Defence Works Functional Standard
Specification 032

Internal Coating of Aviation Fuel Tanks

DEFENCE ESTATE ORGANISATION (WORKS)
MINISTRY OF DEFENCE

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Internal Coating of Aviation Fuel Tanks

AIRFIELDS AND BULK FUELS GROUP (ABFG)
DEFENCE ESTATE ORGANISATION (WORKS)

Ministry of Defence

London: HMSO

ISBN 0 11 772481 5

Foreword

This document is for the use of Top Level Budget Holders (TLBHs) for application by the Project Sponsors, Property Managers (PROMs), Project Managers (PMs), Establishment Works Consultants (EWCs), Works Services Managers (WSMs) and other parties involved in the internal coating of aviation fuel storage tanks on the MOD Estate.

This Standard is expected to be used by principally by EWCs, WSMs, PMs and tank coating Contractors: it replaces DOE/PS A Standard Specification (M&E) No 24 'Internal Coating of Static Bulk Aviation Fuel Tanks, Pipelines and Fittings'.

This document sets out the means by which the WSM or PM can provide an internal coating regime which meets the performance requirements for fuel quality, coating integrity and intended tank life.

Amendments to this Functional Standard will be advised by DEO(W) Technical Bulletin, issued to PROM and TLBH Works Staff. It is the responsibility of the user to check with the PROM or Project Sponsor if amendments have been issued. There is a feedback sheet at Annex B, for suggested changes or developments to the document.

Technical advice and assistance on MOD petroleum matters can be obtained from DEO(W). Approaches may be through local DEO(W) offices or directly to the petroleum Technical Authority, (DEO(W)TA):

Head of Bulk Petroleum Installations
Airfields and Bulk Fuels Group
Defence Estate Organisation (Works)
St. George's Barracks, Blakemore Drive
SUTTON COLDFIELD
West Midlands
B75 7QB

Compliance with a DEO(W) Functional Standard will not of itself confer immunity from legal obligations.

Abbreviations

BS	British Standard
DFT	Dry Film Thickness
DEO(W)	Defence Estate Organisation (Works)
DRA	Defence Research Agency
EWC	Establishment Works Consultant
MOD	Ministry of Defence
PM	Project Manager
PROM	Property Manager
TA	Technical Authority
TLBH	Top Level Budget Holder
WSM	Works Services Manager

Contents

Section 1 General Requirements

1.1 INTRODUCTION

Installation of a coating system is an effective method of protecting steel tanks from corrosion or product contamination. The specific reason for coating aviation fuel tanks is to minimise the risk of migration of the products of corrosion into the aviation fuel. The selected coating must not degrade the performance of any fuel which is in contact with it, neither must the fuel degrade the coating.

There are three essential factors to tank coating:

— selection of the appropriate coating system

— proper surface preparation

— correct application

This Standard was prepared to enable developments in coating technology to be applied within a framework determined by performance requirements.

Within this Functional Standard the terms coating, painting and lining shall be synonymous.

This Standard must be utilised for the internal coating of all tanks containing aviation fuel.

This Standard is so arranged to enable current and future coating media approved to Def Stan 80-97 to be applied and also to permit new coating media to be used provided that compliance is attained with the approval test procedures.

The approval test procedures specified in Annex A are to be undertaken with the grade of fuel intended for the tank. Present fuel grades are:

NATO Code	Joint Service Designation
F-18	AVGAS 100 LL
F-34	AVTUR / FSII
F-35	AVTUR
F-43	AVCAT
F-44	AVCAT / FSII

To ensure future flexibility it is recommended that the approval test procedures are undertaken with all fuel types.

1.2 AIM

The aim of this Functional Standard is to:

a. Detail the inspection and test requirements for coated tanks.

b. Advise the Contractor and WSM or PM of the requirements of achieving approved coating systems.

c. Provide the Contractor with details of the surface preparation and application requirements of coating systems.

1.2.1 ARRANGEMENT

The document is arranged in the following manner, to achieve the aim:

a. Section 1 defines the applicable standards and regulations.

b. Section 2 advises the safety requirements to be employed.

c. Sections 3 and 4 provide details of tank preparation and coating application.

d. Section 5 indicates the requirements for achieving type/qualification approval of coating systems.

e. Sections 6 and 7 provide details of quality requirements.

1.3 DEFINITIONS

The terms used within this Standard shall be read as having the definitions given below:

Approving Authority: The organisation responsible for acceptance of the paint products and systems for use in aviation fuel tanks. The acceptance of the paint products and systems is the responsibility of the Service sanctioning the work.

Contractor: The company employed to carry out coating work on a site.

Establishment Works Consultant (EWC): The organisation responsible for the provision of specialist examinations, surveying, scheduling, financial assessments and overseeing services in support of the PROM of the Establishment.

Gas Free: Any environment free from exposed fuel and residue, not liable to vapour drift in which the concentration of combustible gas is 1% of the Lower Explosive Limit or below.

Hazardous Area: An area where flammable or explosive gas or vapour-air mixture (often referred to as explosive gas-air mixtures) is, or may be expected to be, present in quantities which require special precautions to be taken against the risk of ignition.

Holiday: A defect due to faulty application techniques seen as areas where the film of a coating material is of insufficient thickness or where there is a complete absence of coating materials on random areas of the substrate.

Non-hazardous Area: An area in which an explosive atmosphere is not expected to be present so that special precautions for the construction and use of the electrical equipment are not required.

Project Manager (PM): An official of the MOD or commercial representative responsible for the purpose of management and administration of the works covered within this Functional Standard. For work within the remit of the WSM, the term PM shall be read as WSM.

Property Manager (PROM): An MOD official responsible for conducting the day-to-day property management business at the establishment.

Project Sponsor: The representative of the TLBH responsible for the delivery of the project through all stages.

Technical Authority: Branch of DEO(W) with responsibility for providing authoritative technical works advice.

Works Services Manager (WSM): The organisation responsible to the PROM for planning, organisation and managing operation, maintenance and repair of plant and facilities, and the design and construction of new works up to a specific value on the MOD establishment for which it is appointed.

1.4 REGULATIONS

The completed work, and all aspects of the execution thereof, shall comply with all relevant latest enactments, statutory instruments, regulations and codes including the following where applicable:

a. The Factories Acts and Regulations made thereunder.

b. The Health and Safety at Work Act and Regulations made thereunder.

c. The Control of Pollution Act and Regulations made thereunder.

d. The Control of Substances Hazardous to Health Regulations.

1.5 STANDARDS

The Works shall comply with the latest editions of appropriate standards including:

a. British Standards:

BS EN 605	Paints and Varnishes. Standard Panels for Testing
BS EN ISO 1513	Paints and Varnishes. Examination and Preparation of Samples for Testing
BS EN ISO 2409	Paints and Varnishes. Cross-cut Test
BS 3900	Methods of Test for Paints
	Part A7: Determination of the Viscosity of Paint at a High Rate of Shear Part A12: Determination of Density Part C5: Determination of Film Thickness Part Dl: Visual Comparison of the Colour of Paints Part D5: Measurement of Specular Gloss of Non-metallic Paint Films at 20°, 60°, 85° Part E2: Scratch Test Part E7: Resistance to Impact (Falling Ball Test) Part F4: Resistance to Continuous Salt Spray Part F9: Determination of Resistance to Humidity (Continuous Condensation)

	Part G5: Determination of Resistance to Liquids. General Methods
BS 3978	Specification for Water for Laboratory Use
BS 7079	Preparation of Steel Substrates before Application of Paints and Related Products
	Part O: Introduction Part A1: Specification for Rust Grades and Preparation Grades of Uncoated Steel Substrates and of Steel Substrates after Removal of Previous Coatings Part E3: Specification for Cast-steel Shot and Grit Part E4: Specification for Low Carbon Cast-steel Shot
BS EN 29117	Paints and Varnishes. Determination of Through-dry State and Through-dry Time. Method of Test

b. Institute of Petroleum Standards

IP 131	Existent Gum in Fuels, Jet Evaporation Method
IP 323	Thermal Oxidation Stability of Turbine Fuels

c. MOD Standards

Def Stan 05-97	Requirements for Deliverable Quality Plans
Def Stan 80-97	Paint System for the Interior of Bulk Fuel Tanks
JSP 375	Joint Service Health and Safety Handbook
DEO(W) Functional Standard Specification 031	Internal Cleaning of Fuel Tanks
SRP03	Safety Rules and Procedures for Work on Petroleum Installations

Where there is a discrepancy either between the requirements of this document and those listed in clauses 1.4 and 1.5 herein, or between the documents listed in clauses 1.4 and 1.5 themselves, such discrepancy shall be referred to the PROM or WSM for resolution.

It should be assumed that the resolution will be in favour of the most onerous requirement.

Section 2 Safety Requirements

2.1 INTRODUCTION

a. This Standard calls for the use of substances and test procedures that may be injurious to health if adequate precautions are not taken. It refers only to the technical suitability and in no way absolves either the coating manufacturer or the Contractor from statutory obligations relating to health and safety at any stage of manufacture, test or application.

2.2 REQUIREMENTS

a. The Contractor shall be fully responsible for all safety measures relating to surface preparation, testing and coating application processes. This includes, but is not limited to, the provision of adequate ventilation arrangements in confined spaces to deal with any hazardous atmospheres created by the processes, the earthing and bonding of process equipment and the provision of the correct personal and respiratory protective equipment for the working environment.

b. The work must be controlled in accordance with the MOD Safety Rules and Procedures for Work on Petroleum Installations. The WSM or PM may advise of special precautions which apply to the particular installation.

A formal assessment of the risks associated with the coating task at the particular location must be performed and presented in writing at the planning stage of the project so that additional task related safety measures are fully identified for implementation

c. The WSM or PM will arrange for the tanks to be emptied, gas freed and cleaned prior to the commencement of the coating task.

d. The WSM or PM will advise the Contractor of any hazards associated with a tank's previous usage and special precautions that shall be taken when working in a tank which has at any time contained lead products.

e. The Contractor shall review the flashpoints of all proposed coating products individually and when combined to ensure adequate precautions are in place prior to commencement of work.

f. The Contractor shall be conversant with and implement the requirements of JSP 375 Joint Service Health and Safety Handbook and the Control of Substances Hazardous to Health Regulations.

Section 3 Preparation Prior to Coating Operations

3.1 STRUCTURAL CONDITION

a. All tanks must be structurally sound. It is the responsibility of the EWC to ensure that tanks presented for coating are checked to ensure that they are structurally sound and the plate thickness is adequate for the tank's intended life. Coatings are intended to mitigate corrosion, prevent product contamination and give assurance against leakage. It is not the purpose of coatings to afford structural strength to the tank.

3.2 INTERNAL SURFACE CONDITION

a. It is imperative that all surfaces are clean, dry and in a condition suitable for surface preparation and application of the coating system.

b. Tanks must be gas free (refer to Section 2).

c. All inlet pipes must be blanked off.

d. As part of the preparatory process prior to the coating task, all surfaces will be de-sludged and residues removed from the tank. Oil and grease must be removed from all surfaces to be coated.

e. Heavy scale must be removed from all surfaces.

f. Corroded steel must be replaced.

g. Any hot work or welding must be completed before surface preparation commences.

h. New tanks which have been hydrotested with salt or brackish water must be flushed with fresh water to achieve a neutral condition.

Section 4 Coating Operation Procedures

4.1 STEELWORK PREPARATION

a. Steelwork preparation is required to ensure coating performance at areas which have sharp edges. The following actions shall be taken:

— sharp edges, sharp weld spatter, plate laminations, manual weld bead irregularities and gas cut surface irregularities shall be dressed with a disc grinder or sander.

— weld undercuts and pitting shall be ground and welded.

4.2 SURFACE PREPARATION

a. Abrasive blast cleaning is normally undertaken to achieve either Sa $2^1/_2$ or Sa 3 (BS 7079) depending on the paint manufacturers' requirements.

b. For comparative purposes the following standards can be applied:

United States SSPC	British BS 7079
White Metal SP 5	Sa3
Near White Metal SP 10	Sa$2^1/_2$
Commercial Blast SP 6	Sa2

c. Compressed air to be used for blasting must be clean, oil free and dry. A minimum pressure of 7 bar shall be utilised.

d. The abrasive used for blasting shall be dry, clean and free from oil, grease and contamination. The particle size and abrasive type shall be suitable for obtaining the required surface finish (blast profile).

e. Surface preparation procedures shall be approved by the paint manufacturer.

f. After blast cleaning all abrasive shall be removed by the use of brushes and vacuum cleaners. The Contractor shall notify the WSM or PM prior to coating commencement for inspection purposes.

g. The use of temporary protective coatings shall be determined between the paint manufacturer, Contractor and WSM or PM and is dependent on the anticipated length of time between surface preparation and coating

operations. The period between surface preparation and coating shall be a maximum of 4 hours unless the Contractor maintains the relative humidity in the tank below 50% in which case the maximum period can be increased to 12 hours. All surface prepared areas showing visible signs of deterioration shall be reblasted prior to coating. Strict quality control and formal records are to be applied to the process.

h. It is vital that a grit blasting method statement be prepared jointly by the WSM or PM and the Contractor with specific emphasis on the elimination of the possibility of the contamination by grit of any aspect of the aviation fuel installation. All internal and attached equipment must be removed and all inlets and outlets positively blanked. Ingress of grit to pipelines and other aspects of fuel system is unacceptable and must be avoided . A certificate of cleanliness for the tank and the system overall is required at the end of the grit blasting task.
The method statement must also include a risk assessment in compliance with Statutory Requirements.

4.3 CAULKING

a. Caulking shall be utilized to fill and seal surface imperfections which are mechanically sound but which remain after steelwork and surface preparation.

b. Caulking shall be carried out after the prime coat but before application of the first coat.

c. Caulking materials shall be compatible with subsequent applied coating systems and therefore shall be approved by the paint manufacturer.

4.4 ENVIRONMENTAL CONDITIONS

a. Dehumidification

(i) All surfaces to be coated shall be maintained at a temperature of at least 5°C above the dew point of the surrounding atmosphere at all times during the coating procedure.

(ii) Relative humidity levels shall be less than 80% for blast cleaning and less than 50% for coating operations, or in accordance with the paint manufacturers' requirements.

(iii) Tank coating shall only be undertaken when the tank internal atmosphere is stable.

(iv) Provision for 24 hour dehumidification shall be made to ensure optimum levels during the complete coating operation.

b. Ventilation

(i) During surface preparation ventilation shall be provided to allow adequate visibility. The extraction point shall be as close as possible to the blaster.

(ii) While coating operations are in progress the ventilation system shall prevent vapour concentrations exceeding 10% of the Lower Explosive Limit.

(iii) Where organic solvents are being used it is recommended that a minimum of 10 air changes per hour is effected during coating and curing.

(iv) Provision for 24 hour ventilation must be made.

c. Heating

(i) All coating operations shall only be undertaken when the steel temperature is above the minimum temperature as indicated on the paint manufacturers' data sheets.

(ii) The heating and humidification air systems shall be integrated ie. air shall not be heated direct from a naked flame.

(iii) Steel temperatures shall be maintained above the minimum temperature during the curing period.

(iv) Provision for 24 hour heating must be made.

4.5 STRIPE COATING

The life of the system is determined by the dry film thickness of the anti-corrosive coating system present on corners, edges, welds, nuts and bolts, these being the critical areas where breakdown begins. All critical areas shall be given brush applied stripe coats with the same product as the consecutive system coat to achieve the minimum specified dry film thickness. The use of long handled brushes is not permitted.

4.6 SPRAY APPLICATION

a. All coatings shall be applied by airless or conventional spray dependent on the paint manufacturers' instructions.

b. Spray units shall be earthed and conductive hoses used. The Contractor shall take all precautions possible to avoid the build-up of static electricity.

c. Spray guns shall always be held at right angles to the tank surface to enable even, parallel passes to be made. Each pass shall overlap the previous by 50%.

Section 5 Selection of the Coating System

5.1 INTRODUCTION

a. The choice of the selected system shall be based on factors including:

— commercial evaluation

— permitted time between start of work and tank fuel containment

— type/qualification approval of product and system

— experience of the selected coating Contractor with the system

b. All proposed systems must have type/qualification approval which is achieved by the paint manufacturer submitting his products for independent testing and to the Approving Authority. The method of achieving approval is described in Section 5.3.

c. Paint manufacturers with products already type approved to Def Stan 80-97 need not submit the same products for type approval to this Standard.

5.2 SHELF LIFE

The paint, when stored in the original, sealed containers at a temperature between 0 and 35°C, shall retain the properties as described in this Standard for a period not less than 12 months from the date of despatch by the manufacturer.

5.3 TYPE/QUALIFICATION APPROVAL OF COATING SYSTEMS

a. Paint manufacturers' responsibilities:

— to undertake testing at an independent laboratory (approved by the Approving Authority) in accordance with the requirements of Table 1(Batch Tests) and Table 2(Qualification Tests).

b. Approving Authorities' responsibilities:

— to undertake testing in accordance with Table 3(Type Test)

— to provide final type/qualification approval.

c. Financial responsibility

All costs relating to the approval of paint products are to be borne by the paint manufacturer.

d. Test methods and procedures:

— In the following tables and also in Annex A reference to Part ....(eg Part C5) means BS3900 Part....

— Unless otherwise specified all tests shall be carried out at 23 +/- 2°C

— When the base paint and curing agent are examined in accordance with BS EN ISO 1513 they shall be free from extraneous matter and shall not show hard settling, objectionable skinning, tendency to gel or any other defects

Table 1 Batch Tests

Test No	Test Description	System/Substrate	Test Criteria	Test Method
1	Density		+/-2%ofthe Approved Material	Part A12
2	Viscosity		+/- 0.05 Pa s (O.5poise) of the Approved Material	Part A7
3	Pot life		≮ 2 hours	Annex A2
4	Application properties and finish	Single coat, burnished mild steel 300 x 100mm or larger	Smooth opaque even finish free from sags, runs or any other defects	Visual, 24 hours after application
5	Hard-dry time	a) Primer, single coat burnished tinplate b) Finish, single coat burnished tinplate	≯ 4 hours ≯ 16 hours	BS EN 29117
6	Fitness for recoat	Single coat, burnished tinplate	No signs of incompatibility between the coats	Annex A3
7	Colour (finish only)	Single coat, burnished tinplate	White or pale tint as specified by the purchaser	Part Dl under diffuse daylight
8	Resistance to sagging	Single coat, glass	No sagging at a film thickness of: a) Primer 100 µm b) Finish 250 µm	Annex A4
9	Specular gloss (finish only)	Single coat, glass	≮ 50 units	Part D5 using a 60° geometry gloss meter 24 hours after application

Table 2 Qualification Tests

Test No	Test Description	System/Substrate	Test Criteria	Test Method
10	Application properties and finish (air dried)	System, abrasive blasted steel 300 x 100 x 3 mm (or larger)	Smooth, opaque free from runs, sags, wrinkling or other defects	Visual 24 hours after application of the final coat
11	Application properties and finish (force dried)	System, abrasive blasted steel 300 x 100 x 3 mm (or larger)	Smooth, opaque free from runs, sags, wrinkling or other defects	Visual
12	Scratch resistance	System, abrasive blasted steel 3 mm thick	No penetration of the top coat	Part E2 using a load of 1500 g 7 days after application of the final coat
13	Impact resistance (force dried)	System, abrasive blasted steel 5 mm thick	No cracking or loss of adhesion	Part E7 paint film facing upwards
14	Resistance to humidity (primer only)	Single coat, burnished mild steel	No signs of breakdown, no corrosion of the substrate	Part F9 for 10 days 7 days after application
15	Resistance to toluene/ Iso-octane/water	System, abrasive blasted steel 3 mm thick	No softening, blistering or other defects, no corrosion of the substrate	Annex A5 14 days after application of the final coat
16	Resistance to immersion in artificial sea water	System, abrasive blasted steel 3 mm thick	No blistering or other defects, no corrosion of the substrate	Annex A6 14 days after application of the final coat

Table 3 Type Test

Test No	Test Description	System/Substrate	Test Criteria	Test Method
17	Effect on aviation fuels	System, abrasive blasted steel 3 mm thick	No softening, blistering or other defects. Classification 0 fuels to remain within specification limits. Existent gum content shall not increase by more than 3 mg/100 ml	Annex A7 14 days after application of the final coat

Section 6 Coating System Requirements

6.1 PROVISION OF SAMPLE PLATES

Three sample plates shall be coated under the same conditions as the main work. An adhesion test shall be undertaken to the following procedure:

a. The plates shall be tested by cutting with a sharp edge, a grid pattern of approximately 1.6 millimetre squares over an area of about 650 mm^2.

b. A strip of high adhesive transparent tape shall be pressed firmly over the cross cut area and removed sharply with a snap action when held normal to the coated surface.

c. If squares of lining appear on the tape adhesion is not satisfactory.

Tests may also be carried out on the actual coated surface. Provided that all such areas prove satisfactory under test, the Contractor shall be reimbursed at the discretion of the WSM or PM for the repair of such test areas, but if any area shall fail, no additional payment shall be made and the lining including the test plates shall be rectified at the Contractor's expense.

6.2 DRYING AND CURING

a. For any lining to perform as expected sufficient drying time must be allowed before placing the tank into service. The length of time required is dependent on the coating intended , service use, ambient temperature and humidity.

b. The drying and curing or stoving of all coats shall be in strict accordance with the manufacturers' instructions. Where the ambient temperature and humidity are unsuitable for achieving specified drying and curing, the Contractor shall provide at no extra cost artificial heating and/or air conditioning plant to produce the necessary environmental conditions.

6.3 INSPECTION AND TESTING

The WSM or PM, or the appointed specialist inspector, shall inspect and record accordingly at the following stages:

a. After surface preparation.

(i) Comparison with standard for surface preparation.

(ii) Comparison with standard for blast profile.

(iii) Cleanliness of blast surface prior to coating.

(iv) Humidity, dew point and metal temperature during blast cleaning check.

b. During the application of each coat.

(i) Wet film thickness check.

(ii) Humidity, dew point and metal temperature check.

c. Minimum of 24 hours after each coat.

(i) That the coat is free from runs, sags, inclusions and that air bubbles are not trapped in the coating material.

(ii) That the coat is continuous as determined by a wet sponge low voltage type holiday detector. Detectors shall be calibrated against a sample holiday.

(iii) That the minimum thickness as measured by an electro-magnetic thickness tester is within the limits specified. An average of one measurement (3 readings) shall be made for each $10m^2$ of coated surface.As a guideline the maximum thickness should not exceed the minimum thickness by more than 25%.

d. After the stated cure time.

(i) That the coating is fully cured as indicated by the ketone test. The coating shall be rubbed for one minute with a clean white rag soaked in methyl isobutyl ketone (MIBK) or acetone. After a recovery period of 5 minutes the coating shall not have softened as indicated by scratching with the fingernail (a slight indentation is permissible but no material removal shall occur) and the rag shall show only a faint trace of the coating colour. The surface rubbed by the ketone rag shall show no obvious sign of discolouration.

Section 7 Quality Assurance and Control

7.1 COATING COMPOSITION

a. The paint shall not contain metallic zinc, aluminium, lead, cadmium, copper or copper alloys. The manufacturer shall inform the Approving Authority of the composition of the paint material together with details of all the ingredients employed.

b. The colour is left to the discretion of the manufacturer but it shall be sufficiently different to distinguish it from other coats in the same system. The final finish colour shall be white or a pale tint.

c. It is the manufacturer's responsibility to ensure that the paint shall not contain ingredients which may be harmful during application or subsequent removal when operations are carried out in accordance with the manufacturers' instructions.

d. The product shall be manufactured by a company holding type/ qualification approval and shall be of the same formulation as that of the approved product.

e. Should the manufacturer modify the composition of any product then retesting and requalification will be required.

f. The manufacturer shall test each batch in accordance with Table 1.

7.2 MARKING OF CONTAINERS

a. The product shall be filled into sound, clean and dry containers suitable for the product. Trade pattern containers will be accepted unless otherwise specified in the contract.

b. Delivery of materials supplied to this Standard shall be in multiple packs containing base and curing agent in the appropriate ratio.

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

— Functional Standard Title (or Def Stan 80-97 as appropriate)

— Component Name (eg Primer) and Code Number

— Colour

— Batch Number

— Date of Despatch by the Manufacturer

— Manufacturer's Name

— Mixing instructions

7.3 QUALITY PLAN REQUIREMENTS

a. A quality plan shall be formulated in accordance with Def Stan 05-97 'Requirements for Deliverable Quality Plans' and the PMs' Terms of Reference.

Annex A Approval Test Procedures

Annex A1 Preparation of Test Panels

1. For tests 4-9 and 14 use test panels complying with and prepared in accordance with the relevant requirements of BS EN 605.

2. For tests 10-13 and 15-17 use mild steel panels complying with Part A3 and abrasive blasted in accordance with BS 7079, Part A1, Sa 3 quality, using chilled iron grit complying with BS 7079 Parts E3 or E4, to give a maximum amplitude of 25 µm.

3. Where a system is specified apply to the test panel one coat of primer, one coat of coloured finish and one coat of white finish.

4. Apply the paint by airless spraying to the specified panel and allow each coat of the system to dry in a vertical attitude with free access of air at 23 +/- 2°C and relative humidity of 50 +/- 5% for 24 hours before application of the next coat of the system.

5. For tests 11 and 13 allow each coat of the system to dry in a vertical attitude with free access of air at a temperature of 23 +/- 2°C and relative humidity 50 +/- 5% for 15 minutes and then force dry at a temperature of 60 +/- 2°C for 1 hour allow to cool before application of the next coat or testing as appropriate.

6. Allow the painted test panels to dry in a vertical attitude with free access of air for the specified time at 23 +/- 2°C and relative humidity of 50 +/- 5%.

7. Apply the paint to the test panels at a spreading rate sufficient to produce a single coat with a dry film thickness in accordance with the following:

   Primer 50 +/- 5 µm
   Finish 100 +/- 25 µm

Annex A2 Pot Life

1. Store a 5 litre sample of the ready-for-use paint for the specified period in an open container so that the depth of the material is approximately equivalent to the diameter of the container. At the end of the period, inspect the paint for suitability for use.

Annex A3 Fitness for Recoat

1. 24 hours after application of the paint, apply one coat of finishing paint. Allow the panel to dry for 24 hours at 23 +/- 2°C and 50 +/- 5% relative humidity and examine.

Annex A4 Resistance to Sagging

1. Place the applicator in a position at one end of a solvent degreased glass panel to permit the applicator to be drawn over the length of the panel.

2. Stir the paint until a uniform consistency is achieved. Thixotropic materials may require high speed mechanical stirring.

3. Immediately after stirring pour a suitable quantity of paint onto the glass panel directly in front of the applicator and draw the applicator over the panel in one continuous movement.

4. Remove the applicator from the glass panel and immediately stand the panel on its 250 mm edge in a vertical position, such that the horizontal strip of the minimum film thickness is uppermost.

5. Allow to dry undisturbed at room temperature for at least 24 hours.

6. Examine the dry film strips and note the minimum thickness strip which just merges with the next lower strip.

7. Determine the dry film thickness of this strip in accordance with Part C5, method 3.

Note: The following apparatus is required:

— a hardened steel bar applicator having a series of 10 slots ground into its surface 6 mm wide, 1.5 mm apart to a depth suitable for the material under test rising in increments of 25 µm . Guides to be fitted at the sides of the applicator to enable it to be used on a flat glass plate 100 mm wide.

— a plate glass panel 250 mm x 100 mm x 6 mm

Annex AS Resistance to Toluene/Iso-octane/Water

1. Test the paint system in accordance with Part G5, Method 1, Procedure B using water complying with BS 3978 grade 3 / organic solvent mixture *.

2. Immerse the whole panel for a period of 10 weeks. Remove the panel, allow to stand for 30 minutes and then examine.

* organic solvent mixture
70 parts by volume of 2.2.4 trimethyl pentane IP reference fuel quality
30 parts by volume of toluene

Annex A6 Resistance to Immersion in Artificial Sea Water

1. Test the paint system in accordance with part G5, Method 1, Procedure A using artificial sea water complying with Part F4 clause 6.1. Change the artificial sea water every 7 days and maintain aeration of the solution during the entire test period.

2. Immerse the whole panel for a period of 10 weeks. Remove the panel and dry by dabbing with absorbent paper or cloth and examine.

Annex A7 Effect on and Resistance to Aviation Fuels

1. Set aside 25 litres of each batch of fuel for reference purposes.

2. 7 days after application of the final coat of paint, completely immerse the test panel in 20 litres of the specified fuel. Use a separate container for each panel with each fuel. Secure the lid to the container and maintain it and its contents at a temperature of 23 +/- 2°C for a period of 35 days.

3. On completion of the immersion period, remove the panel and allow it to stand vertically with free access of air at a temperature of 23 +/- 2°C and relative humidity of 50 +/- 5%, and transfer the fuel to a suitable sealable container.

4. Examine the paint system 24 hours after removal from the fuel and report any visible defect. Test the paint system in accordance with BS EN ISO 2409 using a manually applied multiple cutting tool with six 30° cutting edges to make 6 cuts 1 mm apart.

5. Examine the fuel by determining its existent gum in accordance with IP 131 and its thermal stability in accordance with IP 323.

Note: The following apparatus is required:

— abrasive blasted mild steel panels approximately 150 mm x 150 mm. Panels to be painted both sides and all edges with the system under test.

— glass containers of approximately 22 litres capacity with facility for sealing the tops to prevent loss of volatiles from the fuels. A separate container is required for each fuel and each panel under test.

Annex B Change Suggestion Form

	Defence Estate Organisation (Works) **Airfields and Bulk Fuels Group** **St. Georges Barracks** **Blakemore Drive** **SUTTON COLDFIELD** **B75 7QB**	**Internal Coating of Aviation Fuel Tanks** **Change Suggestion Form**
Originator:		Date: Ref:
Change Suggestion		
Section:		Page:
Change Detail: Continuation Sheet included? Y ☐ N ☐		
Reason: Continuation Sheet included? Y ☐ N ☐		
DEO(W) Review		
Action:		Ref: Action Date: Approved: Actioned:

Printed in the United Kingdom for HMSO
Dd301939 6/96 C7 G559 10170

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