TEST REPORT

spencerLAB DIGITAL COLOR LABORATORY

HP LaserJet Cartridge Reliability Comparison Study – 2026

HP LaserJet Toner Cartridges vs. EMEA Non-HP Brands

The *spencerLAB* DIGITAL COLOR LABORATORY conducted a reliability comparison of original HP Inc. (HP) LaserJet monochrome toner cartridges and six non-HP brands. The evaluation included CF259A (59A)/CF258A (58A) cartridges for the HP LaserJet Pro M304A/M404dn printer.[1] The non-HP cartridges—comprising two remanufactured and four imitation brands—were sourced from the EMEA region, including Germany, Spain, Switzerland, and the United Kingdom. Ten cartridges of each brand were tested to ensure statistically meaningful results.

The analysis evaluated both Reliability and overall Print Quality across the lifespan of each brand of tested toner cartridge model. Reliability factors—such as Dead-on-Arrival (DOA), Low Quality (LQ), and Premature Failure (PF) cartridges [see definitions in Appendix 4]—were assessed to determine the total number of Problem Cartridges per brand. Print samples were collected at consistent intervals throughout each cartridge's life and evaluated using a Print Quality Acceptance scale developed through a psychometric research study. The four PQ acceptance levels were: External Use (suitable for all uses, including external distribution), Internal Use (within the organization), Individual Use, and Unusable.

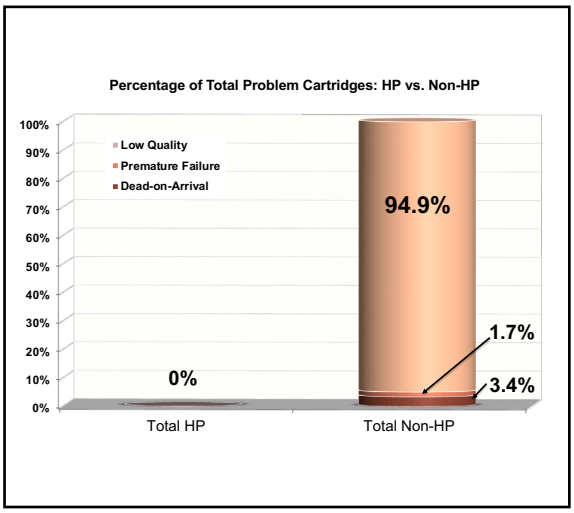
Key Findings

- Testing of the Original HP toner cartridges revealed no Problem Cartridges, while 98% of the tested non-HP cartridges showed some form of reliability issue, including DOA, Premature Failures, and Low Quality.
- None of the Original HP toner cartridges were classified as Low Quality, while 95% of the non-HP cartridges fell into the Low Quality category.
- Original HP toner cartridges had no DOAs or Premature Failures, whereas 3% of the non-HP cartridges were DOA and 2% experienced Premature Failures.
- HP cartridges produced a higher percentage of External Use Print Quality samples at 96%, whereas the tested non-HP brands exhibited only 11% External Use Print Quality samples and 89% Limited Use pages.
- Non-HP brands tested exhibited Print Quality Samples with defects, such as Banding, Light Print, Fade, Ghosting, Dots, Streaks, and Smudge.

Test Results

Cartridge Reliability: Dead-on-Arrival, Premature Failure, and Low Quality

HP cartridges outperformed all tested non-HP brands in total Reliability; notably, 100% of the HP cartridges remained free of Problem Cartridge classifications or Low Quality designations.

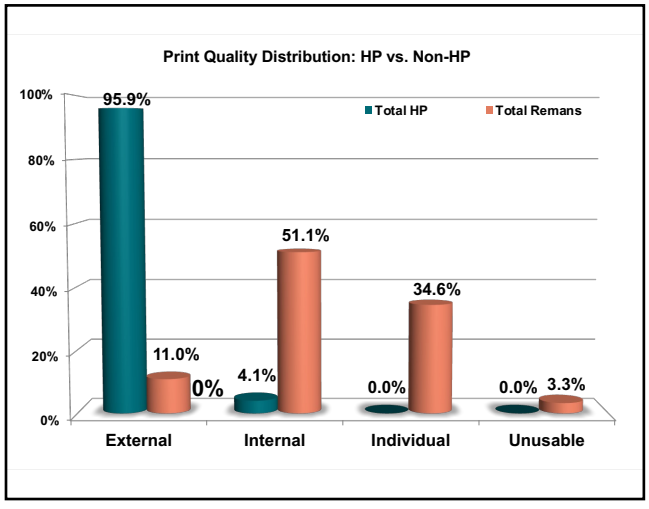


Testing revealed significant Reliability issues within the non-HP cartridges, with 98.3% of the 60 cartridges being classified as Problem Cartridges. The vast majority (94.9%) of these problem cartridges suffered from Low Quality (LQ), producing output where over half the pages were deemed Limited Use. Furthermore, Premature Failures (PF)—units yielding less than 80% of the HP average—accounted for 1.7%, while 3.4% were Dead-on-Arrival (DOA).

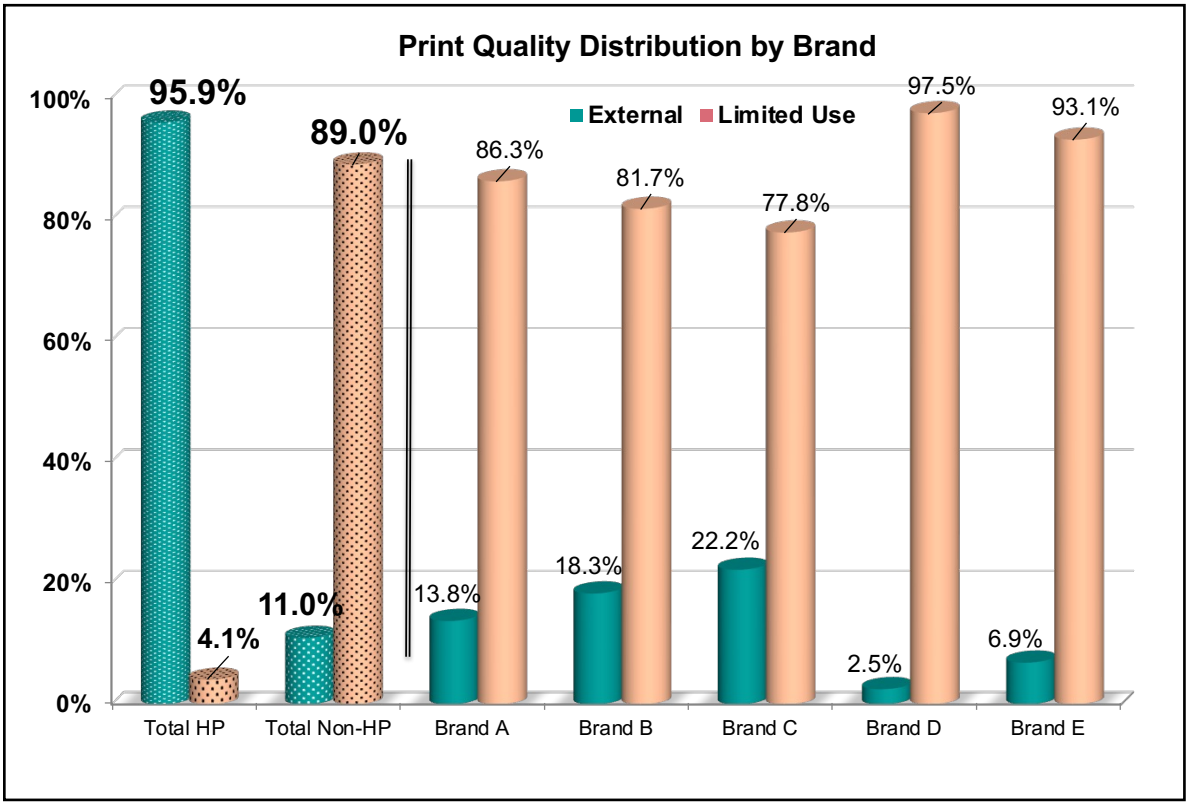
Unreliable toner performance imposes significant hidden burdens on organizational resources. When output fails to meet distribution standards, the resulting need for reprints and troubleshooting disrupts workflows and increases supply consumption. Ultimately, the cumulative impact of these 'problem cartridges' is a rise in operational expenses and a decrease in overall printing efficiency and return-on-investment.

Print Quality Distribution

HP cartridges delivered significantly higher page yields with better Print Quality (PQ) than the tested non-HP cartridges. Of the pages printed with HP cartridges, 95.9% were rated suitable for External Use, compared to just 11% External for non-HP cartridges.



Only 4.1% of pages from HP cartridges were rated for Internal Use, with none classified as Unusable or Individual Use. In contrast, 89% of pages from non-HP cartridges were considered Limited Use, including Internal, Individual, or Unusable categories. These pages displayed print quality defects such as banding (33%), light print (17%), fade (15%), ghosting (10%), dots (8%), streaking (4%), and smudge (2%).



The *spencerLAB* Digital Color Laboratory

With over thirty-five years of industry service, Spencer & Associates Publishing, Ltd. has earned a premier reputation for its expertise in evaluating digital color imaging and printing. Its independent test division, the *spencerLAB* digital color laboratory, is internationally recognized as a leader in unbiased, third-party research and comparative analysis of digital imaging and printing system performance; the laboratory strictly adheres to the integrity of its methodology, even in commissioned studies. *SpencerLAB* provides leadership in quantitative and qualitative comparisons, benchmarking key performance metrics of digital printing systems in all technology classes, from desktop printers to digital color presses – providing research and evaluation services, compliance certifications, benchmark test software/hardware, and focus group management.

Leading vendors and firms for whom printing is mission-critical rely upon *spencerLAB* to provide strategic support and benchmarking of Print Quality, Ink/Toner Yield and Cost-per-Print, Throughput, Availability, Reliability and Usability for ink- and toner-based as well as other printing technologies. Corporate clients turn to *spencerLAB* for expert guidance in print system acquisition and optimizing print operations.

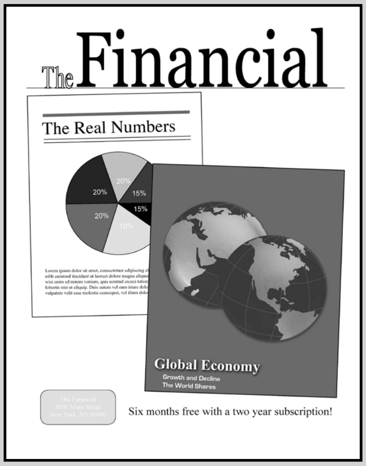
For more information, please visit www.spencerlab.com.

April 2026

[1]The HP 59A and M304 are EMEA regional equivalents of the NA HP 58A and M404 series, respectively.

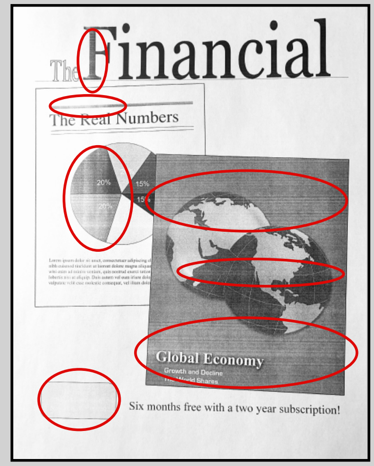
Appendix 1: Problem Cartridges

Original



Non-HP

Non-HP



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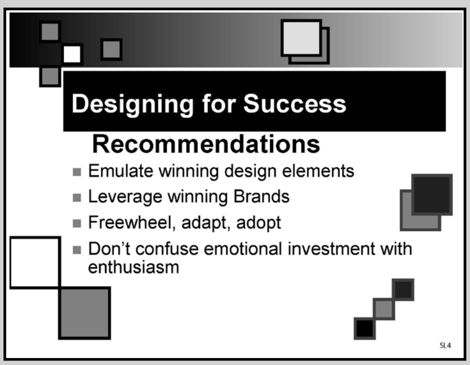

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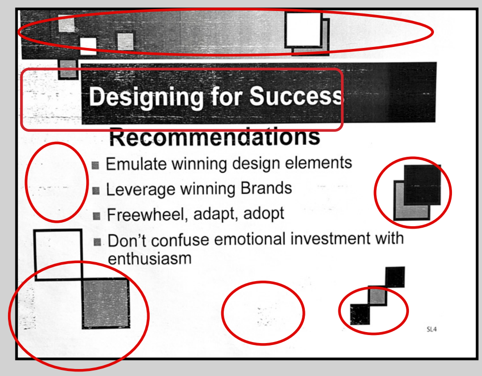
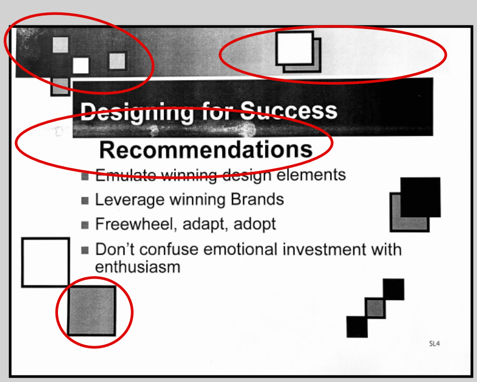
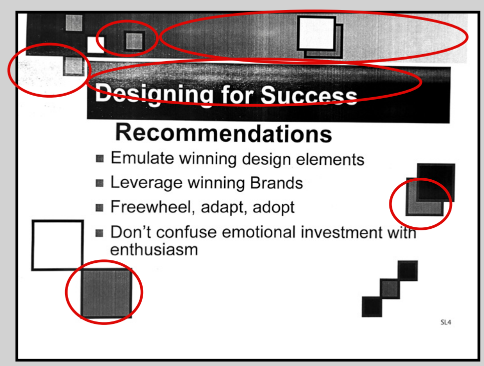


Non-HP



Non-HP

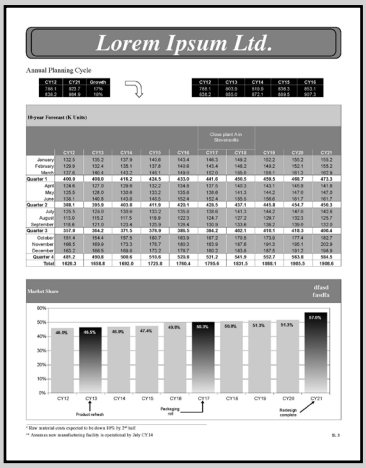


†Images may be magnified to show Print Quality defect.

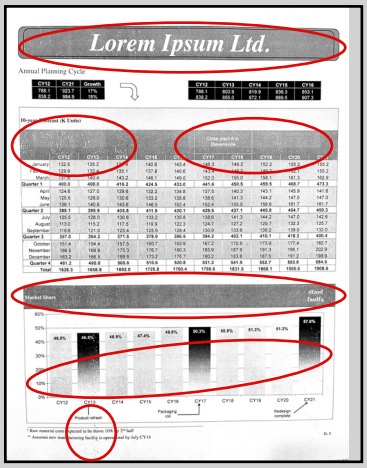
Note: Images may not be accurately reproduced when printed from this report

Appendix 1: Problem Cartridges (con't)

Original



Non-HP



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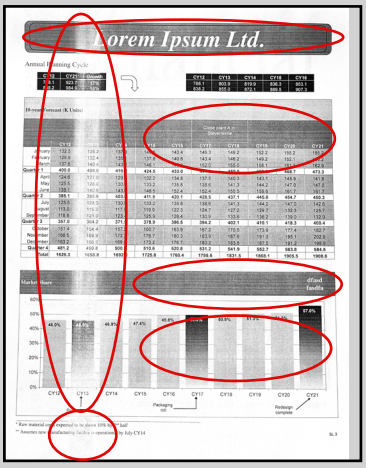
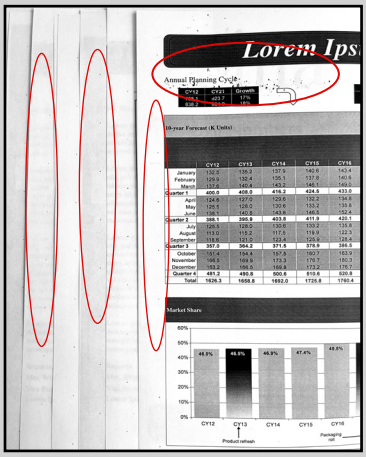
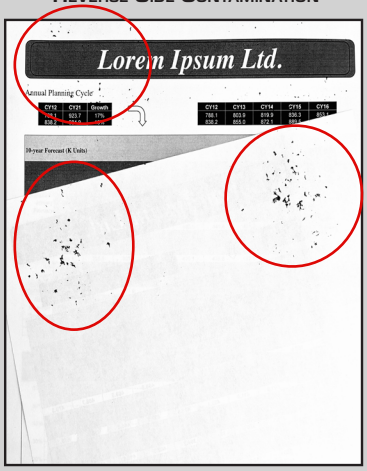


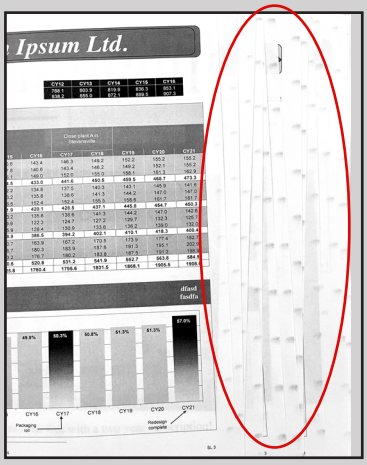
Non-HP
Repetitive Vertical Defects



Non-HP
Reverse-Side Contamination

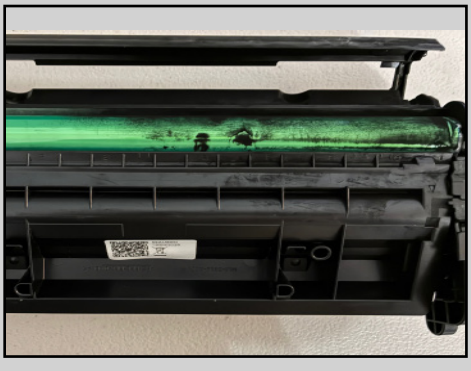


Non-HP
Repetitive Vertical Defects

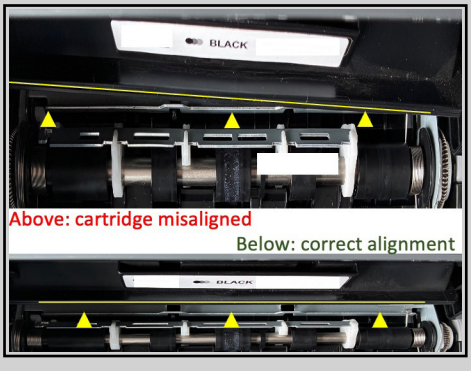


Non-HP DOAs

Toner Leakage



Cartridge Misalignment



†Images may be magnified to show Print Quality defect.

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Appendix 2: Methodology

Test Parameters

The test focused on the 59A/58A cartridge model used in the HP LaserJet Pro M304A/M404n printers. Non-HP brands—both remanufactured and imitation—were selected by HP and sourced from the EMEA region by *spencerLAB* for testing. The HP 59A and M304a are the EMEA regional equivalents of the NA HP 58A and M404 series, respectively. Ten cartridges of each of the six non-HP brands and HP branded cartridges were tested to get significant overall results.

A four-page PDF test suite was printed from a Windows 11 system using Acrobat Reader version 2024.005.20421. Files were printed in default plain paper mode with the latest printer drivers downloaded from HP's website, using Hammermill Fore Multi-Purpose 20 lb., 96 brightness office paper. All test printing was conducted by *spencerLAB*.

All test materials—including printers, toner cartridges, and paper—were acclimated to typical office temperature and humidity conditions for a minimum of 12 hours. Printing was carried out in a semi-continuous process, with pauses for tasks such as paper refills and overnight breaks, and continued until each toner cartridge reached End-of-Life (EOL). EOL is defined as the point at which the Print Quality of any single page from the four-page suite degraded to the Unusable category, based on a grading scale established by a psychometric study [see Appendix 3]. Two shake procedures were performed prior to a cartridge being deemed EOL.

Cartridge Reliability Testing

Prior to printing, all cartridges were carefully unpacked and inspected for any toner leakage and/or damaged components.

Print Quality Assessment

Overall Print Quality was assessed using sixty-four print samples per toner cartridge, consisting of sixteen four-page suites collected at evenly spaced intervals throughout each cartridge's lifespan.

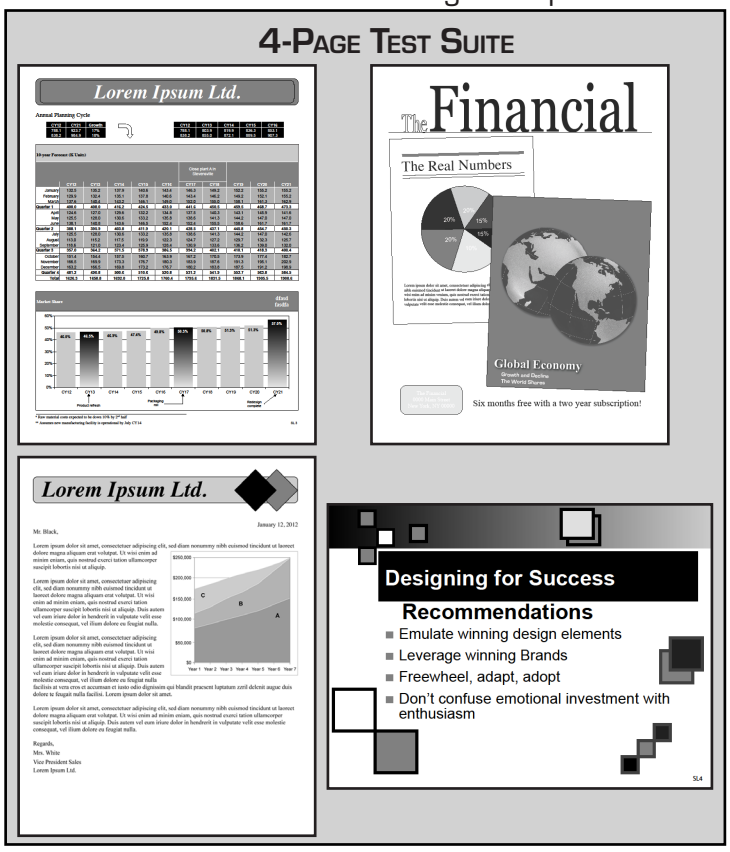
Using the psychometric Print Quality acceptance scale, *spencerLAB* evaluators assessed and rated each print sample, assigning it to one of four categories: External Use, Internal Use, Individual Use, or Unusable. The final Print Quality level for each sample was based on the average of the evaluators' scores, with any observed defects also documented.

Appendix 3: Psychometric Study – Print Quality Scale

A psychometric study of monochrome office printing users was conducted by *spencerLAB* in the greater New York City area (Hicksville, New York), to establish a Print Quality acceptance scale. Participants who printed monochrome documents for personal, internal, and external use, were recruited from a range of professions and business sizes, from micro business (1-49 employees to enterprise business (>500 employees). A total of thirty-eight business printing users participated in the exercise.

Test Suite

SpencerLAB collaborated with HP to design a representative business-user test suite. *SpencerLAB* then utilized the test suite pages to simulate common Print Quality defects such as banding, streaks, dark and light density, ghosting, etc. A total of fifteen test sets were created and each test set had a range of up to twelve variations (based on severity of defect) for a single defect type.



Test sets were printed on a HP LaserJet P3015 using Windows 7 and Acrobat Reader 10.1.2. Test samples were printed in default mode for plain paper, using the latest print driver available from HP's web site at the time of printing on Hammermill Fore MP 20lb., 96 Brightness, plain office paper. All printing was performed by *spencerLAB* and test sets were reviewed to ensure that the test samples were rendered as intended.

Business User Focus Groups

The focus group participants judged fifteen sets of print samples and sorted the samples into four Print Quality levels based on their acceptance level of Print Quality. The test samples were rated in a neutral environment, with no external lights, and uniform lighting.

Participants sorted all the test samples into four Print Quality acceptance levels:

- External Use – acceptable for all purposes, including distribution outside the organization to clients, vendors, and other external parties
- Internal Use – acceptable for internal company distribution, but not acceptable for sharing outside a company
- Individual Use – usable as a copy to read, file, or mark-up in the office, but not acceptable for distribution either internally or externally
- Unusable – not acceptable for any business purpose

SpencerLAB applied proprietary sorting and analysis algorithms to compute the average Print Quality rating for each sample within each test set. These scores were then used to establish the rank order of the samples in each test set.

Appendix 4: Test Terms and Definitions

Terms		Definitions
End-of-Life, (EOL)		A condition determined by one of three mechanisms: 1. Cartridge is Dead on Arrival. 2. Cartridge stops printing and efforts to recover are unsuccessful. 3. Degradation of Print Quality to unacceptable (Unusable) for any one of the Test Suite pages. Any printer documentation recommendations are performed no more than two times to recover PQ. After the second recovery, if PQ does not recover or degrades to Unusable, EOL is reached and marked before pages of unacceptable quality.
Dead-on-Arrival, (DOA)		A condition determined by one of four mechanisms: 1. A cartridge that has at least 50% of the handling surface covered in leaked toner, before or during the installation process and/or toner visibly spilled in the plastic bag containing the cartridge and/or on the exterior of the cartridge. 2. A cartridge that within the first ten pages has at least one page categorized as Unusable and does not improve during the recovery process. • Recovery process requires following the printer manual instructions for correction of the noted defect, or if the defect is not addressed in the manual, the first attempt to recover shall be to remove the cartridge and perform a shake procedure. Following this recovery process, ten more pages shall be printed and evaluated. If at least one page is categorized as Unusable, a second recovery attempt of printing a cleaning page, if available, shall be performed. Following the second recovery procedure, ten more pages shall be printed and pages evaluated for categorization. If at least one page is categorized as Unusable following this recovery process, the cartridge is DOA. 3. Cartridge is broken or missing parts. 4. Cartridge fails to operate upon installation and does not recover upon removing the cartridge and re-installation.
Premature Failure, (PF)		A cartridge with a page count of less than 80% of the average page count for all HP toner cartridges of that model that were not DOA, unless non-HP cartridge stated yield differs from HP stated yield.
Low Quality, (LQ)		A cartridge with 50% or more pages categorized as Limited Use, but was not DOA or PF.
Problem Cartridges		Cartridges categorized as either DOA, PF, or LQ.
Limited Use		Sample pages with PQ categorized as either Internal Use, Individual Use, or Unusable.
Print Quality Levels	External Use	Acceptable for all purposes, including distribution outside the organization to clients, vendors, and other external parties. Examples: marketing materials to promote the company or products, official company correspondence, invoices.
	Internal Use	Acceptable for internal company distribution, but not acceptable for distribution outside the organization. Examples: documents to distribute to colleagues, immediate superiors or subordinates as business communication.
	Individual Use	Usable as a copy to read, file, or mark-up in the office, but not acceptable for distribution, either within or outside a company.
	Unusable	Not acceptable for any business purpose.
Usable Pages		Pages that were acceptable for any use, and not deemed Unusable.
Non-HP Toner Cartridge		A cartridge that is sold as a substitute for an Original HP cartridge, but was not manufactured or authorized by HP.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RELIABILITY TESTED