

Hitachi Blue Paper #2 × 410 Stainless

SanMai / Laminated Steel — Heat Treatment Specification

Revision 1.0 | Baker Forge & Tool, Boone NC

STEEL PROFILES

	Hitachi Blue Paper #2 (Core / Edge)	410 Stainless (Cladding)
Carbon	1.0 – 1.2%	~0.15%
Chromium	~0.5%	~12%
Tungsten	~0.2%	—
Role	High-carbon edge steel — hardening core	Corrosion-resistant jacket — stays soft
Forge Range	1900 – 2100°F	2000 – 2200°F

STEP 1 — NORMALIZE (DO THIS FIRST)

Normalize before hardening to relieve forge stress and even out grain. Blue #2 is sensitive to grain growth — normalization matters.

Parameter	Spec
Cycles	2 – 3 cycles recommended
Temp	1450 – 1475°F
Hold time	5 – 10 minutes per inch of thickness
Cool	Still air to black (below 900°F) between each cycle
Atmosphere	Neutral to slightly reducing — minimize scale on Blue #2 surface

STEP 2 — AUSTENITIZE & HARDEN

Blue #2 is the hardening core. The 410 cladding will NOT fully harden at these temps — that is by design. Do NOT austenitize above 1500°F or you risk grain growth and toughness loss in the Blue #2.

Parameter	Spec
Austenitize temp	1450 – 1500°F (target: 1475°F)
Soak time	10 – 15 min at temp (use thermocouple — do not guess)
Atmosphere	Controlled kiln strongly preferred. If torch/forge hardening, protect with anti-scale compound.
Quench medium	Fast Parks 50 or equivalent fast quench oil
Quench technique	Edge-first plunge, straight in — no rocking or angling
Quench temp	Oil at 100 – 120°F (warm oil, not cold)
Agitate?	Yes — moderate movement during quench, stop when no longer steaming

⚠ **Do NOT use canola oil, vegetable oil, or water for this steel. Water quench will crack Blue #2. Canola is too slow.**

STEP 3 — SNAP TEMPER (CRITICAL — DO NOT SKIP)

The 410 stainless cladding and Blue #2 core have different thermal expansion coefficients. Without a snap temper immediately after quench, differential stress will delaminate the cladding. This step is non-negotiable.

Parameter	Spec
Timing	Immediately after quench — when blade is cool enough to handle but still warm (~125 – 150°F)

Snap temper temp	350°F
Hold time	20 – 30 minutes
Cool	Still air — remove from oven, cool on rack

STEP 4 — TEMPER

Blue #2 tempers at lower temperatures than most Western steels. Double-temper is recommended. Two full cycles at the same temperature with a full air cool between cycles.

Parameter	Spec
Cycles	2 cycles (double-temper)
Temper temp — hard	375°F → target HRC 63 – 65 (max hardness, fine blades)
Temper temp — balanced	400°F → target HRC 61 – 63 (recommended for most knife use)
Temper temp — tough	450°F → target HRC 58 – 60 (choppers, hard use)
Hold time	1 hour per cycle
Cool between cycles	Full air cool to room temp before second cycle
Cryo?	Optional. Dry ice or LN2 between snap temper and first full temper. Improves edge retention. Freezer is NOT sufficient.

EXPECTED HARDNESS RESULTS

Temper Temp	Blue #2 Core (HRC)	410 Cladding (HRC)	Use Case
375°F	63 – 65	24 – 28 (soft)	Fine kitchen / precision blades
400°F	61 – 63	24 – 28 (soft)	General purpose hunting / EDC
450°F	58 – 60	24 – 28 (soft)	Hard use / camp / chopper

Note: 410 cladding does not meaningfully harden at Blue #2 austenitizing temps. The soft cladding is a feature — it provides ductility and corrosion resistance while the core holds the edge.

FULL PROCESS SUMMARY

#	Step	Temp / Setting	Notes
1	Normalize ×2–3	1450 – 1475°F	Still air cool between each
2	Austenitize	1475°F Soak 10–15 min	Controlled kiln preferred
3	Quench	Parks 50 100–120°F oil	Edge-first, straight plunge
4	Snap Temper ⚠	350°F 20–30 min	IMMEDIATELY after quench — prevents cladding delamination
5	Cryo (optional)	Dry ice or LN2	After snap temper, before full temper
6	Temper ×2	375 – 450°F 1 hr each	Full air cool between cycles

WATCH POINTS & COMMON FAILURES

Issue	What to Watch For / Why It Happens
-------	------------------------------------

Cladding delamination	Almost always caused by skipping or delaying the snap temper. The 410 and Blue #2 move differently during quench — snap temper relieves that stress before it tears the weld.
Grain growth in Blue #2	Overshooting austenitize temp (above 1500°F) or soaking too long. Grain growth = brittle, chippy edge.
Carbon migration	Multiple welding heats at high temp slowly pull carbon from the Blue #2 toward the 410 interface. Work efficiently during the forge weld phase.
Uneven hardness	Uneven soak during austenitizing. Use thermocouple. Don't pull the blade too early.
410 cracking	410 can crack if quenched in water or a fast quench at too-high temp. Stick to warm Parks 50.

POST-HEAT TREAT — ETCHING

Blue #2 / 410 SanMai etches with good contrast. The high-carbon core darkens aggressively while the 410 cladding stays bright, giving a sharp visual line at the transition zone.

Product	Use
Gator Piss Heavy	Recommended for stainless-clad SanMai with carbon core
Gator Skin	Apply after etch for protection. Locks in the contrast.
Grime Reaper	Pre-etch cleaning. Remove all oil, finger prints, and grinding residue before etching.

Baker Forge & Tool — Internal Shop Reference — Do not distribute without authorization