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# मानक

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IS 11246 (1992): glass fibre reinforced polyester resins (GRP) squatting pans [CED 3: Sanitary Appliances and Water Fittings]



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( पहला पुनरीक्षण )

*Indian Standard*

GLASS FIBRE REINFORCED POLYESTER  
RESIN (GRP ) SQUATTING PANS —  
SPECIFICATION  
( *First Revision* )

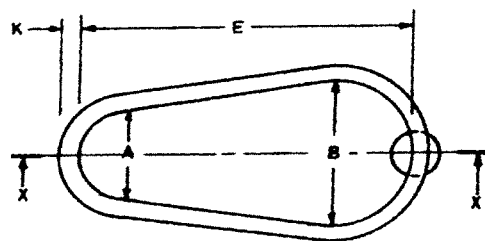
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BUREAU OF INDIAN STANDARDS  
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**AMENDMENT NO. 1 DECEMBER 1998**  
**TO**  
**IS 11246 : 1992 GLASS FIBRE REINFORCED**  
**POLYESTER RESIN (GRP) SQUATTING PANS —**  
**SPECIFICATION**  
*( First Revision )*

( Page 2, Fig. 1, *PLAN* ) — Substitute the following figure for the existing:



PLAN

( CED 3 )

## FOREWORD

This Indian Standard ( First Revision ) was adopted by the Bureau of Indian Standards, after the draft finalized by the Sanitary Appliances and Water Fittings Sectional Committee had been approved by the Civil Engineering Division Council.

In view of the priority given for low-cost urban sanitation by Government of India, alternative and competitive materials ( other than the commonly used ceramic ones ), like GRP, PVC and HDPE are coming into use. A large number of manufacturers have come forward to manufacture glass fibre reinforced plastic ( GRP ) squatting pans because of their lower cost and satisfactory performance.

This standard covering the pourflush type GRP squatting pans was first published in 1985 at the instance of the Technology Advisory Group of the World Bank. In this revision, apart from incorporating the Amendment No. 1 certain dimensions and tolerances on the same have been modified.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a measurement, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values ( *revised* )'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# GLASS FIBRE REINFORCED POLYESTER RESIN ( GRP ) SQUATTING PANS — SPECIFICATION

*( First Revision )*

### 1 SCOPE

1.1 This standard lays down the requirements for material, construction, workmanship, finish, performance and testing for glass fibre reinforced polyester resin ( GRP ) pourflush type squatting pans contact moulded as well as compression moulded.

### 2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
1221 : 1971	Dye based fountain pen inks ( <i>first revision</i> )
3015 : 1985	Specification for brush scrubbing ( <i>first revision</i> )
4955 : 1982	Household laundry detergent powders ( ( <i>second revision</i> ) )
6746 : 1972	Unsaturated polyester resin systems for low pressure fibre reinforced plastics
11320 : 1985	Glass fibre rovings for the reinforcement of polyester and of epoxide resin systems
11551 : 1986	Glass fibre chopped strand mat for the reinforcement of polyester resin systems

### 3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

#### 3.1 Bubbles

Air bubbles entrapped in the pan.

#### 3.2 Coating

A pigmented protective layer provided on the surface.

#### 3.3 Colour Blots

Colour blots appearing on the surface on the account of uneven distribution of colouring material and uneven coating.

#### 3.4 Crazing

Fine hair crack(s) on the surface.

#### 3.5 Defective Impregnation

Imperfect impregnation of glass fibre with unsaturated polyester resin.

#### 3.6 Filler

The material used in the manufacture of squatting pans other than the glass fibre, resin and pigment specified.

#### 3.7 Impurities

The foreign matters present.

#### 3.8 Pin Holes

Pores of size less than 1 mm appearing on the surface.

#### 3.9 Surface

Flushing surface.

#### 3.10 Traces of Mending

The traces left over after mending carried out to eliminate small defects.

#### 3.11 Unevenness

Unevenness and wrinkles present on the surface.

#### 3.12 Warpage

Distortion of original shape during the manufacturing process.

### 4 MATERIAL

#### 4.1 Glass Fibre

The glass fibre in the form of chopped strand mat or rovings used in the manufacture of squatting pan shall be low alkali glass ( for example, E-glass ) compatible with polyester resin ( see IS 11320 : 1985 and IS 11551 : 1986 ).

4.1.1 The glass content of the laminate shall be minimum 30 percent by weight when tested according to the method described in 8.2.10.

#### 4.2 Polyester Resin

Unsaturated polyester resin shall be isophthalic type ( see IS 6746 : 1972 ).

### 4.3 Sheet Moulding Compound ( SMC )

It is the material used for compression moulded squatting pans and shall be of low profile grade and shall consist of glass fibre reinforcements pre-impregnated with filled unsaturated polyester resin system in sheet form.

### 4.4 Surface Coat

Any of the coats specified in 4.4.1 and 4.4.2 shall be provided on the surface.

#### 4.4.1 Gel-Coat

The gel-coat used shall be based on isophthalic grade of polyester resin, resistant to chemicals and suitably pigmented.

#### 4.4.2 Polyurethane Resin Coat

The coat shall be two component polyurethane suitably pigmented.

## 5 CONSTRUCTION

5.1 The contact moulded or cold-pressed squatting pan shall consist of two or more layers

of fibre-glass chopped strand mat or requisite quantity of rovings to build up a minimum thickness of 1.8 mm excluding surface coat, throughout the body of the pan, with additional reinforcement at the rim and the bottom outlet.

5.2 For compression moulded squatting pans the process shall be carried out using SMC ( *see* 4.3 ) and matched metal dies under required temperature and pressure.

### 5.3 Surface Finish

The surface of the moulded pans shall be free from pin holes, unevenness, crazing, cracks, and resin areas. It shall contain no impurities. The surface shall be coated with high gloss, scratch and chemical resistant coating ( *see* 4.4 ). Surface of the pan shall be smooth and free from any sharp edges and unwanted curves, etc.

## 6 DIMENSIONS AND MASS

6.1 The squatting pan shall comply with the dimensions specified in Table 1 read with Fig. 1.

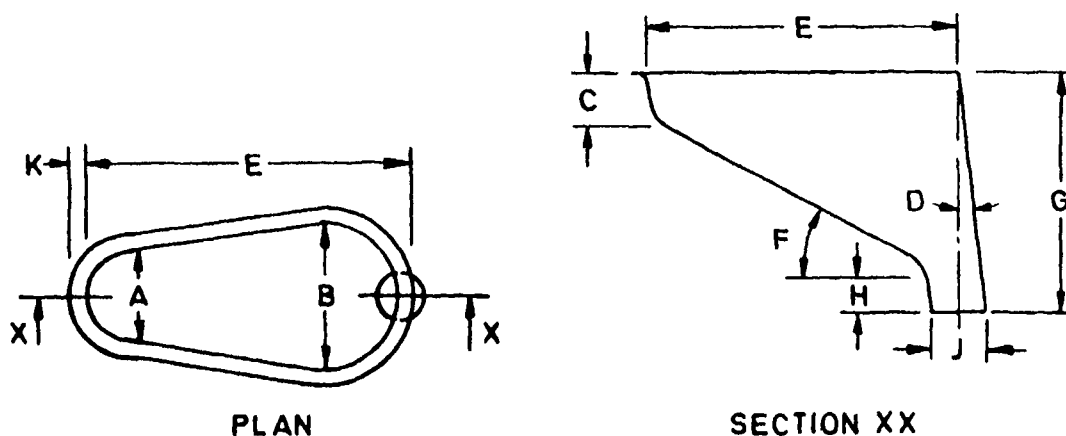


FIG. 1 SQUATTING PAN

Table 1 Dimensions of Squatting Pans

Description ( 1 )	Ref in Fig. 1 ( 2 )	Dimensions ( mm ) ( 3 )
Width of front profile ( semi-circle )	A	125
Width at rear profile ( semi-circle )	B	200
Vertical drop in front wall of pan	C	70
Rear of back wall of the pan inclination to horizontal off set to trap opening	D	6-8°
Length of top opening	E	425
Slope of bottom of pan	F	25-28°
Overall depth of pan ( <i>see</i> Note )	G	320
Length of entry of squatting pan into the P-trap	H	40 Min
Dia at entry from squatting pan to P-trap	J	77, ID
Projected bend of rim all-round	K	20-25

#### NOTES:

1 Dimension C, G and H are for general guidance.

2 Tolerance  $\pm 4\%$  for all dimensions of 50 mm and above.



## 6.2 Thickness

The thickness of the GRP laminate including the surface coat shall not be less than the values given below:

- i) With gel coat — 2.0 mm
- ii) With PU coat — 1.8 mm

**6.2.1** At the point of additional reinforcement, that is rim and bottom outlet, the minimum thickness shall be 2.8 mm with gel coat and 2.6 mm with PU coat.

## 6.3 Mass

The minimum mass of hand laid pans shall be 750 gm and for sheet moulding compound (SMC) shall be 900 gms.

## 7 PERFORMANCE REQUIREMENTS

### 7.1 Warpage

The squatting pan shall be considered to be within warpage limit if a feeler gauge of 4 mm does not slide under it without application of force when tested according to 8.2.1.

### 7.2 Thickness

The thickness of the pan shall be measured on the pieces cut from the pan at ten different points and minimum thickness shall conform to 6.2.

### 7.3 Impact Resistance

Two test pieces cut from the side or bottom of the squatting pan shall be subjected to impact test in accordance with 8.2.2. The test pieces on inspection shall not show any cracks in the surface coat.

### 7.4 Crazing

A complete squatting pan or a test piece taken from any part of it shall not show on visual inspection and signs of cracking or crazing after the oven test conducted in accordance with 8.2.3.

### 7.5 Water Absorption

The squatting pan shall not absorb water in excess of 0.5 percent when tested in accordance with 8.2.4.

### 7.6 Gel Coat

The gel coat, when provided, shall not be less than 0.20 mm thickness and not more than 0.40 mm in thickness when determined in accordance with 8.2.5.

### 7.7 Resistance of Hydrochloric Acid/Uric Acid

There shall be no discoloration and exposure of glass fibre, on subjecting to the tests for hydrochloric acid and uric acid as described in 8.2.6 and 8.2.7 respectively.

## 7.8 Hardness

The squatting pan gel coat surface and backing shall show a minimum reading of 30 points (20 points for polyurethane coated surface) on a Barcol Impressor when tested in accordance with 8.2.8.

## 7.9 Scratch Resistance

Squatting pans shall withstand 40 000 cycles in the scrub test, described in 8.2.9 slight brush marks at the completion of the test, may be permitted.

## 8 INSPECTION TESTS

### 8.1 Visual Inspection

The surface of the squatting pan shall be visually inspected for defects after being inked in accordance with 8.1.1. The light source shall be practically diffused day light, supplemented, is necessary, with diffused artificial light to provide illumination comparable to that usually available within a short distance of the outside window facing north but not in direct sunlight. The illumination shall have an intensity of 1 000 to 2 000 lux. Ink stains and the defects mentioned at 5.3 shall not be permitted.

#### 8.1.1 Ink Test

To do the visual examination of the surface of squatting pan, ink is applied to the area to be inspected as follows :

- a) Wash the entire area to be inspected with a water soluble ink (see IS 1221 : 1971) and allow to dry completely.
- b) Rinse the surface with fresh water and examine. Ink will be entrapped in crazing, cracks, pores, etc.

NOTE — In this standard, all reference to visible defects shall refer to defects apparent to the eye upon close inspection, after the surface has been ink-tested.

### 8.2 Laboratory Tests

#### 8.2.1 Warpage

The squatting pan shall be placed face down on a flat surface preferably a surface plate to ascertain the amount of deviation from the horizontal plane that exists at the edge of the pan. If the pan rocks on two points, a horizontal plane shall be determined by placing a feeler gauge of 4 mm under one low corner and forcing the pan down on this gauge. A second feeler gauge shall be inserted under the opposite edge to check for performance requirement specified under 7.1.

### 8.2.2 Impact

The test pieces shall be tested at room temperature of  $27 \pm 2^\circ\text{C}$  by supporting and clamping them firmly in a 125 mm dia frame. A 38 mm dia steel ball, weighing 225 g shall be dropped on the centre of the panel from a height of 150 mm to strike the reverse side and from a height of 75 mm to strike the surface. Two different samples shall be used for the two tests. After the drop of the ball, the presence of crack shall be determined by applying the ink test to the affected area (see 8.1.1) and carefully examining the area for conformity with 7.3.

### 8.2.3 Oven Test for Crazing

After keeping the pan or a test piece for 10 days in a circulating air oven maintained at  $80 \pm 2^\circ\text{C}$ , the test pieces shall be inspected for conformity with 7.4.

### 8.2.4 Water Absorption

Test pieces shall be cut to size  $50 \times 50$  mm or area of dia 30 mm, the exposed edges of the test pieces shall be coated with resin to prevent inter-laminar attack. The sections of the pieces shall be cleaned, dried for 24 hour in air bath at  $50 \pm 3^\circ\text{C}$  and then allowed to cool in a desiccator. Following this the pieces shall be weighed immediately with the help of a chemical balance. Next the test pieces shall be immersed in distilled water for 24 h at  $27 \pm 2^\circ\text{C}$  test piece then shall be taken out, the water wiped out with a piece of dry cloth and weighed immediately. The absorption coefficient shall be determined from the following:

$$A = \frac{M_2 - M_1}{M_1} \times 100$$

where

$A$  = absorption coefficient (percent),

$M_1$  = mass before immersion, and

$M_2$  = mass after immersion.

### 8.2.5 Gel-Coat Thickness

The thickness of the gel-coat shall be measured by cutting a test section from the areas to be measured and sand-papering the edge of the section until smooth. A suitable measuring device shall be kept across the edge, perpendicular to the plane of the gel-coat and the thickness of the gel-coat shall be measured with the aid of reading glass, if needed, for conformity with 7.6.

### 8.2.6 Test for Hydrochloric Acid

One millilitre of hydrochloric acid of 3 percent concentration is placed on the test piece and inspected after 60 minutes. Following this inspection, the surface hardness shall be tested as per 8.2.8.

### 8.2.7 Test for Uric Acid

One millilitre of uric acid of 0.06 percent concentration is placed on the test piece and inspected after 60 minutes. Following this inspection, the surface hardness shall be tested as per 8.2.8.

### 8.2.8 Hardness

With the indenter perpendicular to the test surface, a light hand pressure is exerted against the instrument to drive the spring load indenter into the material and the hardness dial reading is taken immediately and recorded. An average of at least 5 tests shall be used for determining hardness for conformity with 7.8.

### 8.2.9 Scrub Test

The general construction of the equipment shall be as given in Fig. 2A. Dimensions and other details of scrubbing brush shall be as given in Fig. 2B.

Fix the specimen in the tray rigidly such that the surface is horizontal and adjust the brush height so that it just touches the specimen in vertical position. Then lower down the brush by 10 mm so that it exerts a positive pressure on the specimen and also passes over the specimen to and fro describing a scrubbing path of at least 70 mm. Fill the specimen tray with 0.5 percent detergent (Grade I of IS 4955 : 1982) solution made with distilled water till the sample is immersed. Start the test with the counter reset to zero and stop at 40 000 cycles (80 000 strokes). Add detergent solution in between the test so that the specimen is immersed throughout the testing. Immediately after completion of test, wash the test specimen in tap water and inspect the specimen for conformity with 7.9.

### 8.2.10 Glass Content

The glass content in the laminate shall be determined using the following procedure. The specimen is first weighed on an analytical balance in a previously weighed, ignited crucible. The specimen is placed in the furnace at a temperature not greater than  $345^\circ\text{C}$ . The temperature of the furnace is raised to  $565 \pm 25^\circ\text{C}$ , at a rate that will not cause blowing or loss of inorganic filler. The specimen and crucible are then ignited at this maximum temperature to constant mass (2-6 hours depending on the thickness) and allowed to cool in a desiccator. The residue shall be weighed.

$$\text{Glass content, mass (\%)} = \frac{M_1}{M_0} \times 100$$

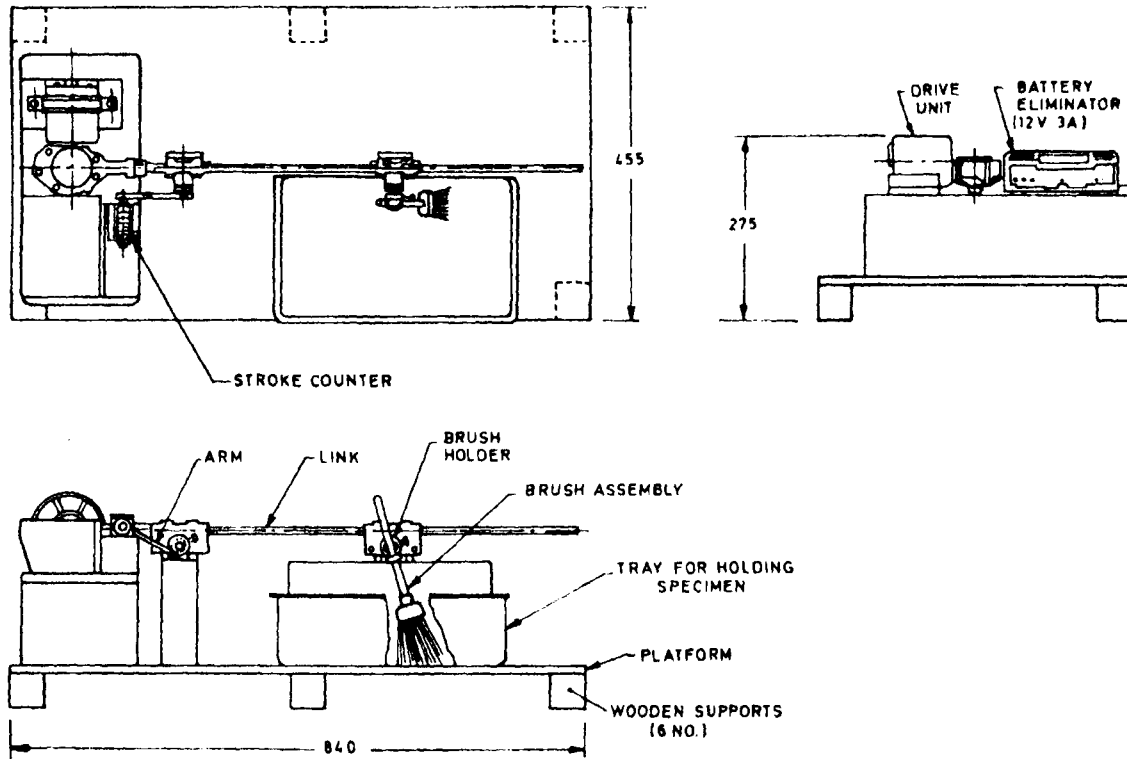
where

$M_1$  = residue mass, and

$M_0$  = original mass.

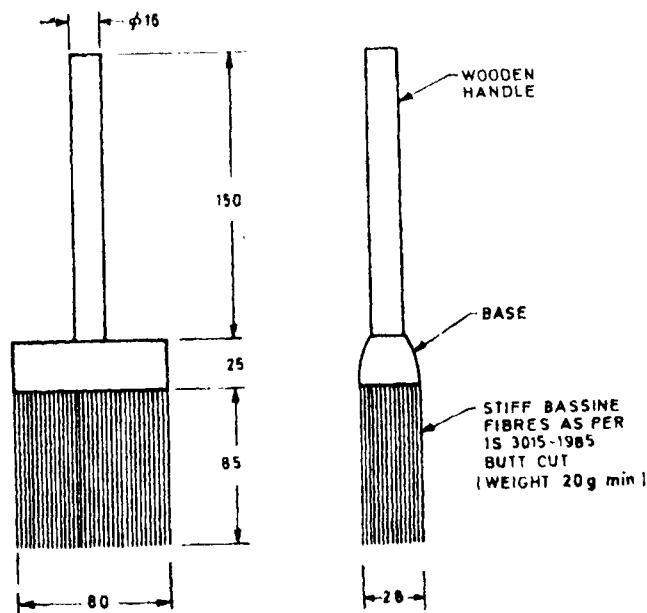
## 9 PACKING

9.1 The squatting pans shall be wrapped with polythene sheets and then packed securely in lots of suitable numbers in cardboard or other cartons to avoid damage in transit.



All dimensions in millimetres.

FIG. 2A TYPICAL SCRUB-TESTING EQUIPMENT



All dimensions in millimetres.

FIG. 2B TYPICAL SCRUBBING BRUSH

## 10 MANUFACTURER'S INSTRUCTIONS

**10.1** The pan manufacturer shall furnish with each squatting pan, suitable instructions for its cleaning and maintenance. Abrasives and scouring powders shall not be used.

## 11 SAMPLING

### 11.1 Type Tests

Type tests are intended to prove the suitability and performance of a new composition, a new technique or a new size of pan.

**11.1.1** The frequency of testing for various type tests to be conducted by the manufacturer is given below:

Characteristics	Clause	Frequency
a) Crazing	7.4	5 pieces per month
b) Water absorption	7.5	5 pieces for every six months
c) Glass content	4.1.1	1 piece per month

**11.1.2** The manufacture or supplier shall furnish to the testing authority the same number of samples as given in 11.1.1. They shall be selected at random from a month's or six months' production as the case may be and subjected to various type tests given in 11.1.1.

**11.1.2.1** If all the samples tested according to 11.1.2 pass the requirements of the type tests given in the specification, the type of pan under consideration shall be considered eligible for type approval. In case of failure, the manufacturer or supplier may be asked to improve the design and re-submit the product for type approval.

### 11.2 Acceptance Tests

Acceptance tests are carried out on samples selected from a lot for the purpose of determining the acceptance or otherwise of the lot.

#### 11.2.1 Lot

All pans, in a single consignment of the same size, manufactured essentially under similar conditions of manufacture and produced in a day shall constitute a lot.

**11.2.2** For ascertaining the conformity of the material in the lot to the requirements of the specification, samples shall be tested from each lot separately.

**11.2.3** The number of pans to be selected from a lot shall depend on the size of the lot and shall be according to Table 2.

**11.2.3.1** These pans shall be selected at random from the lot. In order to ensure the randomness of selection, procedures given in IS 4905 : 1968 may be followed.

### 11.2.4 Number of Tests and Criteria for Conformity

#### 11.2.4.1 Characteristics requiring non-destructive testing

Each of the pans selected according to col 1 and 2 of Table 2 shall be examined for requirements specified in 5.3, 6.1, 6.2, 6.3 and 7.1. A pan failing to satisfy one or more of these requirements shall be considered as defective. The lot shall be considered to have satisfied these requirements if the number of defective found in the sample is less than or equal to the corresponding acceptance number given in col 3 of Table 2. The lot having satisfied these requirements shall be further tested for other requirements according to 11.2.4.2.

**11.2.4.2** Each of the pans given in col 4 of Table 2 shall be tested for requirements requiring destructive testing that are given in 7.3, 7.6 and 7.9. These pans may be selected from those already examined according to 11.2.4.1 and found satisfactory. The lot shall be declared as conforming to the requirements of these specification if there is no failure.

## 12 MARKING

**12.1** Each pan shall be clearly marked by transfix label, on the rear top outside surface, with the name or trade-mark of the manufacturer, data of manufacture, batch number and mass of pan.

**12.1.1** Each squatting pan may also be marked with the Standard Mark.

**Table 2 Scale of Sampling and Permissible Number of Defectives**  
( Clause 11.2.3 )

Number of Pans in the Lot	For Characteristics Given in 5.3, 6.1, 6.2, 6.3 and 7.1		Sample Size for Characteristics Given in 7.3, 7.6 and 7.9
	Sample Size	Acceptance Number	
( 1 )	( 2 )	( 3 )	( 4 )
Up to 50	2	0	1
51 to 100	3	0	1
101 to 300	5	0	2
301 to 500	8	0	3
501 and above	13	1	3

### **Standard Mark**

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#### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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