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# International Standard



# 3453

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Non-destructive testing — Liquid penetrant inspection — Means of verification

*Essais non destructifs — Contrôle par ressuage — Moyens de vérification*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3453 was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*.

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# Non-destructive testing — Liquid penetrant inspection — Means of verification

## 1 Scope and field of application

**1.1** This International Standard provides general guidance on the verification procedures to be applied when carrying out penetrant inspection, for example in accordance with ISO 3452.

NOTE — For the purpose of this International Standard, the terms and definitions given in the glossary of terms used in non-destructive testing (in preparation) apply.

**1.2** These tests are intended to ensure that the penetrant system is functioning correctly and that there has been no harmful deterioration of the process materials during service.

**1.3** Generally, the frequency of checking penetrant materials and black light sources will depend on the frequency and conditions of usage. Specific and maximum intervals should be recommended by the manufacturer.

## 2 References

ISO 3059, *Non-destructive testing — Method for indirect assessment of black light sources*.

ISO 3452, *Non-destructive testing — Penetrant inspection — General principles*.

## 3 Control of penetrant

**3.1** The mass density shall be checked frequently and maintained in accordance with the manufacturer's instructions.

**3.2** Visible dye intensity shall be checked frequently and maintained in accordance with the manufacturer's instructions. For checking purposes, 10 ml of the solution under test is added to 90 ml of colourless kerosene or other inert solvent in a graduated cylinder and mixed thoroughly, the same procedure being carried out on a standard reference penetrant (see the

note). The colour intensities of each sample are then compared by suitable means, for example in Nessler tubes in which working solutions are compared with diluted standard solutions. The penetrant under test shall be discarded if the colour intensities differ by more than 20 %.

**3.3** Fluorescent dye intensity shall be checked frequently and maintained at 75 % at least of that of the standard reference liquid. For checking purposes, both used and reference penetrant samples are diluted to a 10 % solution in methylene chloride (dichloromethane). Equal quantities of each solution are then placed on filter paper and both papers dried in a suitable oven. The filter papers are viewed under a black light source at a distance of 0,5 m and, if a noticeable difference is observed after a period of up to 1 h, a further test for intensity shall be carried out in accordance with annex A of ISO 3059.

NOTE — In order to provide a standard reference for the check, a 0,5 l sample of all new batches of penetrants and emulsifiers should be taken and stored in airtight glass containers, protected from extremes of temperature and direct sunlight, and suitably identified to show the batch of materials to which they belong.

## 4 Control of developers

**4.1** Dry powder developers shall be checked frequently for contamination with penetrant and shall be maintained in a dry fluffy condition.

**4.2** Liquid developers shall be maintained within the working concentrations specified by the manufacturers and their mass density shall be checked frequently.

## 5 Control of black light

The output from black light sources shall be checked frequently and maintained at a level of not less than 50 relative units at the working surface as assessed in accordance with ISO 3059.

## 6 Penetrant plant performance check

**6.1** This check shall be carried out on a daily basis prior to, or in parallel with, the first batch of components to be inspected and whenever there is a change in operating conditions. For this purpose, pieces as described in the annex shall be processed through the complete penetrant system using the times and sequence of operations stipulated.

**6.2** The resulting indications shall compare favourably with corresponding records, for example in the form of replicas or photographs.

## 7 Records

A permanent record of all control tests and plant performance checks shall be maintained.

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## Annex

### Reference pieces

(This annex forms part of the Standard.)

#### A.1 Types

Typical reference pieces for checking plant performance are as follows:

##### A.1.1 Chromium-plated reference pieces

These reference pieces are manufactured by chromium-plating a suitable piece of steel or brass and then stressing the plating until cracks appear. Such pieces are processed through standard reference penetrant materials and the results photographed or replicated.

##### A.1.2 Aluminium alloy reference pieces

Such pieces are quench cracked and are processed using standard reference materials on one half-face and the materials under test on the other half-face. It is advantageous to identify the two half-faces by lightly etching the surface with suitable symbols, for example "A" and "B".

##### A.1.3 Test components

These may also be regarded as reference pieces. They contain known defects which are permanently recorded and shall be of similar surface texture, geometry and material to the components being processed.

#### A.2 Use

Under no circumstances shall reference pieces that have been used for colour penetrant control tests be used for fluorescent penetrant control tests and vice versa.

#### A.3 Restoration

**A.3.1** It is essential that reference pieces be cleaned thoroughly after processing to remove all traces of penetrant materials.

**A.3.2** If, on examination (under black light for fluorescent penetrants and white light for dye penetrants), the slightest trace of penetrant remains on the test piece or test component, it should be subjected to a further cleaning cycle.

**A.3.3** After cleaning, the reference piece shall be protected from contamination, either by placing it in a light-tight sealed container containing a clean mixture of 50 % acetone and 50 % of another suitable approved solvent or by other suitable means until required for the next check.

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