

American National Standard
for Information Technology -

Card Durability / Service Life
Working Paper

Secretariat

Information Technology Industry Council

Post San Francisco, California Working Paper

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American National Standard

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Foreword

The purpose of this Card Durability/Service Life Standard is to provide a uniform means of predicting the service life of an ID card for a specific application.

This standard shall be used to determine the suitability of a card for a particular application.

INCITS B10.3 on Card Durability / Service Life has established the following multi-phase mission statement for generating this standard:

- Phase I: To identify card failure mechanisms and to simulate the mechanisms by accelerated test techniques.
- Phase II: To determine a methodology that can predict the service life of a card construction.
- Phase III: To create a card durability/performance report, guideline or requirement for a range of card applications.

This document contains “NOTES” which are intended to provide helpful information to the reader but are not considered part of the test method requirement. (See ISO/IEC JTC 1 Directives – Part 3 Drafting and Presentation for the use of NOTES.)

Requests for interpretation, suggestions for improvement or addenda, or defect reports are welcome. They should be sent to the National Committee for Information Technology Standards (INCITS), ITI, 1250 Eye Street, NW, Suite 200, Washington, DC 20005.

Card Durability / Service Life

1 SCOPE

This American National Standard defines a method to estimate the durability and service life performance of identification (ID) cards within specified application classes. An ID card is defined as a card identifying its holder and issuer which may carry data required as input for the intended use of the card.

Identification cards include, but are not limited to, such credentials as fishing and driver's licenses, access control, credit and bankcards, student, government and military ID cards.

This standard is to be used by card end users, card issuers, card manufacturers, card component suppliers, and card personalization equipment manufacturers to make predictive comparisons of performance of ID cards. This standard should be useful for comparing the relative durability of newly issued cards and to predict service life. Failure to conform to specified criteria noted within this document shall be negotiated between the involved parties.

2 NORMATIVE REFERENCES

The following references contain provisions that constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All references are subject to revision and interested parties are encouraged to investigate the most recent editions of the references listed below.

Copies of the following documents can be obtained from ANSI: approved ANSI standards, approved and draft international standards (ISO, IEC, CEN/CEN/CENELEC), and approved foreign standards (including BSI, JIS and DIN). For further information, contact ANSI Customer Service Department at 212-642-4900 (phone), 212-302-1286 (fax) or via the World Wide Web at <http://www.ansi.org>. Additional availability contact information is provided below as needed.

Document	Title	Subclause Referenced
ANSI INCITS 322: 2002	<i>Card Durability Test Methods</i> ¹⁾	3
ISO/IEC 7810: 2003	<i>Identification cards - Physical characteristics</i> ¹⁾	3
ISO/IEC 10373-1:1998	<i>Identification cards - Test Methods</i> ¹⁾ <i>Part 1: General Characteristics</i>	A1

¹⁾ Available from American National Standard Institute, 11 West 42nd Street, New York, NY 10036

3 DEFINITIONS (Glossary of terms)

For the purpose of this Standard, the terms and definitions given in ANSI INCITS 322:2002, ISO/IEC 7810 and the following apply.

- 3.1 **Card Durability:** The capacity of maintaining the serviceability of a card over a specified period of time, excluding abused card
- 3.2 **Card Durability Category:** A grouping of 5 card categories, numbered D1 through D5, with D5 being most durable.
- 3.3 **Card Failure:** The point in time at which a card no longer functions at its minimum accepted value.
- 3.4 **Card Fracture:** A crack or break in the card in which the depth appears to be at least 1/3 of the card thickness.
- 3.5 **Degradation:** A deterioration of properties.
- 3.6 **ID-1 Card:** The size of a card specified in ISO/IEC 7810.
- 3.7 **Structural Integrity:** The ability of a card to resist delamination, chipping, cracking, and warping, etc.
- 3.8 **Test Repeatability:** The variability between independent test results, gathered from within a single laboratory, otherwise known as intra-laboratory testing.
- 3.9 **Test Reproducibility:** The variability among single test results, gathered from different laboratories, otherwise known as inter-laboratory testing.

4 Card Durability Category Profile

There are many factors that influence how durable a card structure needs to be for reliable service. The major influencing factors are:

- Redundancy: ability to complete the transaction by an alternative method or card, e.g., a second credit card if the first is rejected
- Necessity or Importance: how important is the transaction, e.g., checking out a library book compared to passing through airport security
- Replacement: how inconvenient or complex is the process to replace the card, e.g., renewing a library card on site or resubmitting a license or passport application
- Usage: How often does the cardholder remove the card from storage and use the card (handle the card)? A frequently used card will need greater durability.
- Expected Card Life: The longer a card is expected to be in service, the greater its durability.
- Allowable Annual Card Returns: The lower the allowable return rate, the greater the card durability.

Since card durability is related to all of the above factors, the Card Durability Category Profile was developed. This table allows a card issuer to input the factors that will influence card life. Once all the factors are taken into consideration, a card durability category can be determined.

Once the card issuer knows the durability category needed for their application, they can look up the appropriate tests and criteria that are needed for the cards.

PROPOSED CARD DURABILITY CATEGORY PROFILE

USAGE 25 points		REDUNDANCY 10 points		NECESSITY 10 points		REPLACEMENT 5 points		EXPECTED CARD LIFE 25 points		ALLOWABLE ANNUAL CARD RETURNS 25 points	
Wgt	Description	Wgt	Description	Wgt	Description	Wgt	Description	Wgt	Description	Wgt	Description
0.0	Annual (< 10 per yr)	0.0	Redundant	0.0	Non-critical	0.0	Trivial	0.0	Less than 1 year	0.0	Greater than 5% per year
0.2	Monthly (10 - 30 per yr)							0.1	1 – 2 years	0.1	2.5 - 5 percent per year
0.5	Weekly (31 - 300 per yr)	1.0	Non-redundant (security identification)	1.0	Critical (security identification)	1.0	Complex	0.4	2 – 4 years	0.2	1.0 – 2.5 percent per year
0.8	Daily (301 - 1000 per yr)							0.8	4 – 6 years	0.5	0.5 – 1.0 percent per year
1.0	Hourly (> 1000 per yr)							1.0	Greater than 6 years	0.8	0.25 – 0.5 percent per year
										1.0	Less than 0.25% per year

CATEGORY D1	$0 \leq X \leq 20$
CATEGORY D2	$20 < X \leq 40$
CATEGORY D3	$40 < X \leq 60$
CATEGORY D4	$60 < X \leq 80$
CATEGORY D5	$X > 80$

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The following table was made to provide an example that illustrates the use of the Card Durability Category for five different card types. The results are in agreement with the durability needs of the card types examined.

	Library card	Gift card	Credit Card	Student Campus Card	Driver's License
Usage	$(0.2 - 0.5) \times 25$	$(0.0) \times 25$	$(0.5 - 0.8) \times 25$	$(0.8 - 1.0) \times 25$	$(0.2 - 0.5) \times 25$
Redundancy	$(0.0) \times 10$	$(0.5 - 1.0) \times 10$	$(0.5) \times 10$	$(0.5 - 1.0) \times 10$	$(1.0) \times 10$
Necessity	$(0.0) \times 10$	$(0.0) \times 10$	$(0.5) \times 10$	$(0.5 - 1.0) \times 10$	$(1.0) \times 10$
Replacement	$(0.0) \times 5$	$(0.5) \times 5$	$(0.5) \times 5$	$(0.5) \times 5$	$(1.0) \times 5$
Expected card life	$(0.0) \times 25$	$(0.0) \times 25$	$(0.4) \times 25$	$(0.4 - 0.8) \times 25$	$(0.8 - 1.0) \times 25$
Allowable annual card returns	$(0.0) \times 25$	$(0.2 - 0.5) \times 25$	$(0.2 - 0.8) \times 25$	$(0.1 - 0.2) \times 25$	$(0.5 - 1.0) \times 25$
Total	5 – 12.5	12 ½ - 25	40 – 50	45 – 72.5	62.5 – 87.5
Resulting Durability Category	D1	D1 – D2	D3	D3 – D4	D4 – D5

It should also be noted that there could be several Card Durability Categories for the same card.

- A credit card issuer will probably accept a very low level of returns for magnetic stripe failures, where they may be more open to a higher number of returns due to degradation of surface coatings (personalization, hologram, signature panel, etc). Therefore, they may require Category D5 requirements for magnetic stripe related tests, but Category D3 requirements for surface coating property tests.
- A Driver's license will probably accept a very low level of defects on surface imaging (photos, security features, etc) while they may allow a greater number of magnetic stripe failures, as the stripes are rarely used. Therefore, the DL program may require Category D5 durability for surface imaging tests, while they may accept Category D3 durability for magnetic stripe related tests.

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5 Durability Requirements – Card Body

INCITS 322 Test Method	Units of Measure	Category D1	Category D2	Category D3	Category D4	Category D5
Delamination – 90°	N/mm	No requirement	0.35 minimum	0.44 minimum	0.70 minimum	1.05 minimum
ID-1 Card Flexure Axis A	Cycles to stopping point	Minimum 6,000 cycles to stopping point with either face up	Minimum 11,000 cycles to stopping point with either face up	Minimum 16,000 cycles to stopping point with either face up	Minimum 80,000 cycles to stopping point with either face up	Minimum 100,000 cycles to stopping point with either face up
ID-1 Card Flexure Axis B	Cycles to stopping point	Minimum 3,000 cycles to stopping point with either face up	Minimum 5,500 cycles to stopping point with either face up	Minimum 8,000 cycles to stopping point with either face up	Minimum 40,000 cycles to stopping point with either face up	Minimum 50,000 cycles to stopping point with either face up
ID-1 Card Stress & Plasticizer Exposure Axes A and B	Hours to stopping point	No requirement	No requirement	No requirement	Cards shall have a stopping point greater than 48 hrs with either face up.	Cards shall have a stopping point greater than 100 hrs with either face up.
Linear Dimensional Change at Elevated Temperature Axes A and B	% shrinkage	No requirement	No requirement	No requirement	1.0 % maximum	1.0 % maximum

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6 Durability Requirements - Cards with Surface Printing/Security Devices

INCITS 322 Test Method	Units of Measure	Category D1	Category D2	Category D3	Category D4	Category D5
Delamination – Cross Hatch Tape Test	Tape test grade	No requirement	3 minimum	3 minimum	5 (no delamination)	5 (no delamination)
Surface Abrasion ^a	Cycles to stopping point	Stopping point shall be greater than 100 cycles	Stopping point shall be greater than 200 cycles	Stopping point shall be greater than 300 cycles	Stopping point shall be greater than 500 cycles	Stopping point shall be greater than 1000 cycles
Exposure Image Stability – Xenon Arc ^{b,c}	Change in color density	Density of surface printing on the cards shall not change by more than 50%.	Density of surface printing on the cards shall not change by more than 50%.	Density of surface printing on the cards shall not change by more than 40%.	Density of surface printing on the cards shall not change by more than 25%.	Density of surface printing on the cards shall not change by more than 10%.

^a Signature panels, stamped holograms, etc may not meet the requirement listed above by design and may require deviation.

^b Test to be performed without the window glass filter

^c Print features to be tested are intended to be equivalent to those listed in INCITS 322. Therefore, this test is intended to be used on equivalent cards. Actual printed field cards will not necessarily be adequate for acceptable color density measurements.

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7 Durability Requirements - Cards with Machine Readable Features

INCITS 322 Test Method	Units of Measure	Category D1	Category D2	Category D3	Category D4	Category D5
Magnetic Stripe Abrasion	Cycles to stopping point	No requirement	Stopping point shall be greater than 100 cycles	Stopping point shall be greater than 200 cycles	Stopping point shall be greater than 300 cycles	Stopping point shall be greater than 400 cycles
Daylight Exposure Image Stability – Xenon Arc	Change in color density	Density of machine-readable printing on the cards shall not change by more than 50%.	Density of machine-readable printing on the cards shall not change by more than 50%.	Density of machine-readable printing on the cards shall not change by more than 40%.	Density of machine-readable printing on the cards shall not change by more than 25%.	Density of machine-readable printing on the cards shall not change by more than 10%.
IC Card with Contacts Micromodule Adhesion	Force (N)	There are no requirements	Peak force shall be greater than 10 N	Peak force shall be greater than 25 N	Peak force shall be greater than 50 N	Peak force shall be greater than 75 N

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Annex A
(Informative)

Bibliography

- ASTM E6 – 86¹ *Standard Definitions of Terms Relating to Methods of Mechanical Testing*
- AAMVA DL/ID-2000 *American Association of Motor Vehicle Administrators National Standard for the Driver License/Identification Card*

¹⁾ Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959