



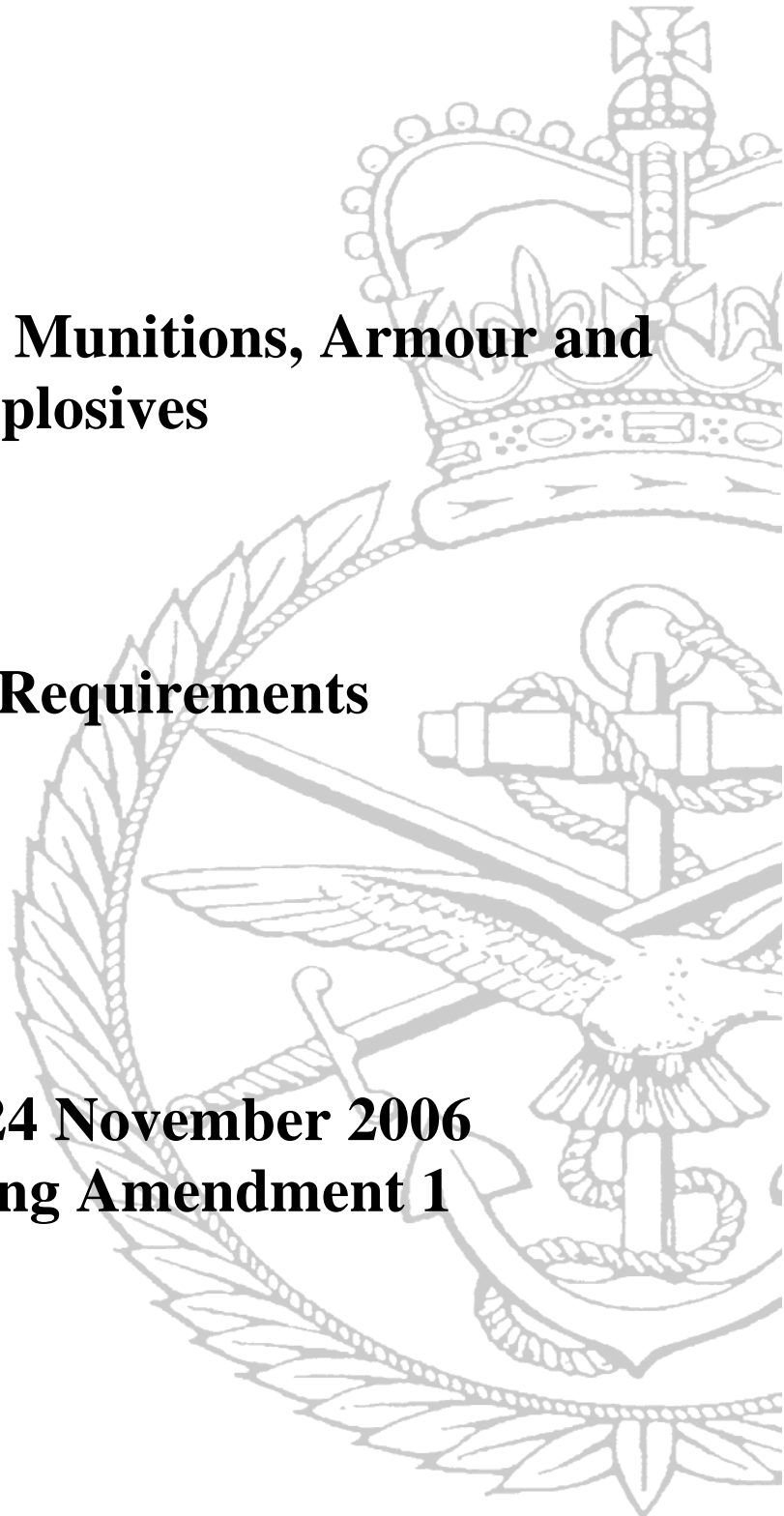
Ministry of Defence
Defence Standard 05-101 Part 1

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**Proof of Ordnance, Munitions, Armour and
Explosives**

Part 1 – Requirements

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Foreword

AMENDMENT RECORD

Amd No	Date	Text Affected	Signature and Date
1	24.11.06	Clauses 8.2 to 8.4	

REVISION NOTE

This Part (1) of the Def Stan is Re-printed at Amdt 1 to update its content.

HISTORICAL RECORD

This standard supersedes the following:

Defence Standard 05-101 Part 1 Initial Issue dated 20 May 2005.

Defence Standard 05-61 Part 11 Issue 2 dated 3 April 1992, Quality Assurance Procedural Requirements, Proof Sentencing.

Defence Standard 05-61 Part 13 Issue 1 dated 31 March 1994, Quality Assurance Procedural Requirements, Acceptance Procedures for Proof Equipment.

Defence Standard 05-61 Part 14 Issue 1 dated 26 August 1994, Quality Assurance Procedural Requirements, proof schedules for Conventional Weapons, Ammunition and Explosive Items of New Manufacture.

Defence Standard 05-61 Part 17 Issue 1 dated 31 December 1992, Quality Assurance Procedural Requirements, Proof of Explosive Operated Devices That Discharge Projectiles.

Defence Standard 13-92 Issue 3 dated 23 February 1996, Manufacture, Inspection and Proof of Ordnance of 20mm Calibre and Over, Section 4, Proof of Ordnance.

Ordnance Board Pillar Proceeding P128 (3), MOD Proof Policy for Ordnance, Munitions and Armour.

- a) This standard provides requirements for the proof of ordnance, munitions, armour and explosives.
- b) This standard has been produced on behalf of the Defence Material Standardization Committee (DMSC) by the Proof Policy and Standards Committee (PPSC). Under the auspices of Defence Ordnance Safety Group (DOSG), the PPSC is composed of representatives of the Ministry of Defence (MOD), QinetiQ and Industry and under its terms of reference acts as the UK focal point for the co-ordination and review of proof policy. The technical content of this standard is ratified by the PPSC before publication.
- c) This standard has been agreed by the authorities concerned with its use and is intended to be used whenever relevant in all future designs, contracts, orders etc. and whenever practicable by amendment to those already in existence. If any difficulty arises which prevents application of the Defence Standard, the UK Defence Standardization (DStan) shall be informed so that a remedy may be sought.

- d) Any enquiries regarding this standard in relation to an invitation to tender or a contract in which it is incorporated are to be addressed to the responsible technical or supervising authority named in the invitation to tender or contract.
- e) Compliance with this Defence Standard shall not in itself relieve any person from any legal obligations imposed upon them.
- f) This standard has been devised solely for the use of the Ministry of Defence (MOD) and its contractors in the execution of contracts for the MOD. To the extent permitted by law, the MOD hereby excludes all liability whatsoever and howsoever arising (including, but without limitation, liability resulting from negligence) for any loss or damage however caused when the standard is used for any other purpose.

Introduction

This Part of the Defence Standard specifies the policy and requirements for the proof of ordnance, munitions, armour and explosives that were previously contained in a number of Standards. The Standard addresses proof of ordnance over 51 mm (including mortars), cannon, small arms, munitions, guided weapons, rockets, mines, demolition stores, pyrotechnics, explosives, armour and armour containing explosives.

Def Stan 05-101 is in three Parts as listed below. All Parts should be considered and used where applicable.

- Part 1 – Proof of Ordnance, Munitions, Armour and Explosives, Requirements.
- Part 2 - Proof of Ordnance, Munitions, Armour and Explosives, Guidance.
- Part 3 – Proof of Ordnance, Munitions, Armour and Explosives, Statistical Methods for Proof.

Proof of Ordnance, Munitions, Armour and Explosives

Part 1 - Requirements

1 Scope

1.1 This standard specifies, in clause 6, the generic proof policy and requirements applicable to all weapons, munitions and other explosive related components. Subsequent clauses specify additional requirements specific to the proof of:

- a) Ordnance of calibres greater than 51mm.
- b) Small arms and cannon
- c) Munitions (less guided weapons and rockets).
- d) Guided weapons and rockets.
- e) Armour and armours containing explosives.
- f) Mines, demolitions, explosives and pyrotechnics.

NOTE 1 For the purpose of this standard, proof is used to mean 'proof', 'control firing' and 'functional firing' (also definition 12).

NOTE 2 Armour Proof is a ballistic test performed to check the consistency of production, and is used for the monitoring of quality for the release of an armour product.

1.2 The standard also specifies, in clause 13, the In-Service Surveillance (ISS) proof policy requirements undertaken as part of the Safety Management Plan in accordance with JSP 520.

2 Warning

The Ministry of Defence (MOD), like its contractors, is subject to both United Kingdom and European laws regarding Health and Safety at Work, without exemption. All Defence Standards either directly or indirectly invoke the use of processes and procedures that could be injurious to health if adequate precautions are not taken. Defence Standards or their use in no way absolves users from complying with statutory and legal requirements relating to Health and Safety at Work.

3 Normative References

The publications shown below are referred to in the text of this standard. Publications are grouped and listed in alpha-numeric order.

AAP 6, The NATO Glossary of Terms and Definitions

AC/225 (LG/3-SG.1)D/9 Manual of Proof and Inspection Procedures for NATO 7.62mm Ammunition (MOPI)

AOP 6, Land Forces Ammunition Interchangeability Catalogue in Wartime

AOP 38, Glossary of Terms and Definitions Concerning the Safety and Suitability for Service of Munitions, Explosives and Related Products

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Army Form BS 562-2, Daily Record of Rounds Fired

BS 3811, Glossary of Terms Used in Terotechnology

BS 4778-2, Quality Vocabulary – Part 2: Quality concepts and related definitions

BS 4778-2, Quality Vocabulary – Part 3: Availability, reliability and maintainability terms — Section 3.1 Guide to concepts and related definitions

BS EN ISO 9000 Quality management systems – Fundamentals and vocabulary

BS EN ISO 9001 Quality management systems — Requirements

CINO Form 338, Memorandum for Inspection, for Barrels

CINO Form 365, Memorandum for Inspection, for Guns

Def Stan 05-10, Drawing Procedure

Def Stan 05-61 Part 1, Quality Assurance Procedural Requirements, Concessions

Def Stan 05-101 Part 2, Proof of Ordnance, Munitions, Armour and Explosives; Guidance

Def Stan 07-85, Design Requirements for Weapons and Associated Systems

Def Stan 13-36 Part 8, Ballistic Standardisation of Gun Ammunition, Crushers and Crusher Gauges

Def Stan 13-92, Manufacture, Inspection and Proof of Ordnance of 20mm Calibre and Over

Def Stan 13-96 Part 1, Lotting and Batching of Ammunition Part 1: General Requirements

Def Stan 13-96 Part 2, Lotting and Batching of Ammunition Part 2: Land Service Ammunition

Def Stan 95-24, Armour Plate, Steel (3-160 mm)

DOSG/006/030/006 01 March 2005, Manual on Proof of Propellants for Guns, Mortars and Cannon

DPEE SOP No 59/2, Mk 8 and Mk 9 Copper Crusher Gauges

Joint Warfare Publication 0-01.1 United Kingdom Glossary of Joint and Multinational Terms and Definitions

MOD Form 77, Application of MOD Quality Assurance Authority for a Major Concession/Production Permit

MVEE 577, Proof of Cradle and Recoil Systems

Ordnance Board Pillar Proceeding P104, Procurement of Munitions Involving a Change in Manufacture

STANAG 4110, Definition of Pressure Terms and their Inter-Relationship for Use in the Design and Proof of Cannons and Ammunition

STANAG 4157, Fuzing Systems: Test Requirements for Assessment of Safety and Suitability for Service

STANAG 4187, Fuzing Systems – Safety Design Requirements

STANAG 4224, Large Calibre Artillery and Naval Gun Ammunition Greater Than 40 mm, Safety and Suitability for Service Evaluation

STANAG 4225, The Safety Evaluation of Mortar Bombs

STANAG 4403, NATO 40mm High Velocity Linked and Packed Grenade Ammunition (Note: Ratified but not promulgated)

STANAG 4493, Tank Ammunition Safety and Suitability for Service Evaluation

STANAG 4519, Gas Generators, Design Safety Requirements and S³ Evaluation

4 Definitions

Wherever practicable, the definitions used in the standard are contained in the following sources, listed in order of precedence:

- NATO AOP 38 NATO Glossary of Terms and Definitions Concerning the Safety and Suitability for Service of Munitions, Explosives and Related Products.
- NATO AAP-6 The NATO Glossary of Terms and Definitions.
- Joint Warfare Publication 0-01.1 United Kingdom Glossary of Joint and Multinational Terms and Definitions.

Where a term is used in this standard and its intended meaning is in conflict with or has a more specific application than that given in the documents listed above, the definition given in **Part 2** of this standard shall apply.

5 Abbreviations

BFA	Blank firing attachments
Cannon DP	Cannon Design Pressure
Cannon Max PP	Cannon Maximum Proof Pressure
Cannon PP	Cannon Proof Pressure
CM	Configuration Management
CSR	Configuration Status Record
DGM	Defence General Munitions
DMSC	Defence Materiel Standardisation Committee
DA	Design Authority
DLO	Defence Logistics Organisation
DPA	Defence Procurement Agency
DS	Design Sponsor
DStan	UK Defence Standardisation
EFC	Effective Full Charge

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FMECA	Failure Modes, Effects and Criticality Analysis (also known as Fault Modes, Effects and Criticality Analysis)
FTA	Fault Tree Analysis
GW	Guided Weapon
HVG	High Velocity Grenade
ISS	In-Service Surveillance
IPT	Integrated Project Team
IPTL	Integrated Project Team Leader
Min PP	Minimum Proof Pressure
MOD	Ministry of Defence
MTS	Mission Termination System
MORAT	Mortar Anti-Tank
OLT	Operating Logic Trees
PMP	Permissible Maximum Pressure
PDS	Post Design Services
PCC	Product Conformity Certification
PPSC	Proof Policy and Standards Committee
PP	Proof Pressure
PRAC	Practice Round
S round	Top Service Charge conditioned to $21 \pm 2^{\circ}\text{C}$
SA	Small Arms
SAA	Small Arms Ammunition
SH	Squash Head Round
SRD	System Requirement Document

6 Generic Proof Policy Requirements

6.1 General

6.1.1 Design Analysis

The Design Authority (DA), where applicable, shall carry out an integrated design analysis incorporating Operating Logic Trees (OLT), Failure Mode Effects and Criticality Analysis (FMECA) and Fault Tree Analysis (FTA) to identify those sub-systems and components of the munition which will require proof.

6.1.2 Product Conformity

Product Conformity Certification (PCC) shall apply to all items that are to be subjected to proof.

6.1.3 Production Control

- a) Compliance with contractual reliability, safety and performance requirements shall be demonstrated by the DA to the IPTL.
- b) Production process control shall demonstrate that the results of development and qualification trials are representative of those to be expected from production items. Where sufficient confidence in performance cannot be obtained by this method then a proof firing shall be specified.

6.1.4 Sampling Plans

The IPTL when specifying acceptance levels in the Systems Requirement Document (SRD) shall agree with the contractor sampling plans or schemes that will provide the desired level of assurance.

6.1.5 Design Trends

The trend of modifying the build standard of ordnance to enhance performance will add risk as a result of introducing unpredicted stresses. If the stresses to which a munition, weapon system or sub-system is subjected have changed then the proof schedule for that item shall be examined to see whether the new parameters lie within those to which the item has been proofed. If the parameters lie outside those of the proof schedule, it will be necessary to re-proof the item to the new parameters.

6.2 Proof Schedule

6.2.1 Proof Requirements

- a) When the requirements for proof have been established and agreed by the IPTL, the proof requirements for every weapon or product that is to be subjected to proof shall be specified either in the product specification or in a separate proof schedule. When a separate proof schedule is used, it shall be defined by reference and issue number in the product specification unless it is itself listed in the Configuration Status Record (CSR) or Technical Data Pack for the product. Any changes to the proof schedule shall be controlled in the same way as modifications to the store.
- b) Draft proof schedules (or portions of the product specification) shall be prepared by the Prime Contractor DA, or their nominated sub-contractor.
- c) The IPTL shall give final approval of the proof schedule acting on behalf of the Approving Authority for the product.
- d) Where sub-component proof is required due to a split between different DA, the Prime Contractor shall ensure that it is carried out.

6.2.2 Format

- a) While there is no standard format for proof schedules, the headings below, which are further amplified at Annex A, shall be included as appropriate:
- 1) Proof requirements.
 - 2) Proof quantity.
 - 3) Accept/reject criteria.
 - 4) Lotting.
 - 5) Proof sample selection.
 - 6) Proof equipment control.
 - 7) Conduct of proof.
 - 8) Recording results.
 - 9) Evaluating results.
 - 10) Sentencing.
 - 11) Distribution.
- b) Proof requirements shall include those safety and performance parameters that are to be measured at system and sub-system level and shall give pass/fail criteria for each test.
- c) Proof schedule aspects particularly relevant to the weapons defined at clause 1 shall be included in a weapon proof schedule as follows:
- 1) Pre-proof Inspection
 - This will cover such items as barrel bore dimensions and non-destructive flaw detection. Clear parameters of accept/reject criteria must be specified.
 - 2) Proof-overpressure test
 - This is applied by the firing of an ammunition proof round generating a higher pressure than that generated by the Service pressure. One or more rounds may be used in this test as advised by the DA and approved by the IPTL.
 - 3) Post-proof inspection
 - This is a repeat of all the pre-proof inspection checks and accept/reject criteria.
 - 4) Proof sentencing
 - Clause 6.3.
 - 5) Proof marking
 - Items sentenced to have passed proof are to be clearly marked with an MOD(DPA) approved proof mark. The required mark shall be made, in a position specified by the DA, such that it remains legible throughout the normal service life of the item to which it is

applied. Any deviation from this procedure can only be made with the approval of MOD(DPA).

- d) A proof paper showing the record of results shall also be included as part of the proof schedule and shall incorporate the details shown in clause A.8 of Annex A.

6.2.3 Review of Proof Schedules

Proof schedules shall be reviewed by the DA at 3 yearly intervals (or more frequently if the Approving Authority so requires) to ensure the continued effectiveness and efficiency of the proof scheme, taking into account the quality history of the store and any development in proof methods or statistical techniques. Proof schedules shall be reviewed if there is a change of manufacture, as defined in Ordnance Board Pillar Proceeding P104.

6.3 Proof Sentencing/Records

6.3.1 In all cases where the conduct of proof is the responsibility of the Contractor, each lot shall be sentenced in accordance with the criteria laid down in the MOD Accepted Proof Requirement. Sentenced proof papers shall be distributed as directed by the Proof Requirement or the contract.

6.3.2 There may be instances of proof requirements where the sentencing criteria is open to interpretation. Where such ambiguities are considered to exist these shall be brought to the attention of the IPTL before the contract is accepted.

6.3.3 If the Contractor has any doubt about a sentence the matter shall be raised with the IPTL. Concession applications shall be processed in accordance with Def Stan 05-61 (Part 1).

6.3.4 The Contractor shall be required to maintain proof records for a period designated by the IPTL or as required by the contract, normally the service life of the item. The retained records shall be open to the inspection of the IPTL. Proposed destruction of records of life expired items shall be notified to the IPTL who is to approve such action.

6.3.5 When the Contractor places a sub-contract which entails proof sentencing the Contractor shall retain overall responsibility for ensuring that such sentencing activities are correctly carried out to the needs of the proof requirements. The Contractor shall also ensure that the associated documentation and records are maintained in accordance with the terms of the contract. Contractors sub-contracting production to overseas contractors, shall be deemed to be responsible for ensuring that proof and proof sentencing activities are executed in accordance with the "MOD Accepted Proof Requirement" identified in the contract.

6.3.6 For in-service surveillance (ISS) testing, records are to be retained as a minimum until the Lot is used up or withdrawn from service.

6.4 Proof Equipment

6.4.1 Contracts Where Proof Arrangements Already Defined

- a) Where a contract is to be placed requiring the use of purpose designed proof equipment, the data pack issued with the Invitation to Tender shall contain such information regarding the purpose designed proof equipment as the Design Sponsor (DS) considers appropriate in the circumstances. Prospective contractors shall apply to the DS for any additional relevant information considered necessary.
- b) Where a contract is placed requiring the use of specific proof equipment and/or proof methods, the use of that specific proof equipment and/or proof methods is mandatory. If the Contractor wishes to propose an alternative, the requirements of the Configuration Management (CM) procedure invoked in the Contract shall apply. No change shall be made without the prior written agreement of the DS.

6.4.2 Contracts Where Proof Arrangements Not Already Defined

- a) Once the DS has agreed the broad principles that are to be adopted for the proof, the DS shall indicate whether the Contractor is to create a complete proof equipment data pack and submit it for DS acceptance. Such a data pack shall include all necessary drawings, CM documentation and a User Instruction defining how it shall be assembled, installed, tested, operated, maintained and calibrated as necessary.
- b) All drawings for new designs of proof equipment shall conform to Def Stan 05-10.
- c) Specially designed proof equipment shall be subject to the same Configuration Management procedure as applies to the item subject to proof. If a Certificate of Design is required for the item subject to proof, then the Contractor shall supply a Certificate of Design for the proof equipment. If a Configuration Status Record (CSR) has been produced for the item subject to proof, then the Contractor shall draft and submit a subsidiary CSR for the proof equipment to the DS.
- d) MOD agreement of the proof arrangements shall be indicated by the DS or his authorized MOD representative formally signing the specification and/or proof schedule which shall have been worded to define the agreed arrangements.

6.4.3 Custody and Issue of Proof Equipment Design Data

Depending on the procurement area concerned, either a MOD organization or a Contractor shall be made responsible for maintaining proof equipment design data and issuing change information to other United Kingdom users who shall be listed in the Post Design Services (PDS) contract concerned.

6.4.4 Equipment Data Pack Reference

Where a specific design of proof equipment has been agreed by the DS, its use shall be fully referenced in the relevant specification and/or proof schedule; for example by CSR or General Assembly Drawing Number. General statements such as "use the approved equipment" are unacceptable.

6.4.5 In-Service Proof Equipment

IPTs shall be responsible for procuring in-service proof equipment that shall replicate production facilities. Where necessary specific equipment shall have been purchased by IPTs for this to happen.

7 Ordnance, Including Mortars, of Calibre greater than 51mm

7.1 General

7.1.1 All ordnance manufactured for Service use shall first be proof fired unless it can be demonstrated that the advances in design, manufacturing processes and material make proof inappropriate. This also applies to ordnance purchased from other countries for Service use in the UK.

7.1.2 This policy applies to all components of an ordnance that are subjected to firing stresses. Any permanent attachment shall be fitted before any proof firing. Proof mountings or rigs shall be used which allow automatic or semi-automatic functioning of the breech to be proved where this is a feature of the ordnance design

7.2 Proof Schedule

7.2.1 A proof schedule shall be completed by the DA in accordance with clause 6 of this standard and approved by the IPTL before production contracts are let. The schedule shall be based on a hazard analysis of the ordnance system taking into account system design, strength of design trials completed during

development, manufacturing and quality processes and the expected induced and natural environments to which the system will be subjected during its life cycle.

7.2.2 The hazard analysis shall include the consideration of all ordnance system assemblies and sub assemblies that are subject to firing loads.

7.2.3 Schedules will vary to reflect the hazards presented by different designs and service environments. The number of weapons tested and the number of rounds fired shall be appropriate for the statistical methods used to analyse the pressure data. Each round fired shall develop chamber pressures equivalent to the Cannon Proof Pressure as defined in STANAG 4110.

7.3 Proof of Spares

The proof schedule shall form part of the weapon system acceptance test schedules and shall include provision for the proofing of spares. Spares which are subject to firing loads shall not be fitted to ordnance systems without being subject to proof or equivalent testing.

7.4 Conduct of Proof

7.4.1 All proof shall be monitored to the satisfaction of the IPTL. The contractor shall give prior notice of all proof activity to the IPT, or the appropriate authority nominated in the contract. Evidence of successful proof of the ordnance under test shall be provided to the IPT. The number of rounds to be fired is stipulated at Annex C.

7.4.2 When the ordnance has passed before-proof inspection, in accordance with Def Stan 13-92, it shall be sent to proof at a range acceptable to the IPTL, and shall be proved to the requirements set out the relevant proof schedule. The data to be recorded is listed at para 7.6. All concessions shall be agreed by the IPTL before proof, in accordance with Def Stan 05-61 (Part 1). Ordnance components with unresolved concessions may only be sent for proof at the contractor's risk. The contractor shall inform the IPTL, in writing, of all overproof or failures occurring at proof.

7.5 Preparation for Proof Firing

Prior to proof firing the ordnance shall be prepared as follows:

- a) The bore shall be thoroughly cleaned and shall be free from oil and grease. The breech mechanism shall be lubricated sufficiently to permit satisfactory operation.
- b) Obturators shall be clean and lightly oiled.
- c) All required fasteners/screw threads on an ordnance shall be either mechanically/positively locked or secured with locking adhesive to prevent slackening. The locking requirements and procedure shall be specified on appropriate drawings.
- d) Prior to proof firing, the ordnance shall be at ambient temperature.
- e) On completion of proof, the ordnance and all components shall be thoroughly cleaned before dispatch. Preservation shall be applied to cover the period of transit from the proof range to the contractor's works or other place where after-proof inspection and examination, in accordance with Def Stan 13-92, are to take place.
- f) Any special instructions regarding proof of parts of the ordnance which are not provided in this Standard shall be issued as necessary by the DA in consultation with the IPTL.

7.6 Proof Data Requirements

The following data shall be recorded as appropriate:

- a) Barrel, chamber and bore measurements, including external measurements and results of inspections and examinations before and after proof firing.
- b) Any evidence of damage or malfunctioning of the ordnance, including concessions.
- c) Muzzle velocities achieved, test procedures, instrumentation and data tolerances.
- d) Chamber pressures achieved, methods of measurement, instrumentation and data tolerances.
- e) Ambient temperature.
- f) Propelling charge designation, mass, lot number and temperature.
- g) Projectile designation and mass.
- h) Depth of ram (for separately loaded ammunition) measured from base of shot to chamber face.
- i) Cartridge head space/clearance before and after firing.
- j) Protrusion of firing pin.
- k) Documentation to show that the ordnance and ammunition components used for the proof firing were of the appropriate build standard.
- l) All ordnance components used for proofing, including slave ordnance, shall be identified.

7.7 Proof Pressures

7.7.1 The proof pressure shall be within the tolerance band specified in STANAG 4110. If this does not provide a sufficiently large tolerance to enable proof firings to be kept within this pressure band, a Minimum Proof Pressure (Min PP) lower than the optimum Permissible Maximum Pressure (PMP) shall be specified. In this instance, PMP shall be reduced in order to coincide with Min PP.

7.7.2 The Cannon Min PP and Cannon Maximum Proof Pressure (Cannon Max PP) for most types of ordnance currently in UK service are given at Annex B. Proof Pressures for ordnance procured in the future will not be added to this table but shall be detailed in the Weapon Specification documentation and held by the DA that is the custodian of this data.

7.7.3 A Proof Charge denotes a charge which at $21^{\circ}\text{C} \pm 2^{\circ}\text{C}$ produces a Cannon Proof Pressure (Cannon PP) between the Cannon PMP, which will be the Min Cannon PP and the Cannon Design Pressure (Cannon DP), which will be the Cannon Max PP.

7.7.4 Chamber pressure for calibres greater than 40 mm, shall be measured using MARK 8 or MARK 9 crusher gauges and coppers in accordance with DPEE SOP No 59/2 and crusher balls in accordance with Def Stan 13-36 (Part 8). The value of the pressure shall be determined using the tarage table appropriate to the mark of crusher gauge and the lot number of the crusher ball.

7.7.5 The contractor shall raise MOD Form 77 for all components subjected to overpressure during proof firings in accordance with Def Stan 05-61 (Part 1).

7.8 Rounds to be Fired

7.8.1 The number and nature of rounds to be fired at proof of ordnance and parts of ordnance are given at Annex C and/or in the relevant proof schedule. Should a defect develop, proof shall be stopped.

7.8.2 For reckoning purposes, rounds fired are to be entered on:

- a) Army Form BS 2562-2 Daily record of rounds fired.
- b) Naval guns on CINO Form 338 Memorandum of Inspection, for Barrels.

and/or

- c) CINO Form 365 Memorandum of Inspection, for Guns.

7.8.3 Any round fired with a charge which exceeds the mass of the top service charge or which results in pressure higher than the Cannon PMP, shall be considered a proof round. All Naval proof rounds equate to two effective full charges (EFC).

7.9 Projectiles

7.9.1 Projectiles used at proof shall be proof shot of nominally the same mass as the service projectile (banded with the same driving band), or inert service projectiles or suitable service rounds where necessary.

7.9.2 For mortar barrel proof, specifically designed mortar bombs shall be used. With the authority of the IPTL, suitable service bombs may be used.

7.9.3 In accordance with STANAGs 4224 and 4225, ammunition shall be conditioned for the minimum durations given in Table 1 below. In the UK the temperature is to be stabilized at $21^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

Table 1 —Stabilising Temperatures

Calibre (mm)	20-40	51	76	81	105	120	155
Duration (hours)	4	8	8	12	18	20	22

7.10 Firing of Additional Rounds

The total number of rounds laid down for proof in Annex C shall only be exceeded with the agreement of DA/IPTL in the following cases:

- a) When using copper crusher gauges, if for any reason a proof round does not give a sufficiently high pressure, additional proof rounds may be fired to obtain the desired pressure.
- b) Additional 'S' rounds (Rounds fired with the top service charge conditioned to $21^{\circ}\text{C} \pm 2^{\circ}\text{C}$) may be fired to test fully any defect which may be discovered.
- c) If it is required to fire additional 'S' or reduced charges for Ballistic Series, carriage or component proof, permission shall be obtained from the IPTL through the contractor. This shall only be permitted providing that, before further firing, inspection of bore and chamber and a visual examination are carried out in situ directly after gun proof. Should any abnormalities be found from these surveys that question the serviceability of the gun, further firing shall not be permitted.
- d) When proving experimental barrels, additional rounds may be fired after proof rounds at the discretion of the DA and with the agreement of the IPTL.

7.11 Proof Markings

Proof markings shall differentiate clearly between those weapons that have undergone proof firings and those that have not been fired but have been passed as suitable for service as part of a sampled batch. Those weapons and associated assemblies that have not undergone proof firing shall be stamped with the letter S.

7.12 Variations and Exceptions

7.12.1 Class 2 (Annex C) proof shall only be carried out in accordance with the terms of the contract, proof schedule or with the agreement of the IPTL, when sufficient confidence has been gained with an ordnance or associated components.

7.12.3 For a Class 2 proof, at the discretion of the IPTL, not more than two experimental charges shall be fired in place of two of the 'S' charges. In these experimental charges the pressure shall be within the permitted maximum and minimum of the proof charge. The maximum pressure in the chamber and at any position in the bore shall not exceed the design pressure at those positions.

7.12.4 For new designs of ordnance for which the nature of propellant and ballistic size have not been decided, instructions shall be issued by the DA responsible for the charge.

7.13 Submission for Reproof

If an obturator fails when proving ordnance, using new or already proved obturators, then the full proof cycle shall be repeated using a different new or already proved obturator. Should there be a recurrence of failure, then the contractor shall conduct a full investigation and report the findings to the IPTL and seek his agreement before the ordnance is submitted for reproof.

NOTE Guidance on other considerations relating to reproof is given in Def Stan 05-101 Part 2.

8 Small Arms and Cannon

8.1 Small Arms

Weapons that are categorised as small arms (SA) are identified in Def Stan 05-101 Part 2.

8.2 Hazard Assessment/Proof Schedule

8.2.1 A hazard assessment shall be conducted and the standard proof schedule applied. If a variation in the proof schedule is desired approval must be sought from the chairman of the Small Arms and Cannons Proof Policy and Standards Committee (SAPPSC) Working Group. Notwithstanding this, any variation in the proof schedule is to be as good as or better than the CIP.

8.2.2 Each weapon and component considered vulnerable to the effects of a rapid change in pressure, for example barrels, breech blocks and bolts, will be tested by firing one dry round at a corrected¹ minimum of 25% over pressure and one oiled round at a corrected minimum of 25% over pressure. 25% over pressure means 25% in excess of the Service Pressure (Pmax). The Service Pressure is defined as the mean pressure generated by the Service Cartridge at a temperature of 21°C. Such a high pressure proof is conducted with both the weapon and ammunition conditioned to an ambient temperature of 21°C.

8.2.3 Each weapon will be individually tested, as defined in Para 8.2.2, from an ammunition Lot that produces a minimum corrected mean chamber pressure in accordance with Table 2 below:

Table 2 – Corrected Proof Pressure Requirement

Calibre	Specific Weapon Detail	Proof Round Pressure Requirement (Bar)	Detailed Requirement for Proof Ammunition
5.56 mm	Designed to chamber NATO ammunition	5375	Pressure recorded in NATO design EPVAT Barrel with Kistler 6215 Transducer or by equipment to Commission Internationale Permanente pour l'épreuve des Armes à Feu Portatives ² requirements
7.62 mm	Designed to chamber NATO ammunition	5190	Pressure recorded in NATO design EPVAT Barrel with Kistler 6215 Transducer or by equipment to CIP. requirements
9 mm	Designed to chamber NATO ammunition	3150	Pressure recorded in CIP. design barrel at mid case position
12.7 mm	Designed to chamber NATO ammunition	5213	Pressure recorded in NATO design EPVAT Barrel with Kistler 6215 Transducer or by equipment to CIP. requirements
All other small arms ammunition for use in "non-NATO Chamber" weapons		As defined by the current CIP legislation.	

NOTE Further guidance on the proof schedule for SA and cannon is given in Def Stan 05-101 Part 2.

8.2.4 The proof schedule shall form part of the weapon system acceptance test schedules and shall include provision for the proofing of spares.

¹ For proof conducted by the MoD or its authorised agent (or for ammunition produced or supplied on behalf of the MoD) the mean pressure of the proof round will be calculated in accordance with the procedures contained in the relevant MoD technical specification for the ammunition. When Proof is conducted by CIP the ammunition may be produced in accordance with CIP specifications but the mean of the ammunition Lot shall meet the minimum chamber pressures specified in Table 2.

² Permanent International Commission for the Proof of Small Arms

8.3 Conduct of Proof

8.3.1 All components of an ordnance that will be subjected to firing stresses shall be adequately proofed. Any permanent attachment shall be fitted before firing. Proof mountings or rigs shall be used which allow automatic or semi-automatic functioning of the breech to be proved where this is a feature of the ordnance design.

8.3.2 All proof is to be monitored to the satisfaction of the IPTL. The contractor shall give prior notice of all proof activity to the IPTL or the appropriate Authority nominated in the contract. Evidence of successful proof of the ordnance under test shall be provided for the IPTL.

8.3.3 Weapons subjected to proof shall be visually examined and pass a Non Destructive Test (NDT) before and after firing, before the appropriate proof mark is applied. All proofed weapons should include a NDT proof mark. Proof marks may not be applied until the weapon or the highly stressed components of the weapon have been proofed in accordance with the regulations.

8.3.4 Weapons shall pass an inspection before undergoing the proof firing; this is outline in Paras 8.3.5 to 8.3.9.

8.3.5 During the inspection of distinctive markings a check is to be made as to whether the following marks have been applied in a clearly visible and durable way on at least one of those component parts of the weapon which are highly stressed:

- a. The name, corporate name, or the registered factory trademark of the manufacturer, or any other marking enabling the weapon to be identified.
- b. The serial identification numbers on the weapon.
- c. The designation of calibre on each barrel of the weapon if the weapon has barrels of different calibres, or on one barrel only if they are of the same calibre.
- d. The designation of calibre on each cylinder in the case where it is possible to change the cylinder of a revolver.
- e. Where appropriate, the marking "dust shot weapon".

8.3.6 When checking on mechanical and applied safety, and visual inspection:

- a. The check on mechanical and applied safety shall include the correct operation of the loading mechanism, of the breech, of the safety catch, and of the cocking and percussion device.
- b. The visual inspection involves looking for any faults in the material, any strength faults and any defective welding in highly stressed components, and also any possible deformation of the barrel and the chamber.
- c. For dust shot weapons, the visual inspection and check revolves around the specific nature of these weapons. Dust shot weapons are defined as short weapons only capable of firing cartridges with projectiles made of metallic shot having a diameter of less than 2 mm.
- d. If, during the course of proof of dust shot weapons, there is evidence of functional irregularities, then safety and functioning will be checked by firing 5 commercial dust shot cartridges through those weapons with single chamber, and 2 commercial dust shot cartridges from each revolver cylinder chamber. A check will be made that the weapon functioning is normal and regular and that the barrel is not blocked. If there is evidence of a barrel obstruction, the barrel will be cleaned thoroughly for a re-proof, which is allowed using double the number of commercial dust shot cartridges. On completion of this latter proof there must be no trace of defect.

8.3.7 Check of dimensions relates to the dimensions listed in Annex 4.2 of the CIP. Where a weapon whose internal barrel and chamber dimensions are not yet listed in the CIP, the proofing authority shall carry out dimensional checks on the basis of detailed information supplied by the manufacturer.

8.3.8 The NDT test shall be carried out in accordance with the schedule provided for the particular weapon. All components for proofing shall be checked and any crack detection in accordance with the schedule, before or after proof firing, results in failure of proof of the weapon.

8.3.9 Any weapons and highly stressed components that have been found to exhibit one of the faults listed below shall be rejected:

- a. Absence of distinguishing marks in accordance with Clause 8.3.5.
- b. Faults produced by incorrect forging, hammering, drilling, welding, turning or milling operations, or by other machining operations if these have an adverse effect on the function and strength, such as:
 - (1) Forging folds.
 - (2) Cracking in the material, veining breaks of continuity in the material or faulty welding.
 - (3) Poor fitting or poor welding of the barrels, hooks, or ribs and the sliding fastener.
 - (4) Score marks or other irregularities caused by the machining of the interior wall of the chamber and barrel, resulting in inadequate polishing clearly visible to the naked eye, making it more difficult to identify faults caused by the proof firing. The acceptance value for the limit of Ra is 1.8 μ for the chamber and 1 μ for the barrel, (to be checked only in the event of a dispute). If any of the irregularities referred to above are observed, and if they are not corrected, then the proofing authority shall use 3 times the specified number of proof cartridges (triple proofing).
 - (5) Pockets on the inside of the barrel and chamber.
 - (6) Phenomena similar to the bulging which appears in particular at the cones between the chamber and the barrel and at the choke, especially those which cause a reduction in strength of the walls.
- c. Depressions, folds or ripples visible to the naked eye on the inside of the barrel.
- d. Inadequate construction of the locking mechanism of the weapons, such that faultless operation cannot be guaranteed during cocking and locking.
- e. Absence of operating safety; in this respect, the following checks must be made:
 - (1) The easy operation of the locking mechanism and mechanical safety of the weapon.
 - (2) The correct operation of the loading and ejection mechanism of semi-automatic weapons.
 - (3) The totally reliable operation of the applied safety catch if fitted or method of applied safety.
 - (4) The absence of the risk of firing during loading.
 - (5) The free movement of the firing pins in their guides; the firing pins must not project beyond the abutment after cocking; there must be no burr present in the firing pin hole and at its head.
 - (6) The correct operation of the trigger mechanism (the release may not be too light, except in the case of special competition weapons).
 - (7) The reliable operation of the cylinder or revolvers.

- f. Dimensions other than those stipulated in the CIP standards; if smooth-bore weapons with a barrel bore diameter B exceeding the maximum permitted value are submitted for proof, they may be accepted provided that the calibre and corresponding length of the chamber and also the calibre corresponding to the bore diameter or the bore diameter for the calibre in question are engraved on the barrel. Moreover the bore diameter B may in no circumstances be less than the minimum set for the calibre of the chamber. Weapons with a rifling form (polygonal barrel) which deviates from the lands and grooves of conventional rifling, may be accepted if the cross section of the barrel bore is no more than a maximum of 0.7% less than the value Q given in the CIP tables, on condition that there has been no increase in pressure in comparison with a barrel having the minimum cross section.
- g. Corrosion and stains. A used weapon may, however, be accepted, but must be subjected to triple proofing.
- h. For rimfire revolvers: absence of a rim recess in the revolver chamber.
- i. If there is evidence of crack formation when inspection is carried out for the NDT test which are not in accordance with the schedule provided.

8.3.10 The proof firing shall be performed on finished weapons or on finished highly-stressed components. Weapons which require further burnishing and/or engraving shall be regarded as finished weapons. If the assembly of a weapon involved the fitting of highly-stressed components which had already been subjected to proofing, then the complete weapon shall also be subjected to proofing. In the case of weapons with more than one barrel, each barrel shall be subjected to proofing; in the case of revolvers, each chamber of the cylinder.

8.3.11 When proofing suppressors or any similar barrel attachment, these may be proofed using a slave barrel. The attachment shall pass a visual inspection and a NDT as detailed above prior and post firing. The firing of the proof rounds will consist of two 25% overpressure dry rounds.

8.3.12 If there are grounds to believe that the proof cartridge was faulty, then the proofing authority shall fire one additional round (of that type), over and above the stipulated number of rounds.

8.3.13 After the proof firing, the weapons or highly-stressed components shall pass a further inspection. The same provisions as those set out above for inspection prior to proof firing shall apply to this inspection. Any weapons and highly-stressed components which have been visibly deteriorated by the proof firing, or any weapons in which inspection has revealed one of the faults listed below, shall be rejected:

- a. Failure to fire.
- b. Unexpected discharge of the round on closing the weapon.
- c. Unexpected discharge of a number of cartridges in weapons with more than one barrel, even when commercial ammunition is used.
- d. Hard extraction of cartridge cases caused by abnormal deformation of the case. This hard extraction is to be checked using cartridges developing a mean pressure equal to P_{max} (defined in clause 8.2.2).
- e. Perforation of the primer, even when commercial ammunition is used.
- f. Any deformation of the barrel and chamber likely to impair the safety of the weapons.
- g. Any dilation of the barrel, including dilation of the form of undulations at the weakest points of barrel.
- h. Failure of welding ribs or hooks.
- i. Permanent separation of the locking mechanism in excess of the maximum value stipulated by the CIP.
- j. Deterioration or deformation of essential components of the locking mechanism.

- k. Cracking on the inside and on the outside of the barrel and chamber, and on other essential components of the weapon.
- l. Operating system clearly defective or not safe (safety and firing mechanisms; trigger, loading and ejection mechanisms, locking mechanism, and cylinder rotating device) or ineffective safety catch.
- m. Non concentricity of the barrel bore with the cylinder chamber of the revolver.
- n. Failure (appearance of cracks) due to the NDT test.

8.3.14 If any weapon fails proofing the relevant Integrated Project Team (IPT) shall be contacted.

8.3.15 In the event of the result of the proof firing giving rise to the slightest doubt as to the strength of a weapon or of one of its highly-stressed components, or if there are grounds to suspect the presence of deterioration or of a fault, or if a fault is observed in a cartridge case from a proof round, the proofing authority shall conduct an investigation in conjunction with the Chairman of the Small Arms and Cannons Proof Policy and Standards Committee (SAPPSC) Working Group.

8.3.16 Any weapons and highly-stressed components may be resubmitted for proof if it can be shown that any faults noted have been remedied. The proofing shall then be repeated.

8.3.17 If proofing has been carried out in a different manner to that specified in Def Stan 05 - 101, guidance on how to proceed must be sought from the chairman of the SAPPSC Working Group before any accepted proof mark is applied.

8.3.18 If a weapon or a highly-stressed component which has already been proofed has undergone one of the following operations, which is likely to have impaired the safety of the weapon, then that weapon or component shall be subjected to re-proofing:

- a. Replacement of a highly-stressed component, requiring fitting other than normal assembly.
- b. Any modification of the dimensions.
- c. Any perceived deterioration in the strength of the materials.

8.3.19 If a weapon being re-proofed fails, all proof marks shall be obliterated, and the weapon shall be disabled from further use.

8.4 Proof Marking

8.4.1 When an ordnance or component has passed proofing the appropriate proof mark shall be applied in the correct location on the proofed item.

8.4.2 Accepted proof marks are all those accepted by the CIP (as listed in Annex A) and the UK MOD owned proof marks. Any other proof marks may be accepted upon prior approval and agreement by the chairman of the SAPPSC Working Group.

8.4.3 Proof marks shall be engraved/stamped on:

- a. All weapons except revolvers: on each barrel and action body, frame, or the essential component parts of the locking mechanism.
- b. For revolvers: on the barrel, cylinder and frame.
- c. For weapons with a chamber that is not fixed solidly to the body of the barrel, on the barrel, each chamber and the essential component parts of the locking mechanism.

8.4.4 A proof mark that allows the year of proofing to be determined shall be applied to each weapon and to each barrel submitted separately for proofing. In addition the NDT proof mark Δ shall be applied to demonstrate the weapon has been subjected to pre and post proof testing.

8.4.5 In the case of weapon with smooth barrel(s), each barrel shall be marked, in addition to the indication of the depth of the chamber, either with the diameter of the bore at a distance of 25 +/- 3 cm from the breech face, expressed in millimetres to an accuracy of one tenth of a millimetre, or a mark known to all Proof Houses that enables the characteristics of the steel used to be identified immediately.

8.4.6 There may be occasions when it would be advantageous to engrave/stamp the proofed component with the proof pressure. This should be engraved/stamped to identify in numerical terms the bar proof pressure achieved by proof firing

9 Munitions (Less Guided Weapons And Rockets) Proof Policy

9.1 General

9.1.1 Munitions covered by this clause include:

- a) Small arms ammunition.
- b) Cannon ammunition.
- c) Grenades.
- d) Mortar ammunition.
- e) Bombs.
- f) Depth charges.
- g) Large calibre ammunition.
- h) Sub-munitions.
- i) Fuzes.
- j) Propellant.

9.1.2 Proof policy within this standard shall apply to those parts of munitions that are associated with energetic materials, associated structures subjected to pressure from the performance of energetic materials and the structures designed to absorb the firing stresses.

9.1.3 Compliance with contractual reliability, safety and performance requirements for such munitions shall be demonstrated to the IPTL. The requirements of clause 6 of this standard shall apply to all munitions except where otherwise stated.

9.1.4 Production process control shall be adequate to ensure that development and qualification trials are representative of those expected from production items.

9.2 Small Arms Ammunition (SAA)

9.2.1 Requirements contained in Defence General Munitions (DGM) IPT Production Testing and proof schedule documents, where available, shall apply.

9.2.2 The proof requirements for other natures of SAA shall be contained in a proof schedule produced in accordance with clause 6 of this Standard.

9.3 Grenades

9.3.1 The proof requirements for the 40mm High Velocity Grenade (HVG) are included in STANAG 4403 and the NATO Manual of Proof and Inspection AC/225 (LG/3-SG/1) D/17.

9.3.2 The proof requirements for other grenades shall be contained in a proof schedule produced in accordance with clause 6 of this Standard.

9.4 Mortar Ammunition

9.4.1 The proof policy and requirements of clause 10 shall apply for Mortar Anti-Tank (MORAT) mortar bombs.

9.4.2 The proof requirements for other mortar bombs shall be contained in a proof schedule produced in accordance with clause 6 of this Standard.

9.5 Bombs

9.5.1 The proof policy and requirements of clause 10 shall apply to precision guided bombs.

9.5.2 The proof requirements for other bombs shall be contained in a proof schedule produced in accordance with clause 6 of this Standard.

9.6 Sub-Munitions

9.6.1 The proof policy and requirements of clause 10 shall apply to precision guided sub-munitions.

9.6.2 The proof requirements for other sub-munitions shall be contained in a proof schedule produced in accordance with clause 6 of this Standard..

9.7 Fuzes

9.7.1 Compliance with STANAGs 4157 and 4187 shall be verified during development.

9.7.2 A proof schedule shall be produced in accordance with clause 6 of this Standard.

9.8 Propellant

Propellant proof shall comply with the policy, methods and requirements of the 'Manual on Proof of Propellants for Guns, Mortars and Cannon' , DOSG/006/030/006 dated 01 March 2005.

10 Guided Weapons (GW) and Rockets

10.1 General

10.1.1 Proof policy within this clause shall be limited to those parts of the systems or munitions associated with energetic materials and any associated canisters/tubes subject to pressure.

10.1.2 Compliance with contractual reliability, safety and performance requirements for such munitions shall be demonstrated to the IPTL. The requirements of clause 6 of this standard shall apply to all GW, rockets and relevant sub-assemblies except where otherwise stated.

10.2 Proof Schedules for GW/Rocket Sub-Systems

Proof schedules shall be provided for:

- a) The complete warhead and, as appropriate, for boosters and stemming, safety and arming units, pyrotechnic and explosive time delays, detonators and triggering mechanisms.
- b) Missile propulsion systems.
 - The schedule shall include the measurements of pressure, temperature and thrust as appropriate. Consideration shall be given, in particular when a Pressure Relief System (PRS) is employed, to inclusion within the schedule, tests to determine levels of toxicity, noise, local pressures (when used in closed areas), efflux characteristics, and the degree of particle ejection from the boost motor.
- c) Rocket motor igniters, both pyrotechnic and pyrogenic, even if these items are also assessed within the rocket motor schedule.
- d) Ignition safety devices, where provided.
- e) Power supplies, including electro-chemical components, the electrical output of the battery and, dependant on design, the thermal and pressure effects on the container.
- f) Energetic devices that form part of the missile guidance and control system.
- g) Gas generators, for which the strength of design, propellant safety and toxic contamination, safety tests and assessments shall be undertaken in accordance with STANAG 4519.
- h) Thrusters that shall be proofed in the manner most representative of their design application.
 - The missile propulsion system schedule, clause 10.2 b) above, shall include assessment of thrust vector control systems that are integral with the rocket motor.
- i) Pressure switches that are fed with gas ducted from the rocket motor casing are used to close electrical contacts, thus connecting an electrical circuit within the missile.
 - The proof schedule shall consider any electrical/pyrogenic links as well as the effects of pressure. Proof of compliance for safety critical pressurised structures shall be demonstrated by production proof pressure testing in accordance with the requirements of Def Stan 07-85.
- j) Dispensing mechanisms that employ an explosive cutting device or a gas actuator. If so, the proof schedule requirements for the energetic device used shall be specified.
- k) Flares where the proof requirements, covering energetic components, shall include, as appropriate, measurements of brightness, burn time and a check that no thermal damage is caused to the missile body. In addition, the attenuation and visibility for command signals in either the radar or infrared wavelengths shall be considered where relevant.
- l) Energetic components of the Mission Termination System (MTS) where not covered by other proof testing.
- m) Canisters/tubes where weapons are launched from tubes which are not designed with rear venting holes or from sealed canisters, shall be capable of withstanding the pressure from the rocket motor exhaust.
 - The design of the tube/canister shall take due regard of the most severe operating environment, the use of novel materials, the proximity of other equipment or personnel and the degree of protection provided by the surrounding structure.

- For one shot devices testing may be performed on representative samples during the manufacturing stage; the sample size should be assessed in accordance with the statistical methods in Def Stan 05-101 Part 3.
- Launch tubes subject to many firings shall have an assessment made of any possible degradation in strength and stiffness during the life of the item.
- Proof of compliance for safety critical pressurised structures shall be demonstrated by production proof pressure testing in accordance with the requirements of Defence Standard 07-85.

11 Armour and Armours Containing Explosive Material, Proof Policy

11.1 Armour Supplier

The Prime Contractor shall be responsible for the assessment and selection of the armour material supplier. Under Product Conformity Certification (PCC) policy, the MOD shall not directly approve any sub-contract suppliers nor directly meet any of the costs of the sub-contractor in selection of the proof test facility or of proof testing.

11.2 System Performance and Test Plan

A test plan to ensure that the armour meets the requirements of the SRD shall be prepared by the Prime Contractor and agreed by the IPTL.

11.3 Armour Material Specification and Properties

11.3.1 Material Specification

Armour components shall be manufactured and supplied to recognised and appropriate specifications acceptable to the IPTL.

11.3.2 Armour Properties

- a) The PCC supplied to the IPTL shall identify the armour material properties. These shall include chemical, physical and mechanical properties determined by the Contractor's in house quality assurance processes to at least BS EN ISO 9001 standards.
- b) The ballistic properties shall be determined using an approved Test House and appropriate certification shall be provided.

11.3.3 Ballistic Sampling Rate

The sampling rate for Proof Testing (Material Acceptance) shall be one sample per constant production batch unless agreed otherwise. The sampling for both steel and aluminium plate shall be at least one plate per melt per heat treatment. However, for multi-component armour and castings, this rate may be excessive and an appropriate sampling rate shall be agreed between the IPTL and the Prime Contractor. For personal armour, the number of samples to be tested shall be agreed with the IPTL.

11.4 Provision of Evidence for Material and System Acceptance

Acceptable documentary evidence, including that from an independent source, shall be provided to assure the IPTL that the required level of performance has been achieved.

11.4.1 Certification in Advance of Supply

The Prime Contractor shall declare to the IPTL in advance of supply:

- a) The selected specifications and their applications on the system (eg, Def Stan 95-24 for vehicle construction).
- b) For metallic materials, the chemical compositions selected for the constant production batch within the ranges defined from the selected specification(s), and the manufacturing process to be used. This also applies to proprietary metallic materials.
- c) The manufacturer of the armour components and their Quality Assurance Certification. This should include BS EN ISO 9001 as a minimum.
- d) The selected Proof Test Facility, together with details of its accreditation.
- e) A statement from the Prime Contractor on their confidence in the technical capability of their selected armour manufacturer to produce a product to the required specifications.

11.4.2 Certification of Supply

When supplying the completed product to MOD the Prime Contractor shall provide the following information as a Product Conformity Certificate:

- a) The actual armour material specification used for each application (e.g. Def Stan 95-24 for vehicle construction).
- b) For metallic material, the actual chemical composition of the material used, and the manufacturing process.
- c) The manufacturer of the armour and the Quality Assurance Certification of the manufacturer at the time of manufacture. ISO 9002 should be certified as a minimum.
- d) The Proof Test Facility used, together with a copy of their Proof Test Data and sentencing (Pass/Fail) of the armour.
- e) For metallic materials, a copy of the mechanical test report (e.g. hardness, charpy and tensile strength) certifying the mechanical properties of the armour material.
- f) The Prime Contractor's Quality Assurance Accreditation status.

12 Mines, Demolitions, Explosives and Pyrotechnics

12.1 General

12.1.1 The requirements of clause 6 of this standard shall apply to all mines, demolitions, explosives, pyrotechnics and relevant sub-assemblies except where otherwise stated.

12.1.2 Compliance with contractual reliability, safety and performance requirements shall be demonstrated.

12.1.3 Production process control shall be adequate to ensure that development and qualification trial results are representative of those to be expected from production items.

12.2 Mines

Mines are often relatively simple systems, but consideration shall be given to component proof for more complex systems to supplement complete round testing data.

12.3 Pyrotechnics

12.3.1 Proof of Safety of Life at Sea and Life Saving Stores

In addition to production proof, all stores used in a life saving role shall be subjected to a sample proof at the end of their service life.

13 Tri-Service In-Service Surveillance Proof Policy

13.1 Surveillance Plan

13.1.1 All munitions shall have a Surveillance Plan, forming part of the Safety Management Plan in accordance with JSP 520, that states the surveillance required, including frequency, sampling basis and critical attributes to be measured. The production of the Surveillance Plan is the responsibility of the IPTL.

13.1.2 The point at which In Service Surveillance (ISS) is required for life extension of a munition shall be included in the Surveillance Plan.

13.1.3 ISS shall be conducted in accordance with Service procedures.

13.2 Results and Analysis of In-Service Surveillance

All results and analysis of ISS shall be provided to the IPTL.

13.3 In-Service Failures and Defects

13.3.1 Failures and defects detected during use either at training or on operations shall be recorded as part of the ISS data. This will provide indicators toward potential failure modes or areas on which to focus attention.

13.3.2 The imposition of any ban, constraint or restriction shall be notified to each Service user.

Annex A

Format of a Proof Schedule

A.1 Proof Requirements

All the proof requirements shall be stated in the proof schedule or specification including:

- a) Safety.
- b) Lot size, proof sample size and selection - see paras below.
- c) Sequence of testing where sequential testing is employed.
- d) Pre-proofing inspection.
- e) Preparation and conditioning of products prior to test (where necessary).
- f) Proof procedure and parameters to be recorded.
- g) Post-proofing inspection.
- h) Authority and criteria for acceptance, reproof and rejection.
- i) Any criteria for suspension of proof and retention of defective products.
- j) A list of the proof equipment. When the use of a particular piece of equipment is mandatory, it shall be specified by drawing number or other unique designation, and shall be subject to approval by the appropriate Authority. In other cases, it may be sufficient to state the requirement, eg apparatus to record pressure/time characteristic. General statements such as the "approved apparatus" shall not be used.
- k) Proof Equipment Control.
- l) Tolerances on all parameters and on all measurements given in the specification.
- m) Evaluating results.
- n) Disposal instructions for any products remaining after test.

A.2 Proof Sample

A.2.1 Size

The size of the sample which is to be subjected to proof shall be dependent on the lot size and the proof sampling scheme selected as specified in the schedule. In all cases the proof sample size shall be as small as possible consistent with the level of safety, performance and reliability assurance required.

NOTE In some cases where manufacture is in small quantities, the sample size is rarely based on statistical principles and the results are only an indication of the capability of the remainder of the lot or batch to meet the performance specification.

A.2.2 Scheme

The chosen sampling scheme shall be based upon statistically valid plans except where agreed by the Authority (Proof of GW Stores may be an exception, see note above) and shall reflect:

- a) The level of quality required by the user, as defined in the Staff Requirement, or the technical requirement as defined in the contract.
- b) A high probability of accepting those lots at or above the specified level of quality.
- c) A low probability of accepting those lots that are worse than the specified level of quality.
- d) The degree of confidence required in the features being proved and should vary in response to the product quality record.

NOTE: Guidance on sampling schemes is provided in Def Stan 05-101 Part 3.

A.3 Accept/Reject Criteria

The accept/reject criteria for the proof sample shall be specified in the proof schedule. Where the sample plan chosen permits reproof this shall be defined clearly and be unambiguous as shall the accept/reject criteria.

NOTE Advice on the statistical content of proof schedules shall be obtained through the Technical Authority named in the contract.

A.4 Lotting

The system for lotting and batching of ammunition (other than GW) is specified in Def Stan 13-96. The size of the filled lot or batch shall be approved by the Project Manager and prescribed in the proof schedule.

NOTE Guided Weapon procurement follows the principles of lotting and batching but, due to the limited quantities involved, the exact details of lot and batch size are defined in the contract.

A.5 Proof Sample Selection

The proof sample shall be taken at random from the lot from which it is taken.

A.6 Proof Equipment Control

Procedures and responsibilities for control of instructions for proof equipment are described in clause 6.4 of this Standard and Def Stan 05-101 Part 2.

A.7 Conduct of Proof

The safe and satisfactory conduct of proof requires:

- a) The correct working environment.
- b) Detailed work instructions (which shall include safety criteria).
- c) Trained operators.

- d) Adequately documented and defined responsibilities.
- e) Calibrated and maintained instrumentation equipment.
- f) Approved, calibrated and maintained proof equipment.

A.8 Recording Proof Results

A.8.1 Proof Papers

The results of proof shall be recorded in a form designed to contain all information pertaining to proof required by the proof schedule, with space for any additional information that may be needed. The format of the proof paper shall be prepared as part of the proof schedule and shall be subject to approval by the MOD/IPTL. Proof papers are generally to be divided into the following sections:

A.8.1.1 Details of products

These shall include:

- a) Identification of product and manufacturer.
- b) Specification and/or drawing number(s).
- c) Lot number.
- d) Date of manufacture filling/assembly.
- e) Details of associated products including eg specification and batch/lot numbers.

A.8.1.2 Proof details

These shall include:

- a) Results of pre-proof inspection.
- b) Details of proof apparatus, gun, etc.
- c) Climatic conditions.
- d) Results of proof, eg coordinates of points of strike, muzzle velocity, pressure, function or non function, as required by the Proof schedule, presence or absence of induced defects etc.
- e) Results of post-proof inspection.

A.8.1.3 Certification

There shall be space for:

- a) Certification that proof has been correctly carried out.
- b) Contractors Proof Officer's sentence.
- c) Name of Proof Establishment and date proof carried out.
- d) MOD IPT comment.

A.8.1.4 Distribution

This shall indicate to whom the proof papers have to be sent after sentence and shall be shown on the proof papers. This shall include:

- a) Contractor's Quality Manager.
- b) MOD IPTL responsible for the store.
- c) DGM IPT (for Sea & Land stores).
- d) ALM IPT (for Air Service stores).

A.9 Calculation of Results

The methods whereby the derived statistics (eg means, standard deviation, number of failures) are required to be calculated shall be clearly defined in the proof schedule.

A.10 Sentencing

Sentencing shall include comparison of the proof statistics with the sentencing criteria in the proof schedule and the recommendations of Accept, Reject or Reproof.

A.11 Sentencing Authority

This shall indicate the name and status of the individual who is responsible for sentencing the proof results.

Annex B

Service Ordnance Proof Pressures

Ordnance Type	Min Cannon PP (MPa)	Max Cannon PP (MPa)	Remarks
Naval service			
4.5 in Mk 8	511.3	526.7	For accounting purposes, in Naval service one proof round equates to 2 x EFCs
20 mm KAA	440	500	These are proof pressure and design pressure, not min and max. Measured by Piezo Transducer.
30 mm KCB	420 (mean) 450 (single occurrence)	500	
Land Service			
Tank Guns			
Gun, 120 mm Tk L30	604.5	618	
Mortars			
Mortar 51 mm	49.4	51.7	
Mortar 81 mm L16A1	100.4	115.8	
Mortar 81 mm L16A2	109.6	125.1	
Artillery Guns			
105 mm L19 (Light Gun)	392.3	407.7	
105 mm L20 (Light Gun)	301.3	316.7	
155 mm How SP AS90 (Barrel L34A1 39 calibre)	416.2	431.6	
Air Service			
Cannon			
27 mm Mauser	550	550	
30 mm ADEN	363	394	

NOTE For all future ordnance, proof pressures will not be as detailed on this table, but on the Weapon Specification documentation. The Design Authority will specify these pressures and will be the custodian of the data.

Annex C

Charges to be Fired at Proof of Ordnance or Associated Parts

Class	Ordnance or Parts of	Charges Used	Remarks
1	a) Experimental Ordnance. b) First production ordnance of a new design from each maker. (Qty to be agreed between the IPTL and manufacturer) c) First ordnance of an existing design from a new maker. (Qty to be agreed between the IPTL and manufacturer) d) Ordnance where doubt exists regarding adequate strength. e) Barrels which have been bored out to a larger calibre. f) All Naval ordnances including Naval spare breech rings, barrels, breech blocks assemblies, muzzle brakes and mechanisms. g) Spares which require proofing. h) Guns fitted with new breech rings. i) Chain guns.	1 x S 1 x Proof Charge 5 x S (Remark 1) 4 x SH/PRAC (Remark 3)	1. 5 x S only required for semi-automatic guns and Ballistic Series of Naval barrels. On other occasions 1 x S is to be fired after the final proof rounds. 2. sub clause 7.12 for variations and exceptions to charges to be fired at proof and sub clause 7.13 for obturator failures. 3. The 4 x SH/PRAC rounds shall only be required for 120mm Tk barrels to test the adhesion of the chrome plated bore.
2	Reduced Class 1 proof for all Class 1 ordnance	1 x S 1 x Proof Charge 3 x S 4 x SH/PRAC	1. sub clause 7.12 for variations and exceptions to charges to fired at proof. 2. The 4 x SH/PRAC rounds shall only be required for 120 mm Tk barrels to test the adhesion of the chrome plated bore. 3. 3 x S only required for semi-automatic guns; on other occasions 1 x S is to be fired after proof round.
3	Breech screws, blocks and bolts vents axial (BVA) fitted to ordnance/barrels which have been previously proofed.	1 x Proof Charge or 2 x S	

Class	Ordnance or Parts of	Charges Used	Remarks
4	Revolver Cannon	1 x Proof Round	<p>1. Through each barrel, rotor assembly, breech cylinder housing and blast deflector</p> <p>2. Only one chamber is to be loaded during proof firing.</p> <p>3. A slave barrel and blast deflector is to be used for proof firing of the second and subsequent breech chamber cylinder of a new gun.</p> <p>4. It is acceptable for the breech cylinder housing to be subjected to the proof firing of each breech cylinder chamber.</p> <p>5. Spare items are to be proofed to the same scale using slave equipment dedicated to proof firing.</p>
5A	Obturators (Beldam Crossley type) a) Experimental obturators b) First production obturators c) First production obturators of an existing design from a new manufacturer	3 x lowest service charges followed by 3 x Proof Charges	<p>1. One of each new type from the first batch from each manufacturer is to be subjected to 3 rounds at the lowest service charge, and both the charge and the obturator assembly, i.e pad, BVA and any shims, are to be conditioned to the ordnance lower firing temperature, followed by 3 rounds at proof charge.</p> <p>2. sub clause 7.13 for obturator failure.</p>
5B	Obturators (Crossley type) — Routine proof obturator	One round at the lowest service charge followed by 1 x Proof Charge	<p>1. To be applied to obturators representing 10% of each batch.</p> <p>2. sub clause 7.13 for obturator failure.</p>
5C	Obturators (steel) for ordnance 120 mm Tk L11 only	1 x S 1 x Proof Charge	<p>1. For proof of an individual obturator one service charge followed by one proof charge is to be fired.</p> <p>2. For a quantity of obturators at proof on one occasion, the first obturator is to be proved in the one service charge followed by one proof charge and the remainder are to be proved with one proof charge only. If a break of more than 1 hour occurs, a further service charge must be used for the first obturator after such a break.</p>

Class	Ordnance or Parts of	Charges Used	Remarks
6	Multi Barrel Cannon	1 x Proof Round	1. Through each barrel, rotor assembly and blast deflector/diffuser 2. During proof firing only one breech chamber is to be loaded. 3. Spare items are to be proofed to the same scale using slave equipment dedicated to proof firing.
7	Muzzle breaks prototype and routine (other than Naval muzzle breaks in Class 1).	1 x Proof Charge	
8	Blow Back Cannon	1 x Proof Charge	1. Through each barrel, breech-block and blast deflector/diffuser.

NOTE 'S' signifies the top service charge conditioned to $21^{\circ}\text{C} \pm 2^{\circ}\text{C}$ that is used for the proof of ordnance.

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