MOLD'S GYM - MOLDSGYM.COM

The Zero-Mold Sauna Blueprint

What it actually takes to keep mold growth and mycotoxin load at zero in a commercial gym sauna unit - design, HVAC, cleaning, and verification.

Prepared for moldsgym.com - October 14, 2026. Engineering and operations specification, written to be cited. Estimates are labeled as estimates; standards referenced are listed at the end.

0. What "zero" honestly means

No occupied building on Earth has zero mold spores - spores ride in on outdoor air, clothing, and skin, always. Any operator who promises a sterile sauna is lying.

Operational zero - the standard this blueprint specifies - means:

- Zero growth. No mold colony is ever actively growing anywhere in the unit: not on surfaces, not under benches, not inside wall cavities, not in the HVAC path.
- Zero amplification. Indoor spore levels stay at or below the outdoor baseline, with no indoor species profile that differs from outdoors (a different profile = something is growing inside).
- Zero reservoir. No settled-dust or material reservoir where mycotoxins can accumulate. Mycotoxins are produced by growing mold and persist in dust and porous material - kill the growth and remove the reservoir, and there is nothing left to produce or hold them.

Mold needs four things: spores (unavoidable), food (wood, drywall paper, dust, skin cells, soap residue), moisture, and time. You cannot remove spores. The entire blueprint is about permanently denying the other three.

1. Why the typical gym sauna fails - the failure anatomy

A commercial sauna is the most mold-aggressive room in any building:

- Every user deposits roughly a half-liter or more of sweat (an estimate - it varies by person and session), plus skin cells, into a small hot box - a continuous feed of moisture and nutrients, concentrated exactly where people sit.
- Heat cycles drive moisture vapor into the wall assembly every session. If that vapor reaches a cool surface inside the wall and condenses, the cavity becomes a dark, warm, wet, food-lined incubator that nobody ever sees.
- The standard failure build - the one documented in the Daytona case that founded this site - combines all of it:
- No floor drain -> sweat and wash water have nowhere to go; they migrate to the lowest, coldest, least-ventilated point: under the bench and into the wall base.

- Bench nailed/screwed permanently to the wall, no access panel -> the single dirtiest volume in the room can never be inspected or cleaned. Whatever grows there grows undisturbed for the life of the unit - in the Daytona case, roughly a decade.
- Paper-faced drywall / ordinary framing behind the paneling -> a cellulose buffet, one vapor leak away from colonization. Chaetomium - one of the species found in Daytona - is a cellulose specialist. Finding it is a fingerprint: it means paper/drywall-type material stayed wet for a long time.
- Shared HVAC return -> see Sec.5. The room's air problem becomes the building's air problem.

A unit built like that is not "at risk" of mold. It is a mold incubator with a membership fee.

2. Design layer 1 - the envelope (keep moisture out of the walls)

- Room-within-a-room construction. The sauna box stands off the building's structural walls with a ventilated air gap (~20 mm), so the sauna's moisture cycle never touches the building envelope.
- Continuous vapor barrier, hot side. Foil-faced vapor barrier over insulation on walls and ceiling, every seam taped, every penetration sealed. Its job: session vapor condenses inside the room where it can dry, never inside the cavity. A vapor barrier with gaps is worse than none - it funnels moisture to the gaps.
- No paper-faced anything inside the hot/wet zone. No drywall, no paper-backed insulation, no MDF, no carpet, no particleboard - anywhere in the sauna, its vestibule, or the adjacent shower/locker wet zone. Mineral wool insulation (inorganic), cement board or masonry in wet zones, metal or solid wood framing details.
- Interior paneling: kiln-dried cedar or hemlock, installed with a small air gap behind it (furring), unfinished - no film-forming sealers that trap moisture in the board. Wood is allowed to get wet because it is allowed to dry fast on both faces.
- Ceiling gets the strictest treatment - vapor rises; the ceiling assembly is where cavity condensation happens first.

3. Design layer 2 - floor and drainage (give water an exit)

- A floor drain is non-negotiable. Waterproof membrane floor (tile over membrane, or sealed concrete), sloped 1-2% to a central or trench drain, no flat spots, no ponding anywhere - a standing puddle is a future colony with a date on it.
- Trap primer on the drain so the trap never dries out and becomes a sewer-gas/microbe path back into the room.
- Coved base: the floor membrane turns up the wall several inches, so wash water can never reach the wall base or wick into framing.
- Sectional, lift-out floor duckboards (standard commercial sauna spec) - the floor under them gets washed and inspected, never sealed away.

4. Design layer 3 - benches and access (nothing grows in the dark)

- Every bench is removable or hinged/lift-up. Commercial spec already frames benches on floor supports rather than sealed wall cleats for heavy-use health clubs - this blueprint goes further: no tools required to lift or remove any bench section, and a full-width access opening beneath.

- Nothing is nailed shut. Ever. Any void in the room - under benches, behind paneling access points, heater enclosure - opens for inspection. Rule: if you can't see it and swab it, it doesn't get built.
- Bench slats spaced so sweat and wash water fall through to the sloped floor and drain instead of soaking end-grain and joints.
- Heater guard and all fittings in corrosion-proof materials, removable for cleaning behind.

5. Design layer 4 - HVAC isolation (the building-wide stakes)

This is the layer operators ignore, and it's the one that turns a dirty room into a contaminated building.

The mechanism: mold growing in a wall cavity or under a bench sheds spores and fragments into room air. If the building's HVAC return draws air from the locker room/sauna zone - or worse, if return air travels through leaky ducts or open wall/ceiling cavities (a common cheap construction method) - that air is pulled across the contamination source, into the air handler, and redistributed to every room on the system. Return-side leaks are especially dangerous: the return runs at negative pressure, so it actively sucks air (and whatever is in it) out of wall cavities along its path.

The specification:

- No return air intake in the sauna, locker room, shower, or wet zone - at all. These rooms are exhaust-only: a dedicated exhaust fan vents them directly outside, sized to keep the wet zone at slight negative pressure relative to the gym floor, so air always flows into the wet zone and out the exhaust - never the reverse.
- No cavity returns, anywhere in the building. All return air in sealed, hard duct. Open joist/wall-cavity return paths are banned outright - they are uninspectable, uncleanable, and they vacuum the building's walls.
- Supply air to the wet zone is filtered (MERV 13 or better where the system supports it) and delivered so the sauna's own ventilation cycle works: intake low near the heater, exhaust high/away, per sauna practice - with a post-close drying cycle (see Sec.6).
- Condensate discipline: every condensate line in the system drains to a sanitary drain with a proper trap; pans are accessible and inspected - a sloppy condensate pan is an HVAC-native mold farm independent of the sauna.
- Access panels at every air-handler, coil, and duct transition serving the zone, so the HVAC path itself can be inspected and swabbed. Ducts that can't be inspected will eventually fail silently.
- UV-C at the coil is an acceptable adjunct for keeping coil surfaces clean. It is not a substitute for any of the above and does nothing for a colony in a wall.

How you prove spread into an HVAC system (the evidence protocol):

- Borescope the sauna wall cavities and the return duct interior (photograph everything).
- Surface/tape samples inside the return plenum and at the air handler, plus air samples in rooms served by the same system.
- Species-profile matching: if the same signature species (e.g., Chaetomium, specific Aspergillus sections) show up in the sauna cavity and the return path and supplied rooms - while absent or at baseline outdoors - that is a documented transport chain, not a coincidence.
- Pressure mapping: verify which way air actually moves between the wet zone, cavities, and return with the system running.

6. Operations layer - cleaning and drying SOP

Design buys you the ability to stay at zero. Operations keep you there.

After close, every day:

- Benches lifted/removed; under-bench volume washed down to the drain.
- Full wash of benches, walls to splash line, and floor with detergent (mold is removed by cleaning, not "killed" by spraying - dead mold and its mycotoxins are still a problem; physical removal is the point).
- Drying cycle: heater and exhaust run after washing until room surfaces are dry - target: room relative humidity back under 60% and falling before the building sleeps. A sauna that stays damp overnight grows; a sauna that dries daily doesn't.

Weekly:

- Heater enclosure opened and cleaned; drain and trap checked; floor membrane and coved base inspected for cracks; door seals and vents checked.

Monthly:

- Moisture-meter readings at fixed wall-base and cavity test points (logged, trended - a rising trend is an alarm, not a surprise).
- HVAC exhaust fan and wet-zone duct inspection; condensate pans checked.

Quarterly:

- Full bench-out deep clean; borescope spot-check of one cavity point and the return path; review of the RH/temperature data loggers (continuous logging in the sauna and locker room - cheap sensors, permanent record).

Annually:

- Independent third-party inspection with surface/air sampling compared against outdoor baseline and the unit's own commissioning baseline. Results posted for members (see Sec.8).

Immediate-action triggers (close the unit until cleared): visible growth anywhere; musty odor that survives a cleaning cycle; moisture readings above threshold at any test point; any water intrusion event (leak, flood) not dried within 24-48 hours - the standard window before wet porous material becomes a growth problem.

7. Remediation layer - fixing an existing bad unit

For a unit already built wrong (no drain, sealed bench, decade of growth), cleaning is not enough. The IICRC S520 / EPA commercial-building framework applies:

- Close and contain. Unit offline, work area sealed under negative air pressure with HEPA exhaust so remediation doesn't seed the rest of the building.
- Open it up. Benches out, paneling off the affected walls. What you cannot open, you cannot remediate - this is the step the nailed-shut design was (in effect) preventing.
- Discard porous contaminated material. Moldy drywall, insulation, and similar porous materials come out and are bagged and discarded - EPA guidance is explicit that mold infiltrates porous material and complete removal from it can be impossible. Semi-porous wood framing can be sanded/HEPA-vacuumed/damp-wiped and verified; if it's structurally or deeply colonized, it goes too.
- HVAC path assessed and cleaned per Sec.5's evidence protocol - samples before and after; if the

return path is contaminated, it is cleaned or the affected duct sections replaced, and any cavity-return arrangement is eliminated permanently.

- Rebuild to this blueprint - drain, access, vapor control, exhaust-only wet zone. Remediating back into the same design just restarts the clock.
- Clearance before reopening: visual (no growth, no dust/debris), moisture (all materials at dry standard), and lab verification - indoor species profile back to baseline, with the signature species gone from cavity and HVAC samples. Independent clearance, not the operator's say-so.

8. Governance layer - proof, not promises

Every control above fails silently without records. The operating standard:

- Cleaning and drying logs, signed daily, kept on site and auditable.
- Continuous temp/RH data retained - humidity is the leading indicator; the log shows whether the room ever dries.
- Annual independent test results posted publicly (in the locker room and online). Sunlight is the enforcement mechanism the current system lacks: today, no agency is required to inspect these rooms at all, which is exactly the mandate gap moldsgym.com's petition section exists to close.
- Complaint-triggered testing: under this standard, a member health complaint forces a documented inspection within a set window, with results to the complainant. (In the Daytona case, the operator refused to test at all. Under this standard, refusal isn't an option.)

9. What it costs (order-of-magnitude estimates, 2026)

- New build, done right: the mold-proofing elements (drain + membrane floor, vapor detailing, removable benches, dedicated exhaust, sensors) add an estimated 10-20% over a standard commercial sauna install - mostly labor and plumbing, not exotic materials.
- Retrofit of a failed unit: remediation + rebuild is the expensive path - containment, demolition, porous-material replacement, HVAC cleaning - commonly into the tens of thousands for a commercial unit, versus near-zero marginal cost for having built it right. Prevention isn't just safer; it's the cheap option by an order of magnitude.
- Operations: the daily SOP adds an estimated 30-45 minutes of labor to closing duties; sensors and loggers are a few hundred dollars; annual third-party testing typically runs in the hundreds-to-low-thousands depending on sampling scope.

10. The ten red lines - design/ops failures that make mold inevitable

No floor drain. 2. Any bench or panel that can't be opened. 3. Paper-faced drywall or other cellulose material in the wet zone. 4. A vapor barrier with unsealed seams - or none. 5. Return air drawn from the wet zone, or any cavity return. 6. A room that stays damp overnight (no drying cycle). 7. Flat floor / any ponding. 8. "Spray and pray" disinfectant instead of physical cleaning. 9. No moisture monitoring - problems found by smell are years old. 10. Refusing to test when a member reports getting sick.

A unit that avoids all ten can hold operational zero indefinitely. A unit that commits the first three - as the Daytona sauna did - is not an accident waiting to happen. It already happened; it's just growing where nobody is allowed to look.

Standards and sources informing this blueprint

- EPA, Mold Remediation in Schools and Commercial Buildings guide and Mold Course (cleanup methods, porous-material discard, HEPA, containment): epa.gov/mold
- IICRC S520, Standard for Professional Mold Remediation (containment, negative pressure, clearance practice)
- ASHRAE publications on limiting indoor mold and dampness (ventilation-air drying, condensate drainage, surface-RH limits; ASHRAE Standard 62.1 ventilation practice)
- CDC/NIOSH building air-quality action-plan guidance (control nutrients + moisture; RH 30-60%)
- Commercial sauna manufacturer specifications (sectional removable floors for cleaning; floor-supported benches for health-club use; room-within-room air gap and vapor-barrier practice)
- Case basis: the documented August 2024 Gold's Gym Daytona Beach sauna - Mold Armor findings of Chaetomium spp., Aspergillus spp., Nigrospora spp.; no floor drain; bench fixed to the wall with no access panel (see moldsgym.com/story)

This blueprint is an information and advocacy document, not an engineering stamp. Any specific building should be designed/remediated by licensed professionals in that jurisdiction - which is rather the point: gyms should be required to do this, and today, in almost every state, nobody makes them.