

Online Training Conference

DIGITAL DIRECTIONS

Fundamentals of Creating and Managing Digital Collections

PRESENTED BY NEDCC

Session 8.1: Preserving Audiovisual Collections

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AGENDA

- **Role of digitization for preservation of AV**
 - Threats to analog formats
 - Digitization process
 - Target formats and best practices
- **Planning for preservation:**
 - Knowing what you have
 - Format ID
 - Prioritizing and selection for digitization
 - Inventory and assessment



NORTHEAST DOCUMENT CONSERVATION CENTER

WHAT IS AV?

- Also known as “time-based media” because you need to experience it over time
- Includes recorded sound, moving images, multimedia works...



dependent on machines in order to be seen and heard

OBSOLESCENCE





DEGRADATION

- Biological - *Mold*
- Chemical - *breakdown of material*
- Mechanical - *Physical damage*



DIGITIZATION FOR PRESERVATION

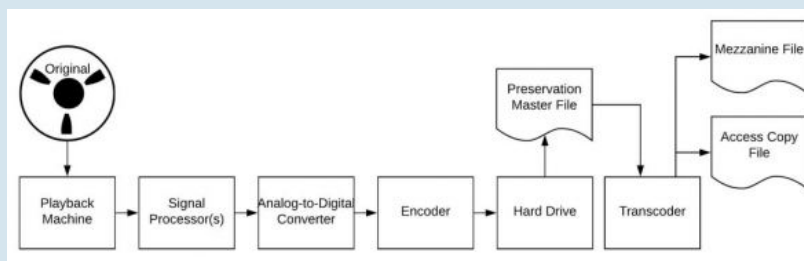


Digitization of AV formats
is the only strategy for
preserving long term
access to their content

The National Recording Preservation Plan,
published by the Library of Congress, predicts
inability to transfer analog materials to digital in

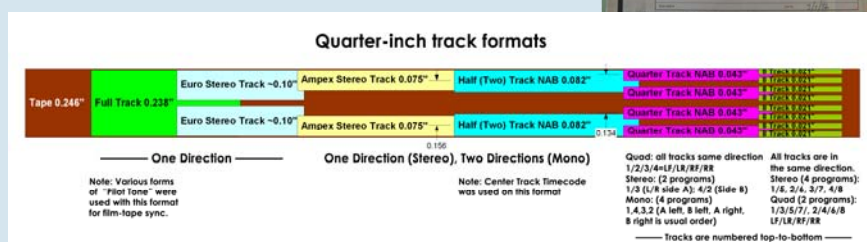
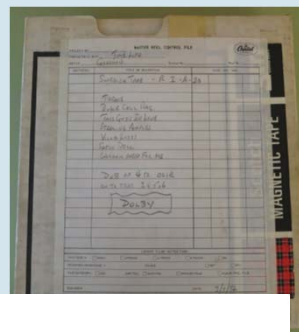
2028

DIGITIZATION: SIGNAL PATH



TECHNICAL REQUIREMENTS

- Recording speed (rpm; ips)
- Track configuration
- Variability in recording characteristics?



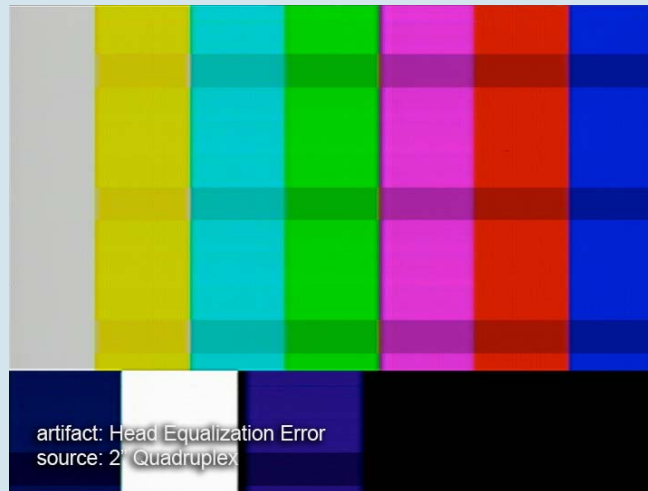
TECHNICAL REQUIREMENTS

The best playback is had when the equipment is selected and calibrated to match the signal on each individual item

- Misalignment can result in loss of the signal, which can impact intelligibility



TECHNICAL REQUIREMENTS



https://bavc.github.io/avaa/artifacts/head_equalization_error.html

SIGNAL PROCESSORS & MONITORS

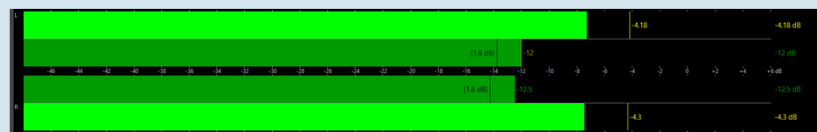
Signal processors and levels set so that signals are as close to the original recording as possible, and within the allowed ranges for digital capture - **monitored throughout transfer**

- **Examples of signal processors:**

- Time base correctors
- Processing amplifiers
- Preamp
- Dolby decoder

- **Examples of signal monitors:**

- Audio level meters
- Audio phase scopes
- Waveform monitor
- Vector scope

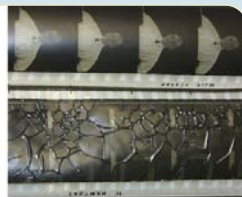


ERRORS – PHYSICAL DETERIORATION

- Damage, scratches, tape/groove wear
- Print through
- “Sticky-shed syndrome”
- Video drop outs
- Tape deformation
- Mold damage



Example of “spoking” in motion picture film.



Example of “channeling” in motion picture film.



STABILIZATION AND REPAIR

Step 1

- Baking to mitigate Sticky-shed
- Repairing splices
- Cleaning
- Mold remediation
- Proper rewinding
- Rehousing



INHERENT ERRORS

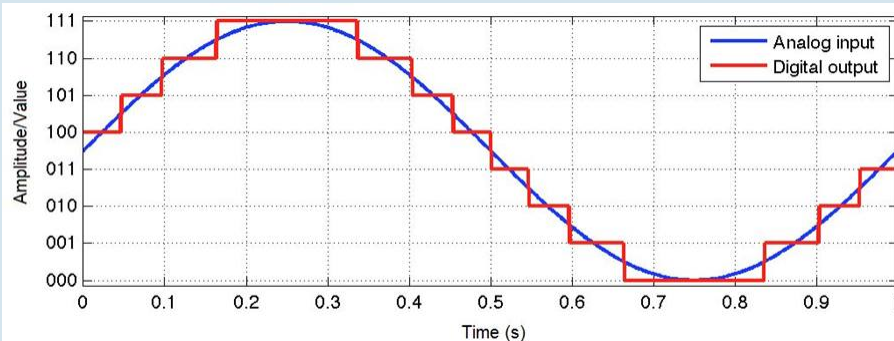
Caused by

- Poor quality or improperly maintained recording equipment
- Operator errors
- Generation loss

- *EX:*
 - recorded distortion
 - recording over earlier content

- Technicians should note these errors, but not reduce or mitigate them

ANALOG VS. DIGITAL SIGNALS



Resolution: measure of how well audio, video or film can faithfully portray images or sound.

Higher resolution = more accurate approximation of analog signal. Measured in:

- Sampling rate
- Bit depth
- Pixel density

DIGITAL OBJECTS (AS WE KNOW)

One or more content files
(TIFF, WAV, PDF/A, etc.)

+

Corresponding metadata
(PBCore, PREMIS, etc.)

+

Wrapper

Digital Object

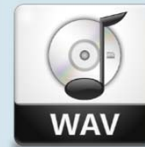
TARGET FORMATS

- **Preservation Master:**
 - Faithful, accurate digital surrogate of analog material
 - Captured “Flat” (not boosting or enhancing signal)
 - Uncompressed
 - Captured at highest resolution that can be afforded
 - **Digital:** captured at native sampling rate and bit depth
 - Embedded technical metadata
 - Head and Tail content
- Sustainable format
 - Non-proprietary
 - Documentation available
 - Widely adopted

AUDIO

- **Broadcast Wave File (BWF):**

- PCM encoded (uncompressed)
- Resolution of at least: 48kHz 24bit
- Ideally: 96kHz 24bit resolution (depending on analog format)
- Embedded technical metadata



[IASA TC-04](#)

FILM AND VIDEO

- **IASA TC06:**

- “Marketplace” but widely adopted
 - **.AVI or QuickTime (.MOV)** containing uncompressed 8-bit or 10-bit stream with 4:2:2 chroma subsampling

- **Others:**

- Matroska (MKV) that contains FFV1 – non-proprietary
- MXF that contains lossless JPEG 2000
- MXF that contains uncompressed v210
- MXF that contains DPX files, common output for high-resolution film scans



[IASA TC-06](#)

[FADGI: Digital File Formats for Videotape Reformatting](#)

[LOC Sustainability of Digital Formats](#)

FFV1/MATROSKA

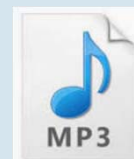
In the process of being standardized by the Internet Engineering Task Force (IETF) for use as a preservation format

- Non-proprietary
- Lossless compression
- MXF that contains DPX (high-resolution film scans) can now be converted to FFV1 MKV, enabling an archive to use single format/wrapper for both film and video
- Checksums at the frame or slice frame level

[FFV1/Matroska Reading List](#)

DERIVATIVES

- **Intermediate or Mezzanine:**
 - High-quality version, but ready for use in standard systems (often lower resolution than PM, but higher than access)
 - A copy from which additional access copies can be made
- **Access:**
 - Identify common uses and generate accordingly (mp4? mp3? DVD?)
 - Generally lower resolution (lossy compression), enables streaming and sharing
 - Signal processing and trimming to improve user experiences
 - Can be optimized for monitor viewing



METADATA

Technical metadata embedded can include:

- Digitization process history/signal chain (hardware + software used to digitize)
- Technical metadata about digital files
 - Sample rate
 - Bit depth
 - File size
- Checksum

FADGI: Guidelines for Embedding Metadata in Broadcast WAVE Files

DIGITIZATION WORKFLOWS

1:1

- Fully-attended
- Heterogeneous, less predictable collections
- Individual calibration
- Slower and more costly

Parallel

- “High-throughput”
- Large and homogeneous collections
- Riskier
- Faster and less costly

Consider:

- Content Value
- Fragility and technical requirements of media
 - Quality Assurance resources
 - Level of support you need

QUALITY CONTROL

- Scope: item-level vs. sampling
- Quantitative vs. Qualitative
- Automated vs. Manual
- Outsourcing vs. In-house

QUALITY CONTROL TOOLS

- **MediaConch**

for MKV, PCM, or FFV1 encoded files, validate files against their specification at the byte-level, or validate against an institutions particular policy.

- **MediaInfo, Ffmpeg, Exiftool**

File characterization: information about files can be extracted.

- **BWF MetaEdit**

View, edit and export embedded metadata in BWF files. Verifies audio-only checksums.

QUALITY CONTROL TOOLS

- **QCTools**

Enables inspection of video signal characteristics for batches of digital media to prioritize quality control, detect common errors, and facilitate targeted response

- **AV Artifact Atlas**

Open source guide used to define and identify common technical issues and anomalies that can afflict audio and video signals during playback and digitization.

QUALITY CONTROL: MANUAL

- Actually viewing/listening...
 - Can designate solely to vendor during digitization
 - “Spot check” percentage of deliverables



PLANNING FOR DIGITIZATION

ID and
Prioritization

KNOWING WHAT YOU HAVE

- Intellectual Control
 - *Lack of information....*



FORMAT PRIORITIZATION/SELECTION

- Likely to contain unique content (non-commercial recordings) – *formats can give us clues*
- Level of risk due to obsolescence
- Known playback/durability/vulnerability issues
- Original vs. duplicate
- Condition

GROOVED AUDIO OVERVIEW

- Oldest sound recording format
- Sound information is inscribed as grooves into the medium's surface



Vertical grooves



Lateral grooves

“IRREGULAR” AND INSTANTANEOUS FORMATS

- Such as:
 - Brown wax cylinders
 - Lacquer discs
 - Uncoated aluminum discs
- Likely to contain unique content
- Fragile
 - Groove wear
 - Mold
 - Exudation
 - Delamination



SHELLAC (78'S) AND VINYL

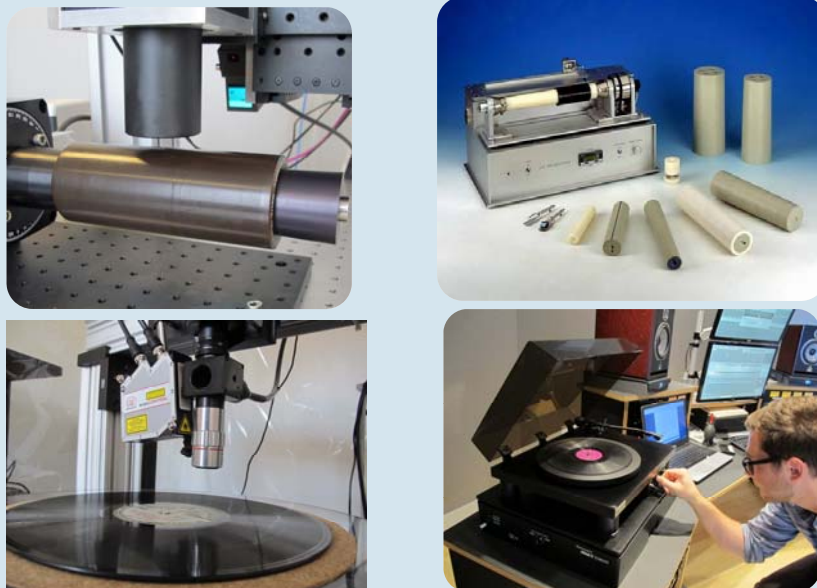


<https://psap.library.illinois.edu/collection-id-guide/phonodisc>

DICTATION RECORDINGS



DIGITIZATION



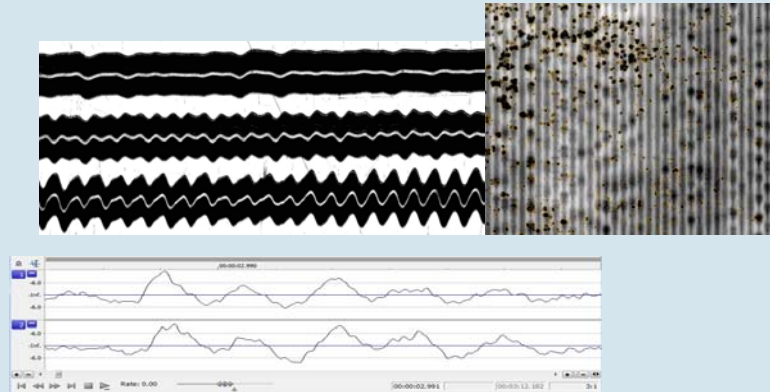
IRENE

- Images (2D or 3D) represent the physical object.
- Software analyzes images and samples them, like an analog-to-digital converter, to create digital audio.

Image:



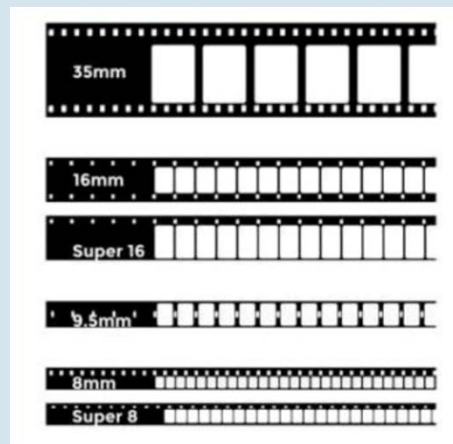
Audio:



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MOTION PICTURE FILM OVERVIEW

- 1890's – TODAY
- Silent until 1927
- Color or B&W
- Three types of carriers:
 - Nitrate
 - Acetate
 - Polyester
- Three types of sound:
 - Image
 - Optical Sound
 - Magnetic Sound



Film gauge comparison chart. Image by Ryan Edge ([CC BY-SA](#))

NEGATIVE, POSITIVES, & REVERSALS

Understanding production and post-production processes to make preservation decisions...

- Original negative
- Print films: work print, projection print
- Internegatives and Interpositives
- Soundtracks
- Composite prints (with soundtrack) or separations
- Leader



REFORMATTING - SCANNING



FADGI – Guidelines: Motion Picture Film Scanning Projects

MAGNETIC AUDIO

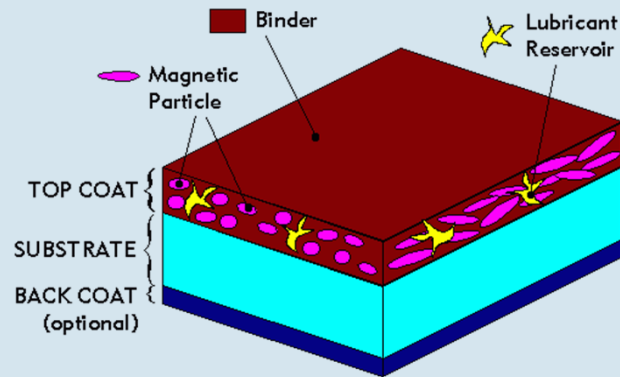
- Wire
- Open-reel tape
- Compact, mini, micro cassette
- DAT



MAGNETIC VIDEO FORMAT ID



TAPE



MAGNETIC MEDIA

- Obsolescence is biggest threat



Image by Flickr user Lee Bennett, available under a Creative Commons Attribution NonCommercial ShareAlike license (CC BY-NC-SA 2.0).

UNIQUE VS. COMMERCIAL



ORIGINAL VS DUPLICATE



KNOWN PLAYBACK ISSUES

- Digital Audio Tape (DAT)
- Hi8



<https://psap.library.illinois.edu/collection-id-guide/>

LONG PLAY TAPES

LONG PLAY

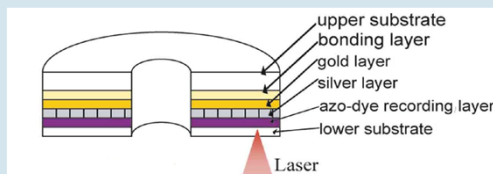


| | | | |
|----------------|----------|----------|----------|
| Mode | EP | LP | SP |
| Recording Time | 360 min. | 240 min. | 120 min. |
| Tape Length | 246m | | |

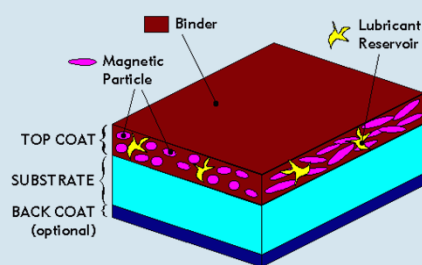
VHS This videocassette is designed for use exclusively with recorders that have the VHS mark.

OPTICAL MEDIA OVERVIEW

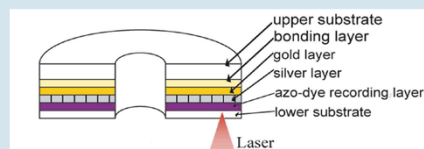
- Audio Compacts Discs (CD'S): 1982 – present
 - First successful consumer digital audio format
- Digital Versatile Disc (DVD): 1995 – present
- Writable (CD-R; DVD-R)
- Rewritable (CD-RW; DVD-RW)



LAYERS AND DETERIORATION



Magnetic Tape



CD-R



COMMON BASE MATERIALS

- **Nitrate** (35mm motion picture film)
- **Acetate** (open-reel audio tape and film)
- **Polyester** (magnetic media and film)

NITRATE DECAY



Level 1



Level 2



Level 3



Level 4



Level 5

ACETATE DECAY

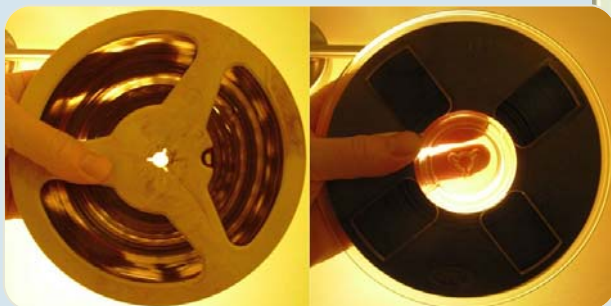
Vinegar Syndrome

1. Vinegar smell
2. Base shrinks, curls, and warps along both length and width
3. Loss of flexibility
4. Cracks and flakes
5. White powder appears along edges and surface



POLYESTER: STICKY-SHED

- Issue with binder or emulsion used on polyester-backed tapes
- Certain brands are known to be susceptible, but it can be an "invisible" issue until discovered during playback



<http://commons.wikimedia.org/wiki/File:Magnetic-tape-acetate-vs-polyester-backing.jpg>

<https://www.flickr.com/photos/fixerbob/8145165718>

MECHANICAL & BIOLOGICAL CONCERNS



HELPFUL TOOLS: IDENTIFICATION

psap COLLECTION ID GUIDE OVER GUIDE LOGIN

PSAP Preservation Self Assessment Program

Collection ID Guide

Audiovisual Media

Paper & Book

Photo & Image Material

Objects

Supplementary

Audiovisual Media

Film

- 8mm
- Super 8mm
- 16mm
- 35mm

Audiotape

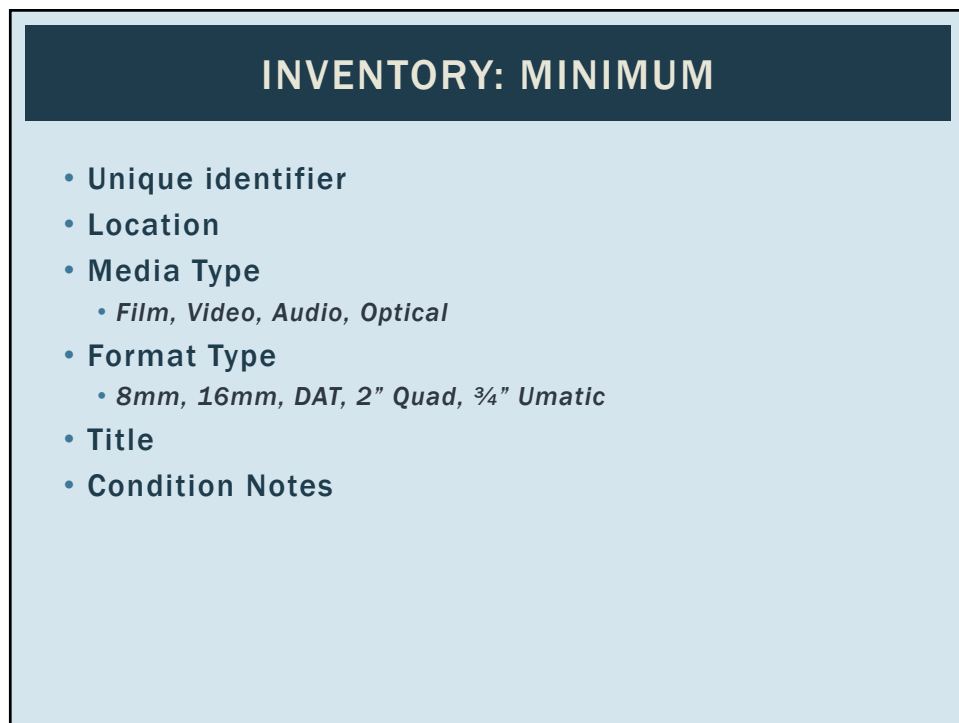
Open Reel

FACET
The Field Audio Collection Evaluation Tool

Format Characteristics and Preservation Problems
Version 1.0

<https://psap.library.illinois.edu/collection-id-guide>

http://www.dlib.indiana.edu/projects/sounddirections/facet/facet_formats.pdf



INVENTORY: HELPFUL

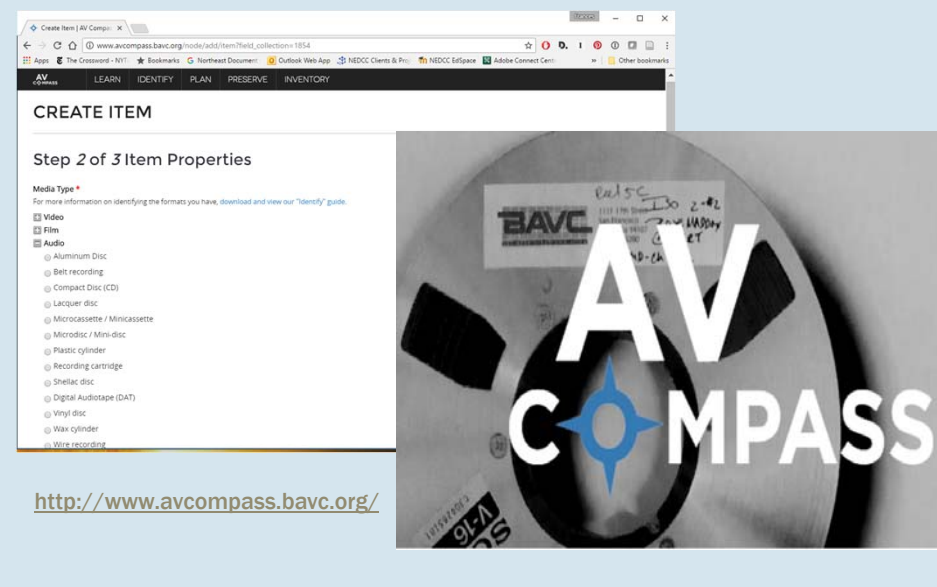
- Description
- Date
- Generation
 - *Original or master?*
- Part (e.g. Reel 1 of 4)
- Commercial or Unique?
- Copyright/Restrictions

INVENTORY: HELPFUL

For Digitization Preparation:

- Duration
 - *Distinguish between duration of recorded content and recording capacity of carrier*
 - *Or proxy information such as: length of tape in ft., tape thickness*
- Size
 - *E.g. 7" diameter ¼" open-reel tape*
- Track configuration (e.g. mono or stereo)
- Recorded in one direction or two
- Recording speed
- Content type
 - *E.g. Music, oral history*

HELPFUL TOOLS: INVENTORY



The screenshot shows the AV Compass website interface. The top navigation bar includes links for LEARN, IDENTIFY, PLAN, PRESERVE, and INVENTORY. The main content area is titled 'CREATE ITEM' and 'Step 2 of 3 Item Properties'. Under the 'Media Type' section, there are checkboxes for Video, Film, and Audio. The Audio section is expanded, showing a list of media types: Aluminum Disc, Belt recording, Compact Disc (CD), Lacquer disc, Microcassette / Minicassette, Microdisc / Mini-disc, Plastic cylinder, Recording cartridge, Shellac disc, Digital Audiotape (DAT), Vinyl disc, Wax cylinder, and Wire recording. A URL is provided at the bottom: <http://www.avcompass.bavc.org/>. The background image features a film reel with the AV COMPASS logo overlaid.

SECTIONS OF SOW

- About the Client and Project
- Brief Description
- Timeline
- Client Point of Contact
- Communication Protocol
- Shipping
- Pilot Project
- Care, Handling, and Storage
- Media Treatment and Preparation
- Reformatting Workflow
- Vendor Quality Control
- Deliverables
- Delivery
- Head and Tail Content
- Directory Structure and File Naming
- Metadata
- Pricing Information
- Questions

PLANNING: SELECTING A VENDOR

- **Every vendor should:**
 - Return your original materials intact
 - Store items in appropriate and secure environment
 - Use well maintained transfer equipment
 - Use highly skilled/trained labor
 - Provide you with master and access files
 - Follow and cite industry standards and best-practices
 - Indicate quality control procedures
- **Considerations:**
 - One-to-one or parallel transfer?
 - How will the vendor handle carriers with unknown contents or unanticipated issues?
 - How will they handle an item that can't be transferred?
 - What level of support do you need throughout project?
 - What level of quality control do you need?
- **Resources:**
 - <https://amianet.org/resources/global-supplier-directory/>

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Thank you!

Please complete the online evaluation form.

A link was sent to your email address.

You can edit your responses until you click submit.