the materiel in adequate time for such capability to be developed.

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210. CONTROL OF CONTRACTOR PURCHASED MATERIEL AND SERVICES

(a) Purchasing

The contractor is responsible for ensuring that all purchased materiel and services conform to contract requirements. The sub-contractor's control of quality shall be reviewed by the contractor at intervals consistent with the nature of the product and the sub-contractor's demonstrated performance. This responsibility shall include, if need be, monitoring by the contractor's staff at the sub-contractor's plant. The selection of sources, and the type and extent of controls exercised by the contractor, shall be dependent upon the type of materiel and services and the sub-contractors' demonstrated capability. The contractor shall provide objective evidence that his controls and those of his sub-contractors are effective.

(b) Purchasing Data

The purchasing document shall contain a complete and clear description of the materiel and services ordered with adequate direction for ensuring its quality control/inspection. The document shall include as applicable:

- (1) The type, class, style, grade or other precise identification.
- (2) The title or other positive identification and applicable issue of specifications, drawings, process requirements or other relevant technical data.
- (3) The quality control/inspection requirements; e.g., the appropriate AQAP or other quality requirements.

- (4) Change control instructions.
- (5) Provision for Government Quality Assurance at the sub-contractors' plant as referenced in para. 210.(d).

(c) Receiving Inspection

Incoming materiel shall not be used or processed unless and until inspected or otherwise found to conform to contract requirements. In determining the amount and nature of receiving inspection, consideration shall be given to the controls exercised at source and the objective evidence shall be given to the controls exercised at source and the objective evidence provided. Incoming materiel shall be withheld pending completion of required tests or receipt of necessary test reports. Exceptionally as prescribed by contractor procedures, materiel may be released for immediate manufacturing purposes providing such materiel does not lose its identity in processing and is identified in a positive manner that permits its immediate recall and replacement in the event that it is found unsatisfactory. Upon receipt of non-conforming materiel from a sub-contractor, the contractor shall comply with the provisions of paragraph 215 and take the necessary action to obtain appropriate corrective action. The contractor shall notify the QAR of non-conforming materiel received from a sub-contractor that has been subject to Government Quality Assurance.

(d) Verification of Purchased Materiel

The QAR reserves the right to verify at source or after receipt that the controls exercised and the materiel provided in satisfaction of the sub-contract conform with requirements. Verification by the QAR shall not relieve the contractor of

his responsibility to provide conforming materiel nor shall it preclude subsequent rejection. When government verification is performed at a sub-contractor's plant, the verification shall not be used by the contractor as evidence of effective control of quality by the sub-contractors. Government verification at a sub-contractor's plant may be requested only by the QAR. When the QAR determines that government verification is required at a sub-contractor's plant, the contractor shall provide for this in the purchasing document and forward copies with relevant technical data to the QAR on request.

211. MANUFACTURING CONTROL

(a) General

The contractor shall ensure that manufacturing and inspection and test operations are carried out under controlled conditions. Controlled conditions include documented work instructions defining the manner of manufacturing or processing, criteria for workmanship, suitable manufacturing equipment, and, when required, any special working environment. Workmanship including accept and reject criteria shall be defined to the greatest practical extent by written standard, or by samples inspected and accepted by the contractor and the QAR. The contractor shall provide for the performance of inspections and tests and identification of accepted and rejected materiel at appropriate points in the manufacturing operation. When process control is appropriate, or when physical inspection of the product is not practical, control by monitoring work operations, process methods, equipment, and personnel shall be provided. Both inspection and monitoring shall be provided when both are essential. Inspection methods or controls selected by the contractor shall be corrected whenever their unsuitability is demonstrated.

(b) Control of Special Processes

The contractor shall establish and maintain control of all special processes which form part of the manufacturing or inspection operations, or required safety precautions. Equipment, essential processing environments and personnel qualifications shall be in accordance with the contract or established procedures and be subject to approval or certification to the satisfaction of the purchaser.

212. PURCHASER SUPPLIED MATERIEL

The contractor shall establish and maintain procedures for the inspection, storage and maintenance of materiel provided by the purchaser for incorporation into supplies. Such materiel shall be inspected upon receipt as necessary to detect damage and to verify identity, completeness, and quantity. Any materiel lost, damaged or otherwise unsuitable for use shall be promptly reported to the QAR.

213. IN-PROCESS AND FINAL INSPECTION AND TESTING

(a) In-Process Inspection and Testing

The contractor shall perform inspection and testing during manufacture on selected characteristics which cannot be inspected or tested at a later stage.

(b) Final Inspection and Testing

The contractor shall perform inspection and testing on the finished product or service necessary to complete the evidence of conformance with contract requirements. Procedures for final inspection and testing shall ensure that inspections and tests that should have been conducted at earlier stages, have, in fact, been performed and that the data is acceptable and available from applicable records.

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- (c) Any unusual difficulties found during inspection and testing shall be reported to the QAR.

214. SAMPLING PROCEDURES

Sampling procedures used by the contractor shall be as stated in the contract. Any sampling plan not stated in the contract shall be subject to agreement by the QAR. Sampling plans may be used when the records, product characteristics, or the non-critical application of the product, substantiate that a reduction in inspections or tests can be implemented and still provide valid confidence that the required quality will be achieved. Sampling which is not in accordance with recognised standards shall be documented in detail.

215. CONTROL OF NON-CONFORMING MATERIEL

The contractor's procedures for controlling materiel which does not conform to technical data shall include provisions for identification, segregation and acceptance, rework or disposal, as appropriate taking into account that the acceptance of non-conforming materiel is the prerogative of the purchaser. All non-conforming materiel shall be clearly identified to prevent unauthorised use, shipment, or mixing with conforming materiel. Holding areas or procedures mutually agreed to by the contractor and the QAR shall be provided by the contractor. Procedures for rejecting, processing and dispositioning of non-conforming materiel shall be documented, and are subject to disapproval by the QAR when it can be shown that they do not provide the necessary controls. All repair and use-as-is dispositions must be acceptable to the QAR. The procedures shall provide for reinspection and retest of characteristics affected by repair, rework or replacement. Adequate records, clearly identifying the materiel, the nature and extent of non-conformance and disposition, shall be maintained and form part of the contractor's records.

216. INDICATION OF INSPECTION STATUS

The contractor shall establish and maintain a system for identifying the inspection status of materiel during all stages of manufacture. The contractor shall distinguish between inspected and uninspected materiel by using suitable identification media such as stamps, tags, routing cards, move tickets or other control devices. Where they are used, inspection stamps shall be traceable to the individuals responsible for their use.

217. HANDLING, STORAGE AND PACKING

The contractor shall establish and maintain a system for the identification, handling, storage and packing of all materiel from the time of receipt through the manufacturing process until delivery.

(a) Materiel Handling

The System shall include handling procedures that prevent abuse, misuse, damage or deterioration.

(b) Storage

Secure storage facilities shall be provided as necessary to isolate and protect materiel pending use or shipment. The condition of materiel in stock shall be assessed periodically.

(c) Packing

The contractor shall arrange for the protection of the quality of materiel and for its identification including where appropriate specified packing, preservation, marking and transit arrangements.

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218. ACCOMMODATION AND ASSISTANCE

The contractor shall provide the QAR with the accommodation and facilities required for the proper accomplishment of his work, and shall provide any assistance required by the QAR for verification, documentation, or release of materiel. The QAR shall have the right of access to any area of the contractor's or his sub-contractors' premises where any part of the contracted work is being performed. The QAR shall be afforded unrestricted opportunity to verify compliance with System procedures and conformance of materiel and services with contract requirements. The contractor shall make his inspection equipment available for reasonable use by the QAR for verification purposes. Contractor personnel shall be made available for operation of such inspection equipment as required.