RP 103-1995
Revision of RP 103-1982

SMPTE RECOMMENDED PRACTICE

Care, Storage, Operation, Handling and Shipping of Magnetic Recording Tape for Television

1 Scope

This practice provides guidance to technical managers, archivists, and technicians for the care, storage, operation, handling, and shipping conditions that help maximize life expectancy and interchange performance for television (video) magnetic recording tape.

2 Storage conditions

2.1 Temperature and humidity

Tapes should not be stored in areas of extreme temperature and/or extreme humidity for long periods of time (see table 1). Temperature and humidity in the storage area should be selected as follows:

For short- and medium-term storage (up to 10 years):

Temperature	+15°C to +23°C
Humidity	40% RH to 55% RH

For long-term storage (over 10 years):

Temperature	+17°C
Humidity	30% RH

2.1.1 Variation from selected storage temperature and humidity from above values should be kept within ± 2°C and ± 5% RH throughout the storage period.

2.2 Airborne contaminants

Floors should be finished so that dust and debris are minimized due to pedestrian traffic. Cement floors should be sealed. Tile floors should not be waxed. Floor covering materials should be selected to minimize airborne debris and static generation. Air entering the storage area should be filtered to ensure or approach a class 100,000 environment as defined by Federal Standard 209D. Air pressure in the storage area shall be maintained at a positive pressure relative to adjacent hallways and rooms.

Table 1 – Summary of environmental conditions

		Storage		
	Operations	Medium term <10 years	Long term >10 years	Shipping
Temperature*	+17°C to +25°C	+15°C to +23°C ± 2°C	+17°C ± 2°C	–20°C to +45°C
Humidity*	30% to 70% ± 5%	40% to 55% ± 5%	30% ± 5%	5% to 80%
Temperature gradient/hour	10°C per hour	n/a	n/a	10°C per hour
Humidity gradient/hour	10% per hour	n/a	n/a	10% per hour
Stray magnetic fields	800 A/m (10 Oe)	800 A/m (10 Oe)	800 A/m (10 Oe)	4000 A/m (50 Oe)

*NOTE – For operations or medium-term storage, the center point for temperature and humidity can be selected anywhere within the allowable range, but the variation cannot exceed the allowable range.

Approved December 7, 1994

2.3 Physical characteristics

2.3.1 To minimize the possibility of the tape taking an unwanted set due to stepped or scattered winding, the tape should be given a continuous, full-length wind or rewind at the transport manufacturer's recommended wind tension and speed before storage. All magnetic recording cassettes may be stored in a fully wound or rewound condition, with the exception of SMPTE type E (3/4-in video cassettes) which must be stored in a fully rewound condition.

2.3.2 Tape destined for long-term storage should have very few record/playback passes to maximize playback performance and minimize the probability of head clogging and physical damage.

2.3.3 Open reel and cassette tapes should be stored in such a manner that they are supported by the hub by maintaining the plane of the flange perpendicular to the horizontal storage surface.

2.3.4 The tape should be stored in a clean, inert plastic container that provides protection from dust, atmospheric pollutants, and excessive moisture. Sealed plastic bags, cardboard containers, and sleeves are not recommended for storage. Except for labels, paper should not be stored inside a storage container .

2.3.5 The outer end of open reel tapes should be secured by an adhesive tab which leaves no residue on the tape after removal. Tab material is usually obtainable from the tape manufacturer.

2.3.6 No splices, other than the splices attaching the leader and trailer to the tape, shall be used in tapes that are placed in long-term storage.

2.4 Stray magnetic fields

The stray magnetic field at any point on the surface of the tape should not exceed a field strength of 800 A/m (10 Oe).

2.5 Environmental pollutants

Certain gaseous impurities commonly found in the atmosphere should be filtered out of the long-term storage environment in order to minimize the deterioration of the recording media and the paper labels and other documentation stored with the media. The recommended maximum levels are as follows:

Sulfur dioxide (SO_2)	1.0 $\mu g/m^3$	0.35 ppb
Nitrogen dioxide (NO_2)	5.0 $\mu g/m^3$	2.43 ppb
Ozone (O_3)	25.0 $\mu g/m^3$	11.70 ppb
Acetic acid CH_3COOH)	Use best control technology	

2.6 Storage shelves

2.6.1 Shelving used for storage of magnetic media should allow the tapes to be stored vertically in their shipping and storage cases with the tape identification label visible from the front.

2.6.2 Shelves should allow for adequate air flow so that the conditioned environment can be maintained throughout the storage area.

2.6.3 To avoid catastrophic damage, shelves should not be placed too close to heat sources, water pipes, and sprinkler heads.

2.6.4 Shelves should be designed to support the weight of tape when fully loaded. Additionally, the shelves should be placed on a floor that can support the weight of a fully loaded shelving system.

2.6.5 The shelves should possess a lip of sufficient depth to prevent dripping of melted plastic and burning plastic onto lower shelves in case of fire.

2.6.6 Magnetic latches on tape storage cabinets should not be used, since they could cause partial erasure of tapes if brought closer than 7 cm to the magnetic latch.

2.7 Periodic physical inspection

Every tape in an archive should be physically inspected at least every 3 to 5 years for such things as tape playback performance, debris, contaminants, container gasket deterioration, or other problems. This can be carried out by inspection of one-third to one-fifth of the archive each year. A full length wind/rewind should be completed on each tape at least once in every ten years, preferably during the periodic physical inspection.

2.8 Identification

Records containing proper date, control-number information, location, title, and other required information shall be maintained.

2.9 Smoking

To minimize airborne debris and reduce fire hazard, smoking should not be allowed in the tape storage area.

3 Operating conditions

3.1 Temperature and humidity

The temperature and humidity in the operations area should be selected and maintained as follows:

Temperature	+17°C to +25°C
Humidity:	30% RH to 70% RH

3.1.1 Variation from selected operating temperature and humidity from the above values should be kept within ± 2°C and ± 5% relative humidity.

3.1.2 Tapes that have been exposed to environmental conditions that are significantly different from planned operating conditions should be allowed to acclimate in the operating environment for at least 24 hours before usage. The maximum temperature and humidity gradient during transition should not exceed 10°C/hour or 10% RH/hour. This gradient refers to the maximum temperature and humidity change that the tape (not the reel, cassette, or container) is subjected to. The tape should remain in its container during acclimation to help control humidity and temperature gradient extremes.

3.2 Physical conditions

The operations area should be maintained as closely as possible to clean-room conditions. The following guidelines will ensure that clean-room conditions are met:

3.2.1 Airborne debris

Air entering the operations area should be filtered to ensure or approach a class 100,000 environment, as defined by Federal Standard 209D. Air pressure in the operations area shall be maintained at a positive pressure relative to adjacent hallways and rooms.

3.2.2 Floors

Floors should be finished so that dust and debris due to pedestrian traffic are minimized. Cement floors should be sealed. Tile floors should not be waxed. Carpeted floors shall utilize carpeting that minimizes debris and static generation.

3.2.3 Surfaces

All surfaces of the tape transport that touch either side of the tape or carrier shall be cleaned in accordance with the method and frequency recommended by the tape transport manufacturer. Isopropyl or ethyl alcohol is an acceptable cleaning fluid for routine cleaning. Other cleaning agents may be acceptable. Care should be taken so that the cleaning fluid does not contact the tape. For other than routine cleaning, such as removal of head clogs, use the transport manufacturer's recommended cleaning procedures.

3.2.4 Tapes

Tapes should be kept in appropriate containers that provide a barrier to water and debris when not on the tape transport.

3.2.5 Restrictions

Smoking, eating, and drinking should not be allowed in the operations area.

3.2.6 Threading

For threading open reel tapes, the tape should only be handled by the ends. Doors on cassette and cartridge tapes shall not be opened unless the tape is inserted into the transport.

3.2.7 Cassette and open reel tapes

Cassette and open reel tapes should be transported so that the tape is supported by the hub. Open reel tape flanges should never be squeezed together. The cassette loading door should never be used as a carrying handle

3.2.8 Tape ends

Frayed or wrinkled ends of open reel tapes should be cut off, using nonmagnetic scissors, prior to thread up.

3.2.9 Opening cartons

Cardboard cartons, such as master shipping cartons, should not be ripped open in the tape operations area, and cardboard use in the operations area should be avoided.

3.2.10 Dust and debris

Tape containers should be wiped clean prior to opening or transportation to the operations area.

3.3 Stray magnetic fields

The stray magnetic field at any point on the surface of the tape should not exceed a field strength of 800 A/m (10 Oe).

3.4 Winding

All tapes should be uniformly wound or rewound as described in 2.3.1 whenever the tape comes out of long-term storage or has been subjected to significant temperature and humidity variations.

3.5 Cassette removal from transport

Cassettes should be fully wound or rewound before removal from a transport. In cases where this is not immediately possible, such as during an editing session, cassette load/eject cycles should be minimized. Cassettes should be fully wound or rewound at the end of the day.

4 Shipping conditions

4.1 Winding

All tapes should be uniformly wound or rewound before shipment, as described in 2.3.1.

4.2 Containers

Tapes should be shipped in containers designed to withstand rugged handling and adverse environments, and should contain adequate shock-absorbing material. Heavy reels, such as those used for 1-in and 2-in open reel television magnetic recording tapes, should be supported by the hub and allowed to rotate freely inside the container. SMPTE type E (3/4-in) cassette tapes that do not provide self-locking reels shall be shipped in containers that provide hub locks.

4.3 Fastening

Open reel tapes should be secured at the outer end as specified in 2.3.5.

4.4 Shipment marking

Shipment of tape shall be marked with appropriate symbols or wording to indicate that the package should be handled with care, protected from excessive heat, cold, and moisture, and protected from magnetic fields.

4.5 Vibration and impact loads

Handling and transporting tapes should be done in a manner that will prevent excessive mechanical loads that would distort or damage the tape or components.

4.6 Temperature and humidity

Tape should be protected from excessive temperature and excessive humidity during transportation. The following limits should not be exceeded and the extremes of these limits should be very short in duration:

Temperature	–20°C to +45°C
Humidity	5% RH to 80% RH

4.6.1 The maximum temperature and humidity gradient during transportation should not exceed 10°C/hour or 10% RH/hour. This gradient is the maximum temperature and humidity change that the tape is subjected to, not the reel, container, or cassette.

4.7 Stray magnetic field

The stray magnetic field at any point on the surface of the tape should not exceed a field strength of 4000 A/m (50 Oe).

4.8 Packing for transportation

Sealed cardboard boxes are recommended for packing approved tape containers for transportation. While shipping video magnetic tape in the tape manufacturer's shipping container assures that the tape will arrive undamaged, shipping that container inside a cardboard box assures that the tape container itself will arrive clean and undamaged.

4.9 Packing fill

If packed in cardboard boxes, use large, clean packing material such as bubble sheets for fill. Do not use styrofoam peanuts, shredded paper, or other small packing material, as the material can cause contamination and/or static problems.

5 Other conditions

5.1 Health and safety

The operation, storage, and transportation of television magnetic recording tape shall be conducted in a manner that is consistent with the appropriate health and safety regulatory agencies.

5.2 Tape pack wind

Tapes should be uniformly wound or rewound as described in 2.3.1 to minimize physical damage.

5.3 Labels

Tape labels should be sufficient in size to adequately identify the tape. Labels should have adhesive backings that will continue to adhere the label to the shell, reel, or container during long-term storage. Labels should be constructed of inert materials. Label marking should be accomplished with nonfading ink.

5.4 Electrostatic charge and discharge

Maintaining the relative humidity within the operating conditions specified in 3.1 will minimize the impact of electrostatic charge and discharge on tapes and cassettes.

6 Definition of terms

6.1 cassette: A device containing magnetic tape on one or two reels within a protective shell.

6.2 container, shipping: A box or case that is designed to protect a magnetic tape from shock, moisture, and debris during transportation.

6.3 container, storage: A box or case that is designed to protect a magnetic tape from shock, moisture, and debris during storage.

6.4 long-term storage conditions: The storage conditions suitable for preservation of recorded information for a period of greater than ten years.

6.5 maximum life expectancy: The length of time that information is predicted to be retrievable in a system under storage conditions.

6.6 medium term storage conditions: The storage conditions suitable for preservation of recorded information from two to ten years.

6.7 open reel tapes: Tape that is wound on a hub that is not enclosed in a shell.

6.8 short-term storage conditions: The storage conditions suitable for preservation of recorded information for less than two years.

6.9 television magnetic recording tape: Magnetic recording tape used to record video and synchronizing signals. The tape may also record other signals such as audio or time code.

6.10 transport: A device designed to carry and guide magnetic recording tapes.

NOTE – The recommendations contained herein assume that all tape transports and recording tapes meet appropriate SMPTE format specifications and that the transports are set up and operating properly.

Annex A (informative)
Bibliography

Federal Standard 209D, Airborne Particulate Cleanliness Classes in Clean Rooms and Clean Zones

Cavanagh, T. Herman, R.N., and Nolan, M. Rewriting RP 103: Handling and care of magnetic tape for television. SMPTE Journal 103: October 1994.