Glove Material Selector: S5 Polymer Compatibility Evaluation Protocol

This diagnostic template identifies whether a glove material is suitable for a specific task, chemical exposure, temperature range, and mechanical hazard. It helps detect material-task mismatch before recommending a safer glove option.

🔹 Phase 1: Research Protocol

Central Entity:

Glove Material Selector

Central Problem Entity:

Glove Material Selector — diagnosing polymer-task incompatibility

Problem Statement:

A glove material may fail when its chemical resistance, mechanical durability, thermal stability, or tactile control does not match the real hazard conditions of the task.

Primary Objective:

To identify the safest glove material match by calculating a Material Adequacy Score (MAS) and eliminating any material that fails the Chemical Safety Gate.

Primary Metric:

Material Adequacy Score / MAS

MAS Formula:

$$\mathrm{MAS} = \frac{\text{Chemical Barrier} + \text{Abrasion Resistance} + \text{Puncture Shield} + \text{Tactile Precision} + \text{Heat/Cold Suitability}}{5}$$

🔹 Phase 2: Variable Isolation & Hazard Mapping

Required Hazard Inputs

Input	Entry
Main Chemical / Fluid	
Concentration	
Contact Type	Splash / Intermittent / Continuous
Exposure Duration	
Task Type	
Temperature Range	
Mechanical Hazard	Abrasion / Puncture / Cut / Grip / None
Dexterity Need	Low / Medium / High

Independent Variables / Stressors

Stressor	What It Tests
Chemical Exposure	Whether the glove material resists the exact chemical or fluid
Contact Duration	Whether the glove protects long enough for the task
Mechanical Wear	Whether the glove resists abrasion, puncture, tearing, or rough handling
Thermal Stress	Whether the glove remains stable in heat, cold, or temperature shifts
Dexterity Demand	Whether the glove allows the required level of finger control

Controls

Keep these consistent during comparison:

- Same task type
- Same chemical or fluid
- Same exposure duration

- Same temperature range
- Same glove thickness category where possible
- Same dexterity requirement

🔹 Phase 3: Suitability Matrix / Quantitative Material Log

Score Scale

Score	Meaning
4	Superior match
3	Good match
2	Conditional / limited use
1	Weak match
0	Incompatible / eliminate

Chemical Safety Gate

Before calculating MAS, check Chemical Barrier first.

Chemical Barrier Score	Decision
4	Strong candidate
3	Acceptable candidate
2	Conditional use only; verify change-out time
1	Reject unless expert approval exists
0	Eliminate immediately

Safety Gate Rule:

If Chemical Barrier is below 2, eliminate the material even if all other scores are high.

Suitability Matrix

Material Candidate	Chemical Barrier	Abrasion	Puncture	Tactile Precision	Heat/Cold	MAS	Decision
Nitrile							
Latex							
Vinyl / PVC							
Neoprene							
Polyurethane / PU							
Leather							
Hybrid / Coated Glove							

🔹 Phase 4: Quantitative Analysis / Failure Vector

Step 1: Eliminate Unsafe Materials

Reject any material with:

- Chemical Barrier below 2
- No chemical-resistance data for the main chemical or fluid
- Known degradation risk for the task substance
- Poor match for expected exposure duration
- Unsafe grip, puncture, heat, or cold performance

Step 2: Diagnose the Failure Vector

Failure Pattern	Diagnosis
Low Chemical Barrier	Permeation, degradation, or breakthrough risk

High Chemical Barrier but low Tactile Precision	Safe barrier, poor dexterity
High Abrasion but low Chemical Barrier	Mechanically durable but chemically unsafe
High Puncture but low Touch Control	Too thick or rigid for precision work
No material scores 3+ across key categories	Task may need a hybrid or coated glove

Step 3: Material Ranking

Rank	Material	MAS	Main Strength	Main Weakness	Use / Reject
1					
2					
3					

Insight Statement

The data indicates that the best material candidate is _____ because it achieved a MAS of __ while passing the Chemical Safety Gate for _____ exposure.

The rejected material was _____ because it failed on _____.

🔹 Phase 5: Testable Hypothesis / Selection Blueprint

Hypothesis

By switching from _____ to _____, I can improve _____ while maintaining acceptable _____ for the task.

Validation Protocol

Validation Step	Pass Condition
Chemical chart checked	Material is listed as compatible with the exact chemical or fluid

Breakthrough / permeation data checked	Protection time is longer than expected exposure or change-out interval
Degradation risk checked	No unacceptable swelling, cracking, softening, shrinking, or discoloration
Task trial completed	Grip, dexterity, puncture resistance, and comfort remain acceptable
Change-out rule defined	Gloves are replaced before protection limits are exceeded

Final Material Decision

Result	Decision
Chemical Barrier 3–4 and $\mathrm{MAS} \geq$	Strong candidate
Chemical Barrier 2 and $\mathrm{MAS} \geq$	Conditional candidate; verify change-out time
Chemical Barrier below 2	Reject
No material passes	Use hybrid glove or consult safety / technical data

Safety Rule

Do not rely on a visual swelling test alone for chemical protection. Chemical glove selection must be based on chemical-resistance data, breakthrough or permeation information, degradation risk, exposure duration, and the real task environment.

Optional Blog / Tool Use

This template can power a “Glove Material Finder” quiz.

Example output:
“For oily automotive fluids with moderate abrasion and medium dexterity needs, the matrix rejects leather because of poor chemical barrier performance and ranks nitrile or neoprene-based options as stronger candidates, pending manufacturer chemical-resistance confirmation.
Glovevision.com