

# Guidelines for the Long Term Preservation of CDs and DVDs

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Excerpts from *CCI Preservation of Collections Workshop:  
Modern Information Carriers* by Joe Iraci

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The following guidelines are mainly for home-recorded optical discs, both CDs and DVDs, those discs that contain information that is unique and irreplaceable. Store-bought CD and DVD recordings, though not as unique, will also benefit from these guidelines.

Long-term access to the information on CDs and DVDs depends on three factors:

- the disc's physical condition
  - good quality manufacture
  - good storage conditions
- the player/reader
  - compatibility with disc
  - technological changes
- the software
  - error rate correction
  - technological changes

Each of these three factors will be addressed below.

## 1) Physical Condition of CDs and DVDs

### a) Good Quality Manufacture:

Different makers of discs produce different qualities of CDs and DVDs. Purchase the best quality discs you can find and afford. The most stable are CD-Rs (write once) with gold metal layer and phthalocyanine dye. Mitsui is a recommended brand name. These are found in archival supply stores.

Second in stability are CD-Rs with silver alloy metal layer and phthalocyanine dye. These are acceptable for long-term preservation if RH and temperature conditions are controlled. These are found in business/office supply stores.

DVDs are less stable than the CD-Rs above. The most stable DVD so far is DVD-R with silver metal layer.

b) Good Storage Conditions:

The causes of physical deterioration of CDs and DVDs are: high temperature, high humidity (RH), light, solvents, adhesive labels, dirt and scratches, and over use/abuse.

**Temperature & Relative Humidity (RH) ~**

In general, discs should be stored in cool and moderately dry conditions with as little fluctuation as possible.

ISO Standard 18925-2002 recommendations for long-term storage:

- temperature should be less than 23° C or 72° F
- temperature should not exceed 25° C or 77° F for extended periods of time
- temperature should never exceed 32° C or 90° F
- temperature below -10° C or 14° F is not recommended
- temperature fluctuation should not be greater than 2-3° C in a 24-hour period
- average level for RH should be between 20% and 50%
- storage below 5% RH is not recommended
- RH fluctuation should not be greater than 10% up or down over a 24-hour period

Note: Acclimatization of discs in storage ~

If storage conditions are very different from use conditions, discs must be slowly acclimatized before use to prevent condensation on the disc, minimize stress and ensure proper playback.

Let the disc gradually get warmer overnight. The ISO standard recommends that temperature and RH change at no more than 10° C and 10% RH in a 1-hour period.

**Light ~**

Always avoid direct sunlight, and store discs out of light when not in use.

**Solvents ~**

The presence of ammonia, chlorine (cleaning supplies), sulphides, peroxides, ozone

(photocopiers), and oxides of nitrogen, smoke, and acidic gases should be minimized.

### **Labeling ~**

This mainly concerns CDs and DVDs that are recorded in-house and therefore do not have a commercial silk-screened label.

When recording, your data is stored on a layer just below the top surface of the disc. Putting a sticky label or writing on it with a ball-point pen or pencil risks damaging the top layers and losing your data.

Recommended options:

- the least expensive is writing on the disc with a water-based permanent-ink pen. Write only in the hub area of the disc (the hole in the centre). The disc must have a special writable surface.
- more expensive but known to be safe is the thermal wax transfer process. Equipment for this process can be purchased for in-house use.
- place a small label on the container instead, using acid-free paper.

Not recommended:

- stick-on or adhesive labels
- customized ink-jet printers (long-term effects unknown)
- light scribe capable disc drive (stability unknown)

### **Storage containers ~**

Storage containers should protect discs from dust, dirt, and moisture. They must be impact resistant and not bend easily. They should prevent the disc from touching the container (to prevent scratching) and have a locking mechanism (to prevent accidental opening).

Recommendations for safe storage containers:

- choose containers made of plastics such as polystyrene, polypropylene or polycarbonate.
- use regular-sized jewel cases with a holding tray
- for discs handled often, use less brittle polypropylene cases
- for added protection from light and variations in environmental storage conditions, store cases vertically (no leaning) in a suitable metal cabinet

Not recommended:

- containers made of paper, cardboard or foam rubber
- containers made of plastics such as cellulose, polyvinyl chloride (PVC) and any other highly plasticized materials
- plastic or paper sleeves
- liner notes (the glossy printed booklets) stored with discs
- thin jewel cases

### **Handling ~**

- handle discs by the edges and inner hub
- wear clean white lint-free cotton gloves when handling disc surfaces
- do not bend discs
- do not eat, drink, or smoke near discs

When transporting optical discs:

- hand carry them to avoid exposure to extremes in environmental conditions
- use an adequate shipping container (rigid, prevents moisture or debris getting in) or seal in a polyethylene bag

### **Inspection and monitoring ~**

CDs and DVDs in long-term storage must be monitored and inspected regularly so that any problems can be detected in time for information to be copied to a new medium before it is lost.

For discs stored under recommended conditions, inspect a sample of the discs every 5 years.

For discs stored in poor conditions, inspections should be more often. Suggest every 2 years.

Visually examine the disc for any warping or other physical distortions, rust spots on the metal layer, disc layers coming apart, the presence of dirt or debris, and any damage to the container or label. Test its readability by playing it.

In Summary:

Good-quality optical discs are fairly stable chemically and are predicted to last for 100 years or more. However, they are susceptible to physical damage such as

scratches to the base layer (affecting readability) or damage to the thin lacquer layer on the top side of the disc (affecting data).

Also, because optical discs have a layered structure, fluctuations in environmental conditions (temperature and RH) should be controlled to prevent problems such as delamination (layers coming apart) or warping.

For more information, please see ISO Standard 18925-2002 “Imaging Materials – Optical disc media – Storage practices” at [www.iso.ch](http://www.iso.ch)

## 2) The Player or Reader

### a) Cleaned and maintained properly

The lens of the player/reader needs to be cleaned periodically. You clean the lens by buying a cleaning disc. Most computer supply stores will carry this.

### b) Compatibility with disc

Not all players/readers handle discs the same way (egg. error correction). A disc that performs poorly in one machine may perform well in another machine.

Also, you must ensure the equipment you are using will play the format of disc you have. In 2006 there are 4 formats:

- Read-only: CD-DA, CD-ROM, CD-I, CD-ROM/XA, CD-V, Laserdisc, DVD-ROM, DVD-Video, DVD-Audio
- Write-once: WORM, CD-R, Photo-CD, DVD-R, DVD+R
- Erasable: Magneto-optical (MO), CD-RW, DVD-RAM, DVD-RW, DVD+RW
- Blue laser: Blu-ray (read-only, write-once, erasable), HD DVD (read-only, write-once, erasable), UDO, PDD

### c) Technological changes

Changes in technology and the obsolescence of equipment are big problems for long-term access to CDs and DVDs. Experience has shown these changes occur every 10 to 20 years.

Information stored on a well-maintained CD or DVD will still be lost if there is no machine capable of reading it. Therefore, changes in technology should be

monitored carefully so that existing information can be copied onto a newer storage medium when required.

### 3) The Software

#### a) Error Rate Correction

Players/readers come with software to direct the machine on how to read the disc. This software also corrects minor errors on the disc due to finger prints, scratches, dirt/dust, and uneven manufacturing quality. This works great until the disc acquires so many errors the software can't compensate anymore and the disc fails. There is no warning: one day the disc works and the next day it doesn't.

If this happens, try the disc on another player/reader because different machines have different error correction software. If you find a machine that can read the disc, make a copy to a new disc immediately.

You can reduce the number of errors created when writing to a disc by:

- using write-once formats (CD-R, DVD-R)
- purchasing highest quality discs
- using good quality recorder
- ensuring the disc and recorder are compatible (check manufacturer specifications)
- ensuring the disc is free of dust or fingerprints prior to recording
- recording at moderate speeds, e.g. 4x to 12x for CD-Rs.

#### b) technological changes

As with the equipment, the software undergoes technological change and obsolescence too. Monitor changes to plan for moving your information to the newer medium.

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