SKILL GUIDE · SANITATION & HYGIENE

Soap Making: Lye & Oils

The Sanitation & Hygiene chapter's Tier 3 guidance calls for soap-making as the skill that produces an effectively unlimited hygiene supply once stocked soap runs out. This guide covers the actual chemistry and the real safety practice behind it: three real methods, why the fat-to-lye ratio has to be calculated, not guessed, how to handle lye without getting hurt, and how to make your own lye from wood ash once buying it isn't an option either.

Three real methods, and which one actually teaches the skill

"Soap making" covers three genuinely different processes, and only one of them is the self-sufficiency skill this chapter actually needs. Melt-and-pour starts from a pre-made soap base, already saponified by the manufacturer, that you melt and customize with color or scent; there's no lye handling and no cure time, which makes it the easiest and safest onramp, but it's still a manufactured input with a supply chain behind it, the same dependency this manual is trying to build away from. Cold process mixes fat and lye at a low temperature, 86–122°F; saponification finishes over the next 24 to 48 hours inside the mold, and the bar needs 4 to 6 weeks of curing after that before it's ready to use. Hot process cooks the same reaction with added heat, finishing saponification in a few hours so the soap is usable almost immediately, at the cost of less control over how the finished bar looks.

Cold and hot process are the real skill: both start from raw fat and lye, the two inputs a household can actually produce or stockpile without depending on a soap manufacturer. Melt-and-pour is worth knowing as a genuine first project, especially for introducing kids to the craft without lye in the room, but treat it as practice for handling a mold and fragrance, not as the skill this chapter is asking for.

The chemistry that makes the ratio non-negotiable

Soap is the product of saponification: a reaction between a fat (a triglyceride) and lye that produces soap and glycerin. Every fat has its own saponification value, the exact amount of lye it takes to fully convert that specific fat to soap, and the value is different for every fat because their fatty-acid profiles differ. Guess the ratio instead of calculating it and there are two ways to get it wrong in opposite directions: too much lye leaves unreacted lye in the finished bar, genuinely harsh and irritating on skin; too little leaves unreacted fat, a soft, greasy bar that spoils faster.

Fat	Approx. SAP value (g NaOH per g fat)	Note
Lard or tallow	0.14	The traditional base fat; widely available from a household already raising or processing livestock
Coconut oil	0.19	Produces a harder, more cleansing bar; used as a smaller fraction of a recipe, not the whole thing, since it's drying at high percentages
Olive oil	0.135	Produces a mild, gentle bar; the base of traditional Castile soap

These numbers are approximate and vary by source, growing conditions, and processing method. Run every real recipe through a lye calculator, SoapCalc is the standard, free one, rather than hand-calculating or reusing a ratio from memory; enter the exact fats and weights in the actual recipe and let it do the math. Set a superfat, sometimes called a lye discount, of 3 to 8 percent: intentionally leaving that percentage of fat unreacted is the real margin of safety against a lye-heavy bar, not an optional refinement.

Weigh every ingredient in grams on a digital kitchen scale, never measure by volume with cups or spoons. Fat density and lye density both vary enough that a volume measurement can throw off the whole ratio the calculator just worked out; the entire safety margin this section describes assumes weighed ingredients.

Handling lye safely

Lye, sodium hydroxide, is genuinely corrosive: it causes severe chemical burns on contact with skin, and worse damage to eyes, where it can destroy tissue before the pain even registers clearly enough to react. Treat every batch with real PPE: splash-proof goggles that seal around the eyes, not regular glasses; nitrile or rubber gloves that cover the wrist, not latex, which lye degrades; and long sleeves and pants, since a single droplet on bare skin can scar in seconds. Mix lye only in a well-ventilated space, outdoors or with real airflow, since the fumes released when lye first dissolves in water are sharp and genuinely irritating to breathe.

Mix lye only in heavy-duty HDPE plastic (labeled #2) or stainless steel, never aluminum, tin, or a thin or flimsy plastic container. Lye reacts with aluminum to release hydrogen gas, genuinely flammable and potentially explosive in enough quantity, while also eating through the metal itself.

A typical starting ratio is about 38 percent water relative to the total oil weight, which works out to a lye concentration (lye weight divided by lye-plus-water weight) of roughly 30 to 33 percent; SoapCalc will calculate the exact water amount for a given recipe, but that's the range a real batch should land in. Dissolving lye in water is a strongly exothermic reaction: the solution can spike to around 200°F within a minute or two of mixing, so let it sit somewhere safe for 1 to 3 hours, or set the container in a cold water bath, until both the lye solution and the oils are down in the 100–130°F range before combining them.

Combining while the lye solution is still near 200°F risks container failure and a real burn hazard, not just a lower-quality bar.

> **WARNING**
>
> **Lye into water, never water into lye**
>
> Remember it as SNOW: sodium hydroxide over water. Always add the lye to the water, slowly, stirring as you go. Adding water to lye instead can trigger a violent, near-instant exothermic reaction that splashes caustic solution out of the container, a real, documented cause of serious injury. If lye contacts skin, flush immediately with cool running water for a full 15 to 20 minutes; never use vinegar to neutralize it, since the acid-base reaction between vinegar and lye releases its own heat and can worsen the burn. For eye contact, remove contact lenses and flush continuously with water for at least 20 minutes while arranging emergency care immediately. If swallowed, do not induce vomiting; call Poison Control (1-800-222-1222) or seek emergency care right away.

Store any lye that isn't used immediately in its original container or another airtight HDPE container, clearly labeled, somewhere cool and dry below 85°F, and locked away from children, pets, and other chemicals. Never store it in a metal container: lye pulls moisture out of the air over time, and that moisture reacts with bare metal.

Combining and reaching trace: how you know when to pour

Once the lye solution and oils are both in the 100–130°F range, combine them and mix, alternating short pulses of a stick blender with periods of hand-stirring, rather than running the blender continuously. What you're watching for is called trace: the point where the oil and lye solution have emulsified into a smooth, thickened batter that leaves a visible trail on the surface when drizzled from the blender or a spoon. Thin trace looks like a light pudding and is the earliest usable stage, medium trace holds a visible trail longer, and thick trace holds its own shape when mounded. Watch for false trace too: solid fats or butters that were still slightly cool can make a batch look thickened before it's actually emulsified; if in doubt, keep pulsing a little longer rather than pouring early.

Have the mold ready before you reach trace, not after: line a wooden or silicone mold with parchment paper or freezer paper if it isn't already silicone, sized to the batch's total volume. Pour at your target trace stage, tap the filled mold on the counter a few times to release trapped air bubbles, and cover it loosely for the first 24 to 48 hours while saponification finishes.

Going deeper: making your own lye from wood ash

Store-bought lye is itself a supply-chain dependency, which is exactly why the traditional method matters for a real Tier 3 or Tier 4 plan: leaching hardwood ash through water produces potassium hydroxide, a real, historically used lye. Oak, maple, and hickory ash work best, since hardwoods concentrate more potassium than softwoods do. Screen the ash through a colander to remove unburned chunks.

Build the leaching barrel itself with a few real drainage holes drilled in the bottom of a wood or food-grade plastic barrel, a layer of pebbles over those holes, then 2 to 3 inches of straw over the pebbles to keep ash from washing through, then fill the rest with the sifted ash. Elevate the whole barrel 3 to 4 feet up on blocks or a simple frame, positioned over a lye-safe collection bucket underneath. Pour hot water through slowly rather than cold, hot water draws more potassium out of the ash, at a rough working ratio of 10 cups of ash per gallon of lye water produced. Run the collected liquid back through the same ash a second time rather than using it straight off the first pass; a first pass typically comes out weak, roughly one quart of usable-strength lye per gallon of ash run through, and the second pass concentrates it closer to soap-making strength.

The traditional strength test is a fresh egg or a chicken feather: if it floats with about a thumbnail's-width above the surface, or the feather actually dissolves, the lye is concentrated enough to make soap. This is a real, functional field test, but it isn't a substitute for knowing the actual concentration the way a bought lye's labeled purity does.

Wood-ash lye doesn't drop into a store-bought recipe's ratio

A recipe calculated for pure, known-concentration sodium hydroxide from a lye calculator assumes a specific strength. Wood-ash lye's concentration varies by wood species, burn temperature, and how much water was run through the ash, so it won't match that calculation. Traditional wood-ash soap recipes lean on generations of practiced judgment (the float test, the eventual feel of the finished soap) rather than a precise calculated ratio; treat your first several batches as calibration, made in small quantities, not a batch-sized bet.

Curing: why a fresh bar isn't a finished one

A cold-process bar is chemically finished saponifying within a few days, but it isn't ready to use. Over 4 to 6 weeks of curing, the bar loses roughly 20 percent of its water content through evaporation, which is what turns a soft, tacky bar into a hard one that lasts. The same period lets pH drop by roughly a full point, commonly from around 11 to under 10, meaningfully reducing how harsh the bar feels on skin. Skipping the cure isn't dangerous the way skipping lye safety is, but a bar used at one week will be softer, shorter-lived, and noticeably harsher than the same bar used at six.

Quick Reference

Method	Lye handling	Time to usable	Best for
Melt-and-pour	None (pre-saponified)	Under an hour	First projects, kids, learning molds and fragrance
Hot process	Full lye safety practice required	Same day to a few days	Faster turnaround; the real self-sufficiency skill
Cold process	Full lye safety practice required	4–6 weeks (cure time)	Traditional method; most control over final bar

Full checklist:

- Real recipe run through a lye calculator (SoapCalc or equivalent) before every batch, not calculated by hand or reused from memory
- Every ingredient weighed in grams on a digital scale, never measured by volume
- Superfat set to 3–8 percent
- HDPE plastic or stainless steel mixing container on hand, never aluminum or tin
- Splash goggles, nitrile/rubber gloves past the wrist, and long sleeves on hand and used every time
- Well-ventilated space confirmed before mixing lye
- SNOW rule (lye into water) understood by everyone handling it
- Cool running water available at the workspace for immediate flushing
- Lye solution and oils both cooled to 100–130°F before combining
- Mold lined and ready before mixing starts, not after reaching trace
- Leftover lye stored labeled, airtight, and locked away from children and pets
- At least one practice batch made and fully cured before treating this as a reliable hygiene-supply source
- If pursuing wood-ash lye: hardwood ash sourced, leaching setup built, and the float/feather strength test understood before batching

Sources

- Saponification, superfat, and cold vs. hot process mechanics: School of Natural Skincare; Sea Witch Botanicals

- SAP values and lye calculator: SoapCalc Oil Chart
- Lye safety, PPE, SNOW rule, and first aid: Learn Soap Making; Certified Lye; CDC/ATSDR Medical Management Guidelines
- Mixing container material (aluminum reacts with lye) and lye storage: Certified Lye; SoapIndex
- Lye-water concentration and ratio: The Nova Studio; Classic Bells
- Lye-solution reaction heat and cooling before combining: Nature's Garden; Brambleberry
- Reaching trace, thin/medium/thick stages, and false trace: Soap Queen; Learn Soap Making
- Wood-ash leaching barrel construction and re-leaching to concentrate: Soap Legacy; Wood Work Science
- Wood-ash lye leaching method and strength testing: Soap Legacy; Soapy Stuff
- Melt-and-pour process: Soap Guild
- Curing time, water loss, and pH change: PetalMade