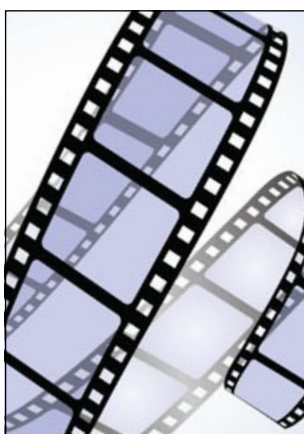


# The dangers of cellulose nitrate film



This leaflet is aimed at private individuals and voluntary groups who have or find old film in domestic or other non-workplace premises. It gives advice on:

- why cellulose nitrate film is hazardous;
- how to identify cellulose nitrate films and negatives;
- how to recognise signs of decomposition;
- what to do if you have cellulose nitrate film;
- contact points for information and advice.

The leaflet **does not** cover requirements for the storage and handling of a large number of cellulose nitrate films and negatives such as may be found in archives on commercial or industrial premises or in museums. Exacting standards are defined for such activity (see British Standard BS ISO 10356:1996 and National Fire Protection Association Code NFPA 40), and it is covered by workplace health, safety and fire legislation including the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR).

Cellulose nitrate film is extremely dangerous. It catches fire very easily and once alight is difficult to put out. Fires involving cellulose nitrate burn extremely quickly with a hot, intense flame and the smoke is particularly toxic, containing large quantities of poisonous gases.

Any cellulose nitrate film that you come across now will be extremely old. This is a problem because the high fire risk from cellulose nitrate film increases as it ages.

Old cinematographic film and old photographic negatives (including X-ray film) may be made from cellulose nitrate (which means they contain nitrated cellulose or other nitrated product). These films are sometimes referred to as 'nitrate', 'nitrate-based', 'nitro-cellulose-based' or 'celluloid' film (although the term 'celluloid' is often used these days to refer to film in general, the film may not actually contain cellulose nitrate – see identification methods later in the leaflet).

## What is cellulose nitrate?

Cellulose nitrate was the plastic commonly used for film-base photographic materials (stills, movie and X-ray films) manufactured up to the early 1950s. It contains a high proportion of nitro-cellulose, otherwise known as celluloid.

More modern film is acetate or polyester-based, which is less hazardous.

## Why is cellulose nitrate film dangerous?

It is dangerous because:

- it can start to decompose and become unstable at temperatures as low as 38 °C, giving off large quantities of poisonous gases, which could cause an explosion. Warmth and humidity (moisture) accelerate this decomposition;
- it catches fire very easily and burns extremely quickly, with a hot and intense flame;
- it produces very dense, poisonous smoke containing copious amounts of choking nitrogen dioxide fumes;
- unlike many other flammable materials, nitro-cellulose does not need oxygen in the air to keep burning and once it is burning it is extremely difficult to put out. Immersing burning film in water may not extinguish the fire and it could actually increase the amount of smoke produced.

## How can I tell if my films or negatives may be cellulose nitrate?

Cellulose nitrate was used for 35 mm photographic roll film and photographic sheets up to about 1940, but it continued to be used for popular (amateur) formats and aerial photography up to about 1950. Most early cellulose nitrate-based cinematographic film is 35 mm gauge and it was used up to about 1951 in the UK, although old film stock may have been used after this date. Cellulose nitrate-based film continued to be in common use in other countries for a number of years after 1951. It was also common practice for 35 mm cinematographic film to be cut down and used for still photography.

Silent film, where the frames occupy the full width between the sprocket holes, is almost certainly cellulose nitrate film. A star printed on the edge of the film denotes cellulose nitrate film. Sound film, which has the soundtrack between the single set of sprocket holes and picture frames, may be marked 'NITRATE FILM', 'NITRATE' or 'N' along its edge and/or have horizontal dashes between every fourth sprocket hole.

Safety film is acetate or polyester-based. It may be marked 'SAFETY', 'S' followed by a number, or it may have vertical dashes every fourth sprocket hole. However, **caution is required** as early films made on safety film may have been copied to cellulose nitrate film, and any safety film marks will also have been copied across. It was also common practice to splice cellulose nitrate leaders onto safety film or to use it to repair damaged film. The whole film should be checked thoroughly.

Amateur 16 mm and 8 mm films are almost certain to be safety film.

**If you are in any doubt, treat the material as cellulose nitrate and contact an expert for advice** (see 'Contacts' at the end of this leaflet).

## How can I tell if my cellulose nitrate film has degraded?

Visual evidence and smell can be used to identify cellulose nitrate film or negatives that are degrading. The following signs of deterioration may be present:

- amber, brown or yellowish discolouration of the film and faded image affecting anything from a small patch to the entire film;
- the film is 'tacky' or 'sticky', possibly stuck together and feels soft;
- there is blistering or bubbling of the surface of the film, possibly with yellowish froth;

- a noticeable acrid odour that may range from being a faintly irritating smell to strongly irritating fumes;
- the film is decomposed beyond recognition into a brittle residue.

Decomposing films stored in metal film cans may also be covered in very fine brown powder as a result of a reaction between the can and the film. A ring of rust on the inside of the metal film is also a sign that cellulose nitrate film is possibly degrading.

## **Handling cellulose nitrate film**

Cellulose nitrate film should, because of its age and the likelihood that it has not been stored in ideal conditions, be treated as being potentially dangerous. If you have film or negatives made from cellulose nitrate (or you think they may be made from cellulose nitrate) **keep them well away from any source of heat** (eg radiators and light bulbs).

When examining a film, keep handling to a minimum and keep cans closed. Handle film in a well-ventilated area, which you can leave quickly in an emergency. To avoid contact with skin and eyes wear protective gloves and eye protection (goggles). Any winding should be on a hand-operated unit, not a motorised one. Do not run film through a projector or put negatives on an enlarger; they can catch fire simply by the heat from the lamp or from friction caused by the film passing over the projector sprockets.

## **What should I do if I have old film?**

Your choices depend on the state of the film (see previous sections). If the film still has viewable images, you should contact a film archive (see 'Contacts') for advice on having the film preserved and, where appropriate, digitised. If the film has reached the stage where the image is badly faded and the film is stuck together, a film archive will be able to give an expert assessment of its historical importance.

If a film archive is willing to take the film, someone will come and assess it and make arrangements for its collection. If the archive does not want the film, and you wish to retain a copy of the image, they or one of the organisations listed at the end of this leaflet can advise you of a licensed laboratory which can safely copy or digitise the image.

Where the film has deteriorated so much that it must be disposed of, or where it is of no further use to you or to an archive, you will need to dispose of it **safely**. You should contact the environmental health department of your local authority for advice on the disposal of dangerous waste. They will be able to make arrangements for its collection or put you in contact with a company authorised to transport and dispose of such waste.

You should also contact the fire safety officer from your local fire and rescue authority to discuss what general fire safety precautions you should take while the film is being stored awaiting collection, in addition to the steps specified in the next section on short-term storage.

**On no account should cellulose nitrate film be sent by post, carried on public transport or disposed of as refuse.**

## How should I store my cellulose nitrate film while I'm waiting for it to be collected or disposed of?

Because of the high risk of a serious fire and the production of toxic gases, the safest course of action is **not** to store cellulose nitrate film. Storing cellulose nitrate film may invalidate your insurance. Long-term storage of cellulose nitrate film should be left to institutions that have the necessary expertise and specialised facilities, and where it can be examined regularly for signs of any deterioration.

However, short-term storage may be unavoidable while you are seeking advice or arranging for the film's disposal. If the film still has images which can be copied, it should be:

- stored away from occupied buildings, where possible;
- separated from other film media and stored away from combustible or acidic materials (eg paper, textiles, flammable solvents, cleaning materials);
- kept in closed metal containers, ideally with loose-fitting lids that will prevent the accumulation of the acidic gases that accelerate the decomposition process. Film cans should be stacked horizontally, no more than six high, preferably in steel drawers or a steel cupboard (these will provide some additional fire resistance);
- stored in a cool (less than 20 °C), well-ventilated, dry place, away from doors and windows and away from any sources of heat or ignition (radiators, hot-water pipes, light fittings, fires etc).

Where film has deteriorated to the point where images cannot be retrieved, or where it has no historical value:

- carefully place the film in its open can in a container of water, ensuring that the water covers the film to a depth of at least 5 cm; and
- store the container somewhere safe – check it regularly and maintain the water level until it can be collected and safely disposed of.

At all times, observe the handling precautions and wear protective gloves and goggles.

If you decide, despite the dangers, to retain your old cellulose nitrate film for long-term storage you should **seek expert advice**, including contacting your local authority and fire and rescue authority.

## **Contacts**

You can obtain general advice on cellulose nitrate film and local archives from:

**British Film Institute:**

National Archives, 21 Stephen Street,  
London W1T 1LN Tel: 020 7255 1444  
Website: [www.bfi.org.uk/](http://www.bfi.org.uk/)

**Film Archives UK**

c/o British Universities Film and Video Council,  
77 Wells Street, London W1T 3QJ  
Tel: 020 7393 1508 Fax: 020 7393 1555  
Website: [www.filmarchives.org.uk](http://www.filmarchives.org.uk)

**National Media Museum**

Bradford, West Yorkshire BD1 1NQ  
Tel: 01274 202030 Fax: 01274 723155  
Website: [www.nmpft.org.uk](http://www.nmpft.org.uk)

**Imperial War Museum Film and Video Archive**

Department of Collections Management  
Lambeth Road, London SE1 6HZ  
Tel: 020 7416 5000 Fax: 020 7416 5299  
Website: [www.iwm.org.uk](http://www.iwm.org.uk)

For advice on safe disposal, contact the environmental health department of your local authority.

For advice on fire safety, contact the community fire safety officer of your local fire and rescue authority.

## **Further information**

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit [www.hse.gov.uk/](http://www.hse.gov.uk/). You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

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