

THE MARLIN'S MOWING SAFETY GLOSSARY

Integrating Industrial Safety Standards into Backyard Care

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This glossary covers 148 safety terms across 11 categories: chemical safety, pool/water chemistry, PPE, regulatory standards, safety organizations, environmental science, certification pathways, general safety science, industrial hygiene (IH), and ergonomics — all aligned to the BCSP CSP Blueprint V.2024.04.24. CSP Blueprint domain tags appear below terms where applicable. This is a living document supporting the 50-article Turf Toxicology & Safety Series at marlinsmowing.com.

Category	Count	Scope
Industrial Hygiene	35	AREC framework, exposure assessment, sampling, noise, heat, ventilation, toxicology, biological hazards
Ergonomics	13	MSD risk factors, HAV/WBV, RULA/REBA, NIOSH Lifting Equation, CTDs
Chemical	5	Chemical handling, mixing, storage, flammability, concentrations
Pool/Water	21	Pool and water chemistry — chlorine, pH, oxidizers, stabilizers, LSI
PPE	4	PPE selection, respirator types, APF, fit testing, hearing protection
Organizations	18	Safety, regulatory, and scientific organizations (OSHA, EPA, CDC, NIOSH, NOAA, WHO...)
Regulatory	15	Federal standards — OSHA, EPA, FIFRA, RCRA, GHS, HazCom, CFR, WPS
Hazard	16	Hazard identification and toxicology — LD50, PEL, TLV, carcinogens, exposure limits
Environmental	5	Environmental protection — drift, runoff, VOCs, bioaccumulation
Certification	4	Professional certifications — CSP, GSP, AHMM, OHST
General	12	General safety science — risk, JHA/JSA, hierarchy of controls, root cause analysis

— A — (16 terms)

AA Rule (Always Add) (AA Rule)

A foundational chemical safety protocol: always add chemicals to water, never water to chemicals.

Adding water to a concentrated chemical can cause violent boil-over or splash-back. The AA rule is the first line of defense against chemical burns during mixing operations.

ACGIH (American Conference of Governmental Industrial Hygienists)

A professional organization that establishes Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) for chemical substances and physical agents in the workplace.

ACGIH TLV-TWA values often provide more current guidance than OSHA PELs, which were established in 1971. For pesticide and fertilizer handling, ACGIH values are the preferred reference when OSHA has not set a formal PEL.

CSP Domain III — Recognition, Evaluation & Control

Action Level (AL)

A concentration, typically 50% of the PEL, that triggers specific OSHA requirements such as exposure monitoring, medical surveillance, and hazard communication — even if the PEL itself is not exceeded.

Reaching the action level for substances like silica or lead expands compliance obligations significantly — medical surveillance, recordkeeping, and enhanced monitoring all become mandatory before the PEL is ever approached.

CSP Domain III — Evaluation

Active Compression

A hearing protection technology that electronically clamps down on damaging noise levels while allowing low-level sounds like voices or warning signals to pass through.

Active compression addresses a key limitation of passive hearing protection — loss of situational awareness. Workers can hear verbal communication and environmental warnings while still being protected from impulse and continuous noise.

Acute Toxicity

Adverse health effects resulting from a single exposure or short-term exposure to a hazardous substance — typically within 24 hours. Characterized by LD50, LC50, and IDLH values.

Signal words on pesticide labels (Danger, Warning, Caution) are primarily based on acute toxicity data. Acute toxicity is always the first dimension of any chemical risk assessment.

CSP Domain III — Toxicology

AHMM (Associate Hazardous Materials Manager)

A professional credential for individuals demonstrating expertise in hazardous materials and waste management, awarded by IHMM.

The AHMM credential reflects competency in chemical lifecycle management — from acquisition and storage through use and disposal — not just knowledge of individual chemical hazards.

AIHA (American Industrial Hygiene Association)

A professional society for industrial hygienists that develops workplace exposure guidelines, laboratory accreditation programs, and technical resources for occupational health.

AIHA's workplace exposure level (WEL) publications and accredited laboratory network are critical resources for conducting or commissioning legally defensible industrial hygiene sampling.

CSP Domain III

ALARA (As Low As Reasonably Achievable)

A radiation and chemical safety principle requiring exposure to hazardous agents be kept as low as reasonably achievable, considering economic and practical factors.

ALARA is not just a radiation principle — it applies to any toxic exposure scenario. Product substitution, engineering controls, and administrative scheduling decisions are all ALARA strategies.

CSP Domain III — Control

Algaecide

A pesticide product registered by the EPA to kill or prevent algae growth in swimming pools and spas; active ingredients include copper-based compounds, quaternary ammonium, and poly(oxyethylene).

Algaecides are EPA-registered pesticides subject to FIFRA — not general pool maintenance chemicals. Over-application of quaternary ammonium algaecides causes persistent foaming; copper-based products cause staining at excessive doses.

Alkalinity (Total) (TA)

A measure of water's ability to resist pH change (buffering capacity), expressed in ppm of calcium carbonate equivalent. Ideal range for pools: 80–120 ppm.

Total alkalinity is the chemical buffer that stabilizes pH. Correcting alkalinity before adjusting pH prevents the pH bounce that wastes reagents and destabilizes water chemistry.

ANSI (*American National Standards Institute*)

A private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, and systems in the United States.

ANSI standards are the basis for PPE performance ratings — eye protection (ANSI Z87.1), head protection (ANSI Z89.1), and foot protection (ANSI Z41) ratings all appear on product labels and must match the identified hazard.

APF (*Assigned Protection Factor*)

OSHA-assigned value representing the minimum level of respiratory protection a properly functioning respirator provides to a trained, properly fitted wearer.

APF is the multiplier used to calculate Maximum Use Concentration (MUC). A half-face APR has an APF of 10; a full-face APR has an APF of 50. Selecting the correct APF for the exposure concentration is a regulatory and safety requirement.

CSP Domain III — Respiratory Protection

AREC Framework (*Anticipation, Recognition, Evaluation, Control*)

The four-step framework defining the practice of industrial hygiene: Anticipate potential hazards before they occur, Recognize them in the field, Evaluate exposure magnitude, and implement Controls.

AREC is the operational sequence that distinguishes industrial hygiene from general safety — it begins before the hazard is present, not after workers have been exposed.

CSP Domain III — Core IH Framework

ASSP (*American Society of Safety Professionals*)

The largest professional safety organization, providing standards, education, and advocacy for occupational safety and health professionals.

ASSP publishes the Safety Professional's Handbook and administers the PSP credential. Their technical publications span all domains of the CSP Blueprint.

ASTM International (*ASTM*)

A global standards organization that develops and publishes voluntary consensus technical standards for materials, products, systems, and services.

ASTM standards govern the chemical resistance testing of gloves (ASTM F739), protective clothing (ASTM F1671), and container integrity — directly applicable to chemical storage and PPE selection.

Audiometric Testing

Periodic hearing tests required by OSHA's Hearing Conservation Standard (29 CFR 1910.95) for workers exposed at or above the action level (85 dBA TWA), used to detect Standard Threshold Shifts (STS).

Baseline audiograms must be established before noise exposure begins and annually thereafter. An upward shift relative to baseline is an STS — a regulatory trigger, not just a medical finding.

CSP Domain III — Hearing Conservation

— B — (7 terms)**BCSP** (*Board of Certified Safety Professionals*)

The premier credentialing organization for safety, health, and environmental professionals, administering certifications including the CSP, ASP, and OHST.

The BCSP CSP Blueprint defines the professional knowledge domains for the safety field — it is the most authoritative framework for structuring safety content at the practitioner level.

BEI (*Biological Exposure Index*)

ACGIH-established reference values for evaluating biological monitoring results — the concentration of a chemical in blood, urine, or exhaled air indicating acceptable exposure.

BEIs complement air sampling by measuring what actually reached the worker's body — accounting for dermal absorption and ingestion routes that airborne monitoring alone misses.

CSP Domain III — Evaluation

Bio-accumulation

The process by which certain chemicals build up in the tissues of living organisms over time, increasing in concentration as they move up the food chain.

Organochlorine pesticides (now largely banned) are the historic example of bioaccumulation risk. Modern pesticide registration includes bioaccumulation potential as an ecological risk criterion under EPA's FIFRA review.

Bioaerosol

Airborne biological particles including bacteria, fungi, mold spores, endotoxins, and pollen — capable of causing infection, allergy, or toxic responses upon inhalation.

Soil disturbance, mulch handling, and thatch removal all generate bioaerosol exposure. Organic Dust Toxic Syndrome (ODTS) — a flu-like febrile illness — is a documented occupational risk in composting and landscape operations.

CSP Domain III — Biological Hazards

Breakpoint Chlorination

The process of adding enough chlorine to oxidize all combined chlorine (chloramines) and reach a residual of free available chlorine — typically requires 10x the combined chlorine level.

The strong chlorine odor commonly associated with pools is caused by chloramines, not free chlorine. Breakpoint chlorination eliminates chloramines by oxidizing them to nitrogen gas — the correct response to that odor, not a reduction in chlorine dose.

Broadcast Application

A method of spreading liquid or granular material uniformly over an entire area, as opposed to spot-treating specific locations.

Broadcast application maximizes efficiency but also maximizes the potential for non-target exposure. Sensitive zones — water features, vegetable gardens, pollinator habitat — must be identified and excluded before broadcast methods are used.

Buffer (Buffering Capacity)

The ability of pool water to resist changes in pH, primarily determined by total alkalinity.

Inadequate buffering capacity allows pH to oscillate dramatically in response to chemical additions, rainfall, and bather load — each oscillation requiring additional corrective chemistry.

— C — (17 terms)

Capture Velocity

The minimum air velocity required at the point of contaminant generation to capture and direct airborne hazards into a local exhaust ventilation (LEV) hood, preventing their escape into the work environment.

Capture velocity must exceed the velocity of the contaminant's release — turbulence from nearby air movement, thermal plumes, or worker movement can defeat a hood with insufficient capture velocity even when it appears to be functioning.

CSP Domain III — Engineering Controls

Carcinogen

Any substance, organism, or agent capable of causing cancer, classified by agencies such as IARC, NTP, and OSHA based on evidence of carcinogenicity.

Three parallel classification systems — IARC (Group 1/2A/2B), NTP (Known/Reasonably Anticipated), and OSHA's Z-list — should all be cross-referenced when evaluating a chemical's carcinogenic potential.

CSP Domain III — Toxicology

CDC (Centers for Disease Control and Prevention)

A federal public health agency within the U.S. Department of Health and Human Services responsible for protecting public health through disease surveillance, prevention research, and response.

CDC's Model Aquatic Health Code (MAHC) and Healthy Swimming guidelines are the most current federal guidance on recreational water quality — including chloramine limits, pH ranges, and Cryptosporidium response protocols.

CFR (*Code of Federal Regulations*)

The codification of the general and permanent rules published in the Federal Register by the departments and agencies of the federal government, including OSHA standards in 29 CFR.

29 CFR 1910 (General Industry), 29 CFR 1926 (Construction), and 40 CFR (Environmental Protection) are the three CFR titles most relevant to outdoor safety and chemical management practice.

Chain of Custody (*COC*)

A documented record tracking the collection, handling, transfer, and analysis of an exposure sample from field collection through laboratory reporting — required for legally defensible IH data.

A sample without a complete chain of custody cannot be used in OSHA enforcement proceedings or litigation. COC documentation must be unbroken from the moment the sample is collected to the final laboratory report.

CSP Domain III — Sampling & Analysis

Chemical Hygiene Plan (*CHP*)

A written program required by OSHA's Laboratory Standard (29 CFR 1910.1450) specifying procedures, equipment, and work practices to protect employees from hazardous chemicals.

The CHP framework — written SOPs, engineering controls, training, medical surveillance, and incident response — is a model for chemical management in any setting, even those not technically covered by the Lab Standard.

Chloramine (*Combined Chlorine*)

A compound formed when free chlorine reacts with nitrogen-containing compounds in pool water. Chloramines cause eye and respiratory irritation and the characteristic pool smell.

Chloramines are less effective sanitizers than free chlorine and are the primary cause of swimmer discomfort. They are measured as the difference between total chlorine and free chlorine — not by smell or eye irritation alone.

Chlorine (Free Available) (*FAC*)

The active, sanitizing form of chlorine in pool water. Recommended range: 1–3 ppm for residential pools. pH dramatically affects chlorine effectiveness.

At pH 8.0, approximately 22% of free chlorine exists as the active HOCl form; at pH 7.2, approximately 75% is active. pH management is therefore the primary determinant of chlorine's sanitizing efficiency — not just the FAC concentration.

Chlorine Lock

A condition where high cyanuric acid levels reduce the effectiveness of chlorine to the point that it can no longer adequately sanitize pool water.

CYA levels above 80–100 ppm bind a disproportionate fraction of free chlorine, leaving insufficient active HOCl for pathogen control. The only correction is partial drain and refill — no chemical addition reverses accumulated CYA.

Chronic Toxicity

Adverse health effects resulting from repeated or prolonged exposure to a hazardous substance over an extended period — often months or years. Includes carcinogenesis, fibrosis, and organ damage.

Chronic toxicity risk cannot be assessed from acute toxicity data alone. The NOAEL and LOAEL from chronic animal studies — not the LD50 — are the basis for long-term occupational exposure standards.

CSP Domain III — Toxicology

Competent Person

As defined by OSHA, one who is capable of identifying existing and predictable hazards in surroundings, and who has the authority to take prompt corrective measures to eliminate them.

The Competent Person designation carries legal weight — OSHA holds the Competent Person responsible for hazard identification and control on the worksite. Academic credentials alone do not confer the designation; demonstrated field authority is also required.

Concentration

The amount of a substance present in a given volume or mass of mixture, typically expressed in ppm, mg/m³, or percentage.

Pesticide label application rates are concentration-specific — mixing above the labeled rate does not improve efficacy and constitutes a FIFRA violation. Over-concentration increases worker exposure, environmental loading, and resistance selection pressure.

Confined Space

A space large enough for a worker to enter, not designed for continuous occupancy, and with limited means of entry or exit — may require a permit if it contains serious hazards.

Permit-required confined spaces in landscape settings include irrigation control vaults, utility manholes, and subsurface drainage structures. Atmospheric testing for oxygen deficiency, combustible gases, and toxic vapors is required before entry.

Contact Stress

Mechanical compression of tissue against a hard or sharp edge — such as a tool handle, workbench edge, or equipment grip — that can compress nerves and blood vessels and contribute to MSD development.

Tool handle geometry is a primary contact stress variable — diameter, cross-section shape, and surface texture all affect pressure distribution across the palm. Anti-vibration padding addresses both HAV and contact stress simultaneously.

CSP Domain IV — Ergonomics

CSP (Certified Safety Professional)

The premier certification in the safety profession, awarded by the BCSP to candidates who pass a comprehensive examination covering the domains of the CSP Blueprint.

The CSP examination covers eight domains — management systems, training, risk management, IH, environmental, fire/life safety, emergency response, and ergonomics. Each domain represents a distinct body of professional knowledge.

Cumulative Trauma Disorder (CTD)

A broad category of musculoskeletal injuries caused by repeated stress over time — synonymous with repetitive strain injury (RSI) and musculoskeletal disorder (MSD) in many contexts.

CTDs develop below the threshold of immediate pain — the worker adapts until the damage is clinically significant. Early symptom reporting programs and periodic ergonomic assessments are the primary surveillance tools.

CSP Domain IV — Ergonomics

Cyanuric Acid (CYA / Stabilizer)

A chemical added to pool water to protect free chlorine from UV degradation. Ideal range: 30–50 ppm for outdoor pools. Levels above 100 ppm significantly reduce chlorine effectiveness.

Dichlor and trichlor products both contain CYA as part of their formulation — each tablet or granule dose raises the stabilizer level. Exclusive use of stabilized chlorine products causes CYA to accumulate without a corresponding benefit.

— D — (9 terms)

dBA (Decibels A-weighted)

A unit of sound measurement weighted to reflect the human ear's frequency sensitivity, used in occupational noise exposure assessments. OSHA PEL: 90 dBA 8-hr TWA; Action Level: 85 dBA TWA.

Commercial mowing equipment typically produces 85–100 dBA. At 100 dBA, OSHA's 5 dB exchange rate allows only 2 hours of unprotected exposure; NIOSH's more protective 3 dB exchange rate allows only 15 minutes.

CSP Domain III — Physical Agents

Dermal Absorption

The penetration of a chemical through the skin into the bloodstream, bypassing inhalation routes. ACGIH designates substances with significant dermal absorption potential with a 'skin' notation on TLV listings.

The skin notation on a TLV means that airborne exposure control alone is insufficient — dermal protection becomes a primary control, not a secondary one. Nitrile gloves provide substantially better pesticide resistance than latex.

CSP Domain III — Routes of Entry

Dichlor (*Sodium Dichloroisocyanurate*)

A chlorine sanitizer containing approximately 56–62% available chlorine and cyanuric acid (stabilizer). Fast-dissolving and relatively pH-neutral.

Dichlor's near-neutral pH makes it compatible with most pool systems, but its CYA contribution accumulates with each application. Rotating to unstabilized chlorine (sodium or calcium hypochlorite) is necessary to prevent CYA overshoot.

Dilution Ventilation (*General Exhaust Ventilation*)

A ventilation strategy that dilutes contaminated air with clean air to reduce concentration of airborne hazards — suitable only for low-toxicity contaminants at low release rates. Less effective than LEV.

Dilution ventilation disperses contaminants rather than capturing them — workers between the source and exhaust point remain in contaminated air. It is appropriate only when contaminant toxicity is low and release rate is uniform and predictable.

CSP Domain III — Engineering Controls

Disinfection Byproducts (*DBPs*)

Chemical compounds formed when disinfectants like chlorine react with organic matter in water. Include trihalomethanes (THMs) and chloramines — some are potential carcinogens.

DBP formation is driven by organic nitrogen load from bathers (sweat, urine, personal care products). Pre-swim showering is the highest-impact behavioral control — more effective than chemical adjustments alone at reducing DBP precursors.

Dose-Response Relationship

The relationship between the magnitude of exposure to a chemical or physical agent and the severity of the effect it produces; foundational to toxicology and risk assessment.

The dose-response relationship is why label application rates exist — they reflect the dose below which the product is effective without producing unacceptable biological effects in non-target organisms and applicators.

CSP Domain III — Toxicology

Dosimeter (Noise)

A personal monitoring device worn by a worker to measure cumulative noise dose over a shift, expressed as a percentage of the allowable daily noise exposure under OSHA's 5 dB exchange rate.

Personal noise dosimetry captures the full task variability of a shift — walk-behind mowing, riding equipment, trimming, blowing — weighted by time. Area measurements and equipment manufacturer specs are poor substitutes for personal dosimetry.

CSP Domain III — Evaluation

DOT (*U.S. Department of Transportation*)

Federal agency responsible for regulating the transportation of hazardous materials, including proper labeling, placarding, packaging, and shipping documentation.

DOT's 49 CFR governs HazMat transport — including pesticide concentrates, oxidizers, and flammable liquids. Container type, quantity thresholds, and required documentation are the three primary compliance variables for small commercial operators.

Drift

The movement of pesticide droplets or particles through the air from the target site to non-target areas, influenced by wind speed, particle size, and application method.

Droplet size is the primary physical drift variable — nozzle selection determines droplet spectrum. Coarser droplets (ASABE classification: Coarse or Very Coarse) reduce drift potential significantly compared to fine or very fine droplet sprays.

— E — (7 terms)**Emergency Action Plan** (*EAP*)

A written plan, required by OSHA (29 CFR 1910.38), describing procedures to follow in the event of a fire or other emergency at a workplace.

An EAP is not a wall poster — it requires site-specific emergency contact information, evacuation routes, spill response procedures, and chemical exposure first aid that is current and accessible at the point of use.

Endotoxin

A lipopolysaccharide (LPS) component of gram-negative bacterial cell walls that becomes airborne in organic dust — causes fever, inflammation, and respiratory effects upon inhalation.

Organic Dust Toxic Syndrome (ODTS) — the primary clinical presentation of acute endotoxin exposure — is often misattributed to viral illness. It is self-limiting but recurs with re-exposure if respiratory controls are not implemented.

CSP Domain III — Biological Hazards

Engineering Controls

Physical modifications to the work environment or equipment that eliminate or reduce hazard exposure — ranked second in the hierarchy of controls after elimination and substitution.

Engineering controls are passive — they protect workers without requiring behavioral compliance at the point of exposure. This reliability advantage over administrative controls and PPE is why they rank higher in the hierarchy.

EPA (U.S. Environmental Protection Agency)

Federal regulatory agency responsible for protecting human health and the environment, including registration of pesticides under FIFRA and hazardous waste regulation under RCRA.

EPA's pesticide registration database (<https://www.epa.gov/pesticide-registration>) provides current label and SDS documents for all registered products — the authoritative source when manufacturer documents are unavailable or outdated.

Ergonomic Hazard

A workplace condition that poses risk of musculoskeletal injury, including awkward posture, repetitive motion, forceful exertion, vibration, and contact stress.

Ergonomic hazards are cumulative and dose-dependent — the same risk factors that cause no injury at low exposure create significant injury risk at sustained high exposure. Duration, frequency, and magnitude all determine risk level.

CSP Domain IV — Ergonomics

Exchange Rate (Trading Ratio)

The increase in sound level (in dB) that results in halving of allowable exposure time. OSHA uses a 5 dB exchange rate; NIOSH and ACGIH recommend the more protective 3 dB exchange rate.

The difference between OSHA's 5 dB and NIOSH's 3 dB exchange rate is substantial at high noise levels. At 100 dBA, OSHA allows 2 hours while NIOSH allows 15 minutes — a factor of 8 difference in allowable exposure duration.

CSP Domain III — Noise

Exposure Limit

A regulatory or advisory concentration of a chemical in air or on skin, below which nearly all workers may be repeatedly exposed without adverse health effects. See PEL, TLV, REL.

Three parallel exposure limit systems exist — OSHA PELs (legally enforceable, often outdated), ACGIH TLVs (updated annually, advisory), and NIOSH RELs (research-based, advisory). The most protective applicable value should guide control selection.

— F — (5 terms)

FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act)

The primary U.S. federal statute governing pesticide registration, distribution, sale, and use, administered by the EPA.

Under FIFRA, the pesticide label is a legally binding document — use inconsistent with label directions is a federal violation. This applies to application rate, timing, target site, required PPE, and restricted-entry intervals.

Fit Test (Respirator)

A protocol required by OSHA (29 CFR 1910.134) to verify that a tight-fitting respirator achieves an adequate face seal for a specific wearer. Qualitative fit tests use a challenge agent; quantitative tests measure actual leakage.

Fit testing is facepiece-model specific — a passing fit test on one respirator model does not transfer to another. Facial hair in the seal zone invalidates any fit test result and prohibits use of tight-fitting facepieces.

CSP Domain III — Respiratory Protection

Flammable Liquid

A liquid with a flash point below 100°F (37.8°C), classified by OSHA and NFPA; requires special storage, handling, and labeling.

OSHA's flammable liquid standard (29 CFR 1910.106) governs storage container types, quantity limits, ventilation, and ignition source control. Portable safety cans with flash arrestors are required for quantities above one gallon.

FMEA (Failure Mode and Effects Analysis)

A systematic technique for identifying all possible failures in a design, process, or service, evaluating their potential effects, and prioritizing corrective actions.

FMEA shifts analysis from reactive (what happened) to proactive (what could happen). Each potential failure mode is evaluated for probability, severity, and detectability — generating a Risk Priority Number (RPN) that guides prevention investment.

Forceful Exertion

One of the primary ergonomic risk factors for MSD development — the physical effort required to perform a task, such as gripping, pushing, pulling, or lifting beyond comfortable capacity.

Force requirements in outdoor power equipment are directly related to equipment condition — dull blades, low tire pressure, and misaligned decks all increase the operator force required. Equipment maintenance is an ergonomic control.

CSP Domain IV — Ergonomics

— G — (2 terms)

GHS (Globally Harmonized System of Classification and Labelling of Chemicals)

An international system for standardizing chemical classification and communication — adopted by OSHA as the basis for the Hazard Communication Standard (HazCom 2012).

GHS standardized nine hazard pictograms, two signal words (Danger and Warning), and a 16-section SDS format globally. A worker who can read a GHS label can assess the primary hazards of any chemical, anywhere in the world.

GSP (Graduate Safety Practitioner)

A designation from the BCSP recognizing safety professionals who hold a qualifying degree and are working toward full CSP certification.

The GSP designation bridges academic preparation and professional practice — it signals formal safety education while the holder accumulates the professional experience required for CSP eligibility.

— H — (9 terms)

Hand-Arm Vibration (HAV)

Mechanical vibration transmitted from vibrating tools and equipment to the hand and arm — a cause of hand-arm vibration syndrome (HAVS), Raynaud's phenomenon, and carpal tunnel syndrome.

HAV risk is quantified using A(8) — the daily vibration exposure value normalized to an 8-hour reference period per ISO 5349-1. Tool manufacturers are required to publish declared vibration emission values that enable A(8) calculations.

CSP Domain IV — Vibration / Ergonomics

Hand-Arm Vibration Syndrome (HAVS)

A progressive and irreversible occupational disease caused by prolonged HAV exposure, characterized by vascular, neurological, and musculoskeletal effects — including blanching of the fingers (vibration white finger).

HAVS staging uses the Stockholm Workshop Scale — vascular and sensorineural components are assessed separately. There is no effective treatment for established HAVS; vibration cessation slows progression but does not reverse existing damage.

CSP Domain IV — Ergonomics

Hardness (Calcium) (CH)

The concentration of dissolved calcium in pool water, expressed in ppm. Ideal range: 200–400 ppm. Low hardness causes corrosive water; high hardness causes scale.

Calcium hardness has no practical downward chemical correction — the only way to reduce it is dilution via partial drain and refill. Prevention through source water management and conservative dosing is the only reliable strategy.

Hazard

A condition, substance, or practice with the potential to cause harm, injury, illness, or property damage; distinguished from risk, which incorporates the probability of harm.

Hazard and risk are not synonyms — hazard is a property of the agent or condition; risk is a function of hazard magnitude, exposure probability, and population susceptibility. All risks involve hazards, but not all hazards create equivalent risks.

HazCom (Hazard Communication Standard)

OSHA standard (29 CFR 1910.1200) requiring employers to maintain a written HazCom program, provide SDS for all hazardous chemicals, and train workers on chemical hazards.

HazCom training must be chemical-specific — generic awareness training does not satisfy the standard. Workers must be able to read and interpret labels and SDS documents for the specific chemicals they work with.

Heat Illness

A spectrum of conditions caused by heat stress — from heat cramps and heat syncope through heat exhaustion to heat stroke, which is a life-threatening medical emergency.

Heat stroke is a medical emergency characterized by core body temperature above 104°F and central nervous system dysfunction. It requires immediate cooling and emergency medical response — not rest and fluids, which are appropriate for heat exhaustion.

CSP Domain III — Physical Agents

Heat Stress Index

A composite measure of the combined effects of temperature, humidity, radiant heat, and air movement on the physiological strain experienced by a worker. ACGIH's TLVs for heat stress use WBGT as the basis.

Metabolic work rate is a critical but often overlooked component of heat stress assessment. Heavy outdoor physical work generates 300–500 watts of metabolic heat — substantially elevating effective heat exposure above ambient conditions.

CSP Domain III — Physical Agents

Hierarchy of Controls

The NIOSH/OSHA framework for selecting hazard controls ranked by effectiveness: Elimination, Substitution, Engineering Controls, Administrative Controls, and PPE.

The hierarchy reflects a fundamental principle: controls that do not rely on worker behavior or PPE compliance are inherently more reliable. PPE fails when it is not worn correctly, not worn at all, or not selected for the actual hazard.

CSP Domain III — Control

Hypochlorous Acid (HOCl)

The active, most potent form of free chlorine in pool water. Its concentration is pH-dependent — lower pH produces more HOCl. HOCl is approximately 80x more effective than hypochlorite ion (OCl⁻) at killing pathogens.

The HOCl/OCl⁻ equilibrium is the mechanistic reason pH management is the highest-leverage pool chemistry variable. Maintaining pH 7.2–7.6 maximizes the fraction of free chlorine in the active HOCl form.

— I — (6 terms)

IARC (International Agency for Research on Cancer)

A WHO agency that evaluates and classifies the carcinogenicity of substances to humans using a four-group classification system (Group 1 through 2B and 3).

IARC Group 1 (carcinogenic to humans) and Group 2A (probably carcinogenic) classifications are based on the weight of epidemiological and mechanistic evidence — the most rigorous carcinogen assessment process available.

CSP Domain III — Toxicology

IDLH (*Immediately Dangerous to Life or Health*)

A NIOSH-defined concentration representing the maximum level from which a worker could escape within 30 minutes without escape-impairing symptoms or irreversible health effects.

IDLH values are used to establish the upper boundary for air-purifying respirator use — concentrations at or above the IDLH require supplied-air or self-contained breathing apparatus (SCBA), not APRs.

CSP Domain III — Evaluation

IHMM (*Institute of Hazardous Materials Management*)

A credentialing organization that administers the CHMM and AHMM designations for professionals in hazardous materials and environmental management.

IHMM certifications are recognized by federal agencies and the private sector for hazardous materials management roles — bridging regulatory compliance, environmental protection, and emergency response competencies.

Incident Rate

A standardized safety metric: (number of injuries × 200,000) ÷ total hours worked; used to compare safety performance across organizations.

The 200,000 factor normalizes to a 100-worker, 2,000-hour-per-year baseline — enabling meaningful comparison across organizations of different sizes. OSHA 300 log data is the required source for these calculations.

Industrial Hygiene (*IH*)

The science and art dedicated to the anticipation, recognition, evaluation, and control of environmental factors or stresses arising in or from the workplace that may cause sickness, impaired health, or significant discomfort among workers.

Industrial hygiene is defined by its sequence — anticipation before recognition, evaluation before control. This proactive orientation is what distinguishes IH practice from reactive safety management.

CSP Domain III — Core Concept

Integrated Sampling

An exposure assessment method that collects a sample over a defined period (typically a full work shift) by drawing air through a collection medium at a known flow rate — yielding a TWA concentration.

The sampling medium, flow rate, collection duration, and analytical method must all be matched to the target chemical. NIOSH Analytical Methods (NAMs) specify validated protocols for each substance — not all chemicals can be collected on the same medium.

CSP Domain III — Sampling Methods

— J — (2 terms)**Job Hazard Analysis** (*JHA*)

A systematic procedure that identifies hazards associated with each step of a job or task, and prescribes controls to reduce or eliminate those hazards.

A JHA is most valuable when written at the task-step level, not the job level. 'Apply pesticide' is a job — 'mix concentrate into tank' is a task step with distinct hazards from 'calibrate and operate sprayer' or 'clean and rinse equipment.'

JSA (*Job Safety Analysis*)

See Job Hazard Analysis (JHA). A structured process for breaking down job tasks, identifying hazards at each step, and defining corrective actions.

JSA's serve dual functions — hazard control documentation and worker training. A JSA developed collaboratively with the workers who perform the task captures field knowledge that supervisory analysis alone routinely misses.

— L — (6 terms)

Label (*Pesticide Label*)

Under FIFRA, the legal document attached to or printed on a pesticide container specifying required uses, application rates, safety precautions, and first aid instructions. The label is the law.

Pesticide labels are revised periodically — older containers may carry outdated label language. The current label for any registered product is available through EPA's pesticide registration database and supersedes text on older containers.

Langelier Saturation Index (*LSI*)

A calculated index predicting whether pool water will be scale-forming (positive LSI), corrosive (negative LSI), or balanced (LSI near 0). Based on pH, temperature, alkalinity, calcium hardness, and TDS.

The LSI integrates all five major water chemistry parameters into a single predictive value. Corrosive water (negative LSI) dissolves plaster, copper, and grout; scale-forming water (positive LSI) deposits calcium carbonate on surfaces and equipment.

LC50 (*Lethal Concentration 50*)

The airborne concentration of a substance required to kill 50% of a test population over a specified exposure period — used to characterize inhalation toxicity, complementing LD50 (oral/dermal route).

LC50 is expressed in ppm or mg/m³ for gases/vapors or mg/L for liquids. When evaluating a spray product's inhalation hazard, LC50 is the relevant acute toxicity metric — not the oral LD50 listed on the signal word determination.

CSP Domain III — Toxicology

LD50 (*Lethal Dose 50*)

The dose of a substance required to kill 50% of a test population, expressed in mg/kg body weight; used to compare acute oral or dermal toxicity of chemicals.

LD50 values are species-specific and route-specific — rat oral LD50 does not predict rabbit dermal LD50. The value used to establish pesticide signal words under FIFRA is the most sensitive (lowest) LD50 across the tested routes and species.

CSP Domain III — Toxicology

LEV (*Local Exhaust Ventilation*)

An engineering control that captures airborne contaminants at or near their source before they disperse into the work environment, using hoods, ducts, fans, and air cleaning equipment.

LEV performance depends on hood design, capture velocity, transport velocity in the ductwork, and the air cleaning device — all four elements must be correctly specified. A well-designed hood attached to an undersized fan provides no meaningful protection.

CSP Domain III — Engineering Controls

LOAEL (*Lowest Observed Adverse Effect Level*)

The lowest tested dose or concentration of a substance at which a statistically or biologically significant adverse effect is observed in an exposed population.

LOAEL is used when a NOAEL has not been established in the available toxicology literature. Regulatory agencies apply additional safety factors when deriving exposure limits from a LOAEL rather than a NOAEL.

CSP Domain III — Toxicology

— M — (4 terms)

Maximum Use Concentration (*MUC*)

The maximum atmospheric concentration of a hazardous substance from which a worker can be protected by a specific respirator. $MUC = TLV \text{ (or PEL)} \times APF$.

If airborne concentration exceeds the MUC for the selected respirator, a higher-APF respirator is required. Half-face APR: $MUC = PEL \times 10$. Full-face APR: $MUC = PEL \times 50$. Powered air-purifying: $MUC = PEL \times 25$.

CSP Domain III — Respiratory Protection

MSD (*Musculoskeletal Disorder*)

An injury or disorder of the muscles, nerves, tendons, joints, cartilage, or spinal discs — the primary category of work-related illness linked to ergonomic hazard exposure. Includes CTS, tendinitis, low back injury, and HAVS.

MSDs are the most prevalent category of occupational illness in the U.S., accounting for approximately one-third of all recordable cases. The Bureau of Labor Statistics SOII (Survey of Occupational Injuries and Illnesses) tracks MSD prevalence by industry and occupation.

CSP Domain IV — Ergonomics

MSDS (*Material Safety Data Sheet*)

The predecessor document to the Safety Data Sheet (SDS); replaced by the GHS-compliant 16-section SDS under OSHA's HazCom 2012 update.

MSDS formats varied by manufacturer — some were 8 sections, others 16. The GHS-format SDS standardized the 16-section structure globally, making Section 2 (hazard identification) and Section 8 (exposure controls) consistent across all compliant documents.

Muriatic Acid (*Hydrochloric Acid (HCl)*)

A diluted form of hydrochloric acid used in pool maintenance to lower pH and total alkalinity, and for equipment cleaning and acid washing. Highly corrosive; requires full PPE.

Muriatic acid should always be added to a large volume of circulating water — never added near the skimmer (which would concentrate it against the pump) or in proximity to chlorine products (which produces toxic chlorine gas).

— N — (7 terms)

NFPA (*National Fire Protection Association*)

An international nonprofit organization that develops fire, electrical, and life safety codes and standards, including NFPA 704 (hazard diamond) and NFPA 30 (flammable liquids).

NFPA 704 (the hazard diamond) uses a 0–4 scale for health (blue), flammability (red), reactivity (yellow), and special hazards (white). Understanding the rating system is a baseline chemical safety competency for anyone working around storage facilities.

NIOSH (*National Institute for Occupational Safety and Health*)

A federal research agency within the CDC that conducts research and makes recommendations to prevent work-related illness and injury. NIOSH establishes RELs, approves respirators, and publishes the NIOSH Lifting Equation.

NIOSH's pocket guide to chemical hazards (NPG) is the most widely used field reference for occupational exposure limits and basic chemical hazard information — available free at <https://www.cdc.gov/niosh/npg/>.

CSP Domain III — Core Reference

NIOSH Lifting Equation (*NLE*)

A biomechanical and epidemiological tool developed by NIOSH that calculates the Recommended Weight Limit (RWL) and Lifting Index (LI) for manual lifting tasks — used to identify and redesign hazardous lifting operations.

The Lifting Index (LI) = Load Weight ÷ RWL. An LI above 1.0 indicates a lifting task that poses increased low back injury risk for most workers. An LI above 3.0 represents high risk requiring immediate job redesign.

CSP Domain IV — Ergonomics / Lifting

NOAA (*National Oceanic and Atmospheric Administration*)

A federal scientific agency that monitors weather, atmospheric, and oceanic conditions, providing forecasts, severe weather warnings, and environmental data critical to outdoor operations.

NOAA's National Weather Service provides wind speed, precipitation forecast, and heat index data that directly govern pesticide application decisions, heat illness prevention protocols, and outdoor work scheduling.

NOAEL *(No Observed Adverse Effect Level)*

The highest tested dose or concentration of a substance at which no statistically or biologically significant adverse effect is observed in an exposed population — a key anchor for regulatory limit-setting.

Regulatory agencies apply uncertainty factors (typically 10x for animal-to-human extrapolation and 10x for human variability) when deriving allowable exposure limits from a NOAEL — resulting in a Reference Dose (RfD) or Reference Concentration (RfC) well below the NOAEL.

CSP Domain III — Toxicology

Noise Dose

The cumulative noise exposure a worker receives over a work shift, expressed as a percentage of the allowable daily dose under OSHA's Hearing Conservation Standard. A dose of 100% equals the PEL.

Noise dose above 50% (the action level equivalent) triggers mandatory hearing conservation program requirements — audiometric testing, training, and hearing protection availability. Commercial outdoor power equipment routinely produces doses above 50% within the first few hours of operation.

CSP Domain III — Noise

NTP *(National Toxicology Program)*

A U.S. interagency program that evaluates substances of public health concern and publishes the Report on Carcinogens — a key reference for chemical hazard classification.

NTP's Report on Carcinogens is a congressionally mandated biennial publication — the most authoritative U.S. government-issued carcinogen list. It distinguishes Known Human Carcinogens from Reasonably Anticipated to be Human Carcinogens.

CSP Domain III — Toxicology

— O — (4 terms)

OHST *(Occupational Health and Safety Technologist)*

A BCSP certification for safety and health professionals who apply established safety and industrial hygiene principles at an operational level. A recognized stepping stone toward the CSP.

The OHST examination focuses on practical application of safety and IH principles at the technician level — task-based implementation rather than the program design and management emphasis of the CSP.

OSHA *(Occupational Safety and Health Administration)*

The federal agency responsible for setting and enforcing workplace safety and health standards, conducting inspections, and providing training and compliance assistance.

OSHA enforces through inspections triggered by complaints, referrals, programmed targeting, and fatality/catastrophe response. For small commercial operators, the OSH Act's General Duty Clause (Section 5(a)(1)) extends responsibility beyond specific standards to all recognized serious hazards.

Oxidation-Reduction Potential *(ORP)*

A measure of water's sanitizing power, expressed in millivolts (mV). Values above 650 mV indicate sufficient sanitization; 720+ mV is ideal.

ORP captures the combined oxidizing capacity of all disinfectants in the water — not just free chlorine concentration. Two pools with identical FAC readings can have dramatically different ORP values depending on pH and CYA level.

Oxidizer

A chemical that releases oxygen to destroy organic waste, chloramines, and other contaminants in pool water. Common oxidizers include potassium monopersulfate (MPS) and calcium hypochlorite.

Non-chlorine oxidizers (potassium monopersulfate) break down chloramines and organic waste without contributing to CYA accumulation or chlorine residual — useful as a supplemental oxidation treatment without the stabilizer loading of dichlor or trichlor.

— P — (6 terms)

Particulate

Tiny solid particles or liquid droplets suspended in air — classified by size (respirable, thoracic, inhalable) that determines where they deposit in the respiratory system and the health effects they cause.

Respirable particulates (mass median aerodynamic diameter below 4 microns) penetrate to the alveolar region of the lung — the gas exchange zone. Only respirable fraction sampling captures the exposure relevant to fibrogenic and carcinogenic dust hazards like silica.

CSP Domain III — Airborne Hazards

PEL (Permissible Exposure Limit)

OSHA-enforceable airborne concentration limits for hazardous chemicals in the workplace, expressed as TWA (8-hr), STEL, or ceiling values. Established in 29 CFR 1910.1000.

Most OSHA PELs were set in 1971 based on 1968 ACGIH TLVs and have not been updated through rulemaking. OSHA's own compliance documents acknowledge that many PELs do not adequately protect worker health — NIOSH RELs and ACGIH TLVs are more current references.

CSP Domain III — Evaluation

Personal Protective Equipment (PPE)

Equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. Includes gloves, eye protection, hearing protection, respirators, and protective clothing.

PPE selection must match the specific hazard — chemical gloves rated for solvent resistance are not equivalent to gloves rated for pesticide concentrate exposure. OSHA's PPE standard (29 CFR 1910.132) requires documented hazard assessment before PPE selection.

CSP Domain III — Control

pH (Potential of Hydrogen)

A logarithmic scale (0–14) measuring the acidity or alkalinity of a solution; 7 is neutral, below 7 is acidic, above 7 is alkaline/basic. Ideal pool range: 7.2–7.6.

pH is logarithmic — each unit change represents a 10-fold change in hydrogen ion concentration. This means pH 6 is 10 times more acidic than pH 7, and pH 5 is 100 times more acidic. Small pH changes in either soil or pool water have outsized chemical consequences.

Pictogram (GHS Pictogram)

One of nine standardized GHS symbols on chemical labels and SDS documents indicating specific hazard classes.

The nine GHS pictograms cover: flammability, oxidizer, compressed gas, corrosive, acute toxicity, health hazard (chronic), environmental hazard, irritant/narcotic, and explosion. The health hazard symbol (exclamation mark) covers irritants; the health hazard symbol (person with starburst) covers carcinogens, reproductive toxins, and respiratory sensitizers.

PPM (Parts Per Million)

A unit of concentration — the number of units of a substance per one million units of the medium (air, water, or solution).

1 ppm in air equals approximately 1 mg/m³ for substances with a molecular weight near 28 g/mol (like CO); for heavier molecules, the mg/m³ equivalent is higher. Unit conversion is a routine requirement in IH exposure assessment calculations.

— Q — (1 term)

Qualified Person

Under various OSHA standards, a person who, by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience, has demonstrated the ability to solve or resolve problems.

The Qualified Person standard is context-specific — different OSHA standards define qualified persons differently for confined space entry, electrical work, scaffold inspection, and fall protection. The designation must be matched to the specific regulatory context.

— R — (11 terms)

RCRA (*Resource Conservation and Recovery Act*)

Federal law governing the disposal of solid and hazardous waste from 'cradle to grave,' administered by the EPA.

RCRA generator status — Very Small Quantity Generator (VSQG), Small Quantity Generator (SQG), or Large Quantity Generator (LQG) — is determined by monthly hazardous waste generation quantity. Generator status governs storage time limits, disposal requirements, and reporting obligations.

Real-Time Monitoring (*Direct-Reading Instruments*)

Instruments that provide instantaneous or near-instantaneous readings of airborne concentrations — including photoionization detectors (PIDs), electrochemical sensors, and direct-reading aerosol monitors.

Real-time instruments are invaluable for identifying peak exposure events and confirming that engineering controls are functioning — but they require calibration before each use. Calibration gas concentration must bracket the expected field concentrations.

CSP Domain III — Sampling Methods

REBA (*Rapid Entire Body Assessment*)

A posture-based ergonomic assessment tool that evaluates the risk of MSD injury for the entire body — including neck, trunk, legs, upper arms, lower arms, and wrists. Generates a risk score with action levels.

REBA scores range from 1 to 15. Scores 8–10 require investigation and change soon; scores 11–15 require immediate investigation and change. Unlike RULA, REBA captures lower extremity loading — relevant for tasks involving kneeling, squatting, or extended standing on uneven terrain.

CSP Domain IV — Ergonomics Assessment

REL (*Recommended Exposure Limit*)

NIOSH-established recommended concentration limits for chemical exposure in workplaces, often more protective than OSHA PELs. Not legally enforceable but widely used as guidance.

NIOSH RELs are based on the most current toxicological evidence and are updated as new data emerges — unlike OSHA PELs, which require formal rulemaking to change. RELs represent NIOSH's best assessment of safe exposure, independent of economic or technical feasibility.

CSP Domain III — Evaluation

Repetitive Motion

One of the primary ergonomic risk factors for MSD development — performing the same or similar movements repeatedly, particularly at high frequency or with short cycle times.

Cycle time and rest-to-work ratio are the two key variables in repetitive motion risk assessment. Tasks with cycle times under 30 seconds and less than 50% of the cycle spent in recovery are considered high-repetition and require ergonomic intervention.

CSP Domain IV — Ergonomics

Respirator

A device worn over the nose and mouth to protect the wearer from inhaling airborne hazards including particles, vapors, gases, and biological agents. Classified by type (air-purifying vs. supplied-air) and protection level (APF).

Cartridge selection for air-purifying respirators must match the chemical class — organic vapor cartridges do not protect against acid gases, and combination cartridges have lower service life than single-class cartridges. Cartridge change schedules must be established before use.

CSP Domain III — Respiratory Protection

Risk

The probability that a hazard will cause harm combined with the severity of that harm. Risk = Probability × Severity. Distinct from hazard, which is the potential source of harm.

Risk matrices — plotting probability against severity — are the standard tool for prioritizing controls across multiple hazards. They make explicit what informal risk judgment does implicitly, enabling defensible, documented control prioritization.

Risk Assessment

A systematic process of identifying hazards, analyzing exposure potential, and evaluating the risk associated with those hazards to inform control selection.

A documented risk assessment is the foundation of any defensible safety program. It establishes the baseline against which control effectiveness is measured and provides the evidentiary basis for control decisions.

Root Cause Analysis (RCA)

A structured method for identifying the fundamental cause(s) of a problem or incident, rather than addressing only the symptoms — enabling permanent corrective action.

Five-why analysis, fault tree analysis, and fishbone (Ishikawa) diagrams are the three most common RCA methods. Each drives analysis past immediate causes (unsafe acts, equipment failures) to systemic causes (program gaps, design flaws, management decisions).

Routes of Entry

The pathways by which chemical, biological, or physical agents enter the body: inhalation (primary for most occupational exposures), dermal absorption, ingestion, and injection.

Inhalation is typically the primary route of concern in occupational IH — the respiratory tract has a large surface area and rich blood supply. However, for substances with ACGIH skin notations, dermal absorption may contribute more to total body burden than inhalation.

CSP Domain III — Toxicology

RULA (Rapid Upper Limb Assessment)

A posture-based ergonomic assessment tool focused on the upper extremities — upper arms, lower arms, wrists — and neck, trunk, and legs. Generates a grand score with four action levels from acceptable to immediate change required.

RULA grand scores of 5–6 indicate investigation and change required soon; scores of 7 indicate immediate investigation and change. The tool is specifically validated for upper extremity MSDs — it complements rather than replaces REBA for whole-body assessment.

CSP Domain IV — Ergonomics Assessment

— S — (13 terms)

SARA Title III (Superfund Amendments and Reauthorization Act)

Requires facilities storing hazardous chemicals above threshold quantities to report to local emergency planning committees (LEPCs) — promotes community right-to-know.

SARA Title III threshold planning quantities (TPQs) and reportable quantities (RQs) vary by chemical. Some pesticide active ingredients have low TPQs that can be reached by commercial-scale operators who may not realize they have reporting obligations.

SDS (Safety Data Sheet)

A standardized 16-section document providing comprehensive information on a chemical's physical, health, environmental, and regulatory hazards, required under OSHA's HazCom standard.

The 16-section GHS SDS structure is standardized — Section 1 (identification), 2 (hazard identification), 3 (composition), 4 (first aid), 5 (fire fighting), 6 (accidental release), 7 (handling/storage), 8 (exposure controls/PPE), 9 (physical properties), 10 (reactivity), 11 (toxicology), 12 (ecology), 13 (disposal), 14 (transport), 15 (regulatory), 16 (other information).

Shock Treatment (Super-chlorination)

The process of adding a large dose of chlorine to oxidize chloramines, kill algae, and restore water clarity. Requires bather exclusion during treatment.

Shock dosing must be calculated based on measured combined chlorine levels — not by arbitrary rule of thumb. The required shock dose equals 10x the combined chlorine concentration (in ppm) x pool volume (in gallons) ÷ 1,000,000.

Signal Word

A word used on pesticide labels (Danger, Warning, Caution) or GHS labels (Danger, Warning) to indicate the relative level of hazard severity for the product.

Under FIFRA, pesticide signal words reflect the most hazardous effect across oral, dermal, inhalation, and eye/skin irritation endpoints. A product classified as Caution based on all endpoints except eye irritation — which rates as Warning — carries the higher signal word.

Silica (Crystalline Silica)

A mineral compound (SiO₂) found in soil, sand, and rock; inhalation of respirable crystalline silica causes silicosis, lung cancer, and other diseases. OSHA PEL: 50 µg/m³.

Silicosis is irreversible and progressive — the fibrotic process continues even after exposure ends. OSHA's silica standard (29 CFR 1910.1053) requires engineering controls, air monitoring, medical surveillance, and housekeeping practices for covered operations.

CSP Domain III — Airborne Hazards

Skin Notation ((Skin))

An ACGIH designation placed next to a TLV indicating that significant dermal absorption of the substance can occur — meaning airborne exposure limits alone do not fully characterize the hazard.

The skin notation changes the entire control strategy — skin protection becomes co-equal with respiratory protection, not subordinate to it. Biological monitoring (BEI) is often the only way to verify that combined inhalation and dermal controls are adequate.

CSP Domain III — Routes of Entry

Sodium Bicarbonate (Baking Soda)

A mild base (NaHCO₃) used in pool care to raise total alkalinity with minimal pH change. Also used as a neutralizing agent for acid spills.

Sodium bicarbonate raises alkalinity approximately 1.4 ppm per ounce per 10,000 gallons — with minimal corresponding pH shift. This specificity makes it the preferred alkalinity adjuster when pH is already within range.

Sodium Carbonate (Soda Ash / pH Up)

A strong base (Na₂CO₃) used to raise pool water pH rapidly. Raises pH more aggressively than sodium bicarbonate.

Soda ash raises pH approximately 0.2 units per ounce per 10,000 gallons but also raises alkalinity — making sequential adjustments necessary when both parameters need correction. Always dissolve in water before adding to the pool.

Sorbent Tube

A glass tube containing adsorbent material (activated charcoal, silica gel, XAD resin) through which air is drawn to collect organic vapors and gases for subsequent laboratory analysis.

Sorbent selection must match the target analyte — activated charcoal captures organic solvents; Tenax captures polar organics; silica gel captures amines and polar compounds. NIOSH Analytical Method numbers specify the validated medium, flow rate, and analytical procedure for each chemical.

CSP Domain III — Sampling Methods

Standard Threshold Shift (STS)

A change in hearing threshold of 10 dB or more at 2000, 3000, or 4000 Hz in either ear, averaged over those frequencies — the OSHA-defined trigger for mandatory audiogram re-testing and worker notification under 29 CFR 1910.95.

An STS triggers a mandatory review of workplace noise controls and hearing protector adequacy — it is a regulatory compliance event, not merely a medical finding. Age correction is permitted by OSHA when calculating whether an STS is recordable.

CSP Domain III — Hearing Conservation

STEL (*Short-Term Exposure Limit*)

A 15-minute TWA concentration that should not be exceeded during the workday, even if the 8-hour TWA is within the PEL or TLV — protects against peak exposures.

STELs apply specifically to 15-minute sampling periods — they are not averaged over longer durations. A single 15-minute exceedance above the STEL is an overexposure, regardless of the worker's full-shift TWA.

CSP Domain III — Evaluation

Stormwater Runoff

Precipitation that flows over surfaces and collects pollutants — including pesticides, fertilizers, and sediment — before entering storm drains, streams, and other water bodies.

EPA's stormwater programs (NPDES) and state-level pesticide application restrictions near water bodies are the two primary regulatory frameworks governing pesticide and fertilizer runoff from commercial operations.

Systemic Toxicity

Toxic effects that occur at a site distant from the point of entry — for example, a chemical absorbed through the skin causing liver or kidney damage. Contrasted with local toxicity at the point of contact.

Organophosphate and carbamate pesticides are classic systemic toxicants — they inhibit acetylcholinesterase throughout the nervous system after absorption through any route. Their systemic mechanism makes route-of-entry control particularly critical.

CSP Domain III — Toxicology

— T — (6 terms)

Target Organ Toxicity

The tendency of a toxic substance to preferentially damage a specific organ or system — such as the liver (hepatotoxin), kidneys (nephrotoxin), nervous system (neurotoxin), or lungs (pulmonotoxin).

SDS Section 11 (Toxicological Information) identifies target organs and the effects associated with acute and chronic exposure. This section drives biological monitoring parameter selection — monitoring the target organ biomarker confirms whether controls are adequate.

CSP Domain III — Toxicology

TDS (*Total Dissolved Solids*)

The cumulative concentration of all dissolved substances in pool water, expressed in ppm. High TDS causes dull water, reduced chemical effectiveness, and equipment corrosion.

TDS increases monotonically with chemical additions and evaporative concentration — it cannot be reduced by chemical treatment. Partial drain and refill is the only correction; the volume to replace is proportional to the ratio of current to target TDS.

TLV (*Threshold Limit Value*)

ACGIH-published airborne concentration guidelines below which nearly all workers may be repeatedly exposed without adverse health effects. Three types: TLV-TWA, TLV-STEL, and TLV-C.

TLV-C (ceiling) values must not be exceeded at any moment — they apply to substances where even brief exceedances pose acute hazard. TLV-TWA values apply over the full 8-hour shift. TLV-STEL applies to any 15-minute period within the shift.

CSP Domain III — Evaluation

Toxicology

The scientific study of the adverse effects of chemical, biological, or physical agents on living organisms, including dose-response relationships, mechanisms of toxicity, and risk assessment.

Paracelsus's principle — 'the dose makes the poison' — is the foundational axiom of toxicology. It explains why context matters: water is acutely toxic at high enough doses, and pesticides are safe at exposures below their NOAEL.

CSP Domain III — Core Concept

Trichlor (*Trichloroisocyanuric Acid*)

A slow-dissolving chlorine sanitizer (90% available chlorine) commonly used in tablet form in pool floaters and automatic chlorinators. Contains cyanuric acid stabilizer. pH approximately 2.8–3.5.

Trichlor and calcium hypochlorite must never be stored in proximity or mixed in any form — the reaction is highly exothermic and can cause fire or explosion. This is one of the most serious chemical incompatibility hazards in recreational water care.

TWA (*Time-Weighted Average*)

The average exposure concentration over a defined period (typically 8 hours), calculated by weighting each concentration by the time spent at that level.

TWA calculation: sum of (concentration × duration) for each task, divided by total shift duration (usually 8 hours). A single high-concentration task early in the shift — even if followed by zero exposure — can push the full-shift TWA above the PEL.

CSP Domain III — Evaluation

— U — (2 terms)

Universal Waste

A category of hazardous waste subject to simplified management standards under RCRA — includes batteries, pesticides, mercury-containing equipment, and lamps.

The Universal Waste Rule reduces regulatory burden for common hazardous wastes while maintaining basic management standards. Pesticides that qualify as Universal Waste must still be kept in closed containers, labeled, and sent to authorized facilities — the simplification is in storage time limits and manifest requirements.

USDA (*U.S. Department of Agriculture*)

Federal agency responsible for agriculture, food, and natural resources policy — including oversight of pesticide tolerances on food crops and cooperative programs for integrated pest management.

USDA's Natural Resources Conservation Service (NRCS) Web Soil Survey provides county-level soil characterization data — including drainage class, permeability, and runoff potential — that informs pesticide and fertilizer management decisions at the site level.

— V — (3 terms)

Ventilation Airflow Rate ($Q = V \times A$)

The fundamental equation for calculating volumetric airflow through a ventilation system: Q (airflow, cfm or m³/min) equals V (velocity, fpm or m/min) multiplied by A (cross-sectional area, ft² or m²).

$Q = V \times A$ is the starting point for every ventilation system design and evaluation. Measuring velocity with a pitot tube or anemometer across the duct cross-section, then multiplying by the area, yields the actual airflow — which can then be compared to the design requirement.

CSP Domain III — Engineering Controls

Vibration White Finger (*VWF / Raynaud's Phenomenon*)

A component of HAVS characterized by episodic blanching (whitening) of the fingers triggered by cold or vibration — caused by damaged blood vessels in the fingers from chronic hand-arm vibration exposure.

VWF is graded on the Stockholm Workshop Scale from Stage 1 (occasional blanching of one finger) to Stage 4 (blanching of all phalanges of most fingers with trophic changes). Cold ambient temperatures trigger episodes at earlier disease stages.

CSP Domain IV — Vibration

VOC (*Volatile Organic Compound*)

A class of carbon-based chemicals that evaporate readily at room temperature, contributing to air quality concerns and potentially causing health effects at elevated exposures.

VOC content is a regulatory parameter for pesticide formulations in many states — particularly in ozone non-attainment areas under EPA's Clean Air Act. Low-VOC or water-based formulations reduce both ambient air quality impact and applicator inhalation exposure.

CSP Domain III — Chemical Hazards

— W — (4 terms)

WBGT (*Wet Bulb Globe Temperature*)

A composite temperature index used to evaluate heat stress in outdoor and indoor environments, incorporating dry bulb temperature, natural wet bulb temperature (humidity), and globe temperature (radiant heat).

Outdoor WBGT is calculated as: $0.7 \times \text{natural wet bulb} + 0.2 \times \text{globe temperature} + 0.1 \times \text{dry bulb}$. The 0.7 coefficient on wet bulb reflects humidity's dominant role in evaporative cooling — the primary physiological defense against heat illness.

CSP Domain III — Physical Agents

WHO (*World Health Organization*)

A United Nations specialized agency that leads international public health, including classification of pesticide hazards used globally.

WHO's Recommended Classification of Pesticides by Hazard uses Classes Ia (extremely hazardous) through U (unlikely to present hazard under normal use) — a classification system referenced in countries without their own regulatory frameworks.

Whole-Body Vibration (*WBV*)

Mechanical vibration transmitted to the entire body through a supporting surface — typically a seat — from vibrating vehicles or machinery. Causes or accelerates low back disorders and is evaluated per ISO 2631.

ISO 2631-1 defines A(8) for WBV — daily vibration exposure normalized to 8 hours. The EU Physical Agents (Vibration) Directive sets an action value of 0.5 m/s^2 and a limit value of 1.15 m/s^2 — thresholds relevant to ride-on equipment operators across extended shifts.

CSP Domain IV — Vibration / Ergonomics

WPS (*Worker Protection Standard*)

EPA regulation (40 CFR Part 170) protecting agricultural workers and handlers from pesticide exposures, covering training, notification, restricted-entry intervals, and decontamination.

WPS requires posted application information (product name, EPA registration number, location treated, REI) accessible to all agricultural workers. Restricted-Entry Intervals (REIs) range from 4 hours to 5 days depending on product toxicity and exposure potential.

— Z — (1 term)

Zero Tolerance

A safety policy or regulatory standard establishing that any detected level of a specific hazard is unacceptable and requires immediate corrective action.

Zero tolerance policies are most defensible for hazards with no safe threshold — carcinogens without a demonstrated NOAEL, permit-required confined space entry without atmospheric testing, or machine operation with guarding removed. Applying zero tolerance to low-threshold hazards undermines credibility.