

**Ministry of Defence  
Defence Procurement Agency, ADRP2  
Abbey Wood  
Bristol  
BS34 8JH**

## **OBSOLESCENCE NOTICE**

All DTD specifications were declared obsolescent from 1<sup>st</sup> April 1999. All DTD 900 series approvals also lapsed at that time. The standards will no longer be updated but will be retained as obsolescent documents to provide for the servicing of existing equipment.

### **Further Guidance**

The aim in declaring the specifications obsolescent is to recognise that the documents are not being updated and thus should be used with care by both purchaser and supplier. For example, a specification could contain valid technical information but may also contain type approval clauses that contradict procurement policy and/or use materials that do not comply with environmental legislation. The obsolescent specification can still be used as a basis for a purchase provided that the supplier and purchaser agree suitable changes to the specification within the purchase order/contract.

For the DTD 900 system, each specification has provided an MoD approved material and process. For these items, the declaration of obsolescence will constitute the termination of both the extant MoD approval and the continuing MoD assessment that had underpinned those approvals. Again, the technical content of the document remains valid and can be used by both purchaser and supplier as a basis for a contract but an acceptable (to the parties) approval/assessment procedure would be required.

**Aircraft Material Specification**  
**EXTERIOR GLOSSY FINISHING SCHEMES**  
**(Cold curing epoxide type)**

**Scheme I, Scheme II and Scheme III**

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*NOTE 1. This specification is one of a series issued by the Department of Trade and Industry for the Ministry of Aviation Supply either to meet a limited requirement not covered by any existing British Standard, or to serve as a basis for inspection of materials, the properties and uses of which are not sufficiently developed to warrant submission to the British Standards Institution for standardisation.*

*NOTE 2. Specification DEF-1053, Standard Methods of Testing Paints, Varnish, Lacquer and Related Products is published for the Ministry of Defence by H.M.S.O. and is on sale to the public.*

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**1. Description**

(a) The finishing schemes shall consist of one or other of the following combinations of materials.

- Scheme I ..... (i) etch primer and finish.  
(ii) epoxy primer and finish.
- Scheme II ..... (i) etch primer, filler and finish.  
(ii) epoxy primer, filler and finish.
- Scheme III ..... etch primer, epoxy primer and finish.

The scheme to be supplied shall be stated on the contract.

(b) The materials shall consist of:

- (i) a primer - which shall be suitable for direct application to suitably pretreated metal and which shall be one or other of the following types :  
- a chromate pigmented cold-curing epoxide resin vehicle.  
- an etching primer conforming to the requirements described additionally in Clause 1 (f).
- (ii) a filler (where required) - which shall be suitable for application over the primer and which shall be a pigmented cold-curing epoxide resin vehicle conforming to the requirements described additionally in Clause 1(g) below.
- (iii) a finish - which shall be suitable for application over the primer alone, over the primer over-coated with the filler, and over etch primer over-coated with epoxy primer. The finish shall be a pigmented cold-curing epoxide resin vehicle conforming to the requirements described additionally in Clause 1(g) below.

The type of primer and the type of filler to be supplied shall be stated on the contract.

(c) The materials shall be suitable for application to metal in the following order to give, when dry, the weight additions indicated, with or without flattening of the filler:

Primer	.....	.....	.....	epoxy	0.85 ± 0.15 oz/square yard
	.....	.....	.....	etching	0.5 ± 0.1 oz/square yard
Filler	.....	.....	.....	epoxide	2.0 ± 0.25 oz/square yard
Finish	.....	.....	.....	black and silver	0.85 ± 0.15 oz/square yard
				(one or two coats)	
				colours other than black and silver	1.25 ± 0.25 oz/square yard

(d) The catalysed epoxide materials shall be suitable for use by spraying when diluted, if necessary, with not more than 25 per cent of the appropriate thinners. For etching primers see (f)(i) below.

(e) When supplied for use in the Royal Air Force or the Fleet Air Arm the etching primer, epoxy primer, filler and finish shall be compatible with DEF-1216.

(f) the etching primer shall comply with the following requirements in addition to those stated above:

- (i) the etching primer shall consist of a pigmented base and an accelerator. These when mixed together in equal parts by volume shall produce a material suitable for spray application. Where thinners are required, the amount to be added to the mixture of base and accelerator shall not exceed 10 per cent by volume and only thinners for cellulose nitrate paints and dopes to DEF-1216 or other approved cellulose thinners shall be used.
- (ii) the mixtures prepared above shall remain suitable for use for not less than the following period of time after mixing:

8 hours at a temperature of 65°-70°F

4 hours at a temperature of 90°-95°F

(iii) test panels shall be prepared by the method described in Appendix I.

- (iv) when supplied for use in the Royal Air Force or the Fleet Air Arm, etching primer shall comply with the requirements of Specification DEF-1408.
- (g) (i) the cold-curing epoxide primer, filler and finish shall each consist of an epoxide resin vehicle and a curing agent, either or both appropriately pigmented. The resin vehicle and the curing agent shall be suitable for use when mixed together in the declared proportions which shall be in a simple ratio by volume. The manufacturer shall declare the nature of the curing agent and the mixing proportions for each combination. The mixing instructions shall be marked clearly on the containers.
- (ii) the mixtures prepared above shall remain suitable for use for not less than the following periods of time after mixing:
  - 8 hours at a temperature of 65°-70°F
  - 4 hours at a temperature of 90°-95°F
- (iii) curing times of these paint films will be disproportionately extended if curing is carried out under cool temperature conditions. The curing time, however, may be reduced by raising the temperature of the film. Mutually satisfactory schedules of time and temperature shall be agreed upon by the manufacturer and the user. The details of this time and temperature shall be declared to the inspector. If this curing temperature is below 18°C (65°F) the manufacturer shall supply evidence to the inspector that the material will pass the performance requirements of this specification.
- (iv) when ordered for use in the Royal Air Force or the Fleet Air Arm, the epoxide resin vehicle and the appropriate curing agent in correct amount to be used with it, shall be supplied in a duplex container.

## 2. Freedom from objectionable ingredients

Solvents such as chlorinated compounds or other substances which may cause injury or discomfort to operators during or after application shall not be used.

## 3. Rate of drying

- (a) *Primer* - the priming coat shall become sufficiently dry at room temperature for the application of the filler or the finish in not more than the following times:

etching primer	.....	.....	1 hour
epoxy primer	.....	.....	4 hours

There shall be no blistering, wrinkling or lifting of the primer on overcoating with the filler, or the finish when tested by the method described in Appendix II(a).

Where accelerated drying of the primer is required the temperature and time shall be specified by the manufacturer.

- (b) *Filler* - the filler coat shall be capable of being overcoated in not more than four hours when applied as described in Appendix II(b) and no wrinkling, bubbling or other defects shall occur. It shall be capable of being rubbed smooth without clogging the paper when tested by the method described in Appendix III.
- (c) *Finish* - the finishing coat shall become "hard dry" in not more than sixteen hours when applied by the method described in Appendix II(c)(i) or (ii) as appropriate and tested as described in Appendix II(d). No wrinkling, bubbling or other defects shall occur.

## 4. Colour and finish

- (a) The colour of the primer shall be different from that of the filler or the finish; the filler shall be a different shade from the finish.
- (b) The dry film resulting from the application of Scheme I, Scheme II (with the filler coat flatted) and Scheme III to a clean, smooth, metal panel and conforming to the limits of weight specified in Clause 1(c) shall match the standard in colour and finish. Black, white, dark earth, light stone, golden yellow, red, roundel blue and grey-green colours shall additionally be available in matt. Black, Dark Admiralty Grey and Light Admiralty Grey shall also be available in eggshell. The contract shall state which finish is required.
- (c) Details of the standards of colour and finish are obtainable from the Director of Chemical Inspection (D.C.I.) E.135/ 17, Royal Arsenal, Woolwich, London, S.E18.

## 5. Toughness, hardness and adhesion

- (a) *Bend test* - A film of the materials, as here tabulated, when prepared and tested as described in Appendix IV(a), shall withstand being bent double round the specified mandrel without becoming detached or damaged.

Scheme	Nature of film	Diameter of mandrel in
Scheme I	Primer and finish	$\frac{3}{8}$
Scheme II	Primer and filler and finish	$\frac{1}{2}$
Scheme III	Etch primer, epoxy primer and finish	$\frac{3}{8}$

- (b) *Dry scratch test* - The resistance to scratching of a film of the material consisting of primer and finish (Scheme I), of primer, filler and finish (Scheme II), or etch primer, epoxy primer and finish (Scheme III) as appropriate, prepared and tested as described in Appendix IV (b), shall be such that any scratch produced shall not penetrate the top coat.
- (c) *Wet scratch test* - The resistance to scratching of a film of the material consisting of primer and finish (Scheme I), of primer, filler and finish (Scheme II) or etch primer, epoxy primer and finish (Scheme III) as appropriate, prepared and tested as described in Appendix IV (c), shall be such that any scratch produced shall not penetrate the top coat.

#### 6. Protection against artificial sea water

The protection against artificial sea water of a film of the material consisting of primer and finish (Scheme I) of primer, filler and finish (Scheme II) or etch primer, epoxy primer and finish (Scheme III) prepared and tested as described in Appendix V, shall be such that no flaking, change of colour, blistering or corrosion shall occur.

#### 7. Resistance to synthetic lubricating oils

The resistance to cold and hot (pyrolysed) synthetic lubricating oils of films of the material consisting of primer and finish (Scheme I) or primer, filler and finish (Scheme II) or etch primer, epoxy primer and finish (Scheme III) shall be such that when tested by the method described in Appendix VI (a) and (b) the film shall not become detached or show signs of softening, blistering or excessive discolouration. Any scratch produced by the method described in Appendix VI (a) shall not penetrate the top coat.

#### 8. Resistance to organic solvents

The resistance to organic solvents of films of the material consisting of primer and finish (Scheme I) of primer, filler and finish (Scheme II) or of etch primer, epoxy primer and finish (Scheme III) shall be such that when tested by the methods described in Appendix VII the film shall retain its original appearance and shall not become detached or damaged.

#### 9. Resistance to natural weathering (type test)

The resistance to natural weathering of a film of the material consisting of primer and finish (Scheme I), of primer, filler and finish (Scheme II), or of etch primer, epoxy primer and finish (Scheme III) prepared and tested as described in Appendix VIII shall be such that the film shall not show signs of cracking, chipping, flaking or blistering. Retention of colour and finish shall be to the satisfaction of the Director of Chemical Inspection. Some chalking and slight loss of gloss shall be disregarded. Neither the filler coat nor the primer coat shall be visible, and the metal shall be free from corrosion.

#### 10. Retention of adhesion test

The retention of flexibility and adhesion of a scheme consisting of primer and finish prepared and tested as described in Appendix IX shall be such that the film shall withstand being bent double at 0°C round a mandrel of diameter  $\frac{3}{8}$  inch without showing signs of cracking or loss of adhesion.

#### 11. Keeping qualities

The keeping qualities of the materials shall be such that when stored in their original sealed containers, the material shall retain the properties detailed above for not less than the following periods after date of despatch:

- (a) Twelve months in temperate climates.
- (b) Six months in tropical climates.

#### 12. Type approval

Before any particular manufacturer's material is accepted as complying with the requirements of this specification, the manufacturer shall obtain type approval. Applications for type approval shall be submitted to the Director of Chemical Inspection (D.C.I.) E.135/ 17, Royal Arsenal, Woolwich, London. S.E.18, accompanied by:

- (i) evidence that the materials comply with Clause 1 to 10 inclusive of this specification.
- (ii) wet samples including thinners of all materials for which approval is sought together with details of their formulation, i.e. percentage of pigment, medium, volatile and nature of medium, pigments and extenders and the specification references, where applicable, of the ingredients;
- (iii) one sprayed panel prepared in accordance with Appendix VIII in respect of each finishing colour and scheme for which approval is sought, and marked on the reverse with the description and film weight of each applied coat.

The Director of Chemical Inspection (D.C.I.) may at his discretion grant a provisional type approval on the basis of short term tests before natural ageing tests can be completed. Provisional approvals will be issued only in special circumstances and after consideration of evidence supplied by the applicant of durability of materials of the same or similar formulation, definition of the type of medium and the names of the manufacturers of any proprietary resins used, in addition to details supplied under (i), (ii) and (iii) above.

Type approval shall be obtained in respect of each component and each finishing colour. After provisional or formal approval has been given, no change in the formulation will be permitted unless approval of the change has been sought and given.

### 13. Routine inspection

A representative sample of each batch of each of the components of the scheme (i.e. primer and finish, Scheme I, or primer, filler and finish, Scheme II) shall be tested by the manufacturer and proved to comply with Clause 1 to 8 and 10 inclusive before release is authorised.

The Director of Chemical Inspection may require the manufacturer to test to Clause 9 at any time.

### 14. Preparation for delivery

- (i) delivery of material supplies under this specification shall be in dual pack containers of 1 gallon and 1 quart, i.e. half the final quantity of each component. Where materials with mixing ratios other than 1 : 1 are specified dual pack containers of the appropriate ratio shall be used.
- (ii) in addition to bearing the markings called for by statutory requirements, the packages constituting a consignment shall be clearly and durably marked with the designation of the paint as shown by the title of this specification, a distinctive trade mark and such markings as may be prescribed in the terms of the contract or required by the provisions of DEF-1234.
- (iii) the following warning notices shall also be marked on drums as appropriate:
  - (a) "Use with Curing Agent . . . and Thinner . . ."
  - (b) "This material shall be mixed in equal parts by volume with Curing Agent . . . prior to use", or specifying the alternate ratio as appropriate.
- (iv) in addition to the above, each container of pigmented component and curing agent shall have marked on the bottom outside surface:
  - (a) Manufacturer's proprietary reference number or description.
  - (b) Batch number.

## APPENDIX I

### Method for the preparation of aluminium panels

The panels shall comply with the specification and gauge as described in Method 2 para. 5 of specification DEF-1053. They shall be hard or soft as required.

For tests of etching primers they shall be untreated metal and shall be cleaned with either:

(a) trichlorethylene to B.S.580 Type II (vapour or liquid).

or (b) pure toluene to B.S.805/1 used at room temperature.

For tests of epoxy primers they shall be acid chromate pickled as described in Method 2 para. 5(b)(ii) of Specification DEF-1053.

## APPENDIX II

### Method for the determination of rate of drying

- (a) *Primer* - One coat of the primer shall be applied by spray to a hard aluminium panel prepared as described in Appendix I. The panel shall then be kept in a horizontal position at a temperature of 65°- 70°F for the specified drying time, i.e.:

etching primer ..... 1 hour

epoxy primer ..... 4 hours

The relative humidity shall be controlled at 60-70 per cent during this period. The film weight when dry shall be as specified in Clause 1(c).

One coat of filler shall then be sprayed over the primer to give a film weight as specified in Clause 1(c), and the panel shall be kept in a horizontal position at a temperature of 65°-70°F for 16 hours at a relative humidity of 60-70 per cent. The panel shall then be visually examined.

The test shall be repeated using one coat of finish instead of one coat of filler.

- (b) *Filler (Scheme II)* - one coat of the primer shall be applied to a clean smooth metal panel as described at (a) above.

One filler coat shall then be sprayed over the primer to give a film weight when dry as specified in Clause 1(c), and the panel shall be kept in a horizontal position at a temperature of 65°-70°F for four hours at a relative humidity of 60-70 per cent. One coat of the finish shall then be sprayed over the filler to give a film weight when dry as specified in Clause 1(c), and the panel shall be kept in a horizontal position at a temperature of 65°-70°F and a relative humidity of 60-70 per cent overnight. The panel shall then be visually examined.

*(c) Finish*

- (i) over primer (Scheme I) - a clean smooth metal panel shall be prepared and coated with the primer as described at *(a)* above. The finish coat shall then be applied to give a weight when dry as specified in Clause 1 *(c)*, and the panel shall be kept in a horizontal position at a temperature of 65°-70°F for sixteen hours at a relative humidity of 60-70 per cent. The finish shall then be tested as described at *(d)* below.
- (ii) over filler (Scheme II) - a clean smooth metal panel shall be prepared and coated with the primer and the filler as described at *(b)* above.  
Four hours after the application of the filler, the finish coat shall be applied to give a weight when dry as specified in Clause 1 *(c)*, and the panel shall be kept in a horizontal position at a temperature of 65°-70°F for sixteen hours at a relative humidity of 60-70 per cent. The finish shall then be tested as described at *(d)* below.
- (iii) over etch primer and epoxy primer (Scheme III) - a clean smooth metal panel shall be prepared and coated with the etch primer to give a weight when dry as specified in Clause 1 *(c)* and allowed to dry for one hour. One coat of epoxy primer shall be applied to give a weight when dry as specified in Clause 1 *(c)* and shall be allowed to dry for four hours. The finish coat shall then be applied to give a weight when dry as specified in Clause 1 *(c)*, and the panel shall be kept in a horizontal position for sixteen hours and shall then be tested as described at *(d)* below. All drying times shall be at a temperature of 65°-70°F and a relative humidity of 60-70 per cent.
- (d) Test for dryness*-The panel shall be placed on one pan of a pair of scales. After balancing the scales, a weight of 5 lb shall be placed in the other pan. The scales shall then be balanced again for 20 seconds by pressing the thumb on the film. No sign of tackiness to the thumb shall be apparent, and any impression produced shall be capable of being wiped away with dry cotton wool without damaging the film or shall disappear on standing for one minute.

**APPENDIX III****Method for the determination of rubbing properties of the filler**

A panel of hard aluminium not less than one square foot in area, cleaned as described in Appendix I, shall be coated with primer and filler as described in Appendix II *(b)* and allowed to dry for 16 hours at a temperature of 65°-70°F and a relative humidity of 60-70 per cent.

The panel shall then be rubbed with silicon carbide paper Grade A320, B.S.872, wet with water.

**APPENDIX IV****Method for the determination of toughness, hardness and adhesion**

- (a) Bend test* - Method No. 13 of Specification DEF-1053 shall be used employing a mandrel of specified diameter. The test panel shall be of soft aluminium coated as described in Appendix II with the scheme under test. After the application of the final coat the panel shall be allowed to dry at a temperature of 65°-70°F and a relative humidity of 60-70 per cent in a horizontal position for 7 days before testing. The test shall be made at 0°C.
- (b) Dry scratch test* - Method No. 14 of Specification DEF-1053 shall be used employing a panel of hard aluminium and a load of 1,500 grammes. The test panel shall be coated as described in Appendix II with the scheme under test. After the application of the final coat the panel shall be allowed to dry at 65°-70°F and a relative humidity of 60-70 per cent in a horizontal position for 7 days before testing.
- (c) Wet scratch test* - The test described at *(b)* above shall be repeated after immersion of the panel for 24 hours in distilled water at 65°-70°F. Surplus water shall be removed rapidly from the surface of the panel by shaking or by means of clean, dry filter paper and the wet scratch test performed immediately using a weight of 1,200 grammes.

**APPENDIX V****Method for the determination of protection against artificial sea water**

- (a)* A burnished steel panel prepared by Method No. 2, paragraph 2 of Specification DEF-1053 shall be coated with the materials as described in Appendix II with the scheme under test. After the application of the finishing coat the panel shall be allowed to dry at a temperature of 65°-70°F in a horizontal position for 7 days. The back of the panel shall be protected either with the materials under test or with any other protective which will not affect the testing solution. The edges shall be protected by dipping for ¼ inch in melted wax. Alternatively two panels each painted on one side only may be placed back to back and sealed around the edges with wax.
- (b)* The test panels shall be partially immersed in the testing solution, at ordinary temperatures, continuously for one week, immediately after which time the panel shall be examined visually. A strip of paint film shall be removed from the face of the panel by a suitable paint remover so that a representative section of the panel is exposed, and the metal shall be examined for signs of corrosion.

The composition of the testing solution shall be that given in Specification DEF-1053, Method No. 24, para. 3.

## APPENDIX VI

### Method for the determination of resistance to lubricating oils

- (a) *Cold oil* - A small panel of hard aluminium shall be coated as described in Appendix II with the scheme under test. After the application of the last coat the panel shall be allowed to dry in the horizontal position at a temperature of 65°-70°F for 7 days at a relative humidity of 60-70 per cent. A cut shall then be made through the film down to the metal, using a sharp knife or razor edge. The cut shall be made down the middle of the panel parallel to the long edge.

The panel shall then be immersed continuously for 1,000 hours in lubricating oil; aircraft turbine engines - synthetic type to Specification D.Eng.R.D.2487 (RDE/O/463) at a temperature of 65°-75°F. Oils other than RDE/O/463 shall not be used for this test unless the agreement of the Director of Chemical Inspection has been obtained.

At the discretion of the Inspecting Officer the time of immersion may be reduced to 4 days for routine testing.

The panel shall then be removed from the oil and wiped with a soft rag dipped in a mixture of:  
 75 parts by volume ..... 2.2.4 trimethyl pentane, I.P. reference fuel quality and  
 25 parts by volume ..... toluene to B.S.805/ 1.

The panel shall be subjected to the scratch test described in Appendix IV(b) using a weight of 1,200 grammes. The scratch shall be made parallel to and approximately ½ inch from the cut described above.

- (b) *Hot pyrolysed oil* - A small panel of hard aluminium shall be coated as described in Appendix II with the scheme under test. After the application of the last coat it shall be allowed to dry in a horizontal position for seven days at a temperature of 65°-70°F and a relative humidity of 60-70 per cent.

Half the area of the panel shall be uniformly spread with 0.1 ±0.02g of pyrolysed ester lubricant (prepared by the method described below) and the treated panel shall be placed horizontally on the shelf of an oven maintained at 70 ± 2°C for 48 hours. After cooling to room temperature the panel shall be examined for softening, blistering or discolouration. Pyrolysed ester lubricant shall be prepared by heating lubricating oil: aircraft turbine engines - synthetic type to Specification D.Eng.R.D.2487 (RDE/O/463) in a standard distillation apparatus until approximately one third of the lubricant has broken down and distilled over. The rate of heating shall be such that the thermometer at the top of the distillation column reaches 175°C at the end of the process, although the temperature of the lubricant itself may be approximately 500°C. The distillate and residue shall be allowed to cool to room temperature and then mixed together. Further details of the preparation may be obtained from the Director of Chemical Inspection (D.C.I.), E135/17, Royal Arsenal, Woolwich, London, S.E.18.

## APPENDIX VII

### Method for the determination of resistance to organic solvents

A small panel of soft aluminium shall be coated as described in Appendix II with the scheme under test and after the application of the finishing coat shall be allowed to dry at a temperature of 65°-70° and a relative humidity of 60-70 per cent in a horizontal position for 7 days.

The panel shall then be immersed for 2 hours at a temperature of 65°-70°F in a mixture of:

75 parts by volume ..... 2.2.4 trimethyl pentane I.P. reference fuel quality and  
 25 parts by volume ..... toluene to B.S.805/ 1.

as described in Method No. 42 of Specification DEF-1053.

The panel shall be removed, examined and allowed to dry for 1 hour.

It shall then be bent double over a mandrel of appropriate diameter as specified in Clause 5(a). This bend test shall be made in the apparatus described in Method No. 13 of Specification DEF-1053 at a temperature of 65° to 70°F.

The time of bending shall be not less than one second or more than 1½ seconds.

## APPENDIX VIII

### Method for the determination of resistance to natural weathering

A panel of hard aluminium shall be coated as described in Appendix II with the scheme under test. In Scheme II the filler coat shall be flatted. After the application of the finishing coat, the panel shall be allowed to dry at a temperature of 65° -70°F and a relative humidity of 60,70 per cent in a horizontal position for seven days. The panel shall have an exposed area of at least 35 in<sup>2</sup> and the back of the panel shall be protected. Edges of the panel shall be rounded but not protected other than by application of the material under test.

The treated panel shall be exposed for two years in the open facing south at an angle of 45° to the horizontal. During the exposure, the panel shall be sprayed three times per working day at intervals of three to four hours with a solution of artificial sea water the composition of which is given in Specification DEF-1053, Method No. 24, para. 3.

**APPENDIX IX****Method for the determination of retention of adhesion**

The test panel shall be of soft aluminium prepared in accordance with Appendix I.

A coat of primer shall be applied and allowed to dry in a horizontal position at a temperature of 65°-70°F and a relative humidity of 60-70 per cent for 7 days. It shall then be overcoated with a coat of finish and dried in a horizontal position at a temperature of 65° -70°F and a relative humidity of 60-70 per cent for a further 7 days and then bent in accordance with Method No. 13 of Specification DEF-1053.

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Approved for issue,

E. W. RUSSELL,

Director of Materials (Aviation).

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