PERRIN CONFERENCES

ARTIFICIAL STONE SILICOSIS LITIGATION CONFERENCE

JW Marriott Los Angeles | April 28, 2026

OSHA COMPLIANCE

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OSHA CONTROLS & ARTIFICIAL STONE SILICOSIS

Why Mandated Controls Cannot Reliably Keep Workers Safe

A process-by-process analysis of engineering controls, administrative controls, and PPE under real-world fabrication conditions

Aki Vourakis

Stone Silica Exposure and Industry Practice Specialist

25 Years Operational Experience • Aegean Stoneworks (1999–2024) • 200+ Employees • 50,000+ Projects

Expert Qualifications & Scope

25+ Years Owning & Operating a Fabrication Shop

200+ Employees at Aegean Stoneworks

50K+ Projects Fabricated & Installed

Topics

- Hazard identification in artificial stone fabrication
- Exposure from cutting, laminating, grinding, polishing and installation
- Feasibility of engineering controls and dust suppression
- Industry knowledge, customs, and conduct
- Foreseeable risks to fabrication workers

25 years of hands-on experience in templating, engineering, hand fabrication, CNC operations, and installation

Industry Recognition & Awards — Aegean Stoneworks

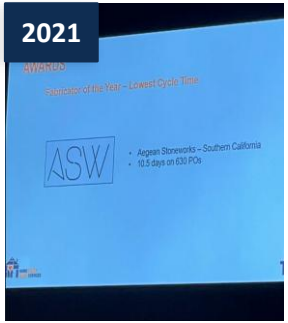
2020

Cosentino C-100

Largest Commercial Project of the Year

Cosentino's annual national conference — 3,000-slab senior living community project

2021



The Home Depot

Nation's Fastest Cycle Time

Fabricator of the Year — Lowest Cycle Time

2022

Cosentino C-100

Home Center Excellence Award

Big-box retail excellence award presented at Cosentino's annual national conference

2023

Costco Wholesale

Fabricator of the Year

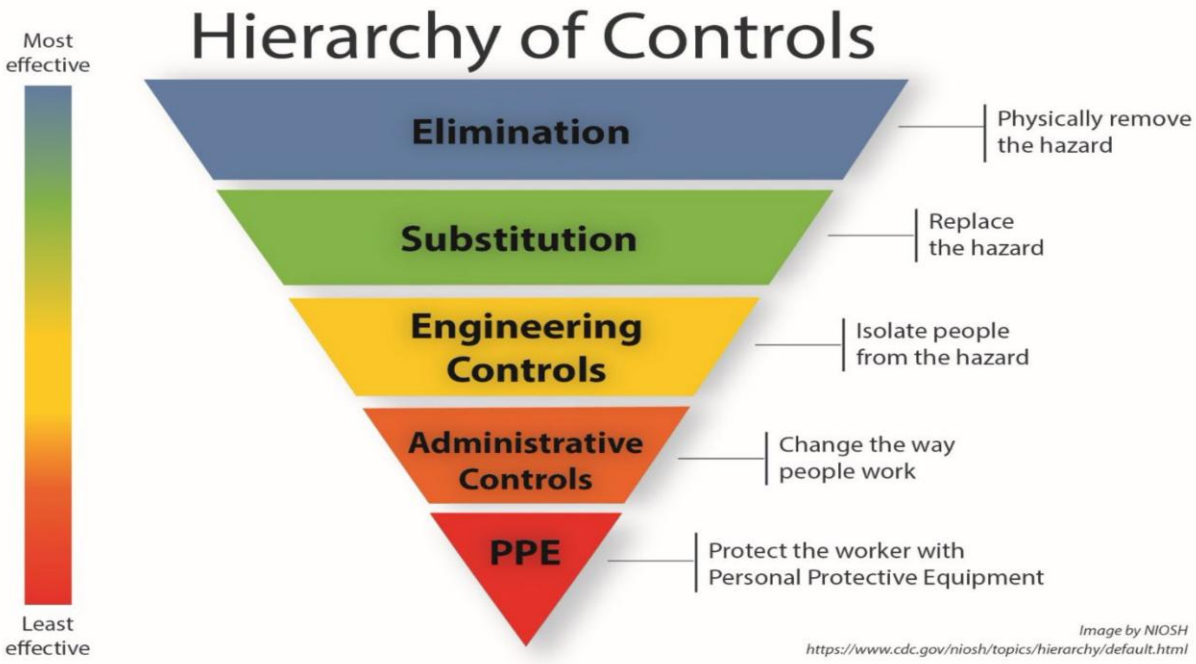
Named Costco's top fabricator and served as keynote speaker at their national fabricators' symposium

SECTION ONE

The Regulatory Framework

What OSHA requires — and what it cannot guarantee

Hierarchy of Controls — NIOSH



SOURCE: NIOSH / CDC | https://www.cdc.gov/niosh/topics/hierarchy/default.html

OSHA SILICA STANDARD & THE PEL

29 CFR 1910.1053 (General Industry) | 29 CFR 1926.1153 (Construction)

PERMISSIBLE EXPOSURE LIMIT

50 µg/m³

8-hour time-weighted average (TWA)

ACTION LEVEL

25 µg/m³

Triggers medical surveillance & enhanced controls

OSHA-MANDATED CONTROL HIERARCHY

1 — Engineering Controls

Wet suppression, LEV/ventilation, enclosed systems

2 — Administrative Controls

Worker rotation, scheduling, exposure time reduction

3 — PPE (Last Resort)

Respirators — OSHA's least preferred and least reliable control

The regulatory gap: OSHA specifies the outcome (stay below 50 µg/m³) but not the method. This gap is where fabricators are trapped.

50 µg/m³ — HOW SMALL IS THE PEL?

Routine exceedances of 20× to 100× the PEL are documented across the industry

50

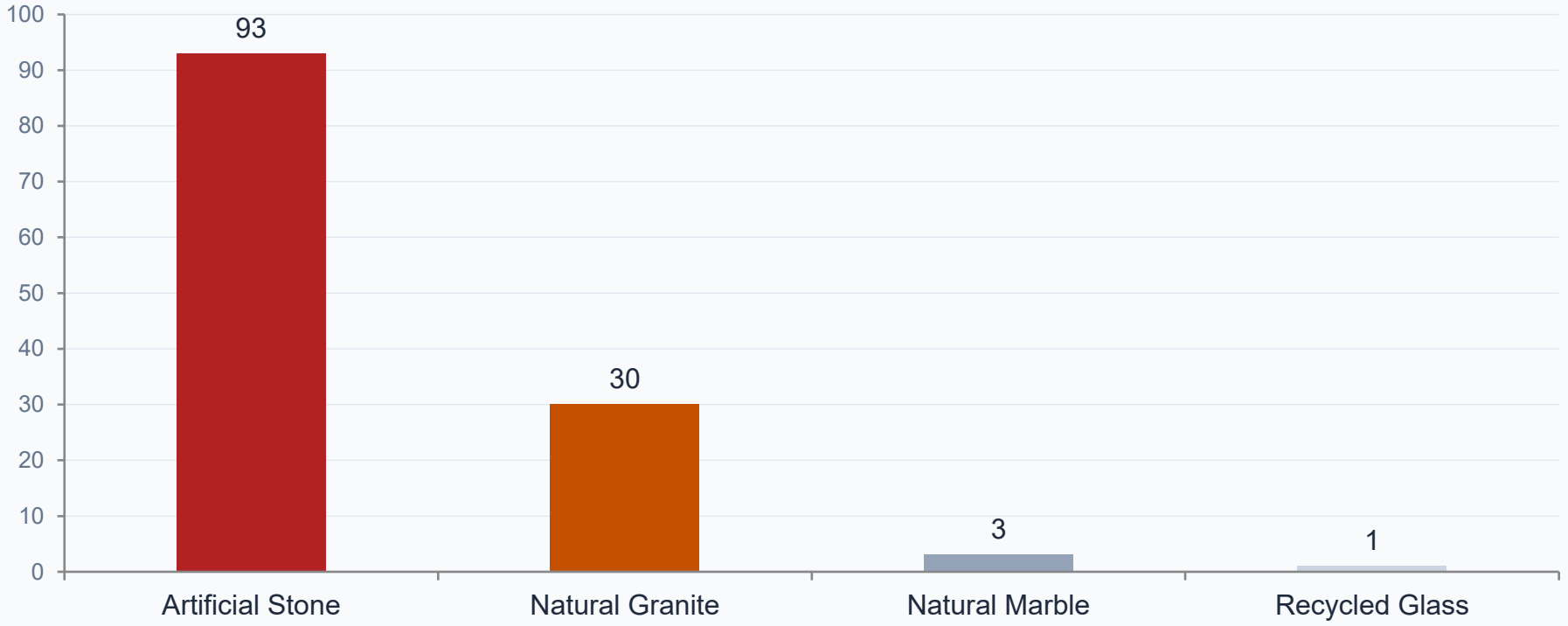
µg/m³ — OSHA PEL (8-hr TWA)

That is 5 hundred-thousandths of a gram — per cubic meter of air — over an 8-hour shift

50 µg is approximately one five-hundredth the weight of a single grain of table salt — an amount invisible to the naked eye.

THE HAZARD: CRYSTALLINE SILICA CONTENT BY MATERIAL

Artificial stone contains silica levels that make exposure control fundamentally different from other stone materials.



Artificial stone: 90–95% crystalline silica — engineered, pulverized, and resin-bound — producing finer dust than any other common fabrication material.

SECTION TWO

Tooling & Equipment

The hand tools and machinery behind every exposure — small shop and large

MANUAL BRIDGE SAW — 10 GPM | SMALL SHOP STANDARD

⚠ **Operator hands-on at all times**

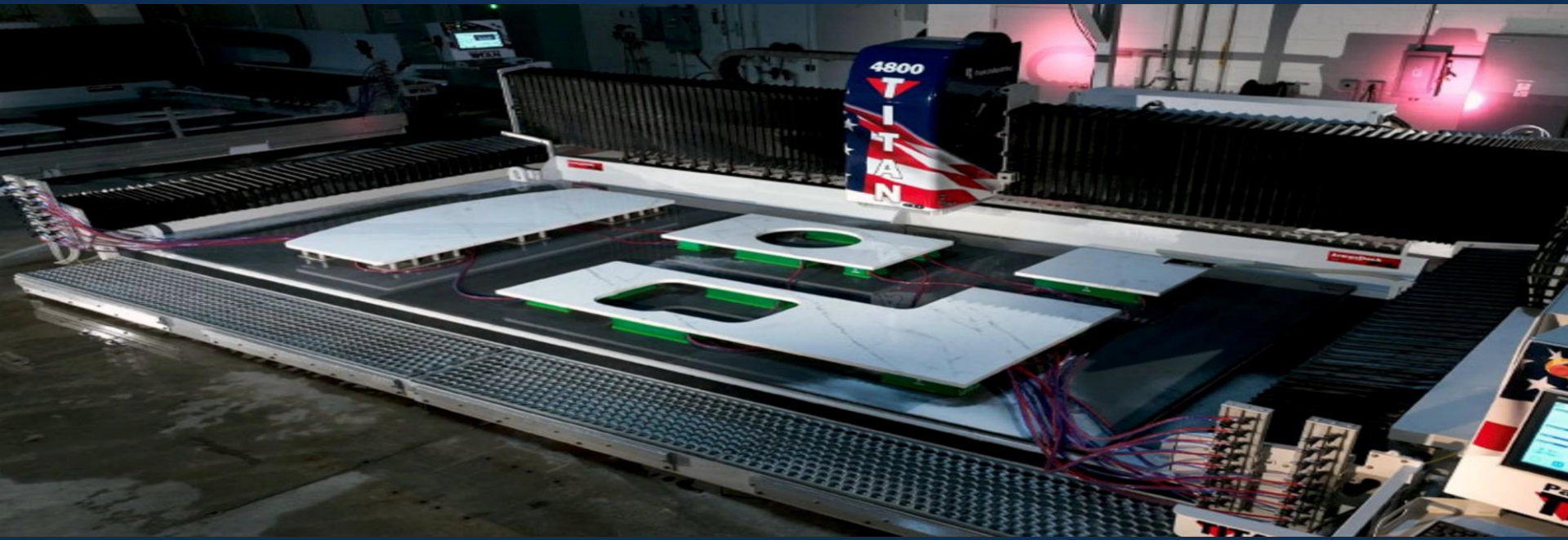
⚠ **Up close to blade during every cut**

⚠ **Exposed to airborne mist generated**

⚠ **Mostly used by small shops**

A manual bridge saw delivers approximately 10 GPM of water suppression during cutting. Unlike automated CNC equipment, the operator is up close and hands-on at all times — positioning the slab, guiding the cut, and adjusting the blade throughout every operation. The worker is continuously exposed to the airborne mist generated by the high-speed blade in direct contact with the artificial stone. This configuration is the standard cutting method for the majority of small fabrication shops.

CNC ROUTER — 25 GPM | SOPHISTICATED SHOP STANDARD



⚠ ~$400,000 to acquire

⚠ Years to operate efficiently

⚠ Sophisticated shops only

⚠ 25 GPM — produces airborne mist

⚠ Operator monitors throughout

⚠ Hand finishing still required

A CNC router is the industry's most advanced cutting machine — and it costs approximately $400,000. While anyone can purchase one, it takes years of training to operate efficiently, which is why these machines are found almost exclusively in the most sophisticated shops. Despite delivering 25 gallons per minute of water suppression at the cutting head, the high-speed rotation produces airborne mist that escapes the machine envelope. The operator must monitor the process throughout each cycle — and every part still requires manual hand finishing before installation.

The Hand Tools Used in Every Shop — Small or Large

Regardless of shop sophistication, the same handheld tools perform the same high-exposure tasks

ANGLE GRINDER

Hand-held rotary power tool — the primary driver of all hand fabrication work. Used for cutting, grinding, edge profiling, and seam work.

DIAMOND CUTTING BLADE

Mounted on the angle grinder. Used for cutting and shaping artificial stone. Generates the highest dust concentrations of any hand operation.

GRINDING / SHAPING WHEEL

Mounted on the angle grinder. Used for edge grinding, miter work, and profile shaping. Generates fine-particle RCS at high rotational speeds.

POLISHING PADS

Mounted on the angle grinder. Multi-grit progression for finishing edges and surfaces. Produces respirable mist when used with water suppression.

The tools do not change with shop size. Neither does the exposure they create.

SECTION THREE

Engineering Controls: Theory vs. Reality

What the textbook says — and what happens on the fabrication floor

Theory: What Engineering Controls Are Supposed to Achieve

The regulatory and industrial hygiene premise — before reality intervenes

01 WET SUPPRESSION

THEORY: Water applied at the cutting surface captures dust particles before they become airborne. Sufficient flow rate (typically 1–3 GPM for hand tools, 25 GPM for CNC) suppresses dust at the point of generation.

ASSUMES: *Assumes consistent water application at the precise point of generation, on every cut, across every tool position.*

02 LOCAL EXHAUST VENTILATION

THEORY: A capture hood positioned at the dust generation source draws airborne particles into a filtration system before they migrate into the breathing zone.

ASSUMES: *Assumes the hood can be positioned within capture velocity range of a constantly moving tool on a large workpiece.*

03 DUST BOOTH VENTILATION

THEORY: Dust booth ventilation reduces the overall concentration of airborne RCS in the shop environment by replacing contaminated air with fresh air.

ASSUMES: *Assumes contaminated air is diluted before workers inhale it.*

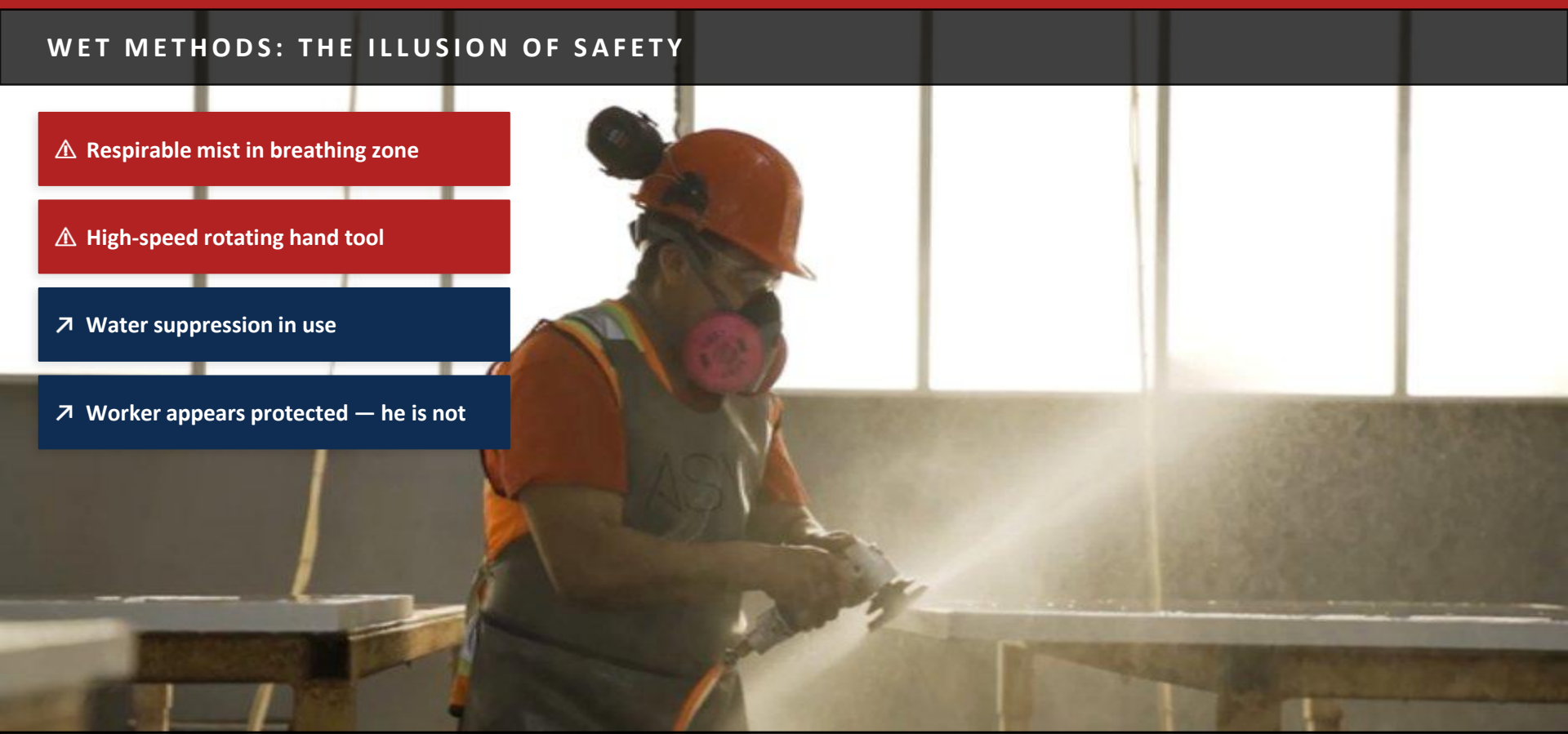
04 ENCLOSED VENTILATION SYSTEMS

THEORY: A fully enclosed booth with dedicated exhaust ventilation contains airborne RCS within the booth envelope and draws it away from the worker through overhead or downdraft extraction.

ASSUMES: *Assumes the booth captures dust faster than the worker generates it — yet documented photographs show workers engulfed in visible dust clouds inside running booths, proving containment cannot keep pace with active stone fabrication.*

Each control rests on a set of assumptions about worker behavior, tool positioning, and process conditions.

WET METHODS: THE ILLUSION OF SAFETY



⚠ Respirable mist in breathing zone

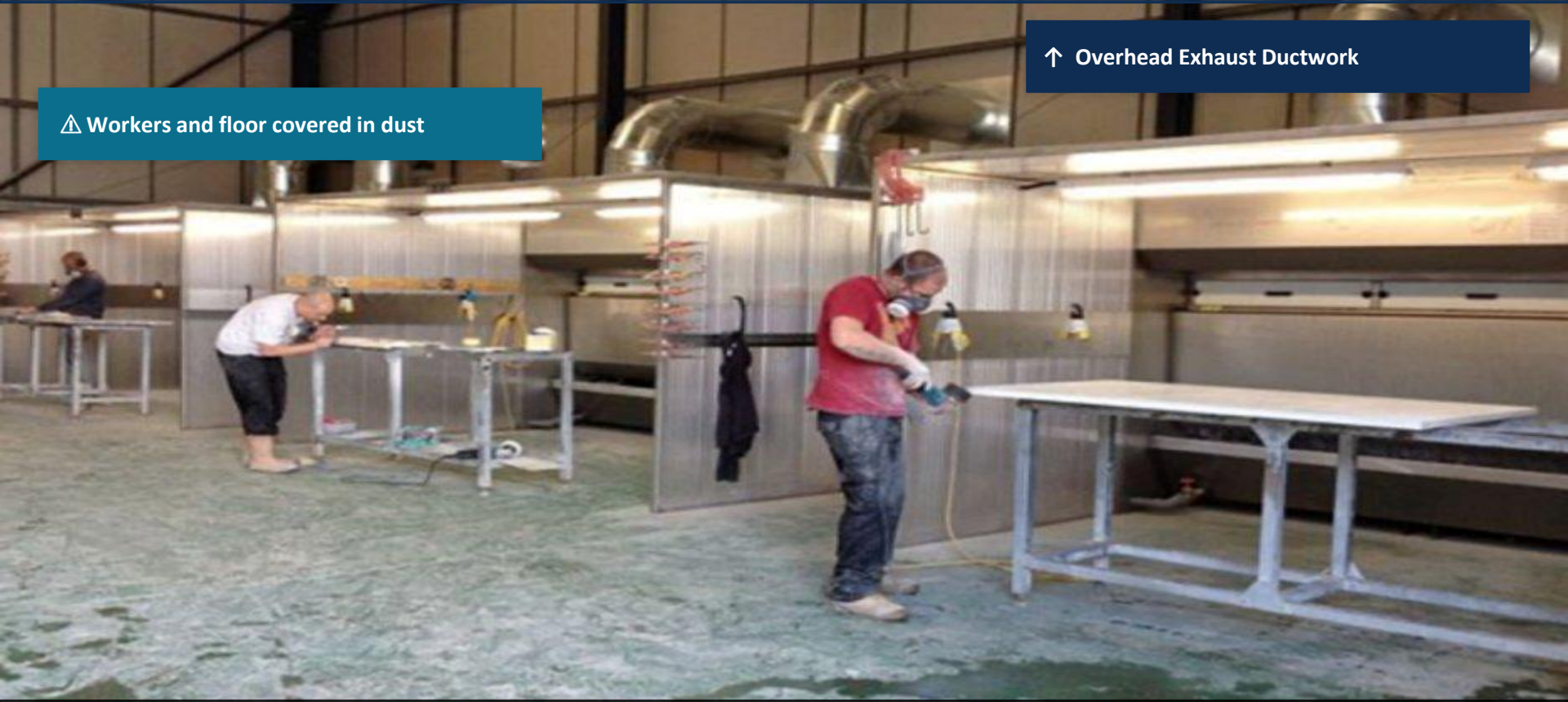
⚠ High-speed rotating hand tool

↗ Water suppression in use

↗ Worker appears protected — he is not

Water applied to cutting, grinding, and polishing equipment suppresses visible dust — but does not eliminate airborne exposure. High-speed rotating tools combined with water produce fine respirable mist that remains suspended in the air and is inhaled by the operator and nearby workers. Because this mist is often invisible or perceived as harmless, it creates a false sense of safety for both workers and shop owners.

SEMI-ENCLOSED DUST BOOTHS — REAL-WORLD CONDITIONS

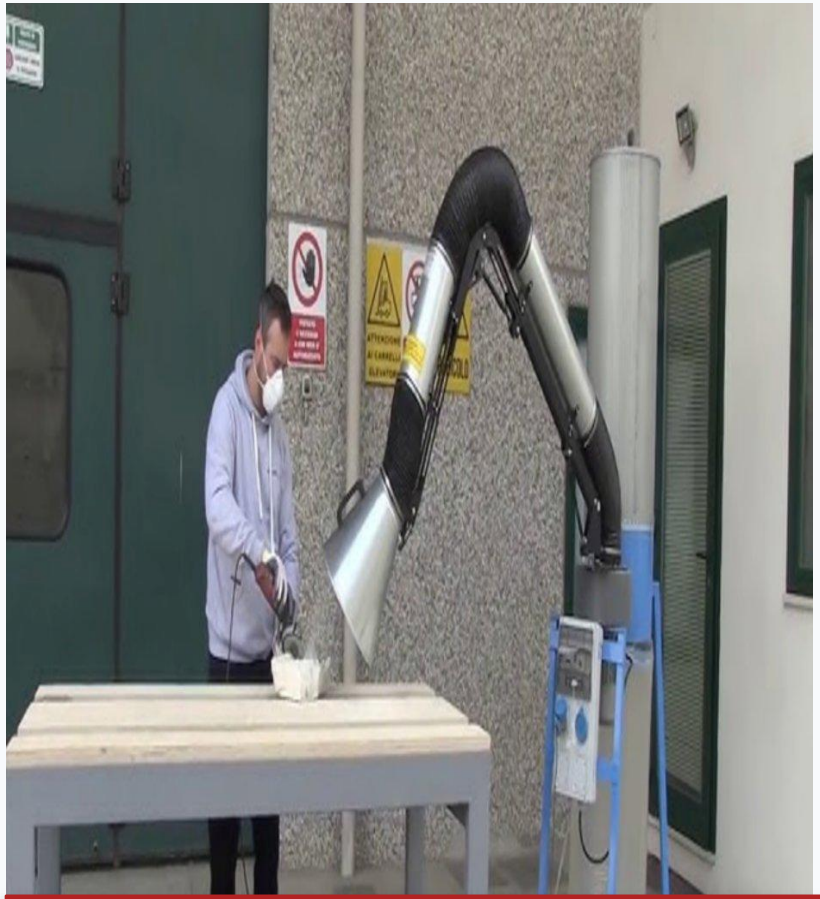


Workers performing hand grinding at dust booths with overhead ventilation ductwork. Despite ventilation infrastructure, workers remain within the dust generation zone during active fabrication.

ENCLOSED VENTILATION BOOTH — AIRBORNE RCS VISIBLE AT THE POINT OF GENERATION

This photograph documents the fundamental failure of enclosed ventilation: the system is operating, the booth is sealed, and the worker is still engulfed in visible airborne RCS at the point of generation.

LOCAL EXHAUST VENTILATION: WHAT THE THEORY ASSUMES — AND WHAT FABRICATION REQUIRES



PRECISE HOOD PLACEMENT REQUIRED

LEV capture efficiency drops sharply beyond 12 inches. Fabricators work across parts measuring 5–10 feet.

CONSTANTLY CHANGING TOOL POSITIONS

Fabrication involves large workpieces where the cutting or grinding position moves continuously. The hood cannot follow the tool across every cut.

LARGE WORKPIECES — INCOMPLETE COVERAGE

Countertop parts span several feet. A single LEV hood captures dust from one zone while the remainder of the workpiece generates uncontrolled airborne RCS.

CONSISTENT CAPTURE IS NOT ACHIEVABLE

Sufficient airflow, correct maintenance, and correct positioning must all be maintained simultaneously — across every task, every worker, every shift.

LEV reduces — it does not reliably eliminate — RCS exposure during active stone fabrication.

FIELD INSTALLATION: DRY CUTTING USING A HEPA VACUUM

⚠ Dust coating entire slab surface

⚠ Dust visible on worker's hands

Field installation is where all engineering controls end. No wet suppression. No LEV. No dust booth. The worker enters a residential or commercial space with a dry angle grinder and, at best, a HEPA vacuum. Dust accumulates on every surface — and on the worker. This is not an exception. This is routine.

SECTION FOUR

Administrative Controls & PPE

Why the the hierarchy fails in fabrication environments

ADMINISTRATIVE CONTROLS: INFEASIBLE IN PRACTICE

Worker rotation · Exposure time reduction · Task scheduling · Production pauses

TRAINING PERIOD: 5–8 YEARS

Skilled fabricators require years to develop proficiency. Rotating untrained workers into high-exposure tasks is not operationally viable and creates both quality and safety problems.

CONTINUOUS PRODUCTION DEMAND

High-volume fabrication shops operate under tight delivery schedules. Production pauses and rotation protocols that reduce output are commercially unsustainable.

SKILLED LABOR SCARCITY

Qualified stone fabricators and installers are in short supply. Shops often cannot field a bench of interchangeable workers for rotation — one person owns each specialized task.

RETAILER CYCLE TIME PRESSURE

Big-box retailer programs, builders, and commercial projects impose strict turnaround requirements. Administrative controls that extend production time create contract compliance failures.

Administrative controls assume that production flexibility exists. In real-world fabrication environments — under commercial volume, skilled labor constraints, and retailer cycle time pressure — that flexibility does not exist.

PPE: OSHA'S LEAST PREFERRED CONTROL

Respirators are the last line of defense — and the most dependent on factors outside employer control.

OSHA Hierarchy of Controls: Elimination → Substitution → Engineering → Administrative → PPE (Least Effective)

REMOVAL DURING SHIFT

Workers remove respirators to drink, eat, talk, wipe sweat, adjust equipment, and communicate. Each removal creates an unprotected exposure window during ongoing dust generation.

FIT DEGRADATION

Proper seal requires individual fit testing. Facial hair, sweat, physical movement, and extended wear all compromise the seal — often without worker awareness.

FILTER LOADING & CLOGGING

High-dust environments clog filters rapidly. Breathing resistance increases, workers cut seals or remove masks. Replacement discipline is inconsistent across shifts.

CANNOT ENFORCE CONTINUOUSLY

No employer can maintain constant, shift-long respirator compliance across all workers on all tasks. Physical supervision of every worker is not feasible.

CUMULATIVE SHORT REMOVALS

Repeated 30-second removals across a full career accumulate significant cumulative dose. The dose-response relationship for silica means there is no safe threshold — every unprotected exposure contributes.

NOT A SUBSTITUTE FOR CONTROLS

OSHA is explicit: respirators are supplemental. Where engineering controls are not achieving the PEL, adding PPE does not make the operation compliant or safe.

PPE is not a control. It is a supplement of last resort — and its effectiveness is entirely contingent on perfect human performance during every minute of every shift across an entire career.

THE PAPR QUESTION: IF CONTROLS WORK, WHY ARE WORKERS WEARING THE HIGHEST LEVEL OF RESPIRATORY PROTECTION?

ONE OF THE WORLD'S MOST SOPHISTICATED FABRICATION FACILITIES

THE PAPR PARADOX

What are PAPRs?
Powered Air-Purifying Respirators — the highest level of respiratory protection available without supplied air. They are used in the most hazardous industrial environments in the world.

Why are workers wearing them here?
Because the engineering controls — wet suppression, LEV, ventilation — are not sufficient to achieve PEL compliance without supplemental respiratory protection even in the most sophisticated facility on earth.

What does this prove?
If engineering controls were reliably achieving the PEL, there would be no need for PAPR-level respiratory protection. The PAPR is the admission — in equipment form — that controls alone are not enough.

One of the most sophisticated shops requires the most protective respirator in the world.

SECTION FIVE

The Real-World Evidence

Air monitoring data, field documentation, and what it tells us

TWO SHOP TYPES — ONE IDENTICAL HAZARD

SMALL WET SHOP

Manual hand work, dust residue across the shop floor. Typical small wet shop operating under real-world production conditions.

ONE OF THE WORLD'S MOST SOPHISTICATED SHOPS

Fully automated production line. **Even here — the hazard is not eliminated.**

Shop sophistication determines the level of investment — not whether workers are protected from silica exposure.

FABRICATION PROCESS: EXPOSURE AT EVERY STEP

SMALL SHOP

Manual wet bridge saw · Hand grinding · Edge profiling · Field installation

Slab Cut (Bridge Saw)	Lamination (Hand Tools)	Edge Work (Hand Grinder)	Polishing/Finish (Hand — Wet)	Field Install (Dry/HEPA)
Wet — 10 GPM Mist generated	2cm slabs Dry	Wet — 3 GPM	Wet — 3 GPM	No wet suppress. HEPA vacuum only

RESULT: PEL EXCEEDANCE ACROSS ALL TASKS

LARGE SHOP

CNC automation — water recycling, ventilation, PPE programs, field installation

CNC Saw / Waterjet	Lamination (Hand Tools)	Inline Edger	CNC Router	Polishing/Finish (Hand — Wet)	Field Install (Dry/HEPA)
Wet — 25 GPM Mist generated	2cm slabs Dry	Wet — 10 GPM Mist generated	Wet — 25 GPM Mist generated	Wet — 3 GPM	No wet suppress. HEPA vacuum only

RESULT: PEL EXCEEDANCE ACROSS ALL TASKS

Both shop types — regardless of capital investment or equipment sophistication — document PEL exceedances at every stage of fabrication and installation.

Decades of Knowledge — Decades of Inaction

Timeline of Delayed Industry Response

= DECADES of unmitigated exposure during widespread market expansion

MANUFACTURER CONDUCT

- Marketed quartz as "natural" and safe
- Failed to provide prominent slab warnings
- Provided marketing materials in lieu of safety guidance
- Posted fabrication videos showing unsafe practices

NET EFFECT

Emphasized water use for tool cooling and warranty protection — not worker health.

Created a false sense of safety and prevented fabricators from understanding the magnitude of the hazard.

Aegean Stoneworks — Production floor: automated CNC bridge saws, routers, inline edger, and sawjet wet system.

THE CENTRAL QUESTION

Does Shop Sophistication Eliminate the Hazard?

COMMON DEFENSE NARRATIVE

A well-run CNC shop with water suppression, LEV, and PPE programs can consistently keep silica exposures below OSHA's PEL of 50 µg/m³.

WHAT THE EVIDENCE SHOWS

Air monitoring at ASW — one of the most advanced shops in the country — documented PEL exceedances during routine fabrication and installation despite best-available controls.

The answer is no. The hazard is inherent — not a function of shop quality.

Who Was Affected at Aegean Stoneworks

Despite state-of-the-art controls, workers at every level developed silicosis.

- **CNC Operators**
- **Fabricators**
- **Managers**
- **Laminators**
- **Installers**
- **Shop Supervisors**

These outcomes did not occur because of negligence.

They occurred because the hazard is inherent to artificial stone fabrication under real-world conditions.

ONE WORKER DIED FROM SILICOSIS IN 2025.

A CNC operator, affected worker of ASW, using a vacuum lifter system to load a slab of artificial stone equipped with PPE; engineering controls in use.

Ultimate Opinion

"It is not feasible, under real-world fabrication and installation conditions, to consistently fabricate or install artificial stone while reliably maintaining respirable crystalline silica exposures below OSHA's permissible exposure limit."

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