MULTIVIEW TECHNOLOGY

CINNAMON TOAST CRUNCH GRADING STANDARDS — V1_3

Updated October 2025

1. PURPOSE

These standards define the consistent methodology and weighting criteria used by Multiview Technology for grading Cinnamon Toast Crunch specimens. They establish the physical ideal, measurable defect tolerances, and a categorical subgrade system modeled on PSA-style evaluation but tailored to cereal morphology.

2. IDEAL SPECIMEN — A-REF

Property	Description	Target
Planarity (Flatness)	Surface lies within a plane; minimal bowing or sag.	Curvature ≤ 3%
Corners	Four distinct, sharp 90-degree tips; minimal rounding.	Radius ≤ 0.30 mm
Edges	Continuous edges, no compression, flare, or chipping.	Deflection ≤ 0.20 mm
Surface Integrity	Ridge pattern intact, minimal pock marks, no scarring.	≤ 2 pocks per cm^2
Coating Distribution	Even cinnamon/sugar coverage with balanced matte sheen.	Luminance variance ≤ 8%
Aspect Ratio	Width : Height near 1 : 1 (square geometry).	Within 2% of 1.00

3. REALITY BANDS — FLATNESS / WARPING

Condition	Curvature %	Interpretation	Grade Cap
Ideal Flat	0–3%	Engineering goal	—
Nominal Camber	3–5%	Acceptable; no penalty	—
Bowed	5–8%	Minor production warp	≤ 9.0
Warped	8–12%	Noticeable curvature	≤ 8.0
Severe Warp	>12%	Structural deformation	≤ 7.5

4. SUBGRADE CATEGORIES AND WEIGHTS

Category	Weight	What is judged
Corners	0.22	Sharpness, chip presence, symmetry
Edges	0.18	Compression, cracks, uniformity
Surface Integrity	0.20	Ridge clarity, pock density
Coating Uniformity	0.15	Evenness, granule distribution
Geometry / Flatness	0.25	Bowing, warping, aspect ratio

5. AUTOMATIC PENALTY CAPS

Defect	Cap applied
Curvature > 8%	≤ 8.0
Curvature > 12%	≤ 7.5
Missing corner > 1 mm	≤ 6.5
Major pocking or ridge collapse	≤ 7.5
Burn or underbake > 10% area	≤ 7.5

6. PSA-STYLE GRADE MAP

Grade	Label	Interpretation
10	Gem Mint	Perfect; zero measurable flaw
9.5	Mint +	Barely perceptible defect
9.0	Mint	Slight curvature or coating variance
8.5	NM +	Visible bow or minor surface irregularity
8.0	NM	Distinct warp; small edge flaw
7.5	EX +	Pronounced bowing or minor chip
7.0	EX	One damaged corner or clear surface defect
6.5	VG +	Multiple structural issues
≤6.0	G–Poor	Heavy deformation, breakage, burn

11. AI TECHNICAL PROCESS — EXTENDED DETAIL

The Multiview AI Grader executes a deterministic vision pipeline for every specimen. Each image is preprocessed, analyzed, and scored via consistent algorithms that measure geometry, curvature, color, and edge integrity.

Image Ingestion and Normalization

EXIF metadata is parsed to confirm timestamps and exposure parameters. Images are converted to LAB color space for luminance-robust operations. Contrast is equalized via histogram equalization or CLAHE. Backgrounds are removed using adaptive thresholding (Otsu or Sauvola) and morphological cleanup, leaving a clean object mask.

Geometric Reconstruction

The primary contour is simplified using Douglas-Peucker reduction to stabilize vertex counts. Corner candidates are identified by Harris or Shi-Tomasi detection; angles are measured to estimate corner sharpness. Principal Component Analysis (PCA) yields major and minor axes for aspect ratio and symmetry analysis.

Surface Topography and Curvature Mapping

Lighting gradients are interpreted under a Lambertian assumption to approximate height deviation. Curvature percent is computed as (max deviation / half-span) * 100. Fast Fourier Transform (FFT) on grayscale channels quantifies ridge periodicity, and variance filtering identifies micro-pock density per unit area.

Color and Coating Uniformity

Mean luminance and hue variance in HSV space quantify cinnamon distribution. Elevated standard deviation indicates streaking or clumping. Optional heatmaps visualize coating non-uniformity for audits.

Quantitative Scoring and Weighting

Subgrades (Corners, Edges, Surface, Coating, Geometry) are scored 0–10 using normalized metrics. Weighted mean equals the sum of weight times subscore. Curvature caps and strict-mode deductions are then applied. Final grade is rounded down to the nearest 0.5 step on the PSA scale.

Strict-Mode Enforcement

Each metric carries a confidence score. If confidence falls below threshold (e.g., 0.85), the grade is reduced by one PSA tier. Ambiguity never rounds upward, enforcing conservative grading.

Certification and Documentation

Finalized grades generate a JSON log with numeric metrics and a PDF report. Optionally, a SHA256 hash of the photo set and report is computed for provenance tracking.

12. PATCH NOTES / UPDATE LOG

Version	Date	Summary of Changes
v1.0	Oct 2025	Initial release: 5-category weighted model and curvature caps.
v1.1	Oct 2025	Added AI Technical Process, improved formatting and margins.
v1.2	Oct 2025	Expanded Technical Process with algorithmic detail, added system architecture and data
v1.3	Oct 2025	Merged v1.1 structure with v1.2's extended Technical Process; retained v1.1 sections; cl

Certified & Catalogued by: Shawn Wiederhoeft • Multiview Technology