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**Non-destructive testing—
Penetrant testing—Part 2: Testing
of penetrant materials**

ICS 19.100

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by the Japanese Society for Non-Destructive Inspection (JSNDI)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS Z 2343-2:2001** is replaced with this Standard.

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JIS Z 2343 series consists of the following 4 parts under the general title “*Non-destructive testing—Penetrant testing*”:

Part 1: General principles—Method for liquid penetrant testing and classification of the penetrant indication

Part 2: Testing of penetrant materials

Part 3: Reference test blocks

Part 4: Equipment

Non-destructive testing— Penetrant testing—Part 2: Testing of penetrant materials

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 3452-2** published in 2006 without any modifications of the technical contents or the structure.

The portions underlined with dots are the matters not given in the corresponding International Standard.

Precautions : The penetrant materials required by this Standard include chemicals which may be harmful, flammable and/or volatile. All necessary precautions shall be observed. All relevant International, national and local regulations pertaining to health and safety, environmental requirements, etc. shall be observed.

1 Scope

This Standard specifies the technical requirements and test procedures for penetrant materials (hereafter referred to as “materials”), used for penetrant testing specified in **JIS Z 2343-1**, for their type testing and batch testing. It also details on-site control tests and methods.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows:

ISO 3452-2:2006 *Non-destructive testing—Penetrant testing—Part 2: Testing of penetrant materials* (IDT)

The symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS Q 9001 *Quality management systems—Requirements*

NOTE : Corresponding International Standard: ISO 9001 *Quality management systems—Requirements* (IDT)

JIS Q 17025 *General requirements for the competence of testing and calibration laboratories*

NOTE : Corresponding International Standard: ISO/IEC 17025 *General requirements for the competence of testing and calibration laboratories* (IDT)

JIS Z 2300 *Terms and definitions of nondestructive testing*

JIS Z 2305 *Non-destructive testing—Qualification and certification of personnel*

NOTE : Corresponding International Standard: ISO 9712 *Non-destructive testing—Qualification and certification of personnel* (MOD)

JIS Z 2323 *Non-destructive testing—Penetrant testing and magnetic particle testing—Viewing conditions*

NOTE : Corresponding International Standard: ISO 3059 *Non-destructive testing—Penetrant testing and magnetic particle testing—Viewing conditions* (IDT)

JIS Z 2343-1 *Non-destructive testing—Penetrant testing—Part 1: General principles—Method for liquid penetrant testing and classification of the penetrant indication*

NOTE : Corresponding International Standard: ISO 3452-1 *Non-destructive testing—Penetrant testing—Part 1: General principles* (MOD)

JIS Z 2343-3 *Non-destructive testing—Penetrant testing—Part 3: Reference test blocks*

NOTE : Corresponding International Standard: ISO 3452-3 *Non-destructive testing—Penetrant testing—Part 3: Reference test blocks* (MOD)

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS Z 2300** and the following apply.

3.1 batch

quantity of material produced at one operation having uniform properties throughout and with a unique identifying number or mark

3.2 candidate

samples of the testing product submitted for evaluation in accordance with this Standard

4 Classification

4.1 Testing products

Penetrant testing products shall be classified into penetrants, excess penetrant removers and developers, and furthermore the penetrants, excess penetrant removers and developers are subclassified according to type, method and form, respectively (see table 1).

Table 1 Testing products

Penetrant		Excess penetrant remover		Developer	
Type	Denomination	Method	Denomination	Form	Denomination
I	Fluorescent penetrant	A	Water	a	Dry
II	Colour contrast penetrant	B	Lipophilic emulsifier: 1 Oil-based emulsifier 2 Rinsing with running water	b	Water soluble
III	Dual-purpose (fluorescent colour contrast penetrant)	C	Solvent (liquid): Class 1 Halogenated Class 2 Non-halogenated Class 3 Special application	c	Water suspendible
				d	Solvent-based (non-aqueous for Type I)
		D	Hydrophilic emulsifier: 1 Optional pre-rinse (water) 2 Emulsifier (water-diluted) 3 Final rinse (water)	e	Solvent-based (non-aqueous for Type II and III)
				f	Special application
		E	Water and solvent		

4.2 Sensitivity levels

4.2.1 General

Sensitivity levels shall be defined separately for penetrant, excess penetrant remover and developer, and for product families.

4.2.2 Fluorescent product family

Sensitivity levels for this product family shall be defined by reference products:

- sensitivity level 1/2 (ultra-low);
- sensitivity level 1 (low);
- sensitivity level 2 (medium);
- sensitivity level 3 (high);
- sensitivity level 4 (ultra-high).

4.2.3 Colour contrast product family

Sensitivity levels for this product family shall be defined using the type 1 reference block in accordance with **JIS Z 2343-3**:

- sensitivity level 1 (normal);
- sensitivity level 2 (high).

4.2.4 Dual-purpose product family

There are no sensitivity levels for dual-purpose penetrants. Classification may be carried out as for colour contrast systems (see **4.2.3**).

5 Testing of penetrant materials

5.1 Testing facilities

5.1.1 Type testing

Type testing shall be carried out on penetrant materials according to **JIS Z 2343-1** to ensure their conformance to the requirements of this Standard.

Type testing shall be carried out by a laboratory accredited in accordance with **JIS Q 17025** for type testing of penetrant materials or any independent laboratory with equivalent capability.

5.1.2 Batch testing

Batch testing to the requirements of this Standard shall be carried out on each production batch according to **JIS Z 2343-1** to ensure the batch has the same properties as the corresponding type approval sample. In the case of penetrant material packed in spray cans, the content of sulfur and halogens shall be additionally determined according to **6.12**.

Batch testing shall be carried out under a defined and maintained quality system. A system meeting the requirements of **JIS Q 9001** is considered suitable.

5.1.3 Process control testing

Process control testing shall be carried out or commissioned by the user in accordance with **JIS Z 2343-1** and **JIS Z 2343-3**.

5.2 Reporting

5.2.1 Type testing

The testing laboratory or independent laboratory (see **5.1.1**) shall provide a certificate of compliance with this Standard and a report that details the results obtained.

If any changes are made to the penetrant material composition, then a new type test and product identity shall be required.

5.2.2 Batch testing

Manufacturers of penetrant materials shall provide certificates of compliance with this Standard (for example, see **JIS G 0415**:1999).

5.2.3 Process and control testing

Results obtained shall be recorded (see Annex B).

5.3 Tests

5.3.1 Penetrants

Type and batch testing of penetrant properties shall be carried out in accordance with table 2.

5.3.2 Excess penetrant removers (excluding method A)

Type and batch testing of penetrant remover properties shall be carried out in accordance with table 3.

5.3.3 Developers

Type and batch testing of developer properties shall be carried out in accordance with table 4.

Table 2 Properties of penetrants and required tests

Property	Test type	Use test method according to
Appearance	Batch	6.1
Sensitivity	Type and batch	6.2
Density	Type and batch	6.3
Viscosity	Type and batch	6.4
Flashpoint	Type and batch	6.5
Washability (Method A penetrants only)	Batch	6.6
Fluorescent brightness (Type I penetrants)	Type and batch	6.7
UV stability (Type I penetrants)	Type	6.8
Thermal stability (Type I penetrants)	Type	6.9
Water tolerance (Method A penetrants only)	Type	6.10
Corrosive properties	Type and batch	6.11
Content of sulfur and halogens ^{a)}	Type and batch	6.12
Water content (Methods A and E)	Batch	6.20
Other contaminants on request (as required)	Batch	
Note ^{a)} Only required for products designated "low in sulfur and halogens".		

Table 3 Properties of excess penetrant removers and required tests

Property	Test type	Use test method according to
Appearance	Batch	6.1
Sensitivity	Type and batch	6.2
Density	Type and batch	6.3
Viscosity (for Methods B and D only)	Type and batch	6.4
Flashpoint	Type and batch	6.5
Water tolerance (Method B only)	Type and batch	6.10
Corrosive properties	Type and batch	6.11
Content of sulfur and halogens ^{a)}	Type and batch	6.12
Residue on evaporation/solid content (Method C only)	Type and batch	6.13
Penetrant tolerance (Methods B and D only)	Type	6.14
Water content (Method D only)	Batch	6.20
Other contaminants on request (as required)	Batch	
Note ^{a)} Only required for products designated "low in sulfur and halogens".		

Table 4 Properties of developers and required tests

Property	Test type	Use test method according to
Appearance	Batch	6.1
Sensitivity	Type and batch	6.2
Flashpoint (Forms d, e)	Type and batch	6.5
Corrosive properties (except Form a)	Type and batch	6.11
Content of sulfur and halogens ^{a)}	Type and batch	6.12
Solid content (Forms d, e)	Type and batch	6.13
Developer performance (except Form f)	Type and batch	6.15
Re-dispersability (Forms c, d and e)	Type and batch	6.16
Density (of carrier liquid) (Forms d, e)	Type and batch	6.17
Particle size distribution	Type	6.19
Other contaminants on request (as required)	Batch	
Note ^{a)} Only required for products designated “low in sulfur and halogens”.		

5.3.4 Batch tests for spray cans

Batch testing shall be carried out in accordance with the product performance test given in **6.18**.

The first and last containers, and a container from the middle, of the batch shall be tested. Where testing for content of sulfur and halogens in accordance with **6.12** is appropriate, only the first container need be tested.

6 Test methods and requirements

6.1 Appearance

The appearance of the sample shall be the same as that of the type test sample.

6.2 Penetrant system sensitivity

6.2.1 Fluorescent penetrants (Type I)

6.2.1.1 Qualification provisions

6.2.1.1.1 Penetrants (Type I)

Method A (water washable) penetrants and Methods B and D (post-emulsifiable) penetrants/emulsifiers shall be qualified with the appropriate reference dry developer D-1. Method C penetrants shall be qualified either on the basis of their performance as Method A, B, or D materials, or, alternatively, with the appropriate reference remover R-1 and reference dry developer D-1 (see table 5).

Table 5 Reference material designation

Reference material	Designation	
	Method A	Methods B, C and D
Penetrant, Type I, Level 1/2	FP-1/2	
Penetrant, Type I, Level 1	FP-1W	FP-1PE
Penetrant, Type I, Level 2	FP-2W	FP-2PE
Penetrant, Type I, Level 3	FP-3W	FP-3PE
Penetrant, Type I, Level 4	FP-4W	FP-4PE
Penetrant, Type II, Level 1	VP-1W	VP-1PE
Penetrant, Type II, Level 2	VP-2W	VP-2PE
Emulsifier, Type I, Method B		FE-B
Emulsifier, Type I, Method D		FE-D
Emulsifier, Type II, Method B		VE-B
Removers, Class 1, Method C	R-1	R-1
Removers, Class 2, Method C	R-2	R-2
Developer, Form a	D-1	D-1
Developer, Form e	D-2	D-2
FP fluorescent penetrant FE emulsifier for fluorescent penetrant W water-washable VP visible penetrant PE post emulsifiable VE emulsifier for visible penetrant		

6.2.1.1.2 Developers

All developers, except Form f (specific application), intended for use with Type I (fluorescent) penetrant materials, shall be qualified with the reference level 4, Method B penetrant/emulsifier system FP-4PE/FE-B (see table 6). Form f developers shall be qualified in accordance with **6.2.1.1.4**.

A reference sample of each product shall be retained for comparison purposes and designated in accordance with tables 5 and 6. The manufacturer, manufacturer's reference and the batch number shall be recorded.

NOTE : A list of reference products is available from qualified laboratories (e.g. MPA-Hannover, Germany).

6.2.1.1.3 Solvent removers

Classes 1 and 2 solvent removers shall be qualified with reference penetrant FP-4PE and reference developer D-1. Class 3 solvent remover shall be qualified in accordance with **6.2.1.1.4**.