Addendum: Lighting & Color-Capture Specification

Companion to camera-mount-BOM.pdf and the staging-bed addendum · why: Dr. Owen's ~6-color pencil markup is the primary audit data — the scan exists to recover it faithfully

> **Governing principle.** Resolution is sufficient at the rig's working height; **color fidelity is the requirement**. Every choice below serves one goal: that a stroke classified as (say) *blue* in frame 1 is classified *blue* in frame 400, and that both match the physical pencil on the canvas.

1 · Illumination requirements

- **Sources:** two linear LED light bars, mounted parallel to the rails, one each side of the camera path, aimed at the frame center from ~40° above the horizontal. Symmetric placement cancels directional shadowing from paper curl.
- **Quality:** high color rendering — CRI ≥ 95 (check R9, the red rendering index, ≥ 90: red pencil depends on it). Flicker-free (DC-driven or high-frequency dimming).
- **Color temperature:** ~5000 K (the D50 graphic-arts standard), identical for both bars; never mix with the storage bay's overhead lighting — scan with ambient lights OFF or unchanging.
- **Evenness:** ≤ ⅓ stop variation across the 48-inch frame, verified with a gray card photographed at center and all four corners before each session.
- **Stray light control:** matte black cloth flags or foam-core skirts on the gantry sides where reflections off nearby surfaces intrude.

2 · Cross-polarization geometry

- **Why:** graphite and colored-pencil wax are glossy; failing glue is glossier; the acrylic flattening platen is glossiest of all. Specular glare desaturates and falsifies color exactly where the data is. Crossed polarization extinguishes it.
- **Light side:** linear polarizing film sheet over each light bar, both films with their transmission axes aligned to each other (mark the axis on the film edge with tape).
- **Lens side:** a linear polarizing filter clipped over the phone lens, rotated 90° to the lights' axis.
- **Setting the cross:** place a glossy black target (the platen offcut works) in frame; rotate the lens polarizer until the specular hot-spot visibly dies. Tape the filter at that rotation for the session.
- **Cost:** crossed polars eat roughly 1.5–2 stops of light — compensate with brighter bars or longer exposure (the rig is static; long exposures are free). Never compensate with ISO.
- **With the platen:** cross-polarization is mandatory, not optional — shooting through acrylic without it embeds reflections in the record.

3 · Color-card workflow

- **Card:** a 24-patch ColorChecker Classic (X-Rite/Calibrite). Two uses:
- **Session profile:** once per session — and again after ANY change of lights, polarizer rotation, platen on/off, or camera settings — photograph the card filling the frame center; build the session's color profile from this shot.
- **In every frame:** a small card (or the Passport size) lives permanently on the pegboard margin beside the inch tape — never on the canvas — so each of the ~400 frames carries its own verification patches. Drift between frames becomes measurable, not arguable.
- **Capture format:** RAW (DNG) via a manual-camera app; the iPhone SE's native app shoots processed HEIC/JPEG with scene-dependent color — unacceptable. Lock white balance off the card's gray patch; lock exposure; lock focus; ISO at base.
- **Correction target:** after profile correction, mean color error $\Delta E \le 2$ across the card's patches, maximum ≤ 4. Frames exceeding this are reshot, not "fixed later."

4 · The color → text catalog pipeline

1. **Capture:** RAW frames, ~31-inch advance, 35% overlap; inch tape and pegboard grid at every frame edge; per-frame color patches in view.
2. **Correct:** apply the session color profile; verify per-frame patches against target ΔE.
3. **Stitch:** Hugin, with the pegboard's 1-inch grid and the inch tape serving as abundant, machine-findable control points; output one continuous, dimensionally true master image per canvas section.
4. **Segment:** detect each pasted page fragment's boundary (paper edges against canvas ground).
5. **Identify:** read enough text per fragment to match it against the known corpus (First Folio and candidate era works) — fuzzy text-matching, not full OCR; the sources are already perfectly transcribed, so a handful of legible words locates work, edition, page, and line.
6. **Classify strokes:** detect pencil strokes; sample stroke color in CIELAB; cluster into the ~6 pencil classes; assign each stroke a class and a confidence; flag faded or ambiguous strokes for human review rather than forcing a guess. If any period color-legend survives (in Owen's papers or on the canvas), photograph it under the same profile and anchor the clusters to it.
7. **Catalog:** one row per fragment: fragment ID · canvas section · inch-coordinate (from the tape) · source work / edition / page / line · stroke colors present · guide word(s), where determinable · confidence fields. Output as CSV/JSON — **this table is the audit dataset.**

5 · Prove-out protocol (before the artifact)

Print a facsimile Folio page, mark it with six colored pencils in a known pattern, and run the complete pipeline — capture, correct, stitch, identify, classify — both bare and through the platen. Proceed to the artifact only when recovered colors match the known markup and the identification step names the right page. The test sheet costs an afternoon; it validates every claim in this specification.

6 · Parts (additions to the BOM)

Qty	Part	Source / notes
2	High-CRI LED light bar (CRI ≥ 95, ~5000 K, dimmable, DC/flicker-free)	Photo/video suppliers (Amazon); verify R9 spec. Hardware-store shop lights rarely reach CRI 95 — this is the one part worth buying from the photo trade.
2	Linear polarizing film sheet (≥ light-bar length)	Amazon/Edmund Optics. Mark transmission axis on the edge.
1	Clip-on linear polarizing filter for phone lens	Amazon.
1	ColorChecker Classic (24-patch) + small/Passport size	Calibrite. Session profiling + in-frame verification.
1	18% gray card	Evenness checks; white-balance lock.
1	Manual RAW camera app (DNG capture)	App Store (e.g., Halide or equivalent) on the iPhone SE.
—	Matte black cloth / foam-core flags	Stray-reflection control; fabric or craft aisle.

Prepared by Walter H. Wilkinson · gorhambury.org · August 2026 · Lighting & Color-Capture Specification v1 — recreated fresh (prior detailed treatment lost with an earlier session); part of the Bespoke Image Scanner package