



POF 1262  
(FOREIGN SUPPLIES)

Government of Pakistan  
PAKISTAN ORDNANCE FACTORIES  
TENDER ENQUIRY

To

M/s

Dear Sirs,

Reference : TENDER ENQUIRY NO. 0032/GDL/FP/49

DATED 18-JUL-18

You are requested to submit quotations for the items noted in the schedule to the tender. Offers should be sent duly sealed in an envelope. Please note the following instructions for filling the tender:-

**1. SUBMISSION OF TENDER**

1.1 Tenders will be opened at 11:00 hours on 20-AUG-18 and must reach at below

mentioned address on or before 30 Minutes up to due date. The tender received late will not be entertained. You may witness the opening of the tender if you so desire. If a representative is deputed, he should bring a letter of authority from the principal.

1.2 Only one tender should be included in one envelope. The outside of the envelope should be inscribed with:-

Tender Enquiry No: 0032/GDL/FP/49

Tender to be opened on: 20-AUG-18

Address as follows:-

MANAGING DIRECTOR POF GADWAL

CR SECTION C-04 POF WAH CANTT

TEH: TAXILA DIST. RAWLPINDI

1.3 If envelope does not indicate reference of TEs or received late the same may be returned up-opened.

1.4 Tenders will be opened at Bid Centre, Room No.3, adjacent to POF Rabita Hall.

**2. GENERAL INSTRUCTIONS REGARDING PREPARATION OF QUOTATIONS**

2.1 For materials, the prices should be filled in column 5 and delivery date in column 6 of the schedule to this Tender Enquiry. The undertaking should be signed at the bottom of the Schedule which shall form the Quotation. You may use a separate sheet if necessary.

Contd.....P-2

2.2 **For Plant and Machinery**, you are required to quote in two parts:-

**Part I "Technical Offer":** It should exclusively give technical details and literatures/ brochures of the offered plant, machinery and equipment; validity date; delivery schedule; and signed undertaking given on the schedule to this Tender Enquiry. It must not indicate price, costs etc.

**Part II "Commercial Offer":** It should indicate the commercial terms e.g. price, terms of payment, mode of payment, mode of supply.

Each part should be placed in a separate sealed cover. The envelopes should be inscribed with: Part I "Technical Quotation without Price" and Part II "Commercial Quotation with Price".

2.3 The quotation must remain valid for, at least 90 days from the date of opening of tenders.

2.4 The quotation should hold good for any reduced or enhanced quantities without notice.

2.5 In the event of non-acceptance of offer, no intimation may be given to the Tenderers on their request.

2.6 Conditional offers or alternative offers are likely to be ignored.

2.7 Quotations should be based on FOB. The consignment will be shipped through Pakistan National Shipping Corporation (PNSC). In case there is no PNSC service in the country of shipping, please quote on C & F basis. The freight should be indicated separately. Insurance premium should not be included in the quoted price. However, where insurance is considered necessary, advice to that effect should be given in the quotation.

2.8 Submission of the offer through an agent in Pakistan should be avoided. In case it is considered inevitable, the agent's quotation must invariably be accompanied by the original proforma invoice from the principals/manufacturers.

2.9 Country of origin and port of shipment to be stated

2.10 The offer of the principal must clearly indicate whether the rate quoted is inclusive of agent's commission, and if inclusive rate of commission included be specified.

2.11 Suppliers will render necessary information regarding hazardous effects on environment, of the materials/products supplied by them, in their quotations and shipping/despatch documents

2.12 If the requisite information is not furnished on the T.E form or offer received is not in conformity with the requirement of the T.E each offer shall be ignored.

### 3. INSPECTION

3.1 Supplies shall be subject to the inspection and acceptance by the competent inspection authority nominated by the Purchaser, who will arrange it at his own cost. Inspection facilities such as tools, test equipment, instruments etc will, however, be provided by the Suppliers in accordance with the relevant specifications.

3.2 Where considered necessary by the Purchaser, stores may be obtained on Warranty/Guarantee, subject to inspection on receipt. Rejected stores will be removed and replaced with the acceptable stores by the Supplier at his own expense, within a specified time.

**3.3 TENDER SAMPLE**

Where required offer must accompany tender sample strictly according to the description and specification given in Tender Enquiry. Offer not accompanied by tender sample will NOT be entertained excepting the established and reputable firms who have either previously satisfactorily supplied the same or similar stores or have submitted an acceptable sample thereof against previous T.E.

**4. ACCEPTANCE OF OFFERS**

4.1 POF may reject all bids or proposals at any time prior to the acceptance of a bid or proposals, but is not required to justify grounds for its rejection. POF Shall incur no liability towards suppliers or contractors who have

**4.2 PERFORMANCE BOND**

(a) The successful bidder will provide Performance Bond at the rate up to 10% of F.O.B value of the contract in favour of Controller Military Accounts (CMA) POF Wah Cantt. The Performance Bond will be furnished in the form of Deposit At Call Receipt (CDR) from any scheduled bank in Pakistan or an unconditional bank guarantee on prescribed proforma covered by any scheduled bank in Pakistan. The performance Bond shall be furnished within 45 days from the date of opening of Letter of Credit. It shall be valid for a period of 12 months after the date of expiry of letter of credit. If the Performance Bond is not furnished within the prescribed time of 45 days, the Purchaser reserves the right to:

i. Impose penalty @ 1% per month of the value of CDR/BG.  
(Clause-42 (a i) is not applicable in case of procurement of Plant/Equipment/Machinery items).

OR

ii. Cancel the contract and make other arrangements for purchase of the stores at the risk and expense of the Supplier.

(b) No Performance Bond will be required if the total FOB value of the contract is less than US \$50,000 and contract is placed directly on the foreign Supplier.

**4.3 FAILURE TO SUPPLY THE STORES**

All deliveries must be completed by the specified date. In case of failure to deliver the stores within the scheduled time should have arisen from "Force Majeure", which the purchaser may admit as reasonable ground for further time, he will allow such additional time as he may consider to have been required by the circumstances of the case. Otherwise, he will be entitled, at his discretion, to cancel the contract; and/or claim liquidated damages upto 2% but not less than 1% of the contract price of the items and their quantities for each and every month or part of a month, beyond the specified delivery date, during which these may not be delivered, subject to a maximum of 10% of the total contract value of the particular stores which remained unsupplied either in part or in full: or, to purchase from elsewhere, the unsupplied stores at the risk and cost of the supplier.

**4.4 PAYMENT**

Payment will normally be made by means of irrevocable letter of credit. Unless otherwise stated 90% payment will be released on submission of despatch documents to Bank while balance 10% payment will be released on receipt and acceptance of store by the consignee.

All Bank charges incurred in Pakistan in connection with the establishment of L.C. will be borne by the Purchaser, whereas all Bank charges incurred in connection with drawing of payment including charges for confirmation of L.C. by the advising Bank/Foreign Bank will be borne by the Supplier.

**5. SECURITY OF INFORMATION**

The tenderer and his employees must not communicate any information relating to the sale/purchase of stores under this enquiry to any person other than the manufacturer or to any press or agent not authorised in writing by POFs to receive it.

Please return the Schedule to the Tender duly signed by the specified date, alongwith the specifications, drawings etc., if any, enclosed herewith - even if you are unable to quote.

**WARNING** In case the firm abstain from making offers or fail to return/acknowledge the tender form by the specified date on three consecutive occasions, no further tender enquiry may be issued to them and their names would liable to be removed from the approved list.

Yours Faithfully

(MUHAMMAD MASOOD)

G.M PP&C POF GDL.

for PAKISTAN ORDNANCE FACTORIES

Tele 0092-051-9314097-98/

Fax 0092-051-9314099

Telex

**PAKISTAN ORDNANCE FACTORIES**

SCHEDULE TO TENDER NO. 0032/GDL/FP/49

DATED 18-JUL-18

**(1) FOR MATERIALS**

(1)	(2)	(3)	(4)	(5)		(6)
Item No.	Description with Specs. etc.	Unit	Qty	Price Per Unit FOB or free delivery		Delivery Date
				In Figures	In Words	
1	ADHESIVE NATURAL RUBBER RESIN TYPE QX NO. 1 SPEC: DEF-STAN 80-154/ISSUE-2	LTR		120		

WITHIN 03 MONTHS FROM THE DATE OF PLACEMENT OF ORDER

**(2) For Plant & Machinery:  
Specification:-**

**(3) Special Conditions - Store is strictly required as per attached spec**

**(4) Undertaking**

Should our offer be accepted, we hereby undertake to supply the stores/render the services contracted on the basis of Conditions of Contract embodied in Form POF 1280, and to deposit the performance bond within the prescribed time, failing which it will constitute a breach of contract, and POF will have the right to purchase the stores/services elsewhere at our risk and cost.

Place \_\_\_\_\_  
Date \_\_\_\_\_

Signature of the Tenderer \_\_\_\_\_  
Name \_\_\_\_\_  
Position \_\_\_\_\_  
Address \_\_\_\_\_  
Income Tax G.I.R. No \_\_\_\_\_



**Ministry of Defence  
Defence Standard 80-154**

**Issue 2 Publication Date 18 August 2000**

**Adhesive, Natural Rubber-Resin**

### AMENDMENT RECORD

Amd No	Date	Text Affected	Signature and Date

#### REVISION NOTE

This Defence Standard has been revised to bring the methods and procedures into line with up-to-date requirements. The requirement for Grade 2 material has been deleted as this contained a Montreal Protocol substance.

In accordance with MOD policy (promulgated in DCI GEN 197/97), Type Approval has been removed from this standard and, following a risk-based assessment of the uses of this material with explosives, replaced by Product Conformity Certification. As a result, requirements for compatibility with explosives have been added.

#### HISTORICAL RECORD

**This standard supersedes the following:**

Def Stan 80-154/1 dated 2 October 1992  
Adhesive, natural rubber-resin, grade 1 and grade 2

Def Stan 80-79/1 dated 2 June 1982  
Adhesive, natural rubber-resin, type QX

CS 1928E dated 27 February 1970  
Rubber/resin adhesive no. 1, lead free, type X and Rubber/resin adhesive no 2, lead free, type X

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PREFACE

Standards for Defence

Adhesive, Natural Rubber-Resin

- a. This standard provides requirements for adhesive, natural rubber-resin.
- b. This standard has been produced on behalf of the Standards Advisory Group (SAG), Rubbers, Plastics, Adhesives and Adhesive Tapes.
- 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 Directorate of Standardization (D Stan) 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.

## MAIN TEXT

## Standards for Defence

## Adhesive, Natural Rubber-Resin

## SECTION 1 GENERAL REQUIREMENTS

## SCOPE

1 This Defence Standard specifies requirements for a natural rubber-resin adhesive suitable for applications within the temperature range - 20 °C to + 60 °C.

2 The material may be suitable for certain applications where compatibility with explosives is a requirement. However, compatibility with all explosives in all environments has not been established and Design Authorities should seek advice on particular applications. Further information may be obtained from Defence Standard 13-102; Testing of Materials which are Required to be Compatible with Explosives.

## WARNING

1 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.

2 Particular attention is drawn to the following hazards although the list may not necessarily be exhaustive:

Potassium cyanide (see Annex D).

## RELATED DOCUMENTS

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

Designation	Title
BS EN ISO 3696	Water for Analytical Use Specification and Test Methods
BS EN 28510-2	Adhesives. Peel Test for a Flexible-Bonded To-Rigid Test Specimen Assembly. Part 2 180° Peel
BS EN 45014	General Criteria for Supplier's Declaration of Conformity
BS ISO 1042	Laboratory Glassware-One-Mark Volumetric Flasks

**DEF STAN 80-154/2**

**SECTION 1 GENERAL REQUIREMENTS**

BS 871	Specification for Abrasive Papers and Cloths
BS 5214	Specification for Testing Machines for Rubbers and Plastics Part 1: Tensile, Flexural and Compression Types (Constant Rate of Traverse)
BS 5350	Methods of Test for Adhesives Part B2: Determination of Solids Content Part B8: Determination of Viscosity
BS 7164	Chemical Tests for Raw and Vulcanised Rubber. Part 10: Method for Preparation and Examination of Water Extract
BS 7392	Method for Determination of Distillation Characteristics of Petroleum Products
BS F 55	Specification for 345 g/m <sup>2</sup> and 415 g/m <sup>2</sup> Cotton Canvas Fabrics Suitable for Aerospace Purposes
Def Stan 13-102	Testing for Materials which are Required to be Compatible with Explosives
Def Stan 68-148	Solvent for Cleaning Electrical Equipment

3.2 Reference in this standard to any related document means in any invitation to tender or contract the edition and all amendments current at the date of such tender or contract unless a specific edition is indicated.

3.3 In consideration of 3.2 above, users shall be fully aware of the issue and amendment status of all related documents, particularly when forming part of an invitation to tender or contract. Responsibility for the correct application of standards rests with users.

3.4 D Stan can advise regarding where related documents are obtained from. Requests for such information can be made to the D Stan help desk. How to contact the help desk is shown on the outside rear cover of Def Stans.

**INFORMATION TO BE SUPPLIED BY THE PURCHASER**

Where the adhesive is to be used in contact with, or close proximity to, explosives, the purchaser shall state clearly in the order the following requirements:

4.1 The explosive(s) with which the material shall be compatible.

4.2 Whether details of the explosive(s) with which the material is compatible shall be marked on the containers (see 9.2).

4.3 Any other Product Conformity Certification requirements.

## SECTION 1 GENERAL REQUIREMENTS

## 5 COMPOSITION

5.1 The ingredients shall consist essentially of petroleum solvent, natural resin, filler and natural rubber. The petroleum solvent shall be an aliphatic petroleum fraction having a boiling point within the range of 65 to 115 °C when tested by the method described in BS 7392.

5.2 No reclaimed rubber shall be used.

## 6 PRODUCT CONFORMITY CERTIFICATION

6.1 The supplier shall submit evidence that the material complies with clause 5 and the test requirements of clause 7.

6.2 Alternatively, and with the agreement of the purchaser, the contractor shall submit a declaration of conformity that the product complies with all requirements of the standard, including any explosive compatibility testing. A suitable format for the declaration of conformity is given in BS EN 45014.

## 7 TEST REQUIREMENTS

All samples taken from any portion of the supply shall be in accordance with clause 5, of a uniform dispersion or in such condition that stirring readily produces a uniform dispersion, free from visible impurities and foreign matter, and, when tested by the methods specified, shall comply with the requirements of Table 1.

Test	Property	Requirement	Method of test
1	Consistency	The material shall be in such a condition that hand stirring easily produces an adhesive of satisfactory brushing consistency	
2	Viscosity, Pa.s	8.0 min 14.0 max	BS 5350: Part B8: Method 2 Brookfield RVT (or equivalent) at $(23 \pm 1)^\circ\text{C}$ Spindle 5 Speed 20
3	Total solids content, % m/m	47.0 min 53.0 max	BS 5350: Part B2 maintaining the oven at $(100 \pm 2)^\circ\text{C}$ for $(60 \pm 5)$ mins (or an equivalent method)

Ref. M. S. 22978F

1000 CP = 1 Pa.s Sec  
10P = 100 Pa.s Sec

10P = 100 x Density of liquid

## SECTION 1 GENERAL REQUIREMENTS

Test	Property	Requirement	Method of test
4	Aqueous extract		Annex A
	(a) pH	5.0 min 8.0 max	
	(b) Chloride, % m/m calculated as NaCl	0.10 max	
	(c) Sulfate, % m/m calculated as Na <sub>2</sub> SO <sub>4</sub>	0.20 max	
5	Peel strength, N	100 min	Annex B
6	Surface drying time, minutes	15 max	Annex C
7	Lead content, % m/m	0.03 max	Annex D
8	Compatibility with explosives	Shall be compatible	Annex E

## 8 KEEPING QUALITIES

When stored in the original unopened containers at temperatures between 5 and 30 °C, the material shall continue to comply with the requirements of this Standard for a period of not less than nine months from the date of manufacture. Unless otherwise specified in the contract or order, the adhesive shall be dispatched with at least two thirds of unexpired storage life remaining.

## 9 CONTAINERS AND MARKING OF CONTAINERS

9.1 The material shall be supplied in sound, clean and dry containers suitable for the product and in accordance with any additional requirements of the contract or order. The use of contaminated containers will render the whole consignment liable to rejection. After filling, each container shall be securely closed.

9.2 It is the manufacturer's responsibility to mark containers in accordance with any legal requirements. In addition, the containers constituting a consignment shall each be legibly and durably marked with the following details:

- a. Designation viz: ADHESIVE, NATURAL RUBBER-RESIN
- b. Defence Standard number viz: Def Stan 80-154/2
- c. Contract or Order number:

**SECTION 1 GENERAL REQUIREMENTS**

- d. Distinctive Batch number;
- e. Quantity of Contents;
- f. Date of Expiry;
- g. Manufacturer's name, initials or recognized trade mark;

and such other markings as may be prescribed in the terms of the contract or order.

**9.3** The amount of lead and lead compounds, in any part of the containers, shall not exceed 0.5% by mass calculated as metallic lead. This restriction applies to the material used in the construction of the packages, any coating thereof and any solder used for the manufacture, repair, or sealing of the packages.

ANNEX A

**METHOD OF PREPARATION AND EXAMINATION OF WATER EXTRACT**

- A.1 Apply a thin even coating of the adhesive on to siliconized release paper, to give a dry film mass sufficient for the required tests.
- A.2 Allow to dry to constant mass at a temperature between 20 °C and 50 °C in a dust free atmosphere.
- A.3 Remove the film by peeling from the release paper.
- A.4 Prepare a water extract and determine the pH, chloride content and sulfate content in accordance with BS 7164: Part 10.

## ANNEX B

## METHOD OF TEST FOR THE DETERMINATION OF PEEL STRENGTH

**B.1 Apparatus and Materials**

- B.1.1** Three mild steel test plates ( $40 \pm 0.5$ ) mm wide, approximately 90 mm long and at least 2 mm thick.
- B.1.2** Strips of cotton fabric  $345 \text{ g/m}^2$  (complying with BS F 55) 200 mm long and 50 mm wide, cut with their lengths in the warp direction.
- B.1.3** A tensile testing machine complying with BS 5214: Part 1, Grade A.
- B.1.4** A smooth cylindrical steel roller 130 mm diameter by 100 mm long.
- B.1.5** An oven maintained at  $(50 \pm 2)^\circ\text{C}$  ventilated to provide at least two changes of air per hour and large enough to permit free circulation of air around individual test assemblies.
- B.1.6** Grade 0 blue twill emery cloth complying with BS 871.

**B.2 Procedure**

**B.2.1** Degrease one face of a test plate by wiping it thoroughly with a clean lint-free rag saturated with hydrocarbon solvent. Abrade the surface by hand buffing with a circular motion using blue twill emery cloth and finally clean it with another clean lint-free rag saturated with hydrocarbon solvent.

Note: Solvents based on isomers of hexane, heptane or octane have been found to be suitable for cleaning adherend surfaces. Solvents shall contain less than 2% n-hexane. In cases where flammability may be a potential hazard, proprietary cleaners to Def Stan 68-148 may be used.

**B.2.2** Using a small flat short bristle brush, apply a thin uniform coating of the adhesive to the whole of the prepared surface of the test plate with the exception of a margin approximately 10 mm wide at one end.

**B.2.3** Apply a uniform coating of the adhesive to one side of the strip of fabric material over the whole of its width for a distance of 80 mm from one end, working the adhesive well into the fabric. Allow the coatings to dry in a dust-free atmosphere at a temperature of  $(23 \pm 2)^\circ\text{C}$  for 30 minutes. Apply a second coat of the adhesive to the already coated area of the fabric and allow to stand at  $(23 \pm 2)^\circ\text{C}$  for 3 minutes.

**B.2.4** Lay the steel plate length wise along the middle of the fabric strip with the uncoated areas adjacent so that the coated areas are superimposed, leaving an overlap of 5 mm of fabric at each side of the steel plate and taking care to eliminate any air bubbles between the coated surfaces.



**ANNEX B METHOD OF TEST FOR THE DETERMINATION OF PEEL STRENGTH**

**B.2.5** Roll the assembly immediately, on the fabric side, with the cylindrical steel roller, first transversely (4 times in each direction) then longitudinally (4 times in each direction). Allow the assembly to stand at a temperature of  $(23 \pm 2)$  °C for a period of 2 to 4 hours fabric side uppermost, then place it in the oven at  $(50 \pm 2)$  °C for a period of  $(16 \pm 1)$  hours. At the end of this period remove the assembly from the oven and allow to stand at room temperature for 4 to 6 hours.

**B.2.6** Determine the mean peel strength and express the result as described in BS EN 28510-2, excluding clause 10, but at  $(150 \pm 5)$  mm/min.

**B.3 Reporting**

**B.3.1** Report the mean peel strength in newtons.

## ANNEX C

## METHOD OF TEST FOR THE DETERMINATION OF SURFACE DRYING TIME

C.1 Spread a sample of the adhesive on to a clean glass plate to form a uniform film which will give a dry film of approximately  $300 \text{ g/m}^2$ . Expose the plate horizontally, with the prepared face uppermost, avoiding dust, draughts and direct sunlight, at a temperature of  $(23 \pm 2) \text{ }^\circ\text{C}$ .

C.2 Determine whether or not the time required for the film to become surface dry when tested with the knuckle is within the specified period.

## ANNEX D

## METHOD OF TEST FOR THE DETERMINATION OF LEAD

**D.0** For routine control purposes any Standard method, which can be shown to give equivalent results, may be used. The following method shall be used in cases of dispute.

**WARNING:** This method calls for the use of potassium cyanide. Suitable precautions should be in place before the test is commenced.

**D.1 Apparatus**

**D.1.1** Silica crucible.

**D.1.2** A matched pair of Nessler cylinders of 50 ml capacity.

**D.1.3** One-mark volumetric flasks complying with BS ISO 1042, class A (narrow-necked).

**D.2 Reagents**

**D.2.1** Cyanide antidote(s)

**D.2.2** Water complying with BS EN ISO 3696, Grade 3.

**D.2.3** Gum arabic solution. 1% m/m aqueous solution of powdered gum acacia (gum arabic) BP, freshly prepared.

**D.2.4** Ammonium citrate solution. 10% m/m aqueous solution of ammonium citrate.

**D.2.5** Ammonia solution. Dilute one volume of concentrated ammonia solution ( $d = 0.88$  g/ml) with three volumes of water.

**D.2.6** Potassium cyanide solution. 10% m/m aqueous solution.

**D.2.7** Sodium sulfide solution. 10% m/m aqueous solution which shall be freshly prepared before use.

**D.2.8** Ammonium acetate solution. 50% m/m aqueous solution.

**D.2.9** Standard lead solution. Dissolve 1.60 g of lead nitrate in water to make 1 litre of solution. From this "stock" solution prepare a "working standard" solution by diluting 1 ml of the "stock" solution to 50 ml with water immediately before use (1 ml = 0.02 mg Pb).

**D.3 Procedure**

**D.3.1** Weigh accurately approximately 5 g of dried film (prepared as described in Annex A) into a silica crucible and heat gently over a Bunsen flame to remove all volatile material. Finally heat in a muffle furnace at  $(450 \pm 20)$  °C for four hours. Remove the crucible and allow it to cool.

**ANNEX D METHOD OF TEST FOR THE DETERMINATION OF LEAD**

**D.3.2** Moisten the contents of the crucible with sulfuric acid ( $d = 1.84 \text{ g/ml}$ ), add 1 ml of nitric acid ( $d = 1.42 \text{ g/ml}$ ) and heat until most of the nitric acid is driven off. Repeat the process until no carbonaceous matter remains.

**D.3.3** Moisten the residue again with sulfuric acid and heat to fuming. Allow the crucible to cool, add 5 ml of water and boil until no more brown fumes are evolved. Wash the contents of the crucible into a 250 ml beaker using 50 ml of the ammonium acetate solution and boil gently for 10 minutes. Allow the solution to cool and transfer to a 250 ml one-mark volumetric flask and make up to the mark with water.

**D.3.4** Transfer accurately 25 ml of the solution to a 50 ml Nessler cylinder and add the following reagents in the order given, mixing well after each addition:

1. 2 ml of gum arabic solution.
2. 5 ml of ammonium citrate solution.
3. Ammonia solution until slightly alkaline to litmus.
4. 1 ml of potassium cyanide solution.
5. 2 drops of sodium sulfide solution.

**D.3.5** Dilute the contents of the Nessler tube to 50 ml with water, mix well and compare the resultant colour with that produced by treating known volumes of the standard lead solution with the same reagents.

**D.3.6** Determine the lead content of the sample solution by reference to the standards.

**D.3.7** Calculate the lead content as a percentage by mass of the sample.

**Note** The addition of gum arabic reduces the depth of colour of the colloidal lead sulfide considerably and an equal quantity must be added to both the sample and standard solutions.

ANNEX E

COMPATIBILITY WITH EXPLOSIVES

**E.1 General**

The explosive(s) with which the material shall be compatible are to be stated by the purchaser in any order (see 4.1).

**E.2 Frequency of Test**

**E.2.1** Whenever possible, the compatibility tests shall be undertaken on the batch supplied (see Def Stan 13-102, Category 3 materials). With the agreement of the purchaser, the supplier may submit results from compatibility tests conducted on another batch as evidence supporting Product Conformity Certification. The supplier shall confirm that the batch supplied has the same composition and was manufactured by the same process, at the same location, as the batch tested.

**E.2.2** The compatibility of the material shall be tested whenever a change is made to the manufacturing process, the manufacturing location or the composition, or when requested by the purchaser.

**E.2.4** At all times, any material supplied shall be compatible with the explosives specified by the purchaser.

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Defence Procurement Agency  
An Executive Agency of The Ministry of Defence  
Directorate of Standardization  
Kentigern House  
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GLASGOW G2 8EX

#### DStan Helpdesk

Tel 0141 224 2531/2  
Fax 0141 224 2503  
Internet e-mail enquiries@dstan.mod.uk

#### File Reference

The DStan file reference relating to work on this standard is D/DStan/80/154.

#### Contract Requirements

When Defence Standards are incorporated into contracts users are responsible for their correct application and for complying with contractual and statutory requirements. Compliance with a Defence Standard does not in itself confer immunity from legal obligations.

#### Revision of Defence Standards

Defence Standards are revised as necessary by up issue or amendment. It is important that users of Defence Standards should ascertain that they are in possession of the latest issue or amendment. Information on all Defence Standards is contained in Def Stan 00-00 Standards for Defence Part 3, Index of Standards for Defence Procurement Section 4 'Index of Defence Standards and Defence Specifications' published annually and supplemented regularly by Standards in Defence News (SID News). Any person who, when making use of a Defence Standard encounters an inaccuracy or ambiguity is requested to notify the Directorate of Standardization (DStan) without delay in order that the matter may be investigated and appropriate action taken.

DEF STAN 13-95/1  
COPPER AND GILDING METAL RINGS  
FOR DRIVING BANDS

This Defence Standard supersedes  
BS STA 13 dated March 1943

1. This Defence Standard specifies requirements for copper and gilding metal rings for driving bands for shell and shot including proof shot.
2. This Standard has been prepared because there is no suitable national or any other standard acceptable to the Ministry of Defence available.
3. This Standard contains essential technical information and it is the definitive specification for this material. It must be invoked for all tender and contract purposes.
4. This Standard has been agreed by all authorities concerned who are to implement it from its date of issue.
5. If this Standard should be found unsuitable for a particular requirement, the Director of Standardization shall be informed of the circumstances. Any enquiries regarding this Standard in relation to an invitation to tender or a contract in which it is invoked should be addressed to the Quality Assurance Authority named in that invitation to tender or contract.

SPECIFICATION FOR  
COPPER AND GILDING METAL RINGS FOR  
DRIVING BANDS

1. SCOPE

This Standard covers the supply of copper and gilding metal rings for driving bands for shell and shot including proof shot. It specifies the material requirements, the methods of manufacture and the tests required.

2. INFORMATION TO BE SUPPLIED BY THE PURCHASER

The following information shall be stated in the contract or order:

- a. Material - copper or gilding metal (see clause 4).
- b. Type of ring (see clause 5).
- c. Dimensions and tolerances (see clause 8).
- d. Arrangements for Quality Assurance (eg DEF STAN 05-24, or whether it is the purchaser's intention to inspect the material at the supplier's works).
- e. Any special requirements (see clause 6 and sub-clause 9f).

3. RELATED DOCUMENTS

a. Reference is made in this Standard to:

- |                     |  |
|---------------------|--|
| BS 427:Part 1:1961  | 'Method for Vickers hardness test - testing of metals'         |
| BS 1172:1964        | 'Phosphorus deoxidized non-arsenical copper'                   |
| BS 2871:Part 2:1972 | 'Copper and copper alloys, tubes - tubes for general purposes' |

b. The related documents listed above are those applicable at the date of publication of this Standard. Their current applicability must be confirmed by all users of the Standard. The Quality Assurance Authority will supply, on request, information concerning any changes that may be necessary due to the cancellation, replacement, supersession or amendment of the related documents.

4. CHEMICAL COMPOSITION

The rings shall be made from phosphorus deoxidized copper to BS 1172: 1964 or from gilding metal (copper 10% zinc alloy) as stated in the contract or order. The compositions shall comply with Table A.



TABLE A

ELEMENT	PHOSPHORUS DEOXYDIZED COPPER BS 1172:1964		GILDING METAL	
	Per Cent		Per Cent	
	Min.	Max.	Min.	Max.
Copper (including silver)	99.85	-	89.0	91.0
Tin	-	0.01	-	0.03
Lead	-	0.010	-	0.02
Iron	-	0.030	-	0.05
Nickel	-	0.10	-	0.10
Arsenic	-	0.05	-	0.02
Antimony	-	0.005	-	0.01
Bismuth	-	0.0015	-	0.
Phosphorus	0.013	0.050	-	0.01
Selenium and Tellurium	-	0.020	-	-
Tellurium	-	0.010	-	-
Zinc	-	-	remainder	
Total impurities	-	0.060 (excluding silver, arsenic, nickel, and phosphorus)	-	0.10 (excluding silver, and nickel)

5. MANUFACTURE

The rings shall be one of the following types as stated in the contract or order. Only one type shall be specified in any one order.

Type I

Cut from solid drawn seamless tube and annealed after cutting.

Type II

Cut from cups drawn from sheet, strip or plate and annealed after cutting.

Other methods of manufacture may be permitted with the prior agreement of the purchaser, the Quality Assurance Authority and the Design Authority for the store.

6. CONDITION

Rings shall be supplied in the bright annealed or annealed and pickled condition as agreed with the purchaser so as to comply with sub-clauses 9c, 9e and 9f.

7. QUALITY

The rings shall be clean, sound, free from scale, laminations, cracks, blow holes, inclusions, or other defects prejudicial to their use. The surfaces shall be smooth all over and free from swarf or burrs.

8. DIMENSIONS AND TOLERANCES

The dimensions, and tolerances on dimensions, shall be as specified in the drawing, order or contract.

9. INSPECTION AND TESTS

a. General.

The supplier shall notify the purchaser named in the contract or order when he is about to start work on the contract or order and shall grant to the purchaser, or his representative, who may be the Quality Assurance Authority, facilities to inspect the manufacture at all stages. The supplier shall select and identify samples for the tests, in clauses 9b, 9d, 9e and 9f. Except where indicated below, the frequency of the sampling shall be agreed between the supplier and purchaser, or his representative. Where rings are manufactured by the projectile body manufacturer, the flattening test, clause 9f may be waived by agreement with the Quality Assurance Representative.

b. Analysis.

- (1) A representative sample of each cast of copper or gilding metal shall be analysed and the results shall conform to the requirements of clause 4 above. Where casting is continuous or semi-continuous, a sample shall be taken from each casting furnace at intervals agreed between the supplier and purchaser or his representative. This sample shall be analysed and the cast product identified with it.
- (2) The frequency of analysis for impurity elements may be reduced with the agreement of the purchaser and the Quality Assurance Representative, provided that the chemical composition has consistently complied with clause 4 above. If the analysis at the reduced frequency shows that the composition does not meet the impurity requirements every sample subsequent to the last satisfactory sample shall be fully analysed. All subsequent samples shall be fully analysed until the cause of the discrepancy has been investigated and eliminated to the satisfaction of the Quality Assurance Representative.

c. Examination for defects.

All rings of 40 mm calibre and above shall be visually examined and shall conform to the requirements of clause 7. For rings of calibres below 40 mm, visual examination shall be carried out to a sampling plan which shall be agreed with the Quality Assurance Representative. The rings shall conform to the requirements of clause 7.

9. 8. Dimensional check.

Representative rings produced on each set of tools, drawing dies, etc, shall be gauged and shall conform to the requirements of clause 8.

9. Hardness tests.

Representative rings shall be hardness tested in accordance with BS 227 Part 1:1961. The hardness of copper rings shall not exceed 55 HV and the hardness of gilding metal rings shall not exceed 65 HV.

9. Flattening tests.

Representative rings shall be flattened until the interior surfaces meet, in accordance with BS 2871:Part 2:1972 clause 10.3. The rings shall be tested if the rings are to be assembled to projectiles by a hot banding process the flattening test shall be carried out at the temperature specified in the contract or order.

9. Rejection.

(a) If any of the test samples first selected fails to pass the tests specified in clauses 9e or 9f further samples selected as agreed with the purchaser or his representative may be tested. Should all the additional samples pass, the rings represented by the test sample shall be deemed to comply with this Standard. Should any sample fail, the rings represented shall be deemed not to comply.

(b) The supplier may, if he wishes, re-anneal all of the rings represented by the failed sample and re-submit them for the tests specified in clauses 9e, 9f and 9g.

10. REMARKS

All accepted rings shall be covered by release documentation and in addition be identified or bear identification markings or collies which will enable the purchaser to trace the product.

- 1. Specification: DEF STAN 13 - 95/1
- 2. Material: Copper or gilding metal
- 3. Form: Type I or Type II
- 4. Dimensions: as shown
- 5. Marking: as shown
- 6. Test number:
- 7. Order number: