



Article: THE PRESERVATION OF ACETATE FILM MATERIALS: A Cost Benefit Analysis for Duplication and Cool/Cold Storage

Author(s): Steven Puglia

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THE PRESERVATION OF ACETATE FILM MATERIALS- A Cost Benefit Analysis for Duplication and Cool/Cold Storage

By Steven Puglia
Photographic Preservation Specialist
National Archives and Records Administration
8601 Adelphi Road, Room B810
College Park, MD 20910

Overview:

Institutions should perform a cost-benefit analysis to determine the most cost effective approach or combination of approaches to preserve their holdings or collections of acetate film based photographic materials. Cost-benefit analyses can be conducted for specific collections or for an entire institution. Generally, the preservation of acetate film collections will require an approach that combines the systematic duplication of acetate film materials onto polyester based film with the cool/cold storage of original acetate film materials to extend the usable life. Often for small collections it will be most economical to duplicate the collections, while large acetate film collections will require a combined approach of cool/cold storage and a long-term plan for duplication.

Attached are a series of charts and forms designed to facilitate conducting a cost-benefit analysis. The specific information provided in the charts and derived from the forms is intended to provide basic guidance for deciding how best to approach the preservation of photographic film collections. The intent is to provide a framework that can be used to conduct a cost-benefit analysis comparing duplication with cool/cold storage. The same basic approach to cost-benefit analysis can be applied to other preservation management issues.

The cost to duplicate a collection includes the actual cost to duplicate each item, the cost to inspect the duplicates, and the cost to store the originals while they are being duplicated. The cost to store a collection at a specified set of environmental conditions includes the cost to build or lease a vault at the desired environmental conditions and the energy costs to run the vault at those conditions. The cost-benefit analysis can be used to compare the cost of storage at current environmental conditions to storage at colder temperatures which will provide a longer life expectancy for the film.

Generic duplication and storage costs have been worked up based on price quotations from vendors and are provided for various photographic formats. The cost analyses

listed here do not take into account inflation, an inflationary factor should be added to the formula for more accurate estimates. The generic estimates should be used for an initial analysis only, pricing specific to a particular collection or institution should be used for more accurate analyses.

Following the charts and forms are two examples of cost-benefit analyses, one for deteriorating microfilm and one for deteriorating still photo negatives.

The first example is 6400 rolls of 35mm microfilm that show the initial signs of deterioration. The estimated cost to duplicate the 6400 rolls is \$63,780 or \$152,240, the lower price is if only a simple technical quality inspection is conducted on the rolls of duplicate microfilm and the higher estimate includes a frame by frame verification of every roll of duplicate microfilm. The 6400 rolls could be stored for approximately 40 years (the estimated life expectancy at the following conditions for film in the initial stages of deterioration as cited in the IPI Acetate Film Storage Guide) at 55°F and 30% RH for an estimated cost of \$33,600. The estimated life expectancy can be increased to 140 by storing the 6400 rolls at 40°F and 35% RH for an estimated cost of \$313,600. In this example it is probably most practical and economical to duplicate all of the film, the theoretical life expectancy of the new polyester based duplicates is 500 years.

The second example is 3 million still photo negatives, a small percentage of which show the initial signs of deterioration. The estimated cost to duplicate all 3 million negatives by contact printing is \$39.9 million and would take approximately 75 years to complete; the estimated price includes \$2.4 million to store the originals at conditions that will extend the life expectancy to 75 years in order to complete the project. An alternative approach would be to use a large format, long-roll camera system to duplicate the negatives, the estimated cost would be \$15.4 million and it would take approximately 30 years to complete the duplication; this estimated cost includes \$360,000 to store the originals while they are being duplicated. Obviously, when a collection is this large, improved storage to extend the usable life of the acetate film negatives is essential to complete the project. The project could be completed in a shorter time, but it would require significantly more money and staff to do this. Storing the film at 55°F and 30% RH will provide an estimated life expectancy of 40 years at an estimated cost of \$480,000; storing the film at 40°F and 35% RH will provide an estimated life expectancy of 140 years at an estimated cost of \$4.48 million; and storing the film at 20°F and 30% RH will provide an estimated life expectancy of 400 years at an estimated cost of \$24.3 million. For this size collection, storage at 40°F and 35% RH for 140 years is significantly less expensive than either duplication option and it could be combined with prioritized duplication of only the actively deteriorating negatives, the negatives that are of high value, and the negatives that are requested frequently.

Duplication Considerations:

Duplication is an essential part of any preservation plan for collections of photographic materials. Implement long-term duplication projects using available resources. Usually, resources will be limited and most duplication projects will be long-term. Duplicate only those materials that truly warrant duplication, evaluate collections/holdings and prioritize materials to be duplicated. The selection and planning for duplication should be based on three priorities- duplicate materials of high value, duplicate actively deteriorating materials, and duplicate frequently requested materials. Select the most economical method of duplication that meets all archival/technical requirements, including value of originals, quantity of materials to be duplicated, condition of materials to be duplicated, and the level of use/access required for the materials. Use polyester based duplicating film for all applications, including motion pictures. Polyester based duplicates are important to reduce the need for cool/cold storage. Polyester film is significantly more stable than acetate film, even at higher storage temperatures. Maintenance of a collection on acetate based film will always cost more for storage because of the need for cool/cold storage. When duplicating motion pictures, polyester based preservation masters should be placed in extended term storage and acetate based film may be used for printing masters, projection prints, and editing copies.

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Cost-Benefit Analysis Charts and Forms:

COST COMPARISON FOR DUPLICATION VS. LONG-TERM STORAGE

Format:	Size:	Quantity:	Storage Volume:	Film Condition:		
				Good	Init. Det.	Adv. Det.
___ Still Photo	_____	_____	_____	()	()	()
___ Microfilm	_____	_____	_____	()	()	()
___ Motion Picture	_____	_____	_____	()	()	()
___ Aerial	_____	_____	_____	()	()	()
___ X-Rays	_____	_____	_____	()	()	()
Total-			_____			

DUPLICATION

Option 1- Method of Duplication _____

Duplication Costs Per Item:	Cost For Duplication:	Cost for Inspection: () Sample () 100 %	Cost for Storage During Duplication:	A. Total Cost:	Number of Items Dupl. Per Year*:	Years to Duplicate:	Cost Per Year:
_____	_____	_____	_____	_____	_____	_____	_____

Option 2- Method of Duplication _____

Duplication Costs Per Item:	Cost For Duplication:	Cost for Inspection: () Sample () 100 %	Cost for Storage During Duplication:	A. Total Cost:	Number of Items Dupl. Per Year*:	Years to Duplicate:	Cost Per Year:
_____	_____	_____	_____	_____	_____	_____	_____

Option 3- Method of Duplication _____

Duplication Costs Per Item:	Cost For Duplication:	Cost for Inspection: () Sample () 100 %	Cost for Storage During Duplication:	A. Total Cost:	Number of Items Dupl. Per Year*:	Years to Duplicate:	Cost Per Year:
_____	_____	_____	_____	_____	_____	_____	_____

*Determined by amount of funding available, by capacity of laboratory duplicating materials, or the life expectancy at current storage conditions.

STORAGE

	Option 1-	Option 2-	Option 3-	Option 4-	Option 5-
Storage Environment:	_____	_____	_____	_____	_____
Life Expectancy:	_____	_____	_____	_____	_____
Cost to Build or Lease Vault:	_____	_____	_____	_____	_____
Storage Costs Per Year:	_____	_____	_____	_____	_____
B. Total Storage Costs- # of Years To Reach Life Expectancy:	_____	_____	_____	_____	_____
Total Storage Costs- # of Years To Duplicate:	_____	_____	_____	_____	_____

DUPLICATION COSTS

COST TO DUPLICATE: # of items x unit cost

+

COST TO INSPECT: # of items x time/item x hourly rate

+

COST TO STORE DURING DUPLICATION: cubic ft. x cost to store x # of yrs.

=

Total Cost _____

ESTIMATED DUPLICATION COSTS FOR SELECTED B&W FORMATS

<u>Format</u>	<u>Quantity</u>	<u>Cost of Duplication</u>
Still Photo:		
4"x5"		x \$3 to \$12/neg.
5"x7"		x \$3 to \$16/neg.
8"x10"		x \$3 to \$18/neg.
Microfilm:		
16mm, 100' rolls		x \$8 to \$32/roll
35mm, 100' rolls		x \$8 to \$32/roll
Motion Pictures:		
16mm, 1000' rolls		x \$350 to \$600/roll
35mm, 1000' rolls		x \$350 to \$600/roll
Aerial:		
5", 200' rolls		x \$300 to \$450/roll
5", 500' rolls		x \$500 to \$900/roll
9.5", 500' rolls		x \$600 to \$1,200/roll
X-Rays:		
14"x17"		x \$3 to \$24/x-ray

INSPECTION OF DUPLICATES

Still Photos-	15 to 20 min. per image for technical quality inspection.* Use random sampling procedure to inspect 10%.
Microfilm-	5 min. per 100' roll for technical quality inspection. 60 min. per 100' roll for frame by frame (100%) verification.
Motion Picture-	20 to 30 min. per 1000' roll of film for technical quality inspection.
Aerial-	20 to 30 min. per 200'/500' roll of film for technical quality inspection.
X-Rays-	15 to 20 min. per image for the technical quality inspection. Use random sampling procedure to inspect 10%.

*Courtesy of Donna Collins, Prints + Photographs Division, Library of Congress

ESTIMATED COST FOR INSPECTING DUPLICATES

<u>Format</u>	<u>Quantity</u>	<u>Hourly Rate</u>	<u>Cost to Inspect</u>
Still Photo (Sample, 1%):			
4"x5"	x 33 hrs./1000 orig. negs. x	_____	_____
5"x7"	x 33 hrs./1000 orig. negs. x	_____	_____
8"x10"	x 33 hrs./1000 orig. negs. x	_____	_____
Microfilm:			
Sample-			
16mm, 100' rolls	x 0.08 hrs./roll x	_____	_____
35mm, 100' rolls	x 0.08 hrs./roll x	_____	_____
Frame by frame, 100% verification-			
16mm, 100' rolls	x 1.0 hrs./roll x	_____	_____
35mm, 100' rolls	x 1.0 hrs./roll x	_____	_____
Motion Pictures:			
16mm, 1000' rolls	x 0.5 hrs./roll x	_____	_____
35mm, 1000' rolls	x 0.5 hrs./roll x	_____	_____
Aerial:			
5", 200' rolls	x 0.5 hrs./roll x	_____	_____
5", 500' rolls	x 0.5 hrs./roll x	_____	_____
9.5", 500' rolls	x 0.5 hrs./roll x	_____	_____
X-Rays (Sample, 1%):			
14"x17"	x 33 hrs./1000 orig. x-rays x	_____	_____

STORAGE COSTS

COST TO BUILD VAULT: cubic footage x cost to build

or

COST TO LEASE VAULT:

cubic footage x cost to lease x # of years to duplicate

or

cubic footage x cost to lease x # of years to reach life expectancy

+

ENERGY COST TO RUN VAULT:

cubic footage x energy used x comm. rate x # of years to duplicate

or

cubic footage x energy used x comm. rate x # of years to reach life expectancy

=

Total Cost _____

ESTIMATED STORAGE VOLUME FOR SELECTED FORMATS AND QUANTITIES

<u>Format</u>	<u>Quantity</u>	<u>Storage Volume (cubic feet)</u>
Still Photo:		
4"x5"	x 0.0009 cu. ft./neg.*	= _____
5"x7"	x 0.003 cu. ft./neg.*	= _____
8"x10"	x 0.003 cu. ft./neg.*	= _____
Microfilm:		
16mm, 100' rolls	x 0.02 cu. ft./roll	= _____
35mm, 100' rolls	x 0.04 cu. ft./roll	= _____
Motion Pictures:		
16mm, 1000' rolls	x 0.07 cu. ft./roll	= _____
35mm, 1000' rolls	x 0.14 cu. ft./roll**	= _____
Aerial:		
5", 200' rolls	x 0.06 cu. ft./roll	= _____
5", 500' rolls	x 0.16 cu. ft./roll	= _____
9.5", 500' rolls	x 0.33 cu. ft./roll	= _____
X-Rays:		
14"x17"	x 0.006 x-rays/cu. ft.	= _____

*Courtesy Ed McCarter, Still Pictures Branch, NARA.

**Wilhelm, Henry. The Permanence and Care of Color Photographs.

COST TO BUILD VAULT BY SQUARE FOOTAGE

Size of Vault (sq. ft.)	<u>Temp./RH</u>	<u>Range of Cost (\$)</u>	<u>Median Cost (\$)</u>
20	4° C/no RH		2700 est.
80	4° C/no RH		4200 est.
200	60° F/ 50% 35%	35,000 to 85,000	60,000
	20%	45,000 to 85,000	65,000
	40° F/ 50% 35%	55,000 to 85,000	70,000
	20%	40,000 to 88,000	64,000
	20%	50,000 to 88,000	69,000
	20° F/ 50% 35%	62,000 to 92,000	77,000
	20%	82,000 to 112,000	97,000
	20%	82,000 to 112,000	97,000
	20%	82,000 to 112,000	97,000
2000	60° F/ 50% 35%	160,000 to 230,000	195,000
	20%	160,000 to 245,000	202,500
	40° F/ 50% 35%	160,000 to 270,000	215,000
	20%	175,000 to 250,000	212,500
	20%	175,000 to 260,000	217,500
	20° F/ 50% 35%	175,000 to 280,000	227,500
	20%	173,000 to 260,000	216,000
	20%	180,000 to 270,000	225,000
	20%	187,000 to 280,000	234,000

STORAGE CAPACITY PER SQ. FT.

General Office	1 cu. ft./sq. ft.
National Archives at College Park	2.9 cu. ft./sq. ft.
Records Centers, National Archives	5.6 cu. ft./sq. ft.

COST TO BUILD VAULT PER CUBIC FOOT OF RECORDS

<u>Size of Vault (sq. ft.)</u>	<u>Range of Storage Cap. (cu. ft.)</u>	<u>Median Storage Cap. (cu. ft.)</u>	<u>Temp./RH</u>	<u>Range of Cost (\$/cu. ft.)</u>	<u>Median Cost (\$/cu. ft.)</u>
20	20 to 60	40	4° C/no RH	68 to 135	102
80	80 to 240	160	4° C/no RH	26 to 52	39
200	200 to 600	400	60° F/ 50%	102 to 295	198
			35%	112 to 325	218
			20%	122 to 355	238
			40° F/ 50%	110 to 320	215
			35%	121 to 350	236
			20%	131 to 380	238
			20° F/ 50%	153 to 445	299
			35%	167 to 485	326
			20%	183 to 530	356
2000	2000 to 6000	4000	60° F/ 50%	34 to 98	66
			35%	35 to 102	68
			20%	36 to 106	71
			40° F/ 50%	36 to 105	70
			35%	38 to 110	74
			20%	39 to 114	76
			20° F/ 50%	37 to 108	72
			35%	39 to 112	76
			20%	40 to 117	78

MEDIAN COST TO BUILD VAULT PER CUBIC FOOT

Temp/RH	400 cu. ft. (\$/cu. ft.)	4000 cu. ft. (\$/cu. ft.)
60° F/ 50%	198	66
35%	218	68
20%	238	71
40° F/ 50%	215	70
35%	236	74
20%	256	76
20° F/ 50%	299	72
35%	326	76
20%	356	78

ESTIMATED STORAGE COSTS FOR SELECTED STORAGE ENVIRONMENTS

<u>Storage Environments</u>	<u>Storage Costs (per cubic ft. per year)</u>
Office, Air-conditioned 70° F at 50% RH	\$ 1.00*
Cool Storage 65° F at 35% to 30% RH	\$ 2.40**
Cool Storage/Frost-free Refrigerator 35° F to 40° F at 35% RH	\$ 8.00***
Cold Storage 20° F to 25° F at 30 % RH	\$ 15.00 to 20.00
Cold Storage 0° F at 30% RH	\$ 30.00***

*Estimated from NARA Federal Record Centers Handbook.

**Estimate for general storage conditions at the National Archives at College Park.

***Wilhelm, Henry. The Permanence and Care of Color Photographs.

ESTIMATED ENERGY USAGE

<u>Size of Vault (sq. ft.)</u>	<u>Range of Storage Cap. (cu. ft.)</u>	<u>Median Storage Cap. (cu. ft.)</u>	<u>Temp./RH</u>	<u>Range of KWH Used</u>	<u>Median KWH Used</u>
200	200 to 600	400	60°F/ 50%	3.8 to 8	5.9
			35%	7 to 9.5	8.2
			20%	7 to 11.6	9.3
			40°F/ 50%	10 to 13.6	11.8
			35%	10 to 15.2	12.6
			20%	10 to 21.6	15.8
			20°F/ 50%	20 to 34	27
			35%	24 to 41	32
			20%	32 to 54	38
			2000	2000 to 6000	4000
35%	14.2 to 30	22.1			
20%	22.1 to 30	26			
40°F/ 50%	22.2 to 30	26.1			
35%	28.3 to 32.3	30.3			
20%	30 to 45.2	37.6			
20°F/ 50%	33 to 56	44			
35%	39 to 66	53			
20%	52 to 90	70			

MEDIAN ENERGY USAGE PER CUBIC FOOT

<u>Temp./RH</u>	<u>400 cu. ft. (KWH/cu. ft.)</u>	<u>4000 cu. ft. (KWH/cu. ft.)</u>
60 °F/ 50%	5.9	20.15
35%	8.2	22.1
20%	9.3	26
40 °F/ 50%	11.8	26.1
35%	12.6	30.3
20%	15.8	37.6
20 °F/ 50%	27	44
35%	32	53
20%	38	70

COST COMPARISON FOR DUPLICATION VS. LONG-TERM STORAGE

<u>Format:</u>	<u>Size:</u>	<u>Quantity:</u>	<u>Storage Volume:</u>	<u>Film Condition:</u>	<u>Good</u>	<u>Init. Det.</u>	<u>Adv. Det.</u>
— Still Photo	—	—	—	()	()	()	()
— Microfilm	—	—	—	()	()	()	()
— Motion Picture	—	—	—	()	()	()	()
— Aerial	—	—	—	()	()	()	()
— X-Rays	—	—	—	()	()	()	()
Total-	—	—	—				

DUPLICATION

Option 1- Method of Duplication _____

Duplication Costs Per Item:	Cost For Duplication:	Cost for Inspection: () Sample () 100 %	Cost for Storage During Duplication:	A. Total Cost:	Number of Items Dupli. Per Year*:	Years to Duplicate:	Cost Per Year:
_____	_____	_____	_____	_____	_____	_____	_____

Option 2- Method of Duplication _____

Duplication Costs Per Item:	Cost For Duplication:	Cost for Inspection: () Sample () 100 %	Cost for Storage During Duplication:	A. Total Cost:	Number of Items Dupli. Per Year*:	Years to Duplicate:	Cost Per Year:
_____	_____	_____	_____	_____	_____	_____	_____

Option 3- Method of Duplication _____

Duplication Costs Per Item:	Cost For Duplication:	Cost for Inspection: () Sample () 100 %	Cost for Storage During Duplication:	A. Total Cost:	Number of Items Dupli. Per Year*:	Years to Duplicate:	Cost Per Year:
_____	_____	_____	_____	_____	_____	_____	_____

*Determined by amount of funding available, by capacity of laboratory duplicating materials, or the life expectancy at current storage conditions.

STORAGE

	Option 1-	Option 2-	Option 3-	Option 4-	Option 5-
Storage Environment:	_____	_____	_____	_____	_____
Life Expectancy:	_____	_____	_____	_____	_____
Cost to Build or Lease Vault:	_____	_____	_____	_____	_____
Storage Costs Per Year:	_____	_____	_____	_____	_____
B. Total Storage Costs- # of Years To Reach Life Expectancy:	_____	_____	_____	_____	_____
Total Storage Costs- # of Years To Duplicate:	_____	_____	_____	_____	_____

**ESTIMATED LIFE EXPECTANCY FOR NEW CELLULOSE ACETATE
FILM- From the IPI Storage Guide to Acetate Film**

<u>Condition of Film</u>	<u>Storage Environment</u>	<u>Life Expectancy (years)*</u>
New:		
	70°F at 50% RH	40
	65°F at 30% to 35% RH	90
	60°F at 50% RH	80
	60°F at 35% RH	112
	60°F at 20% RH	175
	55°F at 30% RH	200
	40°F at 50% RH	350
	40°F at 35% RH	525
	40°F at 20% RH	800
	35°F to 40°F at 35% RH	800
	25°F at 30% RH	> 1500
	20°F at 50% RH	> 1500
	20°F at 35% RH	> 1500
	20°F at 20% RH	> 1500
	0°F at 30% RH	> 1500

*For new film the LE ratings are the approximate time to the onset of vinegar syndrome, the usable life of the film will be longer than these estimates.

ESTIMATED LIFE EXPECTANCY FOR DETERIORATING CELLULOSE ACETATE FILM- From the IPI Storage Guide for Acetate Film

<u>Condition of Film</u>	<u>Storage Environment</u>	<u>Life Expectancy (years)*</u>
Initial Signs of Deterioration:	70° F at 50% RH	5
	65° F at 30% to 35% RH	15
	60° F at 50% RH	10
	60° F at 35% RH	25
	60° F at 20% RH	45
	55° F at 30% RH	40
	40° F at 50% RH	50
	40° F at 35% RH	140
	40° F at 20% RH	230
	35° F to 38° F at 35% RH	130
	25° F at 30% RH	> 400
	20° F at 50% RH	> 400
	20° F at 35% RH	> 400
20° F at 20% RH	> 400	
0° F at 30% RH	> 400	

*For degrading film the LE ratings are the approximate time for the free acidity to double, the usable life of the film is likely to be longer than estimated.

Example 1

COST COMPARISON FOR DUPLICATION VS. LONG-TERM STORAGE

<u>Format:</u>	<u>Size:</u>	<u>Quantity:</u>	<u>Storage Volume:</u>	<u>Film Condition:</u>	<u>Good</u>	<u>Init. Det.</u>	<u>Adv. Det.</u>
— Still Photo				()	()	()	()
<u>X</u> Microfilm	<u>35mm, 100'</u>	<u>6,400 rolls</u>	<u>280 cu. ft.</u>	()	(X)	()	()
— Motion Picture				()	()	()	()
— Aerial				()	()	()	()
— X-Rays				()	()	()	()
Total-		<u>6,400 rolls</u>	<u>280 cu. ft.</u>				

Example 1

DUPLICATION

Option 1- Method of Duplication roll-to-roll silver gelatin

Duplication Costs Per Item:	\$ 8.70	Cost For Duplication:	\$ 55,680.00	Cost for Inspection: (x) Sample 100 %	\$ 7,680.00	Cost for Storage During Duplication:	\$ 420.00	A. Total Cost:	\$ 63,780.00	Number of Items Dupli. Per Year*:	~ 4300	Years to Duplicate:	~ 1.5	Cost Per Year:	\$ 42,520.00
															2 nd yr. = \$ 21,260.00

Option 2- Method of Duplication roll-to-roll silver gelatin

Duplication Costs Per Item:	\$ 8.70	Cost For Duplication:	\$ 55,680.00	Cost for Inspection: (x) Sample 100 %	\$ 96,000.00	Cost for Storage During Duplication:	\$ 560.00	A. Total Cost:	\$ 152,240.00	Number of Items Dupli. Per Year*:	~ 4300	Years to Duplicate:	~ 1.5 + 0.20	Cost Per Year:	\$ 76,120.00
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Option 3- Method of Duplication _____

Duplication Costs Per Item:		Cost For Duplication:		Cost for Inspection: () Sample 100 %		Cost for Storage During Duplication:		A. Total Cost:		Number of Items Dupli. Per Year*:		Years to Duplicate:		Cost Per Year:	
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*Determined by amount of funding available, by capacity of laboratory duplicating materials, or the life expectancy at current storage conditions.

Example 1
STORAGE

	Option 1-	Option 2-	Option 3-	Option 4-	Option 5-
Storage Environment:	70 F / 50%	65 F / 35%	55 F / 30%	40 F / 35%	20 F / 30%
Life Expectancy:	5	15	40	140	> 400
Cost to Build or Lease Vault:			Lease - \$ 840 / yr.		~ \$ 100,000.00
Storage Costs Per Year:	\$ 280.00	\$ 672.00	\$ 840.00	\$ 2240.00	\$ 4200.00
B. Total Storage Costs- # of Years To Reach Life Expectancy:	\$ 1400.00	\$ 10,080.00	\$ 33,600.00	\$ 313,600.00	\$ 1.8 million

Total Storage Costs- # of Years To Duplicate:
1.5 yrs.
\$ 420.00

EXAMPLE 1

Film: 6400 rolls of 35mm (100' rolls) microfilm

Condition: signs of initial deterioration

Storage Vol.: 280 cu. ft.

A. Cost to Duplicate:

Tech. Insp. Only- \$ 63,780 1.5 yrs. to duplicate **Cost/yr.-** \$ 42,520.00

100% Verification- \$ 152,240 1.5 to 2 yrs. to duplicate **Cost/yr.-** \$ 76,120.00

Storage to Life Expectancy:

B. Cost- \$ 1400 \$ 10,080 \$ 33,600 \$ 313,600 \$ 1.8 million

Life Expectancy- 5 yrs. 15 yrs. 40 yrs. 140 yrs. > 400 yrs.

Conditions- 70°F/35% 65°F/35% 55°F/30% 40°F/35% 20°F/30%

Example 2

COST COMPARISON FOR DUPLICATION VS. LONG-TERM STORAGE

<u>Format:</u>	<u>Size:</u>	<u>Quantity:</u>	<u>Storage Volume:</u>	<u>Film Condition:</u>	<u>Good</u>	<u>Init. Det.</u>	<u>Adv. Det.</u>
X Still Photo	4x5/5x7/8x10	3 million	4,000 cu.ft.	()	(x)	()	()
— Microfilm	—	—	—	()	()	()	()
— Motion Picture	—	—	—	()	()	()	()
— Aerial	—	—	—	()	()	()	()
— X-Rays	—	—	—	()	()	()	()
Total-		<u>3 million</u>	<u>4,000 cu.ft.</u>				

Example 2

DUPLICATION

Option 1- Method of Duplication contact printed

Duplication Costs Per Item:	\$ 12.00	Cost For Duplication:	\$ 36 million	Cost for Inspection: (x) Sample () 100 %	\$ 1.5 million	Cost for Storage During Duplication:	\$ 2.4 million	A. Total Cost:	\$ 39.9 million	Number of Items Dupli. Per Year*:	≈ 40,000	Years to Duplicate:	≈ 75	Cost Per Year:	≈ \$ 532,000.00
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Option 2- Method of Duplication long-roll camera system (5"/105mm roll)

Duplication Costs Per Item:	\$ 4.50	Cost For Duplication:	\$ 13.5 million	Cost for Inspection: (x) Sample () 100 %	\$ 1.5 million	Cost for Storage During Duplication:	\$ 360,000	A. Total Cost:	\$ 15.4 million	Number of Items Dupli. Per Year*:	≈ 100,000	Years to Duplicate:	≈ 30	Cost Per Year:	≈ \$ 513,333.00
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Option 3- Method of Duplication _____

Duplication Costs Per Item:		Cost For Duplication:		Cost for Inspection: () Sample () 100 %		Cost for Storage During Duplication:		A. Total Cost:		Number of Items Dupli. Per Year*:		Years to Duplicate:		Cost Per Year:	
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*Determined by amount of funding available, by capacity of laboratory duplicating materials, or the life expectancy at current storage conditions.

Example 2

STORAGE

	Option 1-	Option 2-	Option 3-	Option 4-	Option 5-
Storage Environment:	<u>70 F / 50%</u>	<u>65 F / 35%</u>	<u>55 F / 30%</u>	<u>40 F / 35%</u>	<u>20 F / 30%</u>
Life Expectancy:	<u>5</u>	<u>15</u>	<u>40</u>	<u>140</u>	<u>> 400</u>
Cost to Build or Lease Vault:	<u>_____</u>	<u>_____</u>	<u>lease - \$12,000/yr.</u>	<u>_____</u>	<u>≈ \$ 312,000.00</u>
Storage Costs Per Year:	<u>\$ 4,000.00</u>	<u>\$ 9,600.00</u>	<u>\$ 12,000.00</u>	<u>\$ 32,000.00</u>	<u>≈ \$ 60,000.00</u>
B. Total Storage Costs- # of Years To Reach Life Expectancy:	<u>\$ 20,000.00</u>	<u>\$ 144,000.00</u>	<u>\$ 480,000.00</u>	<u>\$ 4.48 million</u>	<u>≈ \$ 24.3 million</u>
Total Storage Costs- # of Years To Duplicate:	<u>_____</u>	<u>_____</u>	<u>30 yrs.</u>	<u>30 yrs.</u>	<u>75 yrs.</u>
	<u>_____</u>	<u>_____</u>	<u>\$ 360,000.</u>	<u>\$ 960,000.</u>	<u>\$ 2.4 million</u>

EXAMPLE 2

Film:	3 million still photo negatives
Condition:	signs of initial deterioration
Storage Vol.:	4000 cu. ft.
A. Cost to Duplicate:	
Contact Printing-	\$ 39.9 million 75 yrs. to duplicate Cost/yr.- \$ 532,000.00
Long-roll Camera-	\$ 15.4 million 30 yrs. to duplicate Cost/yr.- \$ 513,333.00
Storage to Life Expectancy:	
B. Cost-	\$ 20,000 \$ 144,000 \$ 480,000 \$ 4.48 mil. \$ 24.3 mil.
Life Expectancy-	5 yrs. 15 yrs. 40 yrs. 140 yrs. > 400 yrs.
Conditions-	70 °F/35% 65 °F/35% 55 °F/30% 40 °F/35% 20 °F/30%