SUBJECT: NN Sound Recordings Procedures Manual

1. **Purpose.** This transmits the new NN Sound Recordings Procedures Manual (SOUND 1404).

2. **Effective date.** This manual is effective upon signature.

3. **Explanation.** This manual prescribes Motion Picture, Sound, and Video Branch (NNSM) procedures that cover unique aspects of accessioning, storing, preserving, and duplicating sound recordings in the custody of NARA.

Distribution: Unit Heads (Washington, DC, area); Directors of Presidential Libraries, Federal Records Centers, and Regional Archives; NCW; NCP; NAPO; Administrative Officers
SOUND RECORDINGS PROCEDURES MANUAL

TABLE OF CONTENTS

CHAPTER 1. GENERAL

CHAPTER 2. ACCESSIONS PROCESSING

CHAPTER 3. STORAGE AND HANDLING

CHAPTER 4. PRESERVATION OF SOUND RECORDINGS

Appendix A. Glossary

Appendix B. Recorded sound at the National Archives

Appendix C. Sound recording formats, 1989

Appendix D. Formats, sizes, composition, and potential problems

Appendix E. Major types of materials used in the sound recordings manufacturing process

Appendix F. Major sources of deterioration

Appendix G. Standards used in audio preservation activities

i and ii
### TABLE OF CONTENTS

#### CHAPTER 1. GENERAL

<table>
<thead>
<tr>
<th>Paragraph Titles</th>
<th>Paragraph Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorities</td>
<td>1</td>
</tr>
<tr>
<td>Purpose</td>
<td>2</td>
</tr>
<tr>
<td>Coverage</td>
<td>3</td>
</tr>
<tr>
<td>Definitions</td>
<td>4</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>5</td>
</tr>
<tr>
<td>Sound recordings collection</td>
<td>6</td>
</tr>
<tr>
<td>Reserved</td>
<td>7 thru 10</td>
</tr>
</tbody>
</table>

i and ii
CHAPTER 1. GENERAL

1. Authorities. Authorities affecting the sound recordings program at the National Archives and Records Administration (NARA) include:

   a. The National Archives and Records Administration Act of 1985 (44 U.S.C. 2101), which authorizes the Archivist to "make and preserve . . . sound recordings pertaining to and illustrative of the historical development of the United States Government and its activities, and provide for preparing, editing, titling, scoring, processing, duplicating, reproducing, exhibiting, and releasing for non-profit educational purposes, . . . sound recordings in his custody."

   b. 44 U.S.C. 2111, which allows the Archivist to accept for deposit in the National Archives "documents, including motion picture films, still pictures, and sound recordings, from private sources that are appropriate for preservation by the Government as evidence of its organization, functions, policies, decisions, procedures, transactions."

   c. Laws and regulations supporting 44 U.S.C. 2114 that define sound recordings as Federal records and require executive agencies or any establishment in the legislative or judicial branches of Government to transfer permanently valuable records produced or acquired in the course of Government business to NARA.

2. Purpose. While the Office of the National Archives (NN) Procedures Manual (ARCHIVES 1400) provides policies and procedures for managing the National Archives of the United States, this manual prescribes Motion Picture, Sound, and Video Branch (NNSM) procedures that cover unique aspects of accessioning, storing, preserving, and duplicating sound recordings in the custody of NARA.

3. Coverage. Archival description of sound recordings is not covered in this manual; refer to ARCHIVES 1400, ch. 5. Coverage of reference services is limited to preparing sound recording reproductions for service orders and for the NNSM research room. Other reference services are described in ARCHIVES 1400, ch. 7.

4. Definitions. A glossary of technical terms related to sound recordings is found in app. A.

5. Responsibilities.

   a. NNSM. NNSM performs the archival functions relating to sound recordings described in the NARA Organization and
Delegation of Authority Manual (ORG./AUTH. 101), pt. 6, par. 15b.

b. Special Media Preservation Branch (NNPS).

(1) Coordinates with NNSM in planning preservation priorities and implementing new preservation technologies.

(2) Performs all in-house technical work for the preservation and restoration of sound recordings, maintains laboratory facilities, and provides technical expertise.

6. Sound recordings collection. A description of the sound recordings collection in the National Archives of the United States is found in app. B. A statistical breakdown of physical formats and types of recordings represented in the collection is presented in app. C; more detailed information is provided in narrative form beginning on page C-2. Apps. D thru F provide background information on sound recordings in general.

7 thru 10. Reserved.
# TABLE OF CONTENTS

## CHAPTER 2. ACCESSIONS PROCESSING

<table>
<thead>
<tr>
<th>Paragraph Titles</th>
<th>Paragraph Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART 1. GENERAL</strong></td>
<td></td>
</tr>
<tr>
<td>Coverage</td>
<td>1</td>
</tr>
<tr>
<td>Definitions</td>
<td>2</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>3</td>
</tr>
<tr>
<td>Reserved</td>
<td>4 thru 8</td>
</tr>
<tr>
<td><strong>PART 2. PROCESSING ACCESSIONS AND DISPOSALS</strong></td>
<td></td>
</tr>
<tr>
<td>Definitions</td>
<td>9</td>
</tr>
<tr>
<td>Receiving accessions, accretions, and internal transfers</td>
<td>10</td>
</tr>
<tr>
<td>Documenting accessions processing</td>
<td>11</td>
</tr>
<tr>
<td>Examining records</td>
<td>12</td>
</tr>
<tr>
<td>Arranging records</td>
<td>13</td>
</tr>
<tr>
<td>Reboxing records</td>
<td>14</td>
</tr>
<tr>
<td>Noting condition of records</td>
<td>15</td>
</tr>
<tr>
<td>Labeling sound recordings</td>
<td>16</td>
</tr>
<tr>
<td>Labeling sound recording containers</td>
<td>17</td>
</tr>
<tr>
<td>Preservation and reference copying</td>
<td>18</td>
</tr>
<tr>
<td>AVOLIS</td>
<td>19</td>
</tr>
<tr>
<td>Space management</td>
<td>20</td>
</tr>
<tr>
<td>Disposal of records</td>
<td>21</td>
</tr>
<tr>
<td>Reserved</td>
<td>22 thru 30</td>
</tr>
</tbody>
</table>

Appendix 2A. NA Form 14101, Receipt of Audiovisual Records and Gift Materials

Appendix 2B. Sample accessions processing memorandum

Appendix 2C. NA Form 14098, Audio Accession Preservation List

Appendix 2D. Sample AVIS location log

Appendix 2E. NA Form 14099, Audio Accession Disposal List

i and ii
CHAPTER 2. ACCESSIONS PROCESSING

PART 1. GENERAL

1. Coverage. This chapter prescribes procedures for processing new accessions, accretions, internal transfers from other NARA units, and internal disposals of records.

2. Definitions. (See glossary of technical terms in app. A.)
   a. Accession. Accessions are Federal records and donated materials for which legal title and physical custody have been transferred to the National Archives of the United States.
   b. Accretion. Accretions are accessioned records that fill a gap or extend the time span or coverage of a previously accessioned series of records.
   c. Internal disposal. After examining accessioned records to identify those lacking sufficient value to warrant their continued retention, an internal disposal is processed. The internal disposal involves either physically destroying the records or returning records to the originating agency if the agency does not concur in the records' destruction.
   d. Internal transfer. An internal transfer is the transfer of accessioned records from one NARA unit to another NARA unit when records require special preservation needs.

3. Responsibilities.
   a. NNSM. NNSM is responsible for the overall direction of the accessioning program for sound recordings in NN. It prepares accession dossiers on transfers of records from Federal agencies and private donors to NARA, directs the assistant branch chief for projects and the projects accessions staff (see subpar. b), resolves shipment and records discrepancies with Federal agencies and donors, arranges security storage for national security classified records, and coordinates internal disposal of records with the Office of Records Administration (NI) and other NARA units.
   b. Assistant branch chief for projects and the projects accessions staff. The assistant branch chief for projects and the projects accessions staff are responsible for receiving, examining, and verifying the contents of, and executing special instructions for, new accessions, accretions, internal transfers, and internal disposals by following the procedures in pt. 2.

4 thru 8. Reserved.

2-1 thru 4
PART 2. PROCESSING ACCESSIONS AND DISPOSALS

   a. Audiovisual Information System (AVIS). AVIS is a computer database that is used to record locations of records in storage areas and to track charged-out items through the use of barcodes (see par. 20).

   b. Audiovisual On-Line Information System (AVOLIS). AVOLIS is a computer database for descriptive control of NNSM holdings. Description is accomplished on three levels: mediagraphic descriptive information (content summary); physical description of records to the recording level; and preservation/condition status of records. The database contains a public display option that displays descriptions in a format similar to a library catalog card.

10. Receiving accessions, accretions, and internal transfers. NNSM receives records from Federal agencies and private donors, and internal transfers from other NARA units, in accordance with the procedures found in ARCHIVES 1400, ch. 3. Upon actual receipt of records, accessions processing staff (hereafter referred to as the "staff") follow the procedures in pars. 11 thru 30 to establish initial control over the records.

11. Documenting accessions processing.
   a. Accession dossier. As in the case of other NN units, an accession dossier is prepared by NNSM for all accessions of sound recordings. Information in the dossier is used to inform staff of pending shipments and to prepare the accessions processing memo (see subpar. c). The dossier may contain the following: relevant parts of Standard Form (SF) 115, Request for Records Disposition Authority; SF 135, Records Transmittal and Receipt; and/or SF 258, Request to Transfer, Approval, and Receipt of Records to the National Archives of the United States; correspondence; notes of negotiations with the agency; or other descriptive material.

   b. NA Form 14101, Receipt of Audiovisual Records and Gift Materials. On a monthly basis, staff prepare and forward an NA Form 14101 (see app. 2A) to NNSM that documents the actual receipt of all accessions, accretions, or internal transfers.

   c. Accessions processing memo. After examining the NA Form 14101, NNSM prepares and forwards to the staff an accessions processing memorandum (see app. 2B), which contains instructions for processing the accession.
April 5, 1993

d. NA Form 14098, Audio Accession Preservation List. Staff prepare an NA Form 14098 (see app. 2C) to document individual items in an accession. The information in the NA Form 14098 is used by the staff for computer input into the AVOLIS database (see par. 19) and to document accession contents for NNSM reference staff. Copies are forwarded to NNSM after completion of processing tasks described in pars. 12 thru 30.

e. Change of status record. See ARCHIVES 1400, ch. 5.

12. Examining records.

a. Verification. The staff verify the contents of shipments by comparing documents submitted by the Federal agency or donor, or NARA if it is an internal transfer, describing the records against the contents of the shipment. Documents may consist of an SF 258; agency-prepared box lists; inventories; and/or other material. Document packages may also contain, or consist solely of, a copy of the accession dossier prepared and forwarded by NNSM. If the shipment is an internal transfer, the documents may consist of memorandums, box lists, and inventories.

b. Discrepancies.

(1) The staff immediately report by telephone to NNSM any discrepancy between the documentation and the actual shipment. This information is then summarized by the staff in a memorandum describing the discrepancy in detail.

(2) When notified in writing that a discrepancy exists in an accession, accretion, or internal transfer, NNSM contacts the agency records officer, or the NARA unit head for internal transfers, to resolve the discrepancy.

c. Classified records. Records received in NNSM that are marked as containing national security information are reported immediately to NNSM. NNSM arranges security storage for records containing classified information in accordance with the procedures in the NARA Information Security Manual (INFO. SECURITY 202).

13. Arranging records. Normally, accessioned records at NARA are kept in the original order as received from the transferring agency, unless it is clear that the records have no arrangement or that the records were disarranged during agency collection or shipment of the records to NARA. Staff arrange records appropriately (e.g., alphabetically, numerically, chronologically) when instructed to do so in the accessions processing memorandum or in discussion with the assistant branch chief for projects or NNSM.
14. **Reboxing records.** All nonarchival sound recording containers received by NNSM must be replaced (see ch. 3, pt. 2) during accessions processing. Also, replace containers that are dirty or damaged with new containers.

15. **Noting condition of records.** Note carefully the physical condition of the records in the "Remarks" column of the NA Form 14098 for later input into AVOLIS. In a separate processing summary memorandum for NNSM, note the overall condition, the number of items, and the type (e.g., 16-inch disc or cassette) of sound recordings received. NNSM will use this information to plan rerecording priorities during the annual workplan process.

16. **Labeling sound recordings.** If original labels on sound recordings are loose, damaged, or illegible, prepare and attach new labels that contain the information found on the original label. Original labels are not discarded but are placed in a folder and shelved with the textual records relating to that record group and series.

17. **Labeling sound recording containers.** Each sound recording container is labeled as follows to identify its contents and to facilitate reference:

   a. Affix a strip label to the container. For disc recordings, affix a strip label to the upper right-hand corner of the open end of the disc jacket. For open-reel magnetic tapes and audiocassettes, affix the strip label to the spine of the recording container. The strip label for each container is given a control number containing the:

      (1) Record group number (e.g., 342),
      
      (2) Series designation as directed (e.g., SFP (if not already assigned by the agency, the projects archivist responsible for the accession assigns a series designation, as directed in the accessions processing memorandum, or after discussion with NNSM)), and
      
      (3) Consecutive item number in the accession (e.g., 01).

   b. Affix one barcode (see par. 20) to each container. On disc recordings, affix the barcode to the upper right-hand corner beneath the strip label. On open-reel magnetic tapes, affix the barcode to the right side of the spine. For audiocassettes, affix the barcode to the side of the cassette or the right side of the spine.
18. Preservation and reference copying. Determine the number of preservation and reference copies needed from NNPS or a contractor by following instructions on the accessions processing memorandum. These rerecording needs will be worked into future preservation priorities. Record this information in the processing summary memorandum to be sent to NNSM.

19. AVOLIS. Information from the NA Form 14098 is entered into AVOLIS by NNSM preservation staff after completion of processing to document the receipt, content, and physical condition of the records in each accession.

20. Space management. The AVIS computer system is used to determine locations for new accessions and accretions to established series of records, and to record all barcode numbers (see "Copy Location" heading of the AVIS location log in app. 2D) for locating records in storage areas. Record all location log information, including all barcode numbers, into AVIS after accession processing steps described in pars. 9 thru 19 have been completed. AVIS procedures are available from NNSM.


   a. Preparing disposals. Disposable records within an accession are identified during accessions processing. The staff inform NNSM of all records to be disposed by forwarding an NA Form 14099, Audio Accession Disposal List (see app. 2E). Records to be disposed are placed on shelves reserved for disposal until disposal authorization is received. Upon receipt of the NA Form 14099 from the staff, NNSM provides to the Records Appraisal and Disposition Division (NIR) a memorandum and draft SF 115 to initiate a disposal in accordance with the Records Appraisal and Disposition Procedures Manual (APPRAISAL 1321), ch. 3.

   b. Requests for disposal services. Once the signed authorization (SF 115) for disposal is received by NNSM from NI, a copy of the SF 115 is sent to the assistant branch chief for projects. The assistant branch chief for projects then prepares an NA Form 5007, Requisition for Equipment, Supplies, or Services, to dispose of the records and forwards the form through appropriate channels to the Facilities and Materiel Management Division (NAF). Include on the NA Form 5007 the location, volume, and types of record containers; method of disposal (destruction, return to agency, or delivery to a Federal records center); and the name of the staff member to consult on removing the records (procedures for completing NA Form 5007 are found in the NARA Administrative Procedures Manual (ADMIN. 201), ch. 7, par. 60).
c. Documenting the disposal. The assistant branch chief for projects annotates a copy of the SF 115 with the date of the actual disposal, which is the date the records were picked up by NAF, and sends a copy to NNSM.

d. Security-classified records. All security-classified records are destroyed in accordance with the procedures described in INFO. SECURITY 202, ch. 4, pars. 14 thru 20.

22 thru 30. Reserved.
MOTION PICTURE, SOUND, AND VIDEO BRANCH

RECEIPT OF AUDIOVISUAL RECORDS AND GIFT MATERIALS

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<th>Quantity</th>
<th>Disposition</th>
<th>Initials</th>
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Appendix 2A. NA Form 14101, Receipt of Audiovisual Records and Gift Materials
Date:  
Reply to: NNSM  
Ann of: NNSM  
To: PSA thru NNSM-Murphy  

Instructions:

X 1. Arrange and select essential preprint. Assign item number(s) as follows:
   Two audiotapes: RG 403.001, 403.002

   2. Recan/bag/label retain item(s).

   3. Retain rejected items in holding area pending disposal authority.

X 4. Prepare accession/control card(s). Submit for review.
   Copy of NA Form 14098 is enclosed, data will be entered into AVOLIS.

   5. Preservation work needed:

   6. Prepare and/or send reference copies to G-13.

X 7. Provide PSA location for A-1 input.
   Audio: 9-8-2

X 8. Other.
   We do not have any of this material in our holdings at this time.

Please return copy of this form with completion date noted.

Appendix 2B. Sample accessions processing memorandum
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<thead>
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</table>

April 5, 1993

Appendix 2C. NA Form 14098, Audio Accession Preservation List

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

NA FORM 14098 (1-92)
<table>
<thead>
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<td>DNS</td>
<td>44455</td>
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<td>018</td>
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<td>Fighting Characteristics of P-38</td>
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<td>-----</td>
<td>------</td>
</tr>
</tbody>
</table>

APPENDIX 2E.
NA Form 14099, Audio Accession Disposal List

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION
TABLE OF CONTENTS

CHAPTER 3. STORAGE AND HANDLING

<table>
<thead>
<tr>
<th>Paragraph Titles</th>
<th>Paragraph Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>1</td>
</tr>
<tr>
<td>Physical storage areas</td>
<td>2</td>
</tr>
<tr>
<td>Control of holdings</td>
<td>3</td>
</tr>
<tr>
<td>Temperature and humidity for sound recordings</td>
<td>4</td>
</tr>
</tbody>
</table>

**Figure 3-1. Temperature and humidity for sound recordings**

Reserved ................. 5 thru 9

**PART 2. STORAGE CONTAINERS**

| General | 10 |
| Cylinder containers | 11 |
| Disc containers | 12 |
| Memovox disc containers | 13 |
| Memobelt containers | 14 |
| Wire recording containers | 15 |
| Magnetic tape containers | 16 |
| Other sound recording containers | 17 |
| Reserved ................. 18 thru 24 |

**PART 3. CARE AND HANDLING**

| General | 25 |
| Cylinders | 26 |
| Discs | 27 |
| Magnetic tapes | 28 |
| Memovox discs | 29 |
| Memobelts | 30 |
| Wire recordings | 31 |
| Other formats | 32 |
| Reserved ................. 33 thru 39 |

**PART 4. INSPECTION**

| Annual inspection | 40 |
| Inspection | 41 |
| Reserved ................. 42 thru 49 |

i
PART 5. TRANSPORT

Environment ........................................ 50
Conditioning ......................................... 51
Potential hazards .................................... 52
Reserved .............................................. 53 thru 59

Appendix 3A. Shelf weight and space requirements

Appendix 3B. Storage container descriptions

Appendix 3C. NA Form 14102, Audio Preservation - Format Inspection
CHAPTER 3. STORAGE AND HANDLING

PART 1. GENERAL

1. Purpose. The life of records can be prolonged significantly by proper storage conditions. This chapter describes archival storage containers and procedures for handling sound recordings and outlines periodic inspection procedures for sound recording formats.

2. Physical storage areas. Specific guidance on storage areas for archival records in the custody of NARA is found in ARCHIVES 1400, ch. 4. General policy guidance for facilities management activities for Washington, DC, area units is found in ADMIN. 201, ch. 10.

   a. Magnetic and electrical fields. Storage areas for magnetic media sound recordings must not be located near strong magnetic or high-intensity electrical fields, such as those produced by large motors and transformers. These magnetic or electrical fields can destroy information on magnetic media. Small motors, such as those in vacuum cleaners, do not affect magnetic media.

   b. Shelving. Shelving for sound recordings must be adjustable to accommodate various format sizes. Shelving must also be heavy-duty to accommodate the weight of audio recordings (see app. 3A).

   c. Nonaudio formats. Never store sound recordings with other media because certain recording formats may emit pollutants that can effect other record types. Vinyl discs, for example, emit chlorine gas that affects motion picture media.

3. Control of holdings. Records removed from storage areas for any reason are charged out using NA Form 14001, Reference Service Slip, or by barcode checkout procedures using AVIS. For instructions on completing NA Form 14001, see ARCHIVES 1400, ch. 7, app. 7L.

4. Temperature and humidity for sound recordings. See fig. 3-1. Procedures for monitoring temperature and humidity and for reporting deviations of either are found in ARCHIVES 1400, ch. 4, pars. 12 thru 14.
1. **General storage parameters.** Records must be maintained at constant temperature and humidity levels. Specifications cited below are averages for a 24-hour period; small, short-term deviations from these standards are acceptable.

   a. **Temperature range:** 65 ± 3 °F
   b. **Humidity range:** 30% ± 3% RH

2. **Special storage considerations.** Records must be maintained at constant temperature and humidity levels. Specifications cited below are averages for a 24-hour period; small, short-term deviations from these standards are acceptable.

   a. **Wax and celluloid cylinders.**
      (1) **Temperature:** 50 °F
      (2) **Humidity:** 50% RH
   b. **Acetate-base magnetic tape.**
      (1) **Temperature:** 55 to 70 °F
      (2) **Humidity:** 30% to 50% RH

   Storage below 55 °F is prohibited because lower temperatures cause brittleness. Acetate tape may not be stored below 30% RH because static electricity develops at lower humidity.

---

Figure 3-1. Temperature and humidity for sound recordings

5 thru 9. **Reserved.**
PART 2. STORAGE CONTAINERS

10. General. Archival storage containers protect media from potentially damaging external environmental conditions and can reduce the extent of some media-specific internal deterioration, such as leaching. The use of proper containers, therefore, substantially prolongs the life of sound recordings. All sound recordings received by NNSM in nonarchival containers must have their containers replaced during accessions processing.

a. Needless exposure. When not in use, sound recordings must not be left exposed outside of their protective containers.

b. Empty containers. Empty storage containers must not be left open to permit the entry of dust or other contaminants.

c. Chemically similar material. Containers that are chemically similar or identical with the recording medium must not be used because similar materials tend to adhere to one another. This is particularly true in the case of plastics, when stabilizers or plasticizers may migrate between the two items.

d. Acidic containers. Acidic containers must not be used. Containers must be buffered to have an alkaline reserve with a minimum pH of 8.5.

e. Acidic paper. Remove acidic paper (notes, transcripts, or other documentation) from storage containers. Duplicate any valuable information on acid-free paper and place it in a separate cross-referenced file. The cross-reference sheet stored with the records must be acid free.

f. Damaged or dirty containers. Provide new containers for damaged or dirty containers (jackets, slipcases, tray boxes, etc.). Ensure that label information is duplicated on the new containers.

g. Labels. Provide new labels for loose labels that can slip and, by coming into contact with the sound recording medium, damage the format. Ensure that all information is transferred to the new label (see ch. 2, par. 16).


a. Cylinder boxes. Replace original acidic boxes with acid-free boxes (see app. 3B).
b. **Tray boxes.** Place 10 to 20 individual acid-free containers in one acid-free 7 3/8" X 7 3/8" X 17" tray box. The exact number of individual containers depends on cylinder size. Use acid-free spacer boards when needed to ensure that cylinders remain vertical (on end). Never store cylinders horizontally (on the grooved surface).

c. **Old acidic boxes.** Any portions of original acidic boxes containing valuable descriptive information must be electrostatically copied onto archival bond paper. Place the archival bond copy in the tray box. Discard the original acidic box.

12. **Disc containers.**

   a. **Original jackets.** Original paper disc jackets offer little protection from light and humidity, and their composition provides nutrients for molds and fungi. Discard old jackets.

   b. **Paper jackets.** Use of paper jackets is prohibited except for shellac discs because paper breaks down over time and contaminates the surface and/or grooves of the recording with paper debris. Replace paper jackets with jackets described in subpar. d.

   c. **Acidic and glassine disc jackets.** Replace acidic paper and all glassine disc jackets with acid-free foil-lined jackets (see subpar. d). Ensure that label information is duplicated on the new jackets.

   d. **New jackets.**

      (1) **Type.** Store cleaned disc recordings (see ch. 4, pt. 2, sec. 2) in an acid-free jacket made of a laminate of paperboard-polyethylene-foil-polyethylene. The polyethylene and foil act as vapor barriers, while the polyethylene inner layer protects the surface of the records from abrasion and damage.

      (2) **Sealing.** Reserved.

   e. **Cellophane.** Remove cellophane and other forms of shrink wrapping from disc containers to prevent warping.

   f. **Slipcases.** The open end of each jacket must face the top side of the acid-free slipcase to provide storage uniformity and to facilitate retrieval (identifying information is placed at the open end of the jacket). When necessary, acid-free spacerboards are used to ensure that discs are stored vertically.
April 5, 1993

(1) **16-inch discs.** Place up to 25 16-inch jacketed discs in a slipcase.

(2) **12-inch discs.** Place up to 25 12-inch jacketed discs in a slipcase.

13. **Memovox disc containers.** Place approximately 20 Memovox discs in an 18" X 4" X 18" acid-free box.

14. **Memobelt containers.** Place individual memobelts in 9 1/2" X 2" X 3" acid-free boxes. Place these boxes in 10" X 12 1/2" X 15" acid-free cartons.

15. **Wire recording containers.** Place in 9 1/4" X 3" X 17" acid-free boxes.

16. **Magnetic tape containers.**

   a. **Reels.** Recordings must be stored on 7" nonslotted plastic reels or on 10" nonslotted metal reels. Reels are immediately replaced if they are deformed.

   b. **Tape boxes.** Boxes should contain inserts that allow reels to be supported by the hub when shelved. This prevents the flanges from bearing the weight of the reels when properly shelved vertically.

      (1) **Microcassettes.** Cassettes are stored in 2 3/4" X 1/2" X 4 1/4" commercially available plastic cassette boxes.

      (2) **Standard cassettes.** Cassettes are stored in 2 3/4" X 1/2" X 4 1/4" commercially available plastic cassette boxes.

      (3) **7-inch reels.**

         (a) **Paper boxes.** Paper boxes must be replaced with plastic boxes (see subpar. (b)) as soon as practical. Temporarily used paper cartons must be hinged along the inside seam as well as outside to ensure longevity. Hinges and glues must conform to chemically neutral requirements. Cartons must be of low acidity products. Unvented acidic cartons permit migration of chemicals to magnetic tape. Ensure that label information is duplicated on the new containers.

         (b) **Plastic boxes.** Place reels in acid-free, plastic, flame-retardant boxes (i.e., boxes that do not contain unsafe levels Halogen compounds in their flame-retarding agents) and have a hub support (see app. 3B). These boxes are embossed with the NARA seal and the date of manufacture.
(4) 10-inch reels. Place reels in acid-free, plastic, flame-retardant boxes (i.e., boxes that do not contain unsafe Halogen compounds in their flame-retarding agents) and have a hub support (see app. 3B). These boxes are embossed with the NARA seal and the date of manufacture.

c. Tray boxes.

(1) Microcassettes. Place 50 cassette boxes in each 9 1/4" X 3" X 17" tray box.

(2) Standard cassettes. Place 50 cassette boxes in each 9 1/4" X 3" X 17" tray box.

(3) 7-inch plastic reels. Place 25 plastic reels in paper or plastic boxes in each 7 3/8" X 7 3/8" X 17" tray box.

(4) 10-inch reels. 10-inch reels are not placed in tray boxes but are stored individually on shelving because of their weight.

17. Other sound recording containers. Reserved.

18 thru 24. Reserved.
PART 3. CARE AND HANDLING

25. General. Sound recordings are created on fragile media that require careful handling. To reduce the chances of accidental damage, follow the procedures for each format in pars. 26 thru 39. Handle all formats with lint-free cotton gloves. See ch. 4, pt. 3, for information on handling various formats during rerecording and playback.

   a. Handling. Handle the most common sized cylinders by inserting the middle and index fingers into the cylinder, spreading them just enough to hold the cylinder securely. Hold the larger diameter "grand" or "concert" cylinders by inserting four fingers into the cylinder while placing the thumb on the edge or rim. Only touch cylinders from the inside or on the extreme edges because touching the sound grooves deposits oil and grime on the sound recording surface.
   b. Temperature changes. Avoid sudden changes in temperature. Allow a cylinder to adjust to room temperature (approximately 70 °F) before handling it; even the heat from a hand may crack a cylinder.
   c. Vertical storage. Always place cylinders in an upright position standing on their ends (on edge, not on the grooved surface). Locate cylinders in such a way that they will not be exposed to sudden jolts or shocks.
   d. Celluloid cylinders. Store celluloid cylinders separate from all others, being sure that their cartons are vented to allow the escaping gases to dissipate.

27. Discs.
   a. Handling. When handling a disc or when placing it in its sleeve, never touch the playing surface, either with the hands or with the surface of the sleeve or its liner. Instead, hold the disc between the fingers and the thumb, with one or more fingers in the center and the thumb on the outside edge of the disc. The sleeve should be slightly bowed, then slide the recording in.
   b. Vertical storage. Shelve discs vertically. Leaning or slanting can produce warping or other distortion of the disc's shape.

   a. Handling. Handle in such a manner as to prevent the reel flanges from being squeezed and causing tape-edge damage.
Reels must always be handled by the hub and never by the flanges. When in use, tapes must be laid down flat and never tilted or hit on the edge. If dropped, check immediately for cracked flanges and inspect the tape for edge damage.

b. **Vertical storage.** Shelve magnetic tape vertically to prevent pack shifting, uneven stress, and consequent physical distortion of magnetic tape.

c. **Rewinding.** Periodic rewinding of original magnetic audiotapes and preservation copies is not required for storage purposes. NNPS will wind magnetic tapes at correct tension to prevent or minimize print-through (see app. A) during long-term storage.

29. **Memovox discs.**

a. **Handling.** Support the disc by placing one or two hands under the disc (ungrooved side).

b. **Storage.** Store Memovox discs horizontally. To prevent damage from weight, do not place more than 20 discs in a box. Insert sheets of acid-free paper between each disc if acid-free sleeves are not available.

30. **Memobelts.**

a. **Handling.** Gently unfold the belt by supporting it with hands placed on the ungrooved, inner side.

b. **Storage.** Store one belt per box on edge to reduce stress on the folds.

31. **Wire recordings.**

a. **Handling.** Handle wire recordings by the reel. Wire recordings are fragile and may break even with gentle handling. Exercise care when threading the wire onto a record/play device or storage reel to minimize kinking.

b. **Vertical storage.** Shelve reels vertically.

32. **Other formats.** Reserved.

33 thru 39. **Reserved.**
PART 4. INSPECTION

40. **Annual inspection.** NNSM annually inspects a 5-percent random sample of specific formats in its holdings based on established priorities in the annual work plan to determine the extent of deterioration of the holdings. The sample is used to identify deteriorating storage containers and formats. The purpose of the latter is to identify specific problems within a record group and to schedule preservation work for those formats requiring immediate laboratory attention. Special emphasis is placed on glass-base discs and/or acetate magnetic tapes.

41. **Inspection.**

   a. **General.** Complete NA Form 14102, Audio Preservation - Format Inspection (see app. 3C), when conducting the annual inspection. When the inspection is complete, make notations and corrections on NA Form 14098 (see app. 2C) so that the records may be scheduled for preservation treatment.

   b. **Memobelt, cylinder, Memovox disc, and wire recordings.** Because of their inherently fragile nature, all memobelt, cylinder, Memovox disc, and wire recordings are immediately scheduled for preservation rerecording.

   c. **Disc inspection.**

      (1) Wearing lint-free cotton gloves, remove the disc carefully from the jacket. Handle each disc as if it is glass until you verify otherwise.

      (2) To determine if a disc is glass-base, a two-step check is required, remembering that normally glass-base discs were used only during the years 1941 to 1945 (see app. B):

         (a) Look into the spindle hole of the disc. If the disc is not glass, the inside rim of the hole will be a silver aluminum or metal color.

         (b) Carefully hold the disc up to the ceiling light. With glass, light will penetrate and you will see light weakly coming through the disc.

      (3) Inspect for fungus and dirt, peeling, warping, breaks and cracks, separation of lamination, leaching of plasticizer (white powdery or oily substance), and scratches.

      (4) When handling a disc, very often the disc label will fall off. Follow procedures in ch. 2, par. 16, to relabel the disc.
d. **Tape inspection.**

   (1) Wearing lint-free cotton gloves, remove the tape from the box.

   (2) Inspect for fungus, tape dust or residue in the box, excessive splices, and uneven wind, and check whether the reel is broken, cracked, or bent.

   (3) Determine if the tape is acetate-base (translucent) or polyester-base (opaque) tape. To do so, hold the reel of tape up to the ceiling light. If light shines through, the tape is acetate base.

e. **Other format inspection.** Reserved.

42 thru 49. **Reserved.**
PART 5. TRANSPORT

50. Environment. Whenever original or preservation audio records are transported from one location to another outside the storage area, ensure that the transport environment is similar to that of the storage area, \(\pm 10^\circ\text{F}\) and 10\% RH.

51. Conditioning. All formats exposed for more than a few minutes to environments significantly different from their storage environments must be conditioned in the storage area for at least 24 hours in their shipping container and an additional 8 hours in their format containers before being returned to shelving.

52. Potential hazards.

   a. Dirt and water. In addition to each format's regular storage containers, records must be transported in closed boxes that prevent the entry of dirt and water.

   b. Impact and vibration. Records must be transported in sturdy boxes lined with shock absorbent materials to prevent damage due to impact and, in the case of magnetic tape, to prevent vibration that can loosen the tape pack.

   c. Labeling shipping containers. Shipping containers must be clearly marked with a NARA return address and with the words "THIS SIDE UP" to indicate vertical orientation, "FRAGILE" to ensure proper handling, and, if the package contains magnetic records, "CAUTION, KEEP AWAY FROM MAGNETIC SOURCES."

53 thru 59. Reserved.
The following is the average weight of sample formats and the approximate count of each format per linear foot when properly packaged.

<table>
<thead>
<tr>
<th>FORMAT</th>
<th>Wght per Item/LB</th>
<th>No. of Items/FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>cylinders</td>
<td>0.27</td>
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<tr>
<td>16-inch acetate disc</td>
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<td>66</td>
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<tr>
<td>16-inch vinyl disc</td>
<td>0.60</td>
<td>66</td>
</tr>
<tr>
<td>78-rpm disc</td>
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<tr>
<td>LP disc</td>
<td>0.51</td>
<td>66</td>
</tr>
<tr>
<td>45-rpm disc</td>
<td>0.22</td>
<td>66</td>
</tr>
<tr>
<td>10-inch magnetic tape</td>
<td>1.77</td>
<td>13</td>
</tr>
<tr>
<td>7-inch magnetic tape</td>
<td>0.73</td>
<td>15</td>
</tr>
<tr>
<td>magnetic cassettes</td>
<td>0.30</td>
<td>18</td>
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</tbody>
</table>

Appendix 3A. Shelf weight and space requirements
April 5, 1993

MOTION PICTURE, SOUND, AND VIDEO BRANCH
AUDIOVISUAL PRESERVATION SERVICE REQUEST

RG: ____________ TITLE: _____________________________

SERVICE ORDER SYSTEM NUMBER: _______________________

PRESERVATION: ( ) MP ( ) AUDIO ( ) CASSETTE ( ) VIDEO

REFERENCE: ( ) MP ( ) AUDIO ( ) CASSETTE ( ) VIDEO

DEADLINE: __/__/__ RESEARCHER: ____________________________

STAFF ORIGINATOR: ____________________________ DATE: __/__/__

INSTRUCTIONS: __________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

TYPE OF COPY TO GO TO LAB: ____________________________

BRANCH CHIEF REMARKS: __________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

( ) APPROVED ( ) DISAPPROVED INITIALS: _______ DATE: __/__/__

DATE RECEIVED IN LAB: __/__/__ INITIALS: ____________

DATE RECEIVED FROM LAB: __/__/__ INITIALS: ____________

DATE RECEIVED IN NNSM: __/__/__ INITIALS: ____________

DATE INSPECTED: __/__/__ INITIALS: ____________

DATE SHIPPED TO RESEARCH ROOM __/__/__ INITIALS: ____________

Appendix 4C. NA Form 14100, Audiovisual Preservation Service Request
1. Cylinder storage containers.

   a. Container. Rectangular box whose top and bottom are folded inward forming pyramidal shapes to support the cylinder from the inside. (Note: Do not close the box too tightly because the top and bottom can act as a wedge and easily split the cylinder.) The box is designed to:

   (1) Keep the cylinder upright;
   (2) Prevent surface contact with solid objects; and
   (3) Prevent dust accumulation on the surface.

   b. Container liner. Inner surfaces of the cylinder box are lined with polyethylene and foil. The inner surface is designed to:

   (1) Give a smooth surface;
   (2) Prevent container debris from coming in contact with the cylinder; and
   (3) Provide a temperature barrier between the container and the cylinder.

2. Disc storage containers.

   a. Jackets. An acid-free jacket made of a laminate of paperboard-polyethylene-foil-polyethylene. The polyethylene and foil act as vapor barriers, while the polyethylene inner layer protects the surface of the records from abrasion and damage.

   b. Slipcases. 18 3/8" X 2 7/8" X 18" (for 16-inch jacketed discs) or 14 3/8" X 2 7/8" X 14" (for 12-inch jacketed discs) two part, acid-free boxes. The larger (outer) part slips over the smaller (inner) part and acts as a top.

3. Magnetic tape storage containers (7-inch and 10-inch reels).

   a. General.

   (1) Material. A rectangular plastic container in two sections that form a top and bottom and is made of inert, flame-retardant polypropylene. Technical specifications for these containers are found in Cold Storage for Color Film Materials, Technical Information Paper No. 3. These specifications are on file in NNSM.

   (2) Colors. Black (composed of carbon black and titanium dioxide only), gray, or white.

Appendix 3B. Storage container descriptions
b. 7-inch reels.

(1) Weight. Reserved.

(2) Dimensions. Reserved.

c. 10-inch reels.

(1) Weight. 440 grams (approx.).

(2) Dimensions. Technical specification for these containers are found in Cold Storage for Color Film Materials, Technical Information Paper No. 3. These specifications are on file in NNSM.
April 5, 1993  
SOUND 1404

AUDIO PRESERVATION - FORMAT INSPECTION

Record Number: ___________________  Date Inspected: ____________
Item Number: ___________________  Inspected By: ______________

LOCATION OF TITLE: (circle one)
Recorded on Reel/Cassette/Disc
Written or Engraved on Leader/Label/Disc
Written on Jacket/Container

FORMAT:

Magnetic tape:

- Cassette  7" reel  10" reel  Other ________

Disc:

- 12" disc  16" disc  Other _________________________

Other (specify)

- ________________________________

Copy:

- Original  Preservation  Intermediate ________

Minutes: ______________

COMPOSITION:

A. BASE (Magnetic tape):
   - Acetate  Polyester
   - Other (Specify)

(Disc only)  - Acetate  Glass  Aluminum  Plastic
   - Metal  Cardboard

B. SURFACE: (Disc only)
   - Shellac  Vinyl  Acetate  Wax
   - Other (specify)

Evaluation:
   - Broken  Leaching  Cracked  Physical Distortion
   - Edge Damage  Other (specify)

______________________________

______________________________

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

Appendix 3C. NA Form 14102, Audio Preservation - Format Inspection
TABLE OF CONTENTS

CHAPTER 4. PRESERVATION OF SOUND RECORDINGS

<table>
<thead>
<tr>
<th>Paragraph Titles</th>
<th>Paragraph Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>1</td>
</tr>
<tr>
<td>Definitions</td>
<td>2</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>3</td>
</tr>
<tr>
<td>Standards</td>
<td>4</td>
</tr>
<tr>
<td>Rerecording policies</td>
<td>5</td>
</tr>
<tr>
<td>Preservation planning</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 4-1. Preservation priorities

Disaster preparedness 7
Reserved 8 thru 12

SECTION 2. SERVICE ORDER AND PRESERVATION COPYING

Applicability 13
Reference 14
Definitions 15
Fee orders 16
Preservation orders 17
Receipt of NA Form 14106 by NNPS 18
Completion of the order 19
Reserved 20 thru 24

PART 2. PREPARATION FOR RERECORDING

SECTION 1. RESTORATION

Responsibility 25
Damaged recordings 26
Discs 27
Sound recordings beyond repair 28
Dewarping 29
Original labels 30

Figure 4-2. Dewarping procedures for vinyl discs

Reserved 31 thru 33
SECTION 2. CLEANING SOUND RECORDINGS

Discs .......................................................... 34
Cylinders ....................................................... 35
Magnetic tapes .................................................. 36
Other media .................................................... 37
Reserved ......................................................... 38 thru 41

PART 3. RERECORDING

SECTION 1. GENERAL

Purpose .......................................................... 42
Audio services contracts ..................................... 43
Definitions ...................................................... 44
Standards ......................................................... 45
Reserved ......................................................... 46 thru 49

SECTION 2. DISC REPRODUCTION

Handling of discs ............................................... 50
Preparation and cleaning ..................................... 51
Disc playing before rerecording ............................. 52
Preservation copies ............................................. 53
Reserved ......................................................... 54 thru 59

SECTION 3. MAGNETIC TAPE REPRODUCTION

General .......................................................... 60
Dried-out magnetic tape ....................................... 61
Spliced magnetic tape ......................................... 62
Damaged reels ................................................... 63
Rewinding ........................................................ 64
Use of unslotted reel hubs ................................... 65
Recording magnetic tape ....................................... 66
Characteristics of playback equipment and tension ...... 67
Noise reduction systems ....................................... 68
Leaders .......................................................... 69
Test tones ......................................................... 70
Technical standards ........................................... 71
Reserved .......................................................... 72 thru 74

SECTION 4. REPRODUCTION OF OTHER MEDIA - RESERVED

Reserved .......................................................... 75 thru 79
### SECTION 5. PREPARATION OF ARCHIVAL PRESERVATION COPY

<table>
<thead>
<tr>
<th>Paragraph Titles</th>
<th>Paragraph Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preservation copies</td>
<td>80</td>
</tr>
<tr>
<td>Reproducing the audio spectrum</td>
<td>81</td>
</tr>
<tr>
<td>Specifications</td>
<td>82</td>
</tr>
<tr>
<td>Winding</td>
<td>83</td>
</tr>
<tr>
<td>New copy labels</td>
<td>84</td>
</tr>
</tbody>
</table>

**Figure 4-3.** Labeling information for magnetic tape containers

<table>
<thead>
<tr>
<th>Paragraph Titles</th>
<th>Paragraph Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaders</td>
<td>85</td>
</tr>
<tr>
<td>Leader information</td>
<td>86</td>
</tr>
<tr>
<td>Quality inspection of preservation copies</td>
<td>87</td>
</tr>
<tr>
<td>Labeling sound recording shelving containers</td>
<td>88</td>
</tr>
<tr>
<td>Reserved</td>
<td>89 thru 94</td>
</tr>
</tbody>
</table>

### PART 4. EQUIPMENT AND EQUIPMENT MAINTENANCE

<table>
<thead>
<tr>
<th>Paragraph Titles</th>
<th>Paragraph Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>95</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>96</td>
</tr>
<tr>
<td>Playback equipment</td>
<td>97</td>
</tr>
<tr>
<td>Other necessary equipment</td>
<td>98</td>
</tr>
<tr>
<td>Cleaning and demagnetizing magnetic tape equipment</td>
<td>99</td>
</tr>
<tr>
<td>Stylus</td>
<td>100</td>
</tr>
<tr>
<td>Reserved</td>
<td>101 thru 109</td>
</tr>
</tbody>
</table>

**Appendix 4A.** NATF Form 73-B, Request for Audiovisual Services

**Appendix 4B.** NA Form 14106, Order for Audiovisual Duplication

**Appendix 4C.** NA Form 14100, Audiovisual Preservation Service Request and instructions

**Appendix 4D.** Technical specifications for audio services contracts

**iii and iv**
CHAPTER 4. PRESERVATION OF SOUND RECORDINGS

PART 1. GENERAL REQUIREMENTS

SECTION 1. GENERAL

1. Purpose. This chapter provides guidance on the restoration, rerecording, and duplication of NARA sound recordings.

2. Definitions.

   a. Duplication. The preparation of copies for research use or sale to the general public. The process involves the unsupervised, high-speed copying of existing preservation or intermediate rerecords.

   b. Fee copy rerecording. A sound recording copy created by NARA from the preservation or intermediate copy for researchers who request a sound recording copy. Costs to the researcher are based on the NARA fee schedule (36 CFR 1258). Copies are produced on either reel-to-reel tapes or audio-cassettes, at the researcher's choice.

   c. Intermediate rerecording. A sound recording copy created by NARA or a contractor from the preservation copy. Intermediate rerecords are created to preclude the recurrent use of preservation rerecords for the production of reference and service order copies. Intermediate rerecords are produced on 7-inch reel, 1.5 mil thick audio magnetic tape.

   d. Original recording. The sound recording received in any format from an agency of the U.S. Government or donor and accessioned into the National Archives of the United States. Upon completion of any preservation copying of sound recordings as described in this chapter, the original sound recordings are retained indefinitely under environmentally controlled storage conditions.

   e. Preservation, or "master," rerecording. A sound recording copy produced by NARA or a contractor from the original recording and used to reproduce the original program content on more stable media. Preservation rerecords are produced on 7-inch reel, 1.5 mil thick audio magnetic tape, recorded at full track, 3.75 or 7.5 ips (inches per second). The preservation rerecords are used to produce reference and service order copies; if a heavy demand for a certain audio recording exists, preservation rerecords may be used to create intermediate rerecords.
f. **Reference rerecording.** A sound recording copy created by NARA or a contractor from either the preservation copy or the intermediate copy and used for reference purposes in NARA research rooms. Reference recordings are produced on audio-cassettes.

  g. **Rerecording.** The transfer of original sound recording program material from an unstable or deteriorating medium onto a more stable medium, currently magnetic tape, for continued preservation of the program material. The process involves real-time playback of originals with 100-percent operator monitoring and speed correction, equalization, etc., as necessary.

  h. **Restoration.** Restoration includes cleaning and rehabilitating damaged or deteriorating sound recordings. Specific actions include washing, dewarping, stabilizing cracked discs, and other actions designed to rehabilitate recordings in danger of loss and to prepare them for copying onto a more stable medium.

3. **Responsibilities.**

   a. **NNSM.** NNSM is responsible for identifying all sound recordings in need of preservation work. NNSM formally requests preservation actions, coordinates preservation priorities with NNPS staff, and coordinates all technical assistance in procurement of contractual agreements for preservation work performed outside NARA.

   b. **NNPS.** NNPS performs all in-house technical work for the restoration and preservation of sound recordings. NNPS operates and maintains laboratory facilities, provides technical expertise, and coordinates with NNSM in planning preservation priorities and implementing new preservation technologies.

4. **Standards.** Audio preservation activities are performed in accordance with sound recording industry standards. The most current version of these standards, which are identified in app. G, are on file in NNPS.

5. **Rerecording policies.** NARA's principle means of preserving sound recordings is to rerecord unstable or deteriorating media onto more stable media. Restoration of the original sound recording is undertaken as a last resort.

   a. A preservation copy is made of each disc program depending on the sound recording's physical condition or the need for access to the information.
b. All magnetic tapes other than quality 1.5 mil polyester-base tape are considered unstable and rerecorded onto 1.5 mil polyester-base, splice-free magnetic tape. All original cassettes are rerecorded onto open-reel tape.

6. Preservation planning.

a. Annual work plan. The annual workplan process (see ARCHIVES 1400, ch. 2) is the principle means of determining which NARA sound recordings shall be rerecorded and/or restored in a fiscal year. Also, NNSM conducts a sampling of holdings based on preservation problems for each format as outlined in the annual work plan. See ch. 3, pt. 4, for procedures on format and container inspection.

b. Preservation priorities. Fig. 4-1 lists the sound recording formats in priority order, generally, for planning preservation or restoration actions. Priorities may be modified by other considerations, such as subject matter and research demand.

1. Memobelts.
2. Cylinders, all types.
3. Instantaneous transcription discs on glass base.
4. Instantaneous transcription discs on metal or cardboard base with acetate coating.
5. Broadcast transcription pressings.
7. Audiocassettes (all types).

Figure 4-1. Preservation priorities

7. Disaster preparedness. The NARA Records Recovery Plan outlines policies and procedures to be followed by NARA personnel in responding to incidents involving fire-damaged and/or water-damaged records in storage areas. The procedures are designed to minimize the extent of damage through timely
notification of appropriate personnel and a team approach to records recovery. (See ADMIN. 201, ch. 10, pt. 12.)

8 thru 12. Reserved.
SECTION 2. SERVICE ORDER AND PRESERVATION COPYING

13. Applicability. NNSM submits an NATF Form 73-B, Request for Audiovisual Services (see app. 4A), to NNPS for all fee order reproductions. NNSM submits an NA Form 14106, Order for Audiovisual Duplication, to NNPS for all preservation reproductions (see app. 4B). These reproductions are produced either in response to researcher requests for fee or reference-use copies, or in accordance with the annual workplan process (see par. 6).

14. Reference. ARCHIVES 1400, ch. 7, pt. 4, contains procedures for responding to researcher requests for reproduction services. The Trust Fund Procedures Manual (TRUST FUND 1801), ch. 5, includes detailed procedures for processing service orders from customers through the Service Order System (SOS).

15. Definitions.
   a. National Archives Trust Fund System 1 (Service Order System (SOS)). The automated system operated by the Trust Fund Cashier (NAJC) to track customer orders for products and services in Washington, DC, area units. SOS orders for sound recordings are generated using the NATF Form 73-B.
   b. NA Form 14098, Audio Accession Preservation List. See ch. 2, subpar. 1ld.

16. Fee orders. When a customer orders a reproduction of a sound recording and no preservation copy has been created from the original sound recording, the preservation copy must be prepared before the order is filled. Original sound recordings are not used to make a fee copy.
   a. Preservation copy exists.
      (1) When the NATF Form 73-B is received from NAJC by NNSM, the preservation copy is pulled from the stacks by the NNSM reference order section, following the procedures outlined in ch. 3, par. 3.
      (2) The NATF Form 73-B is placed with the preservation copy and forwarded by the reference order section to NNPS.
   b. Preservation copy does not exist.
      (1) When the NATF Form 73-B is received from NAJC and the reference order section determines that a preservation copy is needed to produce the fee copy, an NA Form 14100, Audiovisual Preservation Service Request (see app. 4C), is
completed by the preservation section and routed to the assistant branch chief for projects.

(2) The assistant branch chief for projects annotates the NA Form 14098 to record preservation work to be performed by NNPS and annotates the NA Form 14100, if necessary. The assistant branch chief then prepares the NA Form 14106 for preservation and duplication work.

(3) The assistant branch chief sends to NNPS the NATF Form 73-B, the NA Form 14106, a copy of the NA Form 14100, and the original sound recording.

17. Preservation orders. Preservation orders are generated by the annual workplan process (see par. 6); by new accessions, accretions, or internal transfers of records (see ch. 2, par. 18); or by researchers requesting listening copies of sound recordings when no reference copy exists.

a. When accessions processing staff or NNSM reference staff determine that preservation copying is necessary, complete an NA Form 14100 and route the request to the assistant branch chief for projects.

b. The assistant branch chief annotates the NA Form 14098 to record preservation work to be performed by NNPS and annotates the NA Form 14100, if necessary. The assistant branch chief then prepares an NA Form 14106 for preservation and duplication work.

c. The assistant branch chief sends the NA Form 14106, a copy of the NA Form 14100, and the original sound recording to NNPS.

18. Receipt of NA Form 14106 by NNPS. After completing work as indicated on the NA Form 14106, NNPS annotates the form with appropriate information, including the:

a. Number of labor hours expended,

b. Units of preservation work (hours, minutes, etc.),

c. Date the work was completed,

d. Initials of the employee completing the form, and

e. Appropriate notes to NNSM relating to technical problems or defects in the recording.
19. **Completion of the order.**

a. After the preservation order is returned to NNSM, the accessions processing staff verify the accuracy and quality of the new preservation and reference copies, and prepare labels (see par. 84) for them. The fee copies are processed according to TRUST FUND 1801, ch. 5.

b. The NA Form 14098 is annotated to show that a preservation and reference copy exist for the original recording, and this information is entered into AVOLIS (see ch. 2, par. 19).

c. The new preservation copy and the original are shelved, and their location noted in AVIS (see ch. 2, par. 20).

d. The reference copy is routed to the NNSM research room.

e. The preservation orders are filed in accordance with the NARA Files Manual (FILES 203), app. 14.

20 thru 24. **Reserved.**
PART 2. PREPARATION FOR RERECORDING

SECTION 1. RESTORATION

25. Responsibility. NNPS is responsible for basic cleaning and rehabilitating of sound recordings in preparation for rerecording. NNPS follows the procedures described in pars. 26 thru 33.

26. Damaged recordings. NNSM identifies damaged or deteriorating records during accessioning processing or while performing holdings maintenance or inspection. NNSM notifies NNPS of specific work to be done by submitting an NA Form 14106 along with the damaged recording. NNPS decides techniques to be used and feasibility of the preservation work.

27. Discs. Reassemble broken discs for playing but make no unreasonable efforts to eliminate every possible trace of "ticks" caused by disc surface fractures. Use a microscope to align grooves for cracked or broken discs. When grooves are aligned for rerecording, tape the discs with a pressure sensitive tape before rerecording, as follows:

   a. Taping single-sided discs. Place tape on the unrecorded side. Tape may only be placed across the grooves if this eases the rerecording process. Remove tape as soon as possible to prevent buildup of tape residue.

   b. Taping two-sided discs. Place tape on the unrecorded part of the disc (on the side that is to be rerecorded) to hold the pieces together for rerecording. Remove the tape from the first side and tape the other side for rerecording. Remove tape as soon as possible to prevent buildup of tape residue.

   c. After rerecording. NNPS replaces the disc pieces in the disc jacket and NNSM reselves the original recording.

28. Sound recordings beyond repair. NNPS will inform NNSM by indicating on the NA Form 14106 that a particular sound recording is unplayable for rerecording.

29. Dewarping. Dewarp vinyl discs when it is necessary to make them playable or trackable for rerecording. See fig. 4-2 for dewarping procedures.

30. Original labels. Remove labels that are loose or that fall off during laboratory work. Follow the procedures in subpars. a thru d.
1. Wash the disc thoroughly. See subpar. 34c.

2. Place the disc between two pieces of clean, flat, plate glass larger than the disc.

3. Heat the glass to 135-150 °F. Keep at temperature for 10 minutes.

4. Place five 10-ounce weights evenly spaced on glass for 24 hours.

5. Remove the weights and glass plates.

6. Replace the disc in its container for storage.

Figure 4-2. Dewarping procedures for vinyl discs

a. Disc labels.
   (1) Do not readhere loose labels to discs. Tests show that adhesives are unstable and that discs exude plasticizers that leach an oily substance on the surface of the disc, resulting in adhesive failure over time.
   (2) In appropriate circumstances determined by NNSM, place the label in a folder to be shelved with the textual records related to that record group and series in accordance with specific directions on the NA Form 14106.

b. Engraving discs. To control disc identification, engrave a NARA identification number that consists of the record group number and a consecutive number, assigned by NNSM, on the center of the disc. Use a diamond-point scribe to physically cut the original disc identification number into the disc after rerecording.

c. Magnetic tape labels.
   (1) When a label peels, is loose, or falls off a container, affix a new label to the magnetic tape box containing all the original label information, and discard the old label.
   (2) Affix the label to the spine of the reel container.

4-12
(3) When magnetic tape is returned by NNPS, NNSM staff affix a color-coded label on the container of the recording (see subpar. 84c).

d. Other formats. Label other formats on their original containers or as specified on the NA Form 14106.

31 thru 33. Reserved.
SECTION 2. CLEANING SOUND RECORDINGS

34. Discs.

a. General. Grooved discs are cleaned only if they are severely soiled. Cleaning occurs before preservation copying. The type of cleaning solution to be used depends on the recording to be cleaned, the materials of which it is made, and the dirt and debris to be cleaned from its surface. Whether it is a solid or a laminated object must also be taken into consideration. Extreme care must be used when any liquid is applied to laminated recordings, particularly those with a wood or paper base that will expand if it gets wet and cause the recording surface to warp and break even faster than normal.

b. Disc washing. Disc washing is important when dirt, dust, and grease contribute to the background noise heard on a sound recording. However, washing can also be harmful to discs if done improperly and to certain types of discs, especially laminated shellacs and all instantaneous discs. Determine if washing is necessary by listening to a sample portion of the sound recording for recognizable "ticks" associated with noticeable surface dirt or unusually noisy playback.

c. Disc washing procedure. In most cases, washing is performed on turntables. Use only those solutions in subpar. d. Dry discs by wiping along the grooves with camel-hair brushes or lint-free cotton/velvet cloths.

d. Cleaning solutions.

(1) Shellac discs. Clean shellac discs with solutions specifically prepared for use with shellac recordings (e.g., DiscWasher D-4+, Shellac Formula) in a 4-to-1 solution with distilled water. Never use alcohol on shellac discs because various kinds of alcohol dissolve shellac.

(2) Lacquered discs. Clean lacquered discs with a mild detergent that will not remove or reduce the castor oil content of the disc. Do not use alcohol on lacquered discs.

(3) Vinyl discs. Clean vinyl discs with water-base solutions and mild detergents (e.g., DiscWasher D-4+) in a 4-to-1 solution with distilled water. Be sure to rinse the detergent immediately with distilled water. Do not use alcohol when cleaning vinyl discs as it may adversely affect plasticizers and/or stabilizers.
e. **Cleaning procedure.**

(1) Before cleaning, NNPS staff must have a complete understanding of the composition of the sound recordings.

(2) Do not use the same cleaning materials on different recording media because chemically noncompatible soilage can be transferred.

(3) Gently clean most recordings by wiping them with a clean, soft, lint-free cotton/velvet cloth or cleaning brush. The cloth or cleaning brush should be moistened with a cleaning agent.

(4) Do not clean across the grooves. Clean in a circular motion with the grooves; that is, with a lint-free cotton/velvet cloth spiraling outside in or inside out, depending on the type of recording method used when the disc was created.

35. **Cylinders.** Reserved.

36. **Magnetic tapes.** Do not clean unless dirt on the magnetic tape or reel is obvious. Use appropriate solutions, such as denatured alcohol, to clean magnetic tapes.

37. **Other media.** Reserved.

38 thru 41. **Reserved.**
PART 3. RERECORDING

SECTION 1. GENERAL

42. Purpose. All sound recordings will eventually reach a point of deterioration that makes rerecording on more stable media necessary for the preservation of the information. Rerecording is aimed at creating a preservation copy on magnetic tape that is designated as the archival recording of the program material. Often, to accommodate the recurrent use of some sound recordings for reference purposes, two copies are made during rerecording: a preservation copy and an intermediate copy from which subsequent rerecordings and duplications are produced. These services for sound recordings are done in-house by NNPS or under contract.

43. Audio services contracts. Some NARA rerecording is accomplished by contracted services in facilities outside the National Archives. Generally, this is limited to duplication work where reference copies are made from preservation copies previously made in NARA, and in some instances, from original recordings. Contractors must follow technical specifications developed by NNSM, such as those found in appendix 4D.

44. Definitions.

a. Full track. See app. A.

b. Program. See app. A.

c. WOW. See app. A.

45. Standards. Preservation copies must be 7-inch or 10-inch open reels with splice-free 1.5 mil polyester audio magnetic tape, recorded full track monophonic at 7.5 inches per second (ips), in accordance with National Association of Broadcasters (NAB) open-reel standards. The most current version of these standards is on file in NNPS.

46 thru 49. Reserved.
SECTION 2. DISC REPRODUCTION

50. Handling of discs. Discs must be handled with lint-free cotton gloves and must be transported and stored vertically (see also ch. 3, pt. 3).

51. Preparation and cleaning. If necessary, prepare and clean discs before rerecording (see pt. 2).

52. Disc playing before rerecording.

   a. Normally, play all discs with only standard equalization to obtain full natural presence of original sound and the best possible signal from the disc.

   b. Determine the optimum width stylus and play the disc at required speed to record to magnetic tape in real time.

   c. Determine the groove type and the recording speed by listening to a sample of the disc to be recorded. Most discs are 33 1/3 rpm, standard groove.

   d. Determine the proper length of programming. One full side of a 16-inch disc will normally contain 15 minutes of programming.

   e. Determine the recording pattern, whether inside or outside start (refers to where the cutting head was placed to start the recording).

53. Preservation copies. Disc programs may be one side of one disc, or several sides and discs.

   a. Do not combine different programs on the same reel. For example, a 15-minute program (or one disc) will have its own 7-inch reel of 600 ft. A 60-minute program (or four discs) will be two 30-minute reels (i.e., reel 1 of 2 and reel 2 of 2).

   b. Attach head and tail leaders (see pars. 85 and 86) with the NARA disc number written on the leader in archival ink.

   c. The preservation copy will be tails out (see app. A) with even wind (see app. A) when returned by the lab.

54 thru 59. Reserved.
SECTION 3. MAGNETIC TAPE REPRODUCTION

60. General.

a. Because the recording surface, binder, and backing expand and contract at different rates, rapid environmental changes cause flexing, which weakens the tape, much as bending a piece of metal back and forth would do. Magnetic tape shall be brought from storage to the laboratory at least one day before use so it can stabilize under the new environmental conditions (see ch. 3, par. 51).

b. If a tape has been subjected to a hot, wet environment, it must be stored in a cool, dry place for a few days and be wound slowly there first. During the slow wind, an attendant must pay close attention to the tape, watching for problems.

c. Most damage to magnetic tape recordings occurs in playback, when the tension of the equipment is incorrect, or when the user mishandles the tape by frequent use of the fast forwarding and rewinding options on the recorder. When tension is too tight, the tape will stretch. When tension is too loose, tape can wind back on itself and wrinkle, destroying parts of the recording. The ideal solution is to play tapes once through and then store them without rewinding ("tails out"), so the emulsion side of the tape is stored toward the inside of the reel.

d. To further minimize damage, handle the recording part of a magnetic tape as little as possible; use 3-feet leaders at each end so that the tape may be threaded without touching the tape.

61. Dried-out magnetic tape. Magnetic tapes in which original lubricants have evaporated are lubricated with Freon-based dry lubricants in an effort to restore them to a point where they can be rerecorded once; no effort is made to "restore" the original tape.

62. Spliced magnetic tape. Because splices age badly, they must be cleaned and remade before copying tapes.

a. If the original magnetic tape has been spliced, clean off dried or sticky adhesive with appropriate solvents, such as denatured alcohol, applied with a cotton swab.

b. Remake splices (and, when necessary, clean off adjacent layers) when preparing a magnetic tape for copying. After the splices have been remade, clean the tape to remove loose particles. At elevated temperatures, a splicing tape
whose adhesive cures rather than becomes softer and more stringy is recommended (e.g., 3M's number 67 tape).

c. Rewind no faster than 15 ips.

63. **Damaged reels.** Reels with bent flanges must be discarded. Magnetic tape on damaged reels enters the pack at different heights, generating uneven tension during each wrap. The tape stretches over time to equalize these tensions, which then cause pitch drops and warped tape.

64. **Rewinding.** Always run magnetic tape to the end, then rewind completely. If only part of the tape is played, run it back to the head and then wind it slowly. Wind tape onto new reels slowly or, if the recorder is operating well enough to produce a flat tape pack surface on the takeup reel, in the "library wind" mode, or about 60 ips. Do not fast forward or fast rewind tape as the last step before storage.

65. **Use of unslotted reel hubs.** Only use unslotted reel hubs. Hubs with threading slots cause magnetic tape to dimple when winding, causing spoke pressure lines and consequent tape deformation.

66. **Recording magnetic tape.** Record tape full track. Leave tails out; i.e., not rewinding after playing will significantly reduce the effect of print-through (see app. A). Affix the loose tape end to the reel with an adhesive-backed, pressure-sensitive tape (e.g., 3M's number 8125-1/4-90 tape) that does not create dust or dry out as the adhesive ages.

67. **Characteristics of playback equipment and tension.**

   a. Playback speed shall equal that of the recorded program.

   b. Use record and playback machines with the lowest possible tape motion variation to limit WOW (see app. A) buildup in copies. WOW is always greater at lower recording and playback speeds.

68. **Noise reduction systems.** Playback shall be through appropriate noise reduction system decoders.

69. **Leaders.** See pars. 85 and 86.

70. **Test tones.**

   a. NNPS adds test tones (audio calibration signals) to the head of all the preservation rerecordings made in NNPS. The test tone signal consists of several tones in sequence at a precisely controlled level. Test tones are used to
calibrate playback equipment for each individual recording and to monitor deterioration of the medium.

b. Annually, NNPS conducts a random sample of selected tapes as part of the long-term testing program and will, every 5 years, test for degradation of the tones. Over a number of decades, this information will be useful in predicting the useful life of a particular magnetic recording stock.

c. NNPS annotates the tape containers having test tones.

71. Technical standards. All rerecordings are completed in accordance with NAB standards. Copies of these standards are on file in NNPS.

72 thru 74. Reserved.
SECTION 4. REPRODUCTION OF OTHER MEDIA

75 thru 79. Reserved.
SECTION 5. PREPARATION OF ARCHIVAL PRESERVATION COPY

80. Preservation copies.

a. Filtering and noise suppression. The preservation copy must duplicate all the original program material, the original sequence, interference, interruptions, etc., heard on the original program. Nothing must be altered by the engineer except speed correction to match that at which the original was recorded. Only if an obvious technical problem exists on the original program shall selective filtering or noise suppression be used to improve the quality or intelligibility of the original recording.

b. Technical notes. All technical problems and corrective measures taken must be noted on the preservation copy tape box, or in a separate support document in the form of notes attached to the NA Form 14106 returned to NNSM.

c. Length. Preservation recordings shall be physically cut to the length of the recorded program plus identification leader and runup stock as opposed to always making full 7-inch reels. Unrecorded tape shall be wound on the preservation recording before the start of program material and after the end of the program material to allow for sufficient stock for threading, runup, and speed stabilization of any high-speed duplicator that might be used with these tapes in the future (approximately 20 feet of tape on both ends).

d. Timing. Preservation recordings must be timed accurately from the first sound in the program material to the last sound.

81. Reproducing the audio spectrum. All signals are retained in the event that a future enhancement system is developed that can improve the original sound information. This means preserving those parts of the audio spectrum that may make the original uncomfortable to listen to. NARA does not use noise reduction encoding systems in the preparation of preservation copies.

82. Specifications. Preservation tapes, in general, adhere to the provisions of the NAB standard "NAB Standard - Magnetic Tape Recording and Reproduction (Reel-to-Reel) - April, 1965." A copy of the standard is on file with NNPS. In the event of any conflict between the standard and accepted National Archives practice, the NARA practice will be the superseding requirement.

83. Winding. Preservation tape shall be wound oxide in, tail out on standard 7-inch reels with 2.25-inch, slotless hubs.
84. New copy labels. Procedures in subpars. a thru c apply to labeling new copies for work performed either in-house or by a contractor.

   a. NARA-produced copies. NNPS annotates in archival ink the magnetic tape containers with the information in fig. 4-3 when completing preservation or SOS orders.

   b. Contractor-produced copies. NNSM, upon receipt and verification of the new copies, labels the rerecordings following the procedures in subpar. c. NNSM then processes the copies for space assignment and barcodes, using AVIS (see ch. 2, par. 20).

   c. Color-coded labels. After receipt of the new copies, NNSM processing staff type and affix color-coded labels on the containers of the recordings as follows: use red labels to identify original recordings and preservation rerecordings; use green labels to identify reference rerecordings. Each label must contain the title of the recording, description of the recording (e.g., speaker(s)), speed, time (in minutes), and date (if known).

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Type of rerecording (preservation, reference, SOS order).</td>
</tr>
<tr>
<td>2.</td>
<td>Record group/series/item numbers.</td>
</tr>
<tr>
<td>3.</td>
<td>Title of item (if applicable).</td>
</tr>
<tr>
<td>4.</td>
<td>Date originally recorded by agency or donor.</td>
</tr>
<tr>
<td>5.</td>
<td>Side one length (in minutes).</td>
</tr>
<tr>
<td>6.</td>
<td>Side two length (in minutes).</td>
</tr>
<tr>
<td>7.</td>
<td>Technical preservation problems and corrective measures.</td>
</tr>
<tr>
<td>8.</td>
<td>Type of magnetic tape used and magnetic tape manufacturer part number.</td>
</tr>
<tr>
<td>9.</td>
<td>Date copy was made.</td>
</tr>
<tr>
<td>10.</td>
<td>Frequency and magnetic level of test tones.</td>
</tr>
</tbody>
</table>

Figure 4-3. Labeling information for magnetic tape containers
85. Leaders.

a. Paper leaders. Attach acid-free paper leader tapes on an original or NARA-produced preservation or reference copy to (1) protect the tape on the "head" and "tail" and (2) to identify the tape with written identification information (RG and item number, reel 1 of 1, 1 of 2, etc.) should it become separated from its box.

b. Plastic leaders. Because plastic leaders can absorb and generate static, they are not recommended. Static discharge creates tape and head magnetization difficulties. When plastic leaders must be used because paper leaders are unavailable or too costly, leaders with proprietary anti-static coating, such as 3M's Leader Tape numbers 61 and 62, prevent this.

86. Leader information.

a. Attach 36-inch identification leaders (paper or plastic) to the head of each preservation copy. The leader must contain the following identifying information:

(1) Recording speed;
(2) "Head of tape;"
(3) "Preservation;"
(4) Record group, series, and item numbers;
(5) "Reel 1 of 2," "Reel 2 of 2," etc.; and
(6) Program time.

b. Indicate program time on the box label for the tape contained in the box (for multireel programs, indicate times for each reel, not for the total program).

87. Quality inspection of preservation copies. NNSM accessions processing staff conduct a quality inspection on all preservation copies made in-house or by a contractor. All rerecordings must be checked and sound sampled for accuracy, completeness, and quality. To ensure that all program material has been rerecorded, the processing staff listen to selected program material at the beginning, middle, and end of each tape to ensure:

a. The correct tape has been rerecorded.

b. The tape contains the complete program material.
c. The sonic quality of the tape is acceptable.

88. **Labeling sound recording shelving containers.**

a. **Disc storage containers.** Discs are stored in acid-free slipcases (see ch. 3, subpar. 12f), which are labeled with an archival box label containing the following information: record group number, series designation, and the beginning and ending item numbers.

b. **Open-reel magnetic tape storage containers.** Preservation copies of open-reel magnetic tapes are stored in tray boxes (see ch. 3, subpar. 16c), which are labeled with an archival box label containing the following information: record group number, series designation, and the beginning and ending item numbers.

c. **Audiocassette storage containers.** Cassettes are stored in tray boxes (see ch. 3 subpar. 16c), which are labeled with an archival box label containing the following information: record group number, series designation, and the beginning and ending item numbers.

89 thru 94. **Reserved.**
PART 4. EQUIPMENT AND EQUIPMENT MAINTENANCE

95. General. The use of professional equipment for rerecording is vital for the long-term preservation of sound recordings. Professional equipment consists of instruments that meet modern standards of technology, guarantee a minimum of distortion in rerecording, and are durable enough to continue producing recordings of the highest quality after thousands of hours of operation.

96. Responsibilities. NNSM is responsible for the overall maintenance and repair of all sound recording equipment in NARA research rooms. NNPS assists NNSM in maintaining and cleaning this equipment on a day-to-day basis.

97. Playback equipment. Discs are played on Technics SP 15 turntables using cartridges and styli mounted in 16-inch transcription tone arms. Playback of original magnetic tapes is on an assortment of generally older tape drives with adjustable torques, head positions, equalization, and speed. Three Ampex 350 tape drives are refitted with Inovonics electronic packages, Beau multispeed motors, and Nortronics or Sake heads.

98. Other necessary equipment. A selection of older recording equipment is maintained to service unusual recording formats found among the holdings.

99. Cleaning and demagnetizing magnetic tape equipment.

   a. Keep all equipment clean by swabbing the heads and metal guides with appropriate solvents on a cotton swab and by swabbing the rubber rollers with specially formulated rubber cleaner. Check proper tension, replace worn heads, and measure equalization and bias. Playback equipment must have the recording mechanism disengaged.

   b. All machine parts that touch the tape must be demagnetized every 8 hours of use. These parts include: the magnetic heads; capstan (the revolving metal shaft that drives the tape); the pinch roller (the rubber wheel that presses the tape against the capstan); tape guides and lifters; scrape and flutter filters; and the tape tension arms. Because playing causes a small amount of coating to be deposited, machines should be cleaned every 8 hours with appropriate solvents.

100. Stylus.

   a. Wear. Replace the stylus on a routine basis when it shows signs of wear.
b. Maintenance and cleaning. A dirty stylus tip prevents the stylus from making complete contact with the grooves, which causes sound deterioration and can cause abrasive damage to grooves. To clean the stylus, brush lightly from the back to the front of the cartridge and swab the stylus with a solvent designed for that purpose, generally denatured alcohol.

101 thru 109. Reserved.
**REQUEST FOR AUDIOVISUAL SERVICES**

To place an order, you MUST attach this form to NATF Form 72, Order for Reproduction Services. See the NATF Form 72 for payment and shipping instructions.

**INSTRUCTIONS:** Check the box next to the type of reproduction service required. List the items you wish to have reproduced. Specify the type of film or video format needed in the space labeled "SPECIAL INSTRUCTIONS FOR LABORATORY." Please contact the Motion Picture & Sound & Video Branch (202-501-5449) for additional information. Keep the pink copy of this form for your records. Return all other copies with your order.

### INDICATE TYPE OF SERVICE REQUIRED

<table>
<thead>
<tr>
<th>AUDIO</th>
<th>VIDEO</th>
<th>FILM</th>
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<tbody>
<tr>
<td>REEL 7.5 ips</td>
<td>CASSETTE</td>
<td>BROADCAST</td>
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<thead>
<tr>
<th>ITEM &amp; REEL NUMBER</th>
<th>ARCHIVAL COPY FORMAT</th>
<th>TITLE OR DESCRIPTION</th>
<th>FOOTAGE</th>
<th>RUNNING TIME</th>
<th>TYPE OF COPY</th>
<th>SOUND</th>
<th>總</th>
<th>NNSM USE</th>
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Footage and times MAY be estimated. See attached price list for unit prices. Prices are subject to change.

- [ ] RESTRICTIONS IN COPYING APPLY (See marked items).

**TOTAL ESTIMATED COST**

**SPECIAL INSTRUCTIONS FOR LABORATORY**

Specify film or video format needed:

**REPLY COPY - DO NOT DETACH**

Appendix 4A. NATF Form 73-B, Request for Audiovisual Services
### Appendix 4B. NA Form 14106, Order for Audiovisual Duplication

<table>
<thead>
<tr>
<th>Source Record</th>
<th>Type of Copy</th>
<th>Quantity</th>
<th>Cost</th>
<th>FOR LAB USE ONLY</th>
</tr>
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<tr>
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<td></td>
<td>DATE</td>
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</tbody>
</table>

**DEADLINE DATE**

**RELATED SOS NUMBER (if any)**

**COMMENTS:**

**FOR LAB USE ONLY**

**DATE**

**BRANCH USE: DATE SHIPPED**

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

NA FORM 14106 (1-93)
Directions for completing NA Form 14100.

RG: Insert record group/series/item numbers.

TITLE: Insert the title of the item.

SOS No.: Insert the SOS number obtained from the NATF Form 73-B.

PRESERVATION: Check the correct medium for preservation copy.

REFERENCE: Check the correct medium for reference copy.

DEADLINE: Insert the date copy is due.

RESEARCHER: Give the customer's surname.

STAFF ORIGINATOR: Give the name of the employee preparing the form.

DATE: Insert the date form submitted to NNPS.

INSTRUCTIONS: Insert necessary information, including the type of copy (i.e., cassette or 7" reel) desired; whether a reference copy is needed along with the preservation copy; and any special instructions.

TYPE OF COPY TO GO TO LAB: State whether original tape, disc, etc.

BRANCH CHIEF REMARKS: State whether rush job, special, etc.

APPROVED/DISAPPROVED: Check and fill in as applicable.

DATE RECEIVED IN LAB: Give the date received in NNPS. INITIALS: Insert initials.

DATE RECEIVED FROM LAB: Give the date shipped from NNPS and returned to the NNSM preservation staff. INITIALS: Insert initials.

DATE RECEIVED IN NNSM: Give the date received in NNSM from NNPS. INITIALS: Insert initials.

DATE INSPECTED: Give the date inspected by the NNSM preservation staff. INITIALS: Insert initials.

DATE SHIPPED TO RESEARCH ROOM: Give the date the reference copy was sent to research room. INITIALS: Insert initials.

App. 4C-2
Technical Specifications
Master Audio Open-Reel Magnetic Recordings

This specification defines the requirements for master audio open-reel magnetic tape rerecordings as used by the National Archives for the long-term storage of audio program material from various sources.

Master tapes as specified herein shall, in general, adhere to the provisions of the National Associations of Broadcasters' standard "NAB Standard - Magnetic Tape Recording and Reproducing (Reel-to-Reel) - April, 1965". In the event of conflict between the NAB standard and the content of this specification, the content of this specification shall be considered a superseding requirement.

Master recordings shall be made on tape with the following characteristics: 250 mil wide, 1.5 mil thick polyester base, backcoated, ferric oxide magnetic surface. The tape used shall be 3M Company type 808 or its equivalent; discretion as to the equivalency of the selected tape shall be exercised only by the National Archives based not only on the recording characteristics of the selected tape but also on its physical/mechanical properties in long-term storage. 3M Company type 808 is a "low noise/low print" tape optimized for voice recording, and such tape formulations are well suited to the National Archives' predominantly spoken word collection. Recording level, bias, and equalization shall be optimized for the tape used.

Master tapes shall be wound oxide in, tails out on standard 7-inch EIA reels with 2.25-inch hub. Recorded tapes on EIA reel shall be stored in plain white 7-inch reel boxes with hinged lid. Typed labels shall be applied to the exterior of the box, as shown in par. 84.

Identification leader (paper or plastic approximately 3 feet long) shall be attached to the head of each master tape and shall contain identifying information as shown in par. 85. Unrecorded tape shall be wound on the master recording before the start of program material and after the end of the program material to allow sufficient stock for threading, runup, and speed stabilization of any high-speed duplicator that might be used with these tapes in the future (approx. 20 feet of tape on both ends). Master recordings shall be physically cut to the length of the recorded program plus identification leader and runup stock as opposed to always making full 7-inch reels.

Appendix 4D. Technical specifications for audio services contracts
Master recordings shall be timed accurately from the first sound in the program material to the last sound. Program time shall be indicated on the identification leader and on the box label for the tape contained in the box (multireel programs shall have times indicated for each reel, not for the total program). Master recordings shall be made at 3.75 ips or 7.5 ips full track.

Master tapes shall be recorded on state-of-the-art recording equipment capable of taking full advantage of the characteristics of the tape specified above. Certain specifications of all equipment (e.g., frequency response, S/N ratio, distortion, etc.) shall be in line with current good commercial practice. The contractor shall exercise judgment in utilizing equalization changes, compression, etc., in an effort to improve previously existing recordings; such techniques are to be used in moderation and are generally to be applied only to material that is obviously extraneous to the desired program material.

Technical Specifications
Audiocassette Duplicates of Master Open-Reel Tapes

This specification defines the requirements for audiocassette duplicates of master open-reel recordings when such duplicates are to be used by the National Archives as reference or working copies of the master recordings.

Audiocassette copies as specified herein shall, in general, adhere to accepted standards related to "Phillips" type audiocassettes as specified in IEC 94, EIA RS 399A, and other documents. In the event of conflict between published standards and the contents of this specification, the content of this specification shall be considered a superseding requirement.

Duplicates shall be made on standard audiocassettes at 1.875 ips, two track, single channel. The longest cassette used under any circumstance shall be "C90" with "C60" and under preferred. The cassettes used shall be 3M Company "AVM - Studio Master" series or equivalent. The "AVM" features of particular concern to the Archives are its five screw shell assembly, molded in dust tight tape viewing window, backcoated polyester-base tape with low noise ferric oxide, delrin rollers on stainless steel pins, black styrene case, conductive lubricant shims, etc.

Audiocassette duplicate copies of masters shall be housed in a standard "Norelco" or album-type plastic box with a clear top and black bottom. Typed labels shall be applied to the cassette itself in the label space provided on the side of the
shell and on the edge of the cassette box. Cassette duplicates of master recordings shall contain only one "program" (8) per cassette unless instructed otherwise by the Archives staff for specific work requests. Successive parts (cassette sides) shall be labeled "part 1 of ___," "part 2 of ____," etc., where appropriate. Total program time shall be indicated on part one of the cassette. Cassette sides shall be recorded full length before proceeding to successive sides. In rare instances when program length is such that multiple cassettes must be used for a single program, the Archives staff will provide guidance as to labeling, such as "part 1, side one, reel one," etc.

Cassette copies of masters shall be made by any appropriate process at the contractor's discretion (high-speed duplicator, real time machine to machine, parallel with master, etc.). Specifications of equipment used (e.g., frequency response, S/N ratio, distortion, etc.) shall be in line with current good commercial practice.

Technical Specification
Master Audio Open-Reel Magnetic Recordings of Audiodiscs

The technical specifications defined under master audio open-reel magnetic recordings apply to the master audio open-reel magnetic recordings made from audiodiscs. A description of these discs can be found under definitions of terms.

Definitions of Terms

1. "Master audio open-reel magnetic tape recording" - An open-reel audio magnetic tape rerecording of previously existing audio recordings when such previously existing recordings may be in many different formats (mechanical disc, magnetic tape, mechanical tape, optical density or area variations, etc.). Masters are made for two purposes: (1) to standardize the format and media of the audio program material in the National Archives collection and (2) to produce a preservation copy of the program material such that program material will not be lost when previously existing recording media fail with age. The word "rerecording" as used above shall be construed to mean the real time auditioning of the entire length of the original recording such that informed judgments can be made on the necessity for filtering, speed correction, etc., for the entire length of the original recording.

2. "price per minute of program time" - A price that will include all of the contractor's expenses for producing masters and audiocassette duplicates of masters. All programs will be

App. 4D-3
accurately timed in minutes and tenths of minutes from the first audible sound to the last audible sound within a given program. Such times will be noted on labels applied to products and will be the basis for billing and payment.

3. "Normal products" (as associated with the price per minute) - Those products (masters or cassette duplicates of masters) that are produced with only routine effort related to preparing the original recordings.

4. "extremes of temperature and/or humidity absolute values and/or variations thereof" - Previously existing recordings, new rerecordings made from previously existing recordings, and raw materials used in producing new rerecordings shall be stored, used, and transported under environmentally controlled conditions of 70°F, 50% RH. Generally, the storage history of new magnetic tape cannot be accurately determined or controlled. Once it is in the custody of Archives or its contractors, every effort shall be made to maintain the above conditions in the holding facility. When transporting recordings over short distances (10 miles or less), it should be relatively easy to avoid excessive variations in temperature or humidity simply by double boxing materials on extremely warm or cold days, moving them expeditiously from the shipping to receiving facility, and ensuring that they do not sit in any nonenvironmentally controlled space for more than one hour or so. Vehicles with cooling and heating capability in the cargo space are required.

5. "program" - A complete unit of recorded audio material, such as a complete speech, a complete radio show, a series of related audio recordings that have an obvious beginning and ending, etc.

6. "transcription disc" - A type of audiodisc recording used predominantly by the major commercial radio networks and several Government organizations during the broadly defined World War II era (1935-1950, see app. B). The salient physical features of the discs are their 16-inch diameter (range of 10 inches to 18 inches, but 16-inch predominates) and their nominal 2.5 to 4 mil groove size. The discs are constructed of a substrate (aluminum most commonly, cardboard or glass during WW II) coated with a proprietary material usually consisting of cellulose as the basic ingredient with combinations of resins, oils, lacquers, glycerin, pigments, and solvents. The discs were engraved directly on a lathe and were intended to be played a few times at most.
Acetate See Acetate base and Cellulose acetate.

Acetate base Transparent cellulose acetate plastic film used as a tape base (i.e., the backing on which the magnetic oxide is carried). An acetate base tends to break rather than stretch when subjected to excessive stress. As a break can be mended easily and cleanly (whereas tape that has been stretched beyond its elastic limit can only be cut out of the tape), acetate backings offer some insurance against mishandling. However, the properties of polyester (especially Mylar) offer many more benefits when used as a backing (see Polyester). Therefore, acetate bases are no longer used as backing.

Acid A chemical compound having a pH below 7.0 and capable of neutralizing alkalis. Acids damage paper and other organic substances by weakening their molecular bonds. In paper, this results in yellowing and brittleness. Acid is present in paper as a result of impure groundwood pulp, alum-rosin sizing and other additives introduced during the paper-making process, and atmospheric pollutants. Acid material has a low pH. (See Alkali and Neutral.)

Acid migration The ability of acid to transfer from an acidic material to a less or nonacidic material. This takes place either through direct physical contact or through vapor action if acidic and less or nonacidic items are stored in the same container.

Acoustical or Acoustic recording process Approximately 1877 to about 1925 is the period for the use of this process, although acoustical recording continued after 1925. The earliest, commercially practical method of recording by causing the sound waves to actuate a diaphragm to which is attached a stylus. The stylus bears on the recording medium and mechanically engraves or embosses a sound track corresponding to the impressed sound waves. This is the method used before
the advent of electrical recording (see Electrical recording process) in the 1920's. Acoustical recording is also called mechanical recording. Because the output of most of the instruments used for acoustical recording is low and a considerable amount of energy is required to obtain a satisfactory level on the format, horns were used to reinforce the acoustic output. The term acoustic recording also is used to refer to the disc or cylinder produced through this method.

Additives
Materials added to the basic coating composition of discs and tapes that foster specific desired effects, such as lessening friction, softening or plasticizing the binder, retarding fungus growth, or making the coating conductive.

Alkali
A base substance having a pH above 7.0 and capable of neutralizing acids. (See Acid and Neutral.)

Alkaline reserve
Buffer or reserve of an alkaline substance added to paper to counteract acid. The reserve is usually a 3 percent precipitated calcium or magnesium carbonate by weight of paper.

Amertape
See app. B.

AVIS
(Audiovisual Information System). Computer database for location control of NNSM holdings. Used to record locations of records in storage areas and to determine available space for new accessions of records. Also used to track charged-out items.

AVOLIS
(Audiovisual On-Line Information System). Also known as INFOCEN, this computer database is used for descriptive control of NNSM holdings. Description is accomplished on three levels: mediagraphic descriptive information (content summary); physical description of records to the reel or recording level; and preservation/condition status of records.
Backing (base) The base on which the magnetic oxide coating of tape is carried. It gives strength and permits flexibility, and its thickness ensures that the physical separation of successive layers of the magnetic coating is sufficient to hinder print-through. Common materials are acetate and polyester (Mylar); paper was used in the early days of tape, and stainless steel has been tried. The base of a laminated disc is known as the core.

Berliner disc Disc manufactured using the photoengraving process developed by Emil Berliner in the late 19th century. (See Lateral-cut recording.)

Binder A substance used to help the basic materials of a record compound (disc or tape) adhere. In magnetic tape, it is also used to keep the magnetic particles on the coating separate from each other.

Buckling Deformation of the circular form of a roll of magnetic tape caused, generally, by a combination of adverse storage conditions or improper winding tension. Such deformation has a seriously detrimental effect on the quality of sound during playback.

Calendering A natural process that evens the surface of the oxide coating, thereby decreasing the thickness, of a magnetic tape.

Capstan The driven spindle or shaft in a tape recorder—sometimes the motor shaft itself—which rotates against the tape, pulling it through the machine at a constant speed during recording and playback modes of operation. Its rotational speed and diameter thus determine tape speed.

Carbon black An inert filler used to protect the basic resin in a record compound from the action of light by absorbing radiant energy. It is
also used as an antistatic element in magnetic tape.

**Cassette (magnetic tape)**
The compact cassette is a palm-size unit or smaller housing a spool of magnetic tape and a take-up reel. Cassettes permit quick loading and give full mono/stereo compatibility.

**Castor oil**
A pale, viscous fatty oil from castor beans used as a purifier or lubricant during the manufacture of phonographic discs.

**Cellulose**
Complex carbohydrate; chief component of the cell walls of plants, wood, etc. Primary component of paper.

**Cellulose acetate**
(1) Clear, hard, and glossy acetate salt of cellulose. Used in heat-sealing lamination and also as a base for phonographic discs and magnetic tape. Readily absorbs and retains moisture. (2) A phonograph recording disc with an acetate base or coated with cellulose acetate. (3) A magnetic tape with an acetate base. If light can be seen through a plastic or slotted reel of magnetic tape, then the tape is acetate and should be recorded on polyester tape as a preservation measure. The inability to see light through a reel of tape usually means that the tape is polyester. (4) A material used as a tape base and also as the coating on a direct-cut lacquer disc. It is the most fungal resistant of the cellulosics, and, although the best instantaneous recording medium for many years until the development of polyester as a base, it is an unstable medium with a limited storage life. (5) The term "acetate" is commonly used as a synonym for an instantaneous recording since many such recordings were made on acetate discs. See Acetate base and Lacquer disc.

**Cellulose nitrate**
Esters of nitric acid formed through action of nitric acid on cellulose (usually paper). Used to make plastics and varnishes. Used as a base for phonographic discs. The first of the modern plastics that replaced cellulose acetate as a disc or cylinder recording.
medium. Highly unstable and subject to oxidation and denitrination.

Center start disc
A disc recording (usually vertically cut) that requires the pickup and stylus to move from the center of the disc outward (having the beginning of its modulated groove at the outer edge of the inside margin).

Coating
The layer of finely divided magnetic material, bonded in plastic and polished to allow smooth flow over the tape heads, that carries the magnetically recorded signal in tape. Ferric (iron) oxide and chromium dioxide are both used as the recording medium. The outer layer on a laminated disc or cylinder in which the grooves are cut.

Compact disc
See Laser disc.

Cracking
Disintegration or separation of different parts of the format.

Creep
(or plastic creep)
(1) Gradual smoothing of the surface of some phonograph discs and memobelts (e.g., Memovox and Amertape) as ridges and grooves disappear, resulting in irreversible loss of the recorded information. More than 95 percent of plastic creep occurred on the Memovox and Amertapes within 10 years of their creation in the 1940's and 1950's. This factor reduces the concern for immediate preservation. (2) The physical deformation of disc recordings because of continuous load pressure either from improper storage or from the force of gravity. It results in surface imprint from packaging materials, which can impair fidelity by the deformation of the groove walls, disc warpage, and disappearance of grooves on formats composed of soft materials. (3) In magnetic tape, this refers to the residual deformation of the tape, such as curling or longitudinal curvature, that remains even after removal of tension caused by improper winding and storage.

Cylinder
See app. B.
-D-

Deacidic Material with a pH of 7.0 or above (see Acid, Alkali, and Neutral).

Deformation Unwanted change in the format's form or shape, such as disc warpage.

Delamination (1) Separation of the recording material from the core material. (2) The loss of adhesion between layers of a laminated cylinder, disc, or tape caused by poor fabrication, exposure to fungal attack, or extremes of temperature and humidity; e.g., the peeling or flaking of the acetate layer on a lacquer disc.

Demagnetization (1) The erasure of magnetic tapes by neutralizing the oxide particles in the tape coating, achieved through a high-frequency current passing through an erase head over which the tape passes, or through the use of a bulk eraser. Accidental demagnetization can occur when stray, external magnetic fields come into contact with the tape. (2) The neutralizing of the heads and other parts of a tape recorder that come into contact with the tape to prevent magnetic buildup, which can erase or demagnetize the tape.

Dictaphone A trademark name for a dictating machine.

Direct recording See Instantaneous disc.

Disc See app. B.

Disposal list An itemized inventory of records designated for removal through destructions, returns to originating agency, or transfer to a Federal records center. This inventory includes the record group number, number of items, title of the records, and the means for their disposal.

Dropout During playback, the instantaneous loss of a recorded signal because of imperfections in a magnetic tape. The imperfections may take the form of nonmagnetic foreign particles embedded in and flush with the tape's surface. Full-track recordings are less
**Edison cylinder**

Edison cylinders consisted of carnuba wax, lampblack, ceresin, stearic acid, lye, and sodium carbonate. See app. B.

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**Electrical recording process**

(1) From 1925 to the present: Sound waves are directed into a microphone, converted to electrical signals, and then amplified. The amplified signals either drive an electromagnetic cutting stylus that makes grooves in the recording format, usually a disc, or activates a device that magnetizes the recording format, either wire or magnetic tape. (2) Recording system that involves the use of a microphone and amplifier. It replaced the acoustical recording process (see Acoustical recording process). (3) Conversion of acoustical sound waves from a source into electrical energy, an image of which is transduced into a modulated groove of the recording and later reconverted into acoustical sound waves through the playback system.

**Embossed recording**

A form of cylinder, disc, belt, or film recording in which the coating material is displaced by the cutting stylus and shoved upward, appearing as two small ridges at the edges of the grooves. The frequency response of such recordings is rather limited, and the signal-to-noise ratio will vary with different types of recording materials.

**Embrittlement**

Change in physical properties that makes the format subject to cracking or being easily broken.

**Engraved recording**

The most common form of disc recording in which some of the disc coating material is removed from the disc as the cutting stylus is making the grooves.

App. A-7
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equalization</td>
<td>The process of modifying the amplitude/frequency response in a recording and reproducing system to produce flat, overall characteristics; minimize noise; or give an &quot;artistic&quot; effect.</td>
</tr>
<tr>
<td>Fee copy</td>
<td>A sound recording copy created from the preservation or intermediate copy for researchers who request a sound recording copy. Costs to the researcher are based on the NARA fee schedule (36 CFR 1258). Copies are produced on either reel-to-reel tapes or audiocassettes, at the researcher's choice.</td>
</tr>
<tr>
<td>Fidelity</td>
<td>A subjective term used to describe the degree of faithfulness with which recorded and reproduced (or broadcast) sound copies the original.</td>
</tr>
<tr>
<td>Field recording</td>
<td>A recording made with a portable recording instrument (cylinder phonograph, wire recorder, disc cutter, or tape recorder).</td>
</tr>
<tr>
<td>Flaking</td>
<td>The loss of bonding or adhesion between the base and coating of laminated discs or magnetic tape, resulting in pieces of the coating breaking loose from the base. It is essentially the same as peeling but more localized in effect. See Peeling.</td>
</tr>
<tr>
<td>Formats of sound recordings</td>
<td>See app. B.</td>
</tr>
<tr>
<td>Full track</td>
<td>Applies to quarter-inch wide tape only. Magnetic signal covers the full width of the audiotape. All preservation copies are made at full track.</td>
</tr>
</tbody>
</table>
-G-

Glassine  A thin, dense, transparent or semitransparent paper highly resistant to the passage of air and grease.

Graphophone  Reproducing machine invented by Chichester Bell and Charles S. Tainter in 1885, and the first phonograph to have a recording format readily removable, transportable, and replacable for playing. By 1890, it had been adapted to play a brown wax cylinder of normal size, and it became Edison's strongest competition in the cylinder world.

Greying  Commonly used defect term for disc recordings. It indicates widespread needle wear that results in a discoloration, or "greying," of a part or all of the playing surface of the disc. It usually means that the disc has been extensively played, or that it has been played with too heavy a stylus tracking weight. Sometimes called steeling.

Groove  A furrow or embossed cut in the surface of a record (disc or cylinder), which can be a blank (unmodulated) or recorded (modulated) groove, or a combination of both. A cut recording contains one groove cut (or embossed) spirally from the beginning to the end of the item.

-H-

Heads out  Having the beginning of the program information (recorded content) at the head, or outside, of the reel of tape or film ready for immediate playback or projection without the need to rewind.

Hill-and-dale recording  See Vertical-cut recording.

Hiss  An undesirable, wide-spectrum noise heard when a recorded magnetic tape is played back. It sounds similar to a leaky steam pipe. It is caused by various factors, including taping at too low a speed or using poor-
quality tape. Various noise reduction systems have been developed to combat hiss.

**Hub**
The cylindrical object at the center of a tape reel, around which the tape is wound. NAB hub refers to a standard set by the National Association of Broadcasters for all 10 1/2" and 14" diameter reels of professional recording tape.

**Hygrothermograph**
A device for determining or recording (usually on graph paper) the relative humidity and the temperature of the local atmosphere.

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**Inches per second (ips)**
The measurement of the speed at which tape passes through a tape player. Tape speeds are all based on the early standard of 30 ips for coated tape.

**Indentation recording**
Term applied to recording on certain metal discs (e.g., aluminum) with a diamond stylus, in which the material is compressed to make grooves (i.e., no thread is removed or displaced).

**INFOCEN**
See AVOLIS.

**Instantaneous**
Refers to recordings on cellulose acetate and cellulose nitrate that were created as an event was occurring.

**Instantaneous disc**
A recording intended for direct reproduction without further processing. Refers to a disc recording made "live" at an event, and not commercially produced or pressed. Also known as direct recording or spot recording.

**Intermediate**
A sound recording copy created by NARA or a contractor from the preservation copy. Intermediate rerecordings are created to preclude the recurrent use of preservation rerecordings for the production of reference and service order copies. Intermediate
rerecordings are produced on 7-inch reel, 1.5 mil thick audio magnetic tape at 7 1/2 ips.

Intrinsic value Term used to define or describe the qualities of archival materials. Records have varying degrees of intrinsic value based on such factors as uniqueness or value of informational content, age, physical format, artistic or aesthetic qualities, and scarcity. Determination of intrinsic value is closely linked to decisions regarding preservation and physical treatment. Materials having high intrinsic value generally warrant preservation in their original format, while records designated as having little or no intrinsic value often can be copied to preserve informational content.

determinations of intrinsic value, usually based on factors such as uniqueness or value of informational content, age, physical format, artistic or aesthetic qualities, and scarcity. Determination of intrinsic value is closely linked to decisions regarding preservation and physical treatment. Materials having high intrinsic value generally warrant preservation in their original format, while records designated as having little or no intrinsic value often can be copied to preserve informational content.

IPS See Inches per second.

Lacquer A solution of a cellulose derivative (such as nitrocellulose) used in the manufacture of phonographic discs. Any clear or colored synthetic organic coating that typically dries to form a film by evaporation of the solvent.

Lacquer disc A recording disc usually made of metal, glass, or fiber and coated with a lacquer compound, usually acetate or cellulose nitrate, into which grooves are cut. They can be one-sided or two-sided. Sometimes referred to as an "acetate" or as an "acetate disc." Intended for instantaneous recording.

Laminated disc A recording medium composed of several layers of material held together by a binder. Lacquer discs, for example, are laminated.

Laser disc A mass-produced and prerecorded disc. The content of this format is digitally encoded and etched into a reflective layer on the...
disc in the form of holes or pits (depressions). A laser light beam is focused on the disc as it revolves. Where there are no depressions, the light beam simply moves on. Where there are depressions, the light beam is reflected back into the playback apparatus, which "reads" the reflections and eventually converts them back into an analog signal for playback. Commonly referred to as a compact disc.

Lateral-cut recording

Invented by Emil Berliner. It is a recording process by which a stylus cuts a furrow or groove of constant depth but varying lateral displacement into the disc; that is, the images of the sound vibrations are cut into the sides of the groove. With the advent of stereophonic sound, an added vertical compliance was required, but most commercial recordings have been lateral cut. Sometimes called needle-cut recording.

Leader

See Tape leaders and trailers.

Light table

A table with an illuminated glass insert used by some contractors to inspect new sound recordings.

Location register

A manual or automated finding aid or register designating locations of records. The register will normally provide the holding unit, building floor, row, and shelf locations for the records.

Loss of adhesion between laminates

Separation of different laminate layers.

LP

Long playing. Synonymous with 33 1/3-rpm discs.

Magnetic tape

See app. B.

Master disc

A finished disc recording in edited or approved form from which copies can be made in the record production process. It is used
to produce a reverse copy, or metal matrix, that has ridges instead of grooves and is used as a stamper for producing copies in the single-step process, or is used to produce a metal "mother" in the three-step process.

Master rerecording

An open reel, audio magnetic tape rerecording of previously existing audio recordings when such previously existing recordings may be in many different formats (mechanical disc, magnetic tape, mechanical tape, optical density or area variations, etc.). Masters are made for two purposes: (1) to standardize the format and media of the audio program material in the National Archives collection and (2) to produce a preservation copy of the program material so that program material will not be lost when previously existing recording media fail with age.

Matrix

A metal negative (with ridges instead of grooves) of an original master disc. In the record production process, it can be used either as a stamper for producing pressings or to create a "mother" from which the stamper is made.

Mechanical recording process

See Acoustical recording process.

Memovox disc

See app. B.

Mother

A nickle- or copper-plated positive copy of an original master recording (made from a metal matrix or negative copy) that is used to make a stamper for producing pressings in the commercial recording process. It replaces the original master, which can then be stored for safety purposes.

Mylar

A polyester plastic manufactured by the Dupont Company and currently used as the backing in many types of magnetic recording tape.
Needle
See Stylus.

Needle-cut recording
See Lateral-cut recording.

Neutral
Exhibiting neither acid nor base (alkaline) qualities; 7.0 on the pH scale.

Nitrate
See Cellulose nitrate.

Open reel
See Reel-to-reel tape.

Original recording
The sound recording received in any format from an agency of the U.S. Government or donor and accessioned into the National Archives of the United States. Upon completion of any preservation copying, the original sound recording is retained indefinitely under environmentally controlled storage conditions.

Oxidation
Chemical reaction in an object that converts an element into its oxide and generally leads to deterioration of the material. The degrading effect of oxygen on certain resins or plastic compounds dependent on environmental and time parameters, which can cause decomposition, loss of certain physical properties, etc.

Pack
Refers to the form taken by tape as it is wound on a reel or around a hub. A good tape pack will be smooth and free of ripples, buckling, cinching, etc.

Peeling
Commonly used term referring to the widespread separation of the coating layer of a laminated recording from its base or core. It is used interchangeably with flaking,
although the latter usually implies more limited or local deterioration. See Flaking.

Phonograph

Edison applied this word to his first recording/reproducing machine of 1877. In general American terms, a phonograph was and is any machine reproducing sounds from indented, incised, or engraved cylinder or disc records; in general European terms, it is a machine reproducing sounds from cylinders only.

Plastic creep

See Creep.

Plasticizer

(1) An additive used to alter the properties of a basic resin (such as cellulose nitrate), usually to soften or "plasticize," which in turn could induce chemical degradation of the basic resin. Examples are camphors and castor oil. The loss of plasticizer can lead to shrinkage or hardening of the coating, causing flaking or peeling. (2) An additive that plasticizes; a chemical added to rubbers and resins to impart flexibility, workability, or stretchability.

Polyester

The word used for polyethylene glycol terephthalate, a material commonly used as the base film for magnetic tape. It has a higher humidity and temperature stability than most other film-base materials. It also has greater strength and fungus and mildew resistance. Sold under a variety of trade names, including Mylar, Melinex, and Scotchpar. When formulated with no coatings or additives, it is inert and chemically stable.

Polyethylene

A plastic material sometimes used as a protective liner or sleeve for discs and tapes. It furnishes a smooth fungi-resistant surface and is also a moisture barrier for both the disc or tape and the external packaging (jacket or box). A polymer of ethylene; any of various partially crystalline lightweight thermoplastics that are resistant to chemicals and moisture.

Polymerization

The conversion of substances to a new compound by a joining together of their molecular structures. In recordings,
additives are chosen to alter certain physical properties for a desired effect through polymerization. Sometimes these additives can also create undesired effects.

Polymerized vinyl chloride/polyvinyl chloride (PVC)

A synthetic resin that has been manufactured in the United States since the 1930's. In the sound recording industry, it is used in the manufacture of phonograph discs. It was used as a binder in 78-rpm shellac discs, and it is the primary ingredient in contemporary LP discs. See Vinyl.

Polypropylene

Any of various thermoplastic plastics or fibers that are polymers of propylene.

Polystyrene

Another form of plastic used in the production of phonograph discs. Production costs for such discs are lower than PVC for large runs, but require a larger initial capital expenditure. It has chiefly been used in the manufacture of 7-inch, 45-rpm single records.

Polyurethane

Any of various polymers used in flexible and rigid foams, elastomers, and resins.

Preservation copy

A sound recording copy produced by NARA or a contractor from the original recording and used to reproduce the original program content onto more stable media. Preservation rerecordings are produced on 7-inch reel, 1.5 mil thick audio magnetic tape, recorded at full track, 3.75 or 7.5 ips. The preservation rerecordings are used to produce reference and service order copies; if a heavy demand for a certain audio recording exists, preservation rerecordings may be used to create intermediate rerecordings.

Pressing

(1) Any disc phonograph record produced in a record-molding process from a master or stamper. (2) A number of records produced at one time (e.g., the initial pressing order was 1,000 records and the second pressing was 5,000 records). (3) Process of copying phonograph discs by the bearing down of a
metal master on a pliable material, such as vinyl.

Print-through
The unwanted transfer of a magnetic field (and the sound signal) from one layer to another within a roll of tape. The magnitude of this induced signal tends to increase with the storage time and temperature and decrease with the unwinding of the tape roll. It is a result of the magnetic instability of the magnetic oxide on the tape. It causes echo or repeated sound from one layer of tape while the next layer is passing over the playback head.

Program
A complete unit of recorded audio material, such as a complete speech, a complete radio show; i.e., a series of related audio recordings that have an obvious beginning and ending.

Reel
Refers either to the plastic/metal container for a roll of tape or to the roll of tape on such a container.

Reel flange
The sides for a reel of tape. Professional 10 1/2-inch and 14-inch tape reels have flanges mounted on NAB hubs.

Reel-to-reel tape
Magnetic tape wound in spools or packs around a hub and not enclosed in any shell. So called because a full reel or spool unwinds onto an empty reel (hub with flanges or sides) during the recording and playback processes.

Reference copy
The copy created from the intermediate copy and used for purpose of reference.

Relative humidity (RH)
The amount of water vapor in the air, expressed as a percentage of the maximum that the air could hold at a given temperature.

App. A-17
Relative humidity (RH) is temperature dependent; as temperature increases, RH decreases if no additional moisture is added to the air.

Rerecording

The transfer of original sound recording program material from an unstable or deteriorating medium onto a more stable medium, currently magnetic tape, for continued preservation of the program material. The process involves real-time playback of originals with 100-percent operator monitoring and speed correction, equalization, etc., as necessary.

Revolutions per minute (rpm)

The speed at which a disc or cylinder rotates or revolves on the recording or reproducing machine. Although most recordings are described as 78 rpm, 45 rpm, 33 1/3 rpm or 16 2/3 rpm, there were many variations in speed, particularly in the early half of the 20th century.

RH

See Relative humidity.

Rim (of disc or cylinder)

In a disc recording, the rim is the area between the edge and the playing area, which can be sloped, concave, convex, flat, raised, lowered, etc. On a cylinder recording, the starting rim is the same as on a disc. The runoff rim is the area following the playing area.

rpm

See Revolutions per minute.

Scatter wind

Results from incomplete winding, poor tape guide adjustment or worn guides, permitting the edges of random parts of the tape to stick up when they are prone to being folded over, stretching along the exposed edge. This may allow the unprotected edges to interact with the atmosphere more quickly than the balance of the tape.

Scratching

Noise, inability to keep the stylus in the groove, and inability to play back.
Shellac
(1) A term sometimes used interchangeably with 78-rpm record. It is a thermoplastic resin used as the basic ingredient in the production of disc recordings. (2) A composition containing shellac used for making phonograph records.

Skewing
Prevents tape from making full and even contact with the playback head. Skewed tape also means one edge arrives at the playback head at a different time than the other, causing phasing or other anomalies.

Sleeve
Usually refers to the inner paper, glassine, or polyethylene protective envelope for a disc within a cardboard/paper outer jacket (slipcase). There are also specially manufactured, acid-free sleeves used for record protection in archival situations.

Splicing
The joining together of two pieces of magnetic tape using a short length of special adhesive-coated tape. Usually done to repair broken or snapped tape, to join two or more recorded programs onto one reel of tape, or to add leader tape. Splices age poorly and must be remade before duplicating tapes.

Spot recording
See Instantaneous disc.

Steeling
See Greying.

Stylus
Commonly referred to as needle. Includes the cutting stylus or needle used in making a recording (disc or cylinder) and the playback needle, which engages the groove of a recording and transmits the mechanical motion to the pickup or cartridge of the system for conversion (transduction). The different sizes and configurations of recording grooves through the history of recording obviously require different styli. Materials most used today for styli are sapphire and diamond. Wear on the stylus depends on playing weight and the record material; wear on the recording is obviously dependent on the tracking weight and proper shape and size of the stylus in relation to the grooves.

App. A-19
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tail out</td>
<td>A tape recording that is stored after recording or playback without being rewound; i.e., with the tail end of the tape outermost on the reel. Tails out storage is preferable because the tape &quot;pack&quot; tends to be smoother, hence safer, than if the tape had been rewound.</td>
</tr>
<tr>
<td>Takeup reel</td>
<td>The reel on a tape recorder that is on the right side of the head stack and that is empty before the beginning of the recording or playback.</td>
</tr>
<tr>
<td>Tape leaders and trailers</td>
<td>Nonmagnetic tape spliced to the beginning and end of a tape and between segments to indicate visually when recorded material begins and ends.</td>
</tr>
<tr>
<td>Test tone</td>
<td>An alignment tone recorded on a magnetic tape, usually preceding the program information, which assists in adjusting the playback machine to correlate to the machine on which the tape was originally recorded. In professional and archival settings, there are generally accepted standards for recording this tone. NARA adds test tone to the dead areas of all archival recordings.</td>
</tr>
<tr>
<td>Threads per inch (tpi)</td>
<td>The number of adjacent grooves found per longitudinal inch on the surface of a cylinder record or per radial inch on the surface of a disc record.</td>
</tr>
<tr>
<td>Track</td>
<td>The path on magnetic tape on which the signal is recorded. Sometimes confused with &quot;cut&quot; or &quot;band&quot; on a disc recording.</td>
</tr>
<tr>
<td>Trailers</td>
<td>See Tape leaders and trailers</td>
</tr>
<tr>
<td>Transcription lateral</td>
<td>(1) Disc recording, usually slow speed or disc vertical-cut type, specially made for broadcasting. It is often 16 inches in</td>
</tr>
</tbody>
</table>
Uneven tape wind

A condition that causes air pockets within the magnetic tape pack. The tape may then "corrogate" and crease within the pack, which results in variable head contact. These folds are also prime locations for evaporation of binder materials and moisture to enter the tape system. To avoid this, tape will be slow or "library" wound with even tension throughout so that the tape will not move at the center of the pack when the outside layer is pulled.

Vertical-cut recording

A recording in which the sound is engraved in the bottom of the grooves instead of in the sides (lateral-cut recording), causing the stylus to move up and down within the groove. This technique was used in cylinder recording, in some early acoustic disc recording, and in some transcription disc production. It is also known as "hill-and-dale" recording because of the ridges and
valleys in the bottom of the groove. Its
great advantage in early recording was that
the depth of cut dictated the volume of
sound, while in lateral-cut recording a heavy
engraving could cause the stylus to break
into adjoining grooves.

Vinyl

Short form of polyvinyl chloride (PVC). Also
a contemporary slang term for a disc record.
A polymer of a vinyl compound or a product
(as a resin or a textile fiber) made from
vinyllic and used in the manufacture of
phonographic discs. See Polymerized vinyl
chloride.

Vinyl chloride

See Polymerized vinyl chloride.

-W-

Wire recordings

(magnetic)

See app. B.

WOW

A form of distortion in sound recording
systems caused by periodic variation in the
speed of the medium (such as tape) and
characterized by its effect on pitch.

-X-

-Y-

-Z-

App. A-22
1. Background. NARA houses one of the world's largest sound recording collections, comprised of over 162,000 sound recordings, including copies of each item to ensure preservation and research needs. The original recordings are stored in an environmentally controlled area, equipped with refrigerated vaults. Reference copies are maintained adjacent to the audiovisual research room.

2. General characteristics of NARA holdings.
   a. NNSM acts as a depository and receives sound recordings through Federal records management disposition procedures and from donation from private individuals and organizations.

   b. The collection focuses on historical voice recordings. Musical recordings are accepted, but only if produced or sponsored by a Government agency.

   c. 99 percent of the audio collection is in the form of unpublished sound recordings, as opposed to commercially distributed, mass-produced, multiple-copy recordings. Thus, the sound recordings are records of unique radio broadcasts, speeches, interviews, press conferences, interrogations, proceedings, meetings, and other similar events.

3. Subject matter. Dating from the 1890's (with a recording of bugle calls and an unpublished zinc Berliner disc), the sound archives generally reflect the growth of the recording and broadcasting industries and the Federal Government's interest in and use of the sound medium. From 1896 to 1930, audio documentation in the collection is relatively scarce, containing commercially recorded speeches and excerpts from speeches by historical figures of the acoustical recording era, such as William Jennings Bryan, William Howard Taft, Theodore Roosevelt, Woodrow Wilson, and Calvin Coolidge. Highlighting the development of electrical recordings, NARA's collection contains the earliest known electrical broadcast recordings: a 1923 Armistice Day address by Woodrow Wilson and a 1924 National Defense Test Day broadcast featuring Gen. John J. Pershing.

For the 1930's, with the expansion of the commercial radio networks in the United States and the entrance of the Federal Government into widespread use of radio, the increase in audio history is shown through instantaneous transcription recordings of broadcasts produced and sponsored by Government agencies to combat the Depression, ranging from recordings of performances by the Federal Theatre and Music Projects of the Work Projects Administration, to recordings of radio series and special programs produced and distributed by various New Deal agencies to explain and promote the policies of Franklin

Appendix B. Recorded sound at the National Archives
D. Roosevelt's administration. There are also recordings of press conferences, interviews, and speeches promoting and explaining policies and programs of over 80 Federal agencies.

Beginning in the late 1930's and covering the years of World War II, Government radio production continued with the objectives shifting to special programs, documentaries, dramas, and entertainment broadcasts furthering the American war effort. Federal agencies entered into the propaganda and psychological warfare fields as documented in the sound recordings of the Office of War Information, which prepared American propaganda programs for broadcasts in many languages, and the Foreign Broadcast Intelligence Service, which methodically monitored and recorded Axis and Allied shortwave broadcasts worldwide and provided reports of their contents to the military establishment. Extensive news coverage of the decisive campaigns of the war is provided by recordings donated by the commercial radio networks and through on-the-spot recordings made by Armed Forces combat reporters. Recordings of German, Japanese, and Italian leaders, which were captured by U.S. forces during and immediately after the war, are also part of the collection.

Since 1945, Government policy, both domestic and foreign, is reflected through recordings of speeches, press conferences, panel discussions, and interviews involving major political and military leaders, and through radio coverage of world events, including in-depth reports on the Korean war. From the late 1950's through the 1960's there are recordings of meetings of Government-sponsored conferences; speeches of political leaders, political campaigns, and conventions; and recorded documentation of the U.S. involvement in Vietnam.

Important collections of a specific nature include: the complete recordings of the proceedings and testimony of the International Military Tribunal held at Nuremberg from November 20, 1945, to October 1, 1946; recordings of oral arguments before the United States Supreme Court since 1955; and substantial radio coverage of the Watergate affair, including the House Judiciary Committee hearings into the impeachment of Richard Nixon.


App. B-2
4. Formats and preservation. In addition to the depth of its subject matter, the sound recording collection at the National Archives represents in capsule form almost 100 years of the technical evolution of the sound medium. All standard types of recorded sound are included in the holdings, ranging from acoustical era cylinders and discs to modern LP's and audio-cassettes. In addition, special and unusual forms of recorded sound are also evident, including Memovox plastic discs; wire recordings; dictabelts; Amertapes (similar to memobelts); as well as various forms of embossed and pregrooved discs.

The vast majority of sound recordings exist on disc and magnetic tape; approximately 75 percent on disc and 15 percent on magnetic tape. Sound recording formats never were designed for long-term use and storage but for playback qualities and low-cost manufacture. Their resistance to degradation is built in during the manufacturing process because of the types and quality of materials used and the level of quality control imposed.

Various storage conditions that sound recordings were subjected to before transfer to NARA affect the sound recording's material composition and therefore its shelf life. For example, two identical sound recordings may be in different stages of chemical deterioration as a result of one being subjected to fluctuating temperatures sometime during its life.
<table>
<thead>
<tr>
<th>Original Formats</th>
<th>Date Span</th>
<th>Number of Originals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cylinders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field recordings</td>
<td>1921-30</td>
<td>200</td>
</tr>
<tr>
<td>Dictaphone</td>
<td>1938-45</td>
<td>100</td>
</tr>
<tr>
<td>Commercial</td>
<td>1920-30</td>
<td>10</td>
</tr>
<tr>
<td><strong>Disc</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal</td>
<td>1925-50</td>
<td>500</td>
</tr>
<tr>
<td>Instantaneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(soft-cut on various bases)</td>
<td>1930-60</td>
<td>59,000</td>
</tr>
<tr>
<td>Pressings</td>
<td>1928-70</td>
<td>4,000</td>
</tr>
<tr>
<td>Pregroove</td>
<td>1934-36</td>
<td>400</td>
</tr>
<tr>
<td>Vinyl</td>
<td>1955-present</td>
<td>3,000</td>
</tr>
<tr>
<td>Memovox</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1941-45</td>
<td>19,000</td>
</tr>
<tr>
<td>Clear</td>
<td>1945-53</td>
<td>31,000</td>
</tr>
<tr>
<td><strong>Magnetic tape</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reel-to-reel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetate</td>
<td>1950-65</td>
<td>10,000</td>
</tr>
<tr>
<td>Polyester</td>
<td>1965-present</td>
<td>16,700</td>
</tr>
<tr>
<td><strong>Cassettes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>1963-present</td>
<td>3,000</td>
</tr>
<tr>
<td>Micro</td>
<td>1975-present</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memobelts **</td>
<td>1945-49</td>
<td>14,000</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1896-present</td>
<td>100</td>
</tr>
</tbody>
</table>

** Includes commercial Edison cylinders, a Berliner disc, dictabelts, dictaphone discs, wire recordings, etc.

Total NARA holdings:

a. Field recordings: 200 (1921-30)

American Indian linguistics and tribal customs.

b. Dictaphone: 100 (1938-45)

World War II Japanese shortwave broadcasts--speeches, rallies, and pre-World War II U.S. monitoring of foreign broadcasts. Used the electrical recordings process.

c. Commercial recordings: 10

Speeches by U.S. Presidents and recordings from court cases.

A grooved recording format invented and patented by Thomas Edison. Main manufacturing period was 1890-1929. Hollow tube shaped with recording medium on the outside surface. Inside surface usually ribbed and slightly tapered to grip recording or playback mandrel. Playback speed about 160 to 180 rpm. 100 tpi played for 2 minutes, 200 tpi for 4 minutes. Recordings on this format initially could not be duplicated. Created using the acoustical and electrical recording processes. Vertical cut. Common industry sizes: 1 5/16-inch to 5-inch diameters and 1/2-inch to 8-inch lengths.

2. Disc.

Total NARA holdings: 117,000

The recording format patented by Emil Berliner in 1877. Manufactured through today. Flat circular shaped material recorded on one or two sides. Center generally contains the disc label and one small hole for mounting on a turntable. (Some instantaneous discs also had a second hole, a drive hole for a special drive pin, to hold the disc during engraving. Employed both acoustical (1877-1920s) and electrical (1920s-present) recording processes and both vertical and lateral cuts. 95 percent of NARA's holdings consist of 12-inch and 16-inch electrically recorded lateral-cut recordings. Recording direction: Most of NARA's discs are instantaneous discs recorded and played from the center outward toward the rim (inside out or center-start disc).
a. Metal.

NARA holdings: 500 (1925-50)

(1) Aluminum and copper. Format for instantaneous recordings in which the grooves containing the signal are cut directly into the metal base with a diamond stylus. Aluminum could be embossed to make grooves with no removal of the metal. NARA holdings include Mussolini's metal master stampers for producing discs. Most created using the electrical recording process.

(2) Zinc.

NARA holdings: 1 (1894)

U.S. Cavalry instructions, RG 94. NARA's earliest recording. Lateral cut. Created using the acoustical recording process.

b. Instantaneous (lacquer).

NARA holdings: 59,000 (1930's-50's)

A recording disc usually made of metal, glass, or fiber and coated with a thin lacquer compound, usually acetate or cellulose nitrate, into which grooves are cut. Cellulose nitrate more commonly used. They can be one-sided or two-sided. Usually 12-inch or 16-inch diameters recorded at 78 or 33 1/3 rpm. During recording, stylus used to cut lacquer coating. Disc is instantly ready for playback, but the number of playbacks is limited due to the soft lacquer. Fungal resistant, best recording format until introduction of magnetic tape on a polyester base. Instantaneous discs commonly called acetates no matter what base or coating material was used, also commonly called electrical transcripts (ET's) or direct recordings. 90 percent of NARA holdings are on 16-inch instantaneous discs, with aluminum bases, 1/16-inch or less thick, at 33 1/3 rpm, and recorded inside out. Preservation problems: Highly unstable and subject to oxidation. Instantaneous recordings with acetate coatings can be scratched just by improper removal from its sleeve. Most instantaneous discs were created using the electrical recording process.

App. C-3
c. Plastic (trade name: Memovox).

NARA holdings: White - 19,000 (1941-45)

RG 262. Foreign shortwave radio broadcasts.

Clear - 31,000 (1945-53)


Only designed for short-term storage. White plastic very brittle and subject to cracking and chipping. Both white and clear formats were subject to plastic creep. Created using the electrical recording process.

d. Vinyl (polyvinylchloride [PVC]).

NARA holdings: 3,000 (1955-present)

Vinyl chloride compound. Polymerized vinyl chloride, polyvinyl acetate (plasticizer), filler, pigment, stabilizers, and antistatic substances. Used a "microgroove." 12-inch, 33 1/3-rpm LP capable of approximately 30 minutes of sound. 7-inch, 45-rpm EP (extended playing). Most NARA vinyl discs are pressings for public service radio broadcasts concerning Government programs. Created using the electrical recording process.

e. Polystyrene.

NARA holdings: 100

45-rpm EP and 45-rpm "singles." Most relate to military recruiting. Created using the electrical recording process.


NARA holdings: 14,000 (1945-49)


App. C-4
April 5, 1993


NARA holdings: 10 (1900-55)

Replaced by magnetic tape. Stainless steel wire approximately 4 mil in diameter. Magnetized on one side. Sound waves recorded through a microphone, amplifiers, and inductive coil or head onto magnetized iron oxide particles on a wire. On playback, magnetized iron oxide particles create electrical signals that in turn create sound. Created using the electrical recording process. Preservation problem: Repair is difficult if the wire is broken.

5. Magnetic tape.

Total NARA holdings: 30,700 (1950-present)

a. Reel-to-reel.

Common sizes or sizes with "unique" recordings.

15 ips on 1/4-inch or 1/2-inch tape, on 10 1/2-inch reels. Veterans Administration public service announcements and Department of Defense "Country Music Time."

30 ips on 1/4-inch or 1/2-inch tape, on 10 1/2-inch reels. Early captured German (red oxide) recordings of Adolf Hitler and Heinrich Himmler.

3 3/4 ips on 1/4-inch tape on 3-inch, 5-inch, or 7-inch reels. U.S. Supreme Court records.

7 1/2 ips on 1/4-inch tape on 3-inch, 5-inch, or 7-inch reels.

Majority of NARA magnetic tape holdings are 7 1/2 ips on 1/4-inch tape on 7-inch reels.

(1) Reel-to-reel cellulose acetate base.

NARA holdings: 10,000 (1950-65)

Special preservation problems: Base becomes brittle and decomposes with time and varying environments. Created using the electrical recording process.
(2) Reel-to-reel polyester base.

NARA holdings: 8,000 (1975-present)

Thickness: 0.5 mil, 1.0 mil, and 1.5 mil. 1 mil = one-thousandth of an inch. Thicker tape better quality and less preservation problems. Created using the electrical recording process. Preservation strengths: resistant to high humidity, fungus, and mildew; temperature stability; strong and flexible.

b. Cassette.

NARA holdings: 4,000 (1963-present)

Length of polyester-based recording magnetic tape and supported by two hubs inside a sealed plastic shell. Used mainly to record oral history, conferences, meetings, lectures, etc. Created using the electrical recording process. Size and speed causes preservation problems.

(1) Standard size.

NARA holdings: 3,000 (1963-present)

Size: Length: 60 or 90 minutes Width: 1/4-inch

Speed: 1 7/8 ips

(2) Micro size.

NARA holdings: 1,000 (1975-present)

Size: Length: 30 to 60 minutes Width: 1/8-inch

Speed: 15/16 ips
<table>
<thead>
<tr>
<th>FORMAT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>POTENTIAL PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discs</td>
<td>1&quot; - 23&quot; diameter</td>
<td>Paper/Cardboard</td>
<td>Emulsion separating from base</td>
</tr>
<tr>
<td></td>
<td>(usually 10&quot; - 16&quot;)</td>
<td>Rubber, rubber compounds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/16&quot; - 1/4&quot; thick</td>
<td>Metal (copper, nickel, silver, aluminum, steel)</td>
<td>Castor oil plasticizer leaking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shellac</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glass</td>
<td>&quot;Plastic creep&quot;: grooves flattening</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acetate (lacquer)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plastic (vinyl)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compounds and laminates of materials above</td>
<td></td>
</tr>
<tr>
<td>Magnetic tape</td>
<td>1/8&quot; - 3&quot; width</td>
<td>Base - Paper</td>
<td>Acetate base deteriorates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acetate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plastic (polyester)</td>
<td>Splices become brittle, sticky, &amp; ooze adhesive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coating - Ferric oxide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chromium dioxide</td>
<td>Cassette tape: too thin, can break &amp; jam</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binder can deteriorate if stored in high temp/humidity</td>
</tr>
<tr>
<td>Format</td>
<td>Size</td>
<td>Composition</td>
<td>Potential Problems</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------</td>
<td>---------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Cylinders</td>
<td>1 5/16&quot; - 5&quot; diameter</td>
<td>Tinfoil, Wax, Celluloid, Paper/Cardboard</td>
<td>Fragile &amp; brittle, Fungus can form if stored in high humidity</td>
</tr>
<tr>
<td></td>
<td>1/2&quot; - 8&quot; long</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memobelts</td>
<td>35-mm wide, 50' loop</td>
<td>Clear acetate</td>
<td>Brittleness, Plastic creep</td>
</tr>
<tr>
<td>Memovox discs</td>
<td>12&quot; and 16&quot;</td>
<td>&quot;Plastic,&quot; clear &amp; white (unknown composition)</td>
<td>Plastic creep</td>
</tr>
<tr>
<td>USE</td>
<td>MATERIAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>Metal, glass, cardboard, polyester.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resin</td>
<td>Cellulose nitrate (hard and brittle), shellac, and vinyl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extender</td>
<td>Blended with the resin to reduce cost by requiring less resin (examples: wood and plant fiber resin and/or wax).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricant</td>
<td>Added to the surface of lacquer discs to prolong playing life. Also, additives that minimize the abrasiveness of the binder and the oxide particles in magnetic tape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizer</td>
<td>Added to discs and tapes to prevent deterioration or loss of desired physical properties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasticizer</td>
<td>Used to soften a resin (examples: camphor and castor oil).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filler</td>
<td>Used for different reasons (examples: limestone, clay, plant fibers and carbon black). Carbon black absorbs radiant energy and protects the resin.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pigment</td>
<td>Used to provide color.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solvent</td>
<td>Added to disperse one or more substances used in manufacturing.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appendix E. Major types of materials used in the sound recordings manufacturing process
<table>
<thead>
<tr>
<th><strong>SOURCE</strong></th>
<th><strong>EFFECT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiant energy (sunlight and artificial ultraviolet light)</td>
<td>Causes decomposition of plastics</td>
</tr>
<tr>
<td>Thermal energy (heat from the sun and from artificial sources such as radiators)</td>
<td>Initiates embrittlement and chemical reactions</td>
</tr>
<tr>
<td>Temperature changes</td>
<td>Causes expansion and contraction, initiate chemical reactions</td>
</tr>
<tr>
<td>Moisture</td>
<td>Dissolves material, initiates chemical reactions, and growth of fungi and/or mold</td>
</tr>
<tr>
<td>Biological (fungi and mold)</td>
<td>Excretes enzymes and acids that damage the format, especially resins of cellulose nitrate and cellulose acetate. Fungi feed on oils, waxes, cellulose, and some plasticizers in the format and in their storage containers.</td>
</tr>
<tr>
<td>Oxygen</td>
<td>Initiates oxidation</td>
</tr>
<tr>
<td>Atmospheric (pollutants such as sulfur dioxide and carbon dioxide, particulate matter (dust and grit))</td>
<td>Initiates chemical reactions and cause scratches</td>
</tr>
<tr>
<td>Stress and breakage (improper shelving, packaging, and handling)</td>
<td>Causes cracking or disintegration</td>
</tr>
<tr>
<td>Body oils (fingerprints)</td>
<td>Initiates chemical reactions</td>
</tr>
</tbody>
</table>
Abbreviations:

1. ANSI--American National Standards Institute
2. EIA--Electronic Industries Association
3. IEEE--Institute of Electrical and Electronic Engineers
4. NAB--National Association of Broadcasters
5. RIAA--Recording Industry Association of America
6. UL--Underwriters Laboratories


IEEE 151-1981: Definitions of Terms for Audio and Electroacoustics.


RIAA: Standard for Audio Disc Recording and Reproducing.

ANSI PHI.28-1986: Specifications for Photographic Film for Archival Records, Silver Gelatin Type, on Cellulose Ester Base.

ANSI PHI.41-1987: Specifications for Photographic Film for Archival Records, Silver Gelatin Type, on Polyester Base.

ANSI PHI.43-1986: Practice for Storage of Processed Safety Photographic Film.


NAB: Standard for Magnetic Tape Recording and Reproducing (Reel-to-Reel), 1965.


UL: 813-1973 Electric Sound Recording and Reproducing Equipment.

EIA RS-288: Magnetic Playback Characteristics.

EIA RS-295: Disc Recording Characteristics.

ANSI/EIA RS-399A: Standards and Specifications for Compact Audio Cassettes.

Appendix G. Standards used in audio preservation activities
ANSI SI.6-1981: Preferred Frequencies and Band Numbers for Acoustical Measurements.


ANSI PH22.31M-1980: Specification for Motion Picture Safety Film.


ANSI PH22.204-1981: Dimensions for Two Track Photographic Sound Records on 16mm Motion Picture Prints.

ANSI PH22.97-1982: Dimensions and Reproducing Speed of 200 mil Magnetic Sound Records on 16mm Motion Picture Film.


