INTERNATIONAL STANDARD

ISO 18928

Third edition
2013-02-01

Imaging materials — Unprocessed photographic films and papers — Storage practices

Matériaux pour l'image — Films et papiers photographiques non traités — Pratiques de stockage

Reference number
ISO 18928:2013(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 18928 was prepared by Technical Committee ISO/TC 42, *Photography*.

This third edition cancels and replaces the second edition (ISO 18928:2002), of which it constitutes a minor revision with the following changes:

— Annex A has been removed.

Introduction

International Standards have been written specifying the recommended practices for the storage of processed safety photographic film (ISO 18911), processed photographic reflection prints (ISO 18920), processed photographic plates (ISO 18918), and the specifications for safety film (ISO 18906).

This International Standard is concerned with the storage of unprocessed photographic materials. While many of the recommendations for unprocessed and processed storage are very similar, there are some important differences. These include the very beneficial effects of low temperature and the harmful effects of adverse storage and radiation.

Imaging materials — Unprocessed photographic films and papers — Storage practices

1 Scope

This International Standard specifies recommended storage conditions for unprocessed photographic materials. It is not applicable to processed films and prints.

This International Standard is applicable to black-and-white and colour photographic materials (negative films, positive films, reversal films, positive papers, and X-ray films), as well as to safety films.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
raw photographic material
photographic material that has not been exposed to actinic radiation and has not been processed

3 Storage conditions

3.1 General

The photographic properties of imaging materials change during ageing. These changes result from high temperatures and high relative humidities and may also be influenced by plastics, papers, solvents, lacquers, varnishes, gases (see 3.4), and extraneous radiation (see 3.5). Frequent temperature changes may also have adverse effects.

Changes caused by unfavourable storage conditions may be much greater than those due to variations in original manufacture. It is important to comply with the manufacturer's recommended storage conditions and, where given, to an expiration date.

Films and papers should be exposed and processed as soon as possible after the original package has been opened. Opened packages should be resealed under recommended conditions for further storage.

3.2 Relative humidity

Photographic material should generally be kept in equilibrium with 40 % to 60 % relative humidity (RH). Containers shall be kept sealed until the material is used.

Films and papers are not usually stored for long periods between exposing and processing. Production schedules, customer needs, latent image fading or growth, etc., are important factors here. Furthermore, vesicular, diazo, thermally processed silver, and electrographic type materials are normally processed immediately.

If conventional sheet films or papers are not to be processed immediately, they may be stored in commercially available light-tight "paper safes" or in the manufacturer's original container.

The relative humidity of the storage area shall be maintained below 65 % because higher humidities can damage containers (e.g. rust), cause labels, tapes and cartons to deteriorate, and encourage the growth of fungi. It can also induce adhesion (blocking) between adjacent laps or layers.

Humidities below 30 % can make film and paper temporarily brittle and lead to unacceptable curl and possible emulsion cracking.

3.3 Temperature

Recommended temperatures during storage depend on the kind of photographic material and on the duration of storage. General guidelines are given in Table 1. In all cases, the information provided by the manufacturer shall be followed.

When storing for less than a month, photographic materials may be kept at approximately 25 °C. Most manufacturers recommend a maximum temperature of 13 °C for longer periods. Manufacturers' expiration dates can be extended by storing at still lower temperatures. Note that infrared-sensitive films shall be stored at –18 °C.

If films or papers are to be kept for several days or more between exposing and processing, many of the considerations in Clause 3 apply. Storage temperatures should be the same for exposed as for unexposed material.

Table 1 — Storage temperature for films and papers

Sensitive layer of films and papers	Storage from 1 month to 6 months	Storage for more than 6 months
Wet-processable silver-gelatin Thermally-processable silver Photoplastic Diazo	Below 21 °C	Below 13 °C
Chromogenic colour	Below 13 °C	Below 13 °C
Infrared (IR)	–18 °C to –20 °C	–18 °C to –20 °C
NOTE 1 For very long storage of all types of photographic materials, the recommended storage temperature shall be between –18 °C and –20 °C. NOTE 2 The manufacturer's recommendations take precedence over the suggested guidelines of this table.		

3.4 Gases

Storage rooms shall be protected against harmful gases such as hydrogen sulphide, sulfur dioxide, formaldehyde, oxidizing gases, industrial emissions, and mercury vapour. Any of these may penetrate the container seal and fog or desensitize the material.

Materials shall not be stored in the same area as developer or activator solution.

3.5 Extraneous radiations

Photographic materials shall be protected from extraneous penetrating radiation until they are processed. Storage rooms and housings shall be measured for their radiation level before being used. For most materials, a maximum of $1{,}29 \times 10^{-4}$ C/kg is recommended. However, the maximum may be $0{,}1{,}29 \times 10^{-4}$ C/kg for X-ray materials and certain other films (see[5] in the Bibliography).

Some stones or stone aggregates in concrete can emit sufficient radiation (average up to $0{,}516 \times 10^{-4}$ C/kg/yr) to fog very sensitive films after long storage. However, most films and papers are not damaged under normal conditions.

The radiation exposure during airport inspection of carry-on baggage is usually small (see[6] in the Bibliography). Recently, new technology for inspection of checked baggage at airports uses radiation that fogs many, if not most, unprocessed photographic products.

Government regulations in many countries provide for hand inspection of photographic materials which is strongly recommended, thus avoiding the X-ray inspection. Repeated X-ray exposures can damage films faster than ISO 400, scientific films, and X-ray films.

4 Temperature acclimatization

Packages of radiation sensitive films and papers should be opened only immediately before use. If materials have been stored at low temperatures, a warm-up period is necessary to prevent condensation on film or paper.

The required warm-up period depends on the size of the package, its isolation, the temperature difference between storage and surround, and the dew-point of the surround. Recommended periods are given in Table 2. All values are for individual packages separated from each other, except for a carton containing 10 35 mm rolls. The length of material on a roll is less important than the thickness and the insulation of the package.

Table 2 — Minimum recommended warm-up times

Films and papers	Warm-up hours for the difference between storage and surround temperatures	
	15 °C	40 °C
Short roll films[a] Magazines Cartridges	1 to 1,5	1 to 2
Packages with 50 sheets	2	3
Single 16 mm rolls	0,5 to 1,5	1 to 2
Single 35 mm rolls	1,5 to 3	3 to 5
70 mm and 105 mm rolls	3 to 5	5 to 8
Aerial films	2 to 6	8 to 25
Large packages	10 to 25	15 to 25
Large rolls		
Carton with ten 35 mm rolls	10 to 30	30 to 45
X-ray films	10	25

[a] 120-size and 220-size rolls have the same times as the short film rolls.

5 Mechanical requirements

Rolls, mounted on cores and packed in specially designed containers, shall be stored with the radius of the roll in the horizontal position, in order to avoid the weight of the roll exerting a pressure on the lower part of the roll and thereby causing physical damage.

If sheet materials are unopened and are 203 mm × 250 mm or larger, they should be stored in the vertical position. If the boxes have been opened, they should be stored in the horizontal position. Smaller boxes of sheet materials can be stored in either way.

6 Handling conditions

Climatic conditions of 20 °C to 24 °C and 40 % to 65 % RH are recommended for handling in laboratories. In printing rooms, the RH should not be too low in order to prevent static discharges and attraction of dirt. In these cases, low humidity can also cause curl and temporary dimensional changes so that proper handling is no longer possible.

Excessive exposure to recommended safelights may degrade the sensitometry of some products. The manufacturer's literature should be consulted for recommended maximum cumulative exposure.

Air-conditioning systems in laboratories should be equipped with suitable dust filters.

Care should be taken in the handling of sheets of film or paper to avoid physical damage caused by sliding materials over one another, kinking, or fingerprinting. Use of lint-free cotton gloves is recommended.

Annex A
(informative)

Background radiation

A.1 General

The radiation dosage of naturally occurring background radiation is expressed in coulumb per kilogram (C/kg), which is a measure of "exposure" and can be applied to X-rays and ϒ-rays.

The "gray" (Gy) or micro-gray (Gy) is a measure of "dose" due to any ionizing radiation, so there is no exact equivalence between the two basic units. However, an exposure of 0,002 58 × 10^{-4} C/kg results in a dose of 8,69 µGy in air, or 1 Gy in air results from a 296,70 × 10^{-4} C/kg exposure. Hence, the average dose of 500 mR per year cited in 3.5 is only appropriate for naturally occurring background radiation.

Bibliography

[1] ISO 18906, *Imaging materials — Photographic films — Specifications for safety film*

[2] ISO 18911, *Imaging materials — Processed safety photographic films — Storage practices*

[3] ISO 18918, *Imaging materials — Processed photographic plates — Storage practices*

[4] ISO 18920, *Imaging materials — Reflection prints — Storage practices*

[5] Suleiman O.H., Conway B.H., Fewell T.R., Slayton R.J., Rueter F.G., Gray J. Radiation protection requirements for medical x-ray film. *Med. Phys.* 1995, **22** (10) pp. 1691–1693

[6] Walsh J.M., McCarthy D.J., McIninch V.G. *Airport x-rays and camera films*, Technical report prepared for the Photographic & Imaging Manufacturers Association, Inc., 550 Mamaroneck Ave, Harrison, NY 10528, October 1993

[7] PIMA technical report entitled *The CTX-5000SP and camera films*, June 1997

[8] Current information summary, *Avoiding X-ray fogging of motion-picture film*, Eastman Kodak Company publication, December, 1997

ICS 37.040.20,37.040.30

Price based on 6 pages