Glove Condition Log: S5 Structural Integrity Tracking Protocol

This diagnostic template tracks glove wear, damage, and material breakdown over time. Its purpose is to identify when a glove is moving from safe use into retirement risk before visible failure becomes dangerous.

Phase 1: Research Protocol

Central Entity:

Glove Condition Log

Central Problem Entity:

Glove structural integrity decay

Problem Statement:

A glove can lose protection through abrasion, seam weakening, material thinning, chemical exposure, heat stress, or repeated grip movement before obvious holes or tears appear.

Primary Objective:

To calculate a Quantified Integrity Index (QII), identify the main failure vector, and decide whether the glove should remain in use, be downgraded, or be retired.

Primary Metric:

Quantified Integrity Index / QII

QII Formula:

$$\mathrm{QII} = \frac{\text{Palm Wear} + \text{Seam Integrity} + \text{Back Protection} + \text{Tactile Control} + \text{Recovery Score}}{5}$$

Recovery Score:

$$\text{Recovery Score} = \text{Elongation Recovery \%} \div 10$$

Example: 80% *recovery =* 8.0 *recovery score*

Phase 2: Variable Isolation & Control

Decay Factors

Factor	What It Tracks
Abrasion Load	Surface wear from rough materials or repeated friction
Chemical / Thermal Exposure	Softening, cracking, swelling, brittleness, or heat damage
Grip-Cycle Stress	Repeated gripping, twisting, pulling, or tool handling
Seam Stress	Stitching weakness, seam opening, or cuff fatigue
Tactile Loss	Loss of touch, control, flexibility, or grip feel

Controls

Keep these consistent during each condition cycle:

- Same glove model
- Same task category
- Same inspection interval
- Same cleaning method
- Similar storage conditions
- Same scoring scale

Cleaning Control:

Use only the approved cleaning method for the glove material. Do not use harsh solvents, direct heat, or direct sunlight unless the manufacturer allows it.

Phase 3: Quantitative Condition Log

Perform a condition check every 20 hours of use, or sooner after chemical, heat, puncture, or heavy abrasion exposure.

Score Scale

Score	Meaning
10	Factory-new condition
8–9	Strong condition
6–7	Moderate wear
4–5	High wear / downgrade risk
1–3	Retirement risk
0	Failed / hole / unsafe

Condition Matrix

Date	Hours Used	Palm Wear	Seam Integrity	Back Protection	Tactile Control	Recovery %	QII	Decision
	20							
	40							
	60							
	80							

Immediate Retirement Gate

Retire the glove immediately if any of these appear:

- Hole, tear, or puncture
- Chemical swelling, stickiness, cracking, or discoloration
- Burn mark, melting, brittleness, or hardening

- Seam opening or cuff failure
- Unsafe grip loss
- Unknown chemical contamination
- Skin exposure risk

🛑 **Rule:** Do not continue lifecycle testing after a safety gate failure.

Phase 4: Quantitative Analysis & Retirement Threshold

Step 1: Calculate Velocity of Decay

$$\text{VoD} = \text{QII drop per 20 hours}$$

Example: QII drops from 8.4 *to* 6.6 *over* 20 *hours.* $\text{VoD} = 1.8$ *per* 20 *hours.*

VoD Pattern	Meaning
$0-$	Slow wear
$0.6-$	Normal wear
$1.6-$	Accelerated decay
$2.6+$	Structural cascade / urgent review

Step 2: Identify the Primary Failure Vector

First Score Below 4	Main Diagnosis
Palm Wear	Abrasion failure
Seam Integrity	Stitching or cuff failure
Back Protection	Impact or dorsal protection decay
Tactile Control	Flexibility, grip, or precision failure

Recovery Score	Material fatigue or loss of elasticity

Step 3: Safety Zone

QII Range	Decision
$8-$	Green Zone: suitable for normal assigned use
$5-$	Yellow Zone: monitor closely or downgrade to lower-risk tasks
Below 5	Red Zone: retire from safety-critical use
Any safety gate failure	Immediate retirement

Insight Statement

The data indicates that the primary failure vector is _____ because its score dropped below ___ after ___ hours of use. The glove is currently in the _____ zone with a QII of ___.

Phase 5: Testable Hypothesis / Longevity Plan

Hypothesis:

By changing _____, I can slow the glove's decay rate and keep QII above ___ for at least ___ hours of use.

Maintenance / Rotation Test

Failure Vector	Improvement to Test
Palm Wear	Use a higher-abrasion glove or rotate pairs more often
Seam Failure	Test reinforced seams or a better cuff design
Tactile Loss	Use a more flexible glove or reduce overuse duration
Recovery Loss	Improve storage, cooling rotation, or

	material-specific care
Chemical / Heat Damage	Use a compatible glove material and shorten change-out time

Validation Protocol

Test	Glove Pair	Duration	Success Target	Result
Control	Current method	$40 -$ hours	Record normal QII decay	
Improved	New care / rotation / material	$40 -$ hours	Lower VoD and keep QII above 6	

Final Decision

- **QII stays above 8:** Continue normal use.
- **QII stays 5–7.9:** Monitor or downgrade task limits.
- **QII falls below 5:** Retire immediately.
- **Safety gate fails:** Retire immediately.

Optional Blog / Tool Use

This template can support a **“Glove Longevity Calculator”** or **“Glove Retirement Risk Checker.”**

- **Safer wording:** "This tool estimates replacement priority and retirement risk based on visible condition scores, use hours, and decay speed."
- **Avoid unsafe wording:** "This tool tells users exactly how many safety hours are left."