

The Role and Responsibilities of the K–12 Chemical Hygiene Officer for Enhancing Safety in Laboratories and Classroom Instructional Spaces

1. History and Regulatory Context: The Need for Laboratory Safety Standards

The use of hazardous chemicals in K–12 school science laboratory and classroom instructional spaces has been a long-standing practice. However, the regulations governing their use were historically inconsistent. The major shift occurred in 1990 when the Occupational Safety and Health Administration (OSHA) enacted a standard called Occupational Exposure to Hazardous Chemicals in Laboratories, commonly known as the OSHA Laboratory Standard (29 CFR 1910.1450)(Occupational Safety & Administration, 1990).

This standard recognized that science laboratory and classroom instructional spaces are unique workplaces with different potential hazards and resulting risks than industrial manufacturing. Its purpose was to protect employees from the health hazards associated with hazardous chemicals. This federal standard is the legal foundation upon which all modern school chemical safety programs are built.

A. The Foundation: OSH Act of 1970 (29 U.S.C. §§ 651–678)

The Occupational Safety and Health Act of 1970 (OSH Act), Pub. L. No. 91-596, created OSHA and established the national legal framework for workplace safety, including Section 5(a)(1), the General Duty Clause, which requires every employer to maintain a workplace free from recognized hazards likely to cause death or serious physical harm(*Occupational Safety and Health (OSH) Act of 1970 (Williams-Steiger Act)*, 1970). This baseline obligation applies to school districts even where a specific OSHA standard is not directly enforceable because it serves as a better professional safety practice. (For a comprehensive history of the OSH Act and its development, see OSHA's official legislative history at <https://www.osha.gov/laws-regs/oshact/completeoshact>.)

B. The Hazard Communication Standard (29 CFR 1910.1200): The Right to Understand

Before the Laboratory Standard was enacted, OSHA promulgated the Hazard Communication Standard (HCS) in 1983, and it was most recently updated in 2024 to align with the seventh revision of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The HCS, commonly called the Right to Understand standard, requires that employers inform employees about chemical hazards through standardized labeling, Safety Data Sheets (SDSs), and training. For K–12 schools, this requirement means every employee potentially exposed to a hazardous chemical is legally entitled to know what the chemical is, what its hazards are, and how to protect themselves. Chemical manufacturers, importers, and distributors must develop and provide an SDS for each hazardous chemical, and employers must have an SDS for every hazardous chemical in the workplace, as required under 29 CFR 1910.1200(g)(Occupational Safety & Administration, 2012).

C. The OSHA Laboratory Standard (29 CFR 1910.1450): The Controlling Standard

Recognizing that science laboratories and classroom instructional spaces present different potential safety hazards and resulting health and safety risks from industrial manufacturing environments, OSHA enacted the Laboratory Standard effective May 1, 1990, with full compliance required by January 31, 1991. This standard applies to all employers engaged in the “laboratory use of hazardous chemicals,” defined as handling or use of chemicals where manipulations are carried out on a laboratory scale, multiple chemical procedures are used, the procedures are not part of a production process, and protective laboratory practices are in common use (29 CFR 1910.1450(b)) (Occupational Safety & Administration, 1990). K–12 science instruction clearly and unambiguously meets this definition.

The Laboratory Standard was built upon a significant body of prior scientific and professional guidance. Its nonmandatory Appendix A draws directly on the National Research Council’s landmark publication *Prudent Practices for Handling Hazardous Chemicals in Laboratories*, originally published in 1981 and updated in its current edition in 2011 (National Research Council, 1981, 2011). By codifying the core elements of this guidance (including the necessity for the Chemical Hygiene Plan, the Chemical Hygiene Officer, and systematic hazard analysis and risk assessment), OSHA gave these long-accepted professional practices the force of federal law. Further amendments have been made, with critical updates in 2024 and 2025 focusing on Chemical Hygiene Plan enhancements, updated risk assessments, and compliance with the applicable updated HCS 2024 components.

D. The Evidence of Need: A Documented Pattern of Preventable Harm

The regulatory framework described did not arise arbitrarily, and it reflects a documented record of preventable harm in K–12 science laboratories and classroom instructional spaces. A peer-reviewed study analyzing acute chemical release incidents across 14 states between 2008 and 2013, captured by the Agency for Toxic Substances and Disease Registry, found that school chemical incidents accounted for 8.5% of all incidents involving injured persons, despite representing only 1.3% of total chemical release events. Of the 335 school incidents examined, 41 occurred specifically in school science laboratories and classroom instructional spaces, and more than half of those were associated with injuries (totaling 88 injured persons) (Anderson et al., 2017). Students accounted for approximately 62% of all injured persons in these school-based events, confirming that the human cost falls disproportionately on children.

The human cost of inadequate oversight is not abstract. A 2021 study by Dr. Tyler Love (assistant professor of Elementary/Middle Grades STEM Education at Penn State Harrisburg) and Dr. Ken Roy (NSTA’s chief science safety compliance adviser) found that 35% of STEM educators had never received any safety training—a figure that directly correlates with the documented pattern of laboratory instructional space incidents (Roy, 2021). These incidents include a 2017 sulfuric acid spill in Colorado that hospitalized four students; a 2018 chemical explosion in California that burned a teacher during a classroom demonstration; and a 2019 incident in Texas where a student sustained severe burns while conducting an experiment without required personal protective equipment (PPE). Each incident reflects a failure at the program level with the absence of the systematic oversight that a properly designated and empowered Chemical Hygiene Officer is specifically designed to provide.

It is also important to recognize that the absence of systematic data collection is itself significant. As researchers and professional organizations have observed, no federal agency systematically tracks laboratory incidents in K–12 schools as a distinct reporting category, and many legal cases are resolved before trial, leaving little public record. As a result, the documented cases almost certainly underrepresent the actual scope of the problem. The regulatory imperative for a designated Chemical Hygiene Officer is, in part, a structural response to this accountability gap: By requiring incident documentation, reports on near-misses, and regular inspections, the Chemical Hygiene Officer role creates the institutional memory and oversight needed to prevent systemic risk from remaining invisible until it becomes catastrophic.

2. The Core Mandate: The Lab Standard, the Chemical Hygiene Plan, and the Chemical Hygiene Officer

The OSHA Laboratory Standard mandates three key components for any science laboratory or classroom instructional spaces (including teaching labs) where hazardous chemicals are used:

- 1. The Laboratory Standard:** This standard is the overarching regulation that requires employers (e.g., K–12 school districts) to limit employee exposure to hazardous chemicals in science laboratory and classroom instructional spaces and related areas (such as chemical storerooms and preparation rooms).
- 2. The Chemical Hygiene Plan (CHP):** The Laboratory Standard requires every employer to develop and implement a written CHP. This plan is a district’s specific, customized “playbook” that outlines all procedures, equipment, and work practices necessary to protect science laboratory and classroom instructional spaces and related areas employees.
- 3. The Chemical Hygiene Officer (CHO):** The standard explicitly requires the employer to designate a CHO. This individual is defined by OSHA as an employee who is “qualified by training or experience” to provide technical guidance in the development and implementation of the CHP.

3. The Problem: An Inconsistent Standard for K–12 CHOs

While the OSHA Laboratory Standard *requires* a CHO, it does not specify the exact qualifications, training hours, or, most important, specific responsibilities for a K–12 setting. The coverage picture is also uneven: While federal OSHA does not have jurisdiction over public school employees in all states, many states either operate OSHA-approved State Plans that extend the Laboratory Standard to public employees or have state departments of labor that adopt federal OSHA standards by reference, meaning the CHO requirement carries the force of law for a large portion of the country’s public school workforce. (The full jurisdictional landscape is detailed in Section 6.) Taken together, this ambiguity and variation have led to a dangerous inconsistency in how K–12 chemical safety programs are implemented.

This document outlines the clear need for a nationally recognized standard for the role and responsibilities of a K–12 Chemical Hygiene Officer. The primary focus of the CHO is to make science laboratories and classroom instructional spaces and related areas safer and to systematically reduce potential safety hazards and resulting health and safety risks for students and staff.

A. Gap 1: The CHO Role as Defined by the Laboratory Standard and Its Limits in a K–12 Context

Under 29 CFR 1910.1450(b), the CHO is defined as an employee “qualified by training or experience” to provide technical guidance in the development and implementation of the CHP (Occupational Safety & Administration, 1990). In practice, OSHA’s guidance makes clear that the CHO’s core responsibilities include conducting chemical safety training so that staff understand potential safety hazards and resulting health and safety risks and how to handle them safely; developing and maintaining the CHP, including all required procedures, PPE specifications, and work practices; implementing and monitoring the CHP to protect employees from hazardous chemical exposures; providing technical expertise on hazard controls, exposure prevention, and regulatory compliance; and supporting a proactive safety culture in which chemical hazards are systematically identified, evaluated, and controlled at both the institutional and instructional space levels. The CHO is not a paperwork role; it is the district’s primary driver of a living safety program.

The problem is that the standard’s definition is intentionally broad and does not specify minimum qualifications, required training hours, or duties specific to K–12 settings. The regulation explicitly states that it is “not intended to place limitations on the position description or job classification” of the CHO. Although this flexibility serves university and hospital laboratory settings well, it means a school district can technically satisfy the requirement by assigning the title to any employee without providing formal training, defined authority, or dedicated time. A CHO without this

support cannot fulfill the substantive responsibilities described. This document addresses this core gap: the need for a nationally recognized standard that translates the Laboratory Standard's CHO requirement into a clearly defined, effective role for the K–12 context.

B. Gap 2: The Federal Jurisdiction Problem: Public School Employees Are Not Protected by Federal OSHA in Most States

The OSH Act, under Section 3(5) (29 U.S.C. §652(5)), explicitly excludes state and local government entities from the definition of “employer” for purposes of federal OSHA jurisdiction (*Occupational Safety and Health (OSH) Act of 1970 (Williams-Steiger Act)*, 1970). Public school teachers and staff are employees of local educational agencies, which are political subdivisions of state governments. Therefore, federal OSHA cannot inspect, cite, or penalize a public school district for violating the Laboratory Standard in states without an OSHA-approved State Plan.

Currently, there are 22 OSHA-approved State Plans covering both private sector and state and local government workers, as well as seven State Plans (Connecticut, Illinois, Maine, Massachusetts, New Jersey, New York, and the Virgin Islands) that cover only state and local government workers. In total, public school employees in approximately 29 states and territories are covered by an OSHA-approved State Plan and therefore legally subject to the Laboratory Standard and its CHO requirement (Occupational Safety & Administration, n.d.). However, in the remaining 21 states and territories (including large states such as Florida, Texas, and Georgia), public school employers fall entirely outside of OSHA's enforcement jurisdiction. In those states, there is no government agency with statutory authority to require compliance with the Laboratory Standard, which means that in a substantial portion of the country, the requirement to designate a CHO and maintain a CHP exists only as a matter of better professional safety practice and civil liability exposure.

This enforcement gap does not mean that a school district in a state without a State Plan has no legal obligation related to chemical safety. The General Duty Clause concept is mirrored in state common law through the doctrine of negligence and the duty and standard of care. As NSTA has noted in its position statements on liability, courts measure whether a school district has met its duty and standard of care in part by reference to the standards adopted by the relevant professional community. Where the OSHA Laboratory Standard represents the national duty and standard of care, a district's failure to comply with it exposes both the district and individual administrators to significant civil liability in the event of a chemical incident. The OSHA standard does not need to be technically applicable to serve as the benchmark in tort litigation.

C. Gap 3: Private Schools and Charter Schools

The jurisdictional picture is further complicated by the legal status of private and charter schools. Private schools are generally considered employers under the OSH Act and are subject to federal OSHA jurisdiction, as are some charter schools (depending on their governance structure). This creates a situation where a science teacher at a private school two miles from a public school may be covered by the full force of federal OSHA enforcement while the public school teacher is not. The need for a nationally recognized, profession-driven standard—rather than one entirely dependent on variable state enforcement structures—has never been more apparent.

D. The Role of NSTA and Professional Standards in Filling the Gap

In the absence of a universal enforcement mechanism, professional associations play a critical role. NSTA's official position statements on safety and school science instruction and liability of science educators for laboratory safety establish a better professional safety standard of conduct that operates independently of state OSHA coverage. Courts have recognized that the duty and standard of care expected of educational employers is measured in part against the standards adopted by the relevant profession (National Science Teaching Association, 2024a). An NSTA-endorsed standard for the K–12 CHO role therefore serves a dual function: It provides districts with concrete, actionable guidance for building a compliant and effective safety program, and it establishes the better professional

safety standard benchmark against which a district's conduct will be evaluated in the event of a chemical-related incident or legal challenge(National Science Teaching Association, 2024b).

4. Core Responsibilities of the District Chemical Hygiene Officer

To be effective, the CHO must be empowered to manage the district's chemical safety program. This is not a passive role; it is an active management position focused on potential safety hazards and how to reduce the potential for resulting risks. The CHO's responsibilities must include, but are not limited to, the following:

A. Program Development and Management

- Develop, implement, and annually review the districtwide CHP. This CHP is the central guiding document for activities in all science laboratory and classroom instructional spaces and related areas.
- Establish and maintain standard operating procedures for potential safety hazards and resulting health and safety risks in science laboratory and classroom instructional space operations and related areas (e.g., strong acid and base use, flammable liquid handling, specific demonstrations).
- Advise on and approve procurement procedures for chemicals, ensuring that new chemicals are properly vetted and less-hazardous alternatives are considered (GHS-informed purchasing).
- Oversee the districtwide chemical inventory system and ensure it is accurate, accessible, and updated at least annually.

B. Hazard Analysis and Risk Assessment

- Work with teaching staff to conduct and document formal potential hazard analysis and resulting risk assessments for all science laboratory and classroom instructional space activities and related areas.
- Maintain the district's library of SDSs and ensure they are readily accessible to all employees, as required by the Hazard Communication Standard (1910.1200)(Occupational Safety & Administration, 2012).
- Determine and document the proper PPE required for all science laboratory and classroom instructional space activities (e.g., type of safety goggles and/or safety glasses, glove, apron).
- Conduct regular inspections of all science-related areas (chemical storage areas and stockrooms, preparation rooms), science laboratories, and classroom instructional spaces to ensure proper chemical segregation, labeling, and storage conditions.

C. Training and Communication

- Develop and provide mandatory, documented safety training for all K–12 science and STEM-related staff. This training must cover the CHP, SDSs, emergency procedures, and specific hazards employees will face.
- Ensure training is documented and repeated annually or whenever the following changes are present:
 - There is a change in the types of hazardous chemicals used.
 - There is a change in lab procedures that could affect exposure.
 - There is a change in PPE requirements or safety protocols.
 - There is a regulatory update to the Hazard Communication Standard or other OSHA laboratory-related rules
 - There is a change in laboratory or classroom instructional space course assignments.

- Act as the primary technical resource for all staff (teachers, principals, facilities staff members) on matters of chemical safety, hygiene, and regulatory compliance.

D. Monitoring, Auditing, and Recordkeeping

- Establish and monitor a system for “near-miss” and incident reporting, and lead investigations into all chemical-related incidents.
- Maintain all records required by OSHA and state-level regulations, including training records, inspection reports, inventory logs, and incident investigations.
- Verify and document that safety equipment (such as eyewash stations, safety showers, and fume hoods) is functioning, tested, and certified according to manufacturer and regulatory standards.

E. Emergency Preparedness and Waste Management

- Develop and coordinate the emergency response plan for chemical spills, fires, and exposures in partnership with facilities staff and local first responders.
- Ensure all science laboratories and classroom instructional spaces and related areas are equipped with appropriate spill-control kits and fire extinguishers.
- Manage the district’s hazardous waste program, ensuring all chemical waste is properly collected, labeled, stored, and disposed of in compliance with U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act laws and state and local regulations (U.S. Environmental Protection Agency, 2026).

5. Organizational Structure for Success

A CHO’s effectiveness is directly tied to their position within the district’s organizational structure.

A. Reporting to the Superintendent of Schools

To be effective, the CHO must report directly to the superintendent of schools (or their designee at the district cabinet level, such as an assistant superintendent of operations or risk management). This reporting structure is critical for success for the following reasons:

- **Sufficient backing:** A CHO reporting to a building principal lacks the authority to implement districtwide changes. The principal’s focus is on a single building, not systemic, districtwide compliance and safety culture.
- **Districtwide oversight:** Chemical safety is a district-level liability and responsibility. The CHO’s main responsibility is to oversee safety in the science laboratory and classroom instructional space and related areas. However, the CHO should work in cooperation with the district director of environmental health and safety and have the authority, backed by the superintendent, to audit, correct, and (if necessary) halt unsafe practices in any school building.
- **Resource allocation:** Effective safety programs require resources for training, waste disposal, and PPE, among other needs. The CHO must have a direct line to district-level leadership that controls the budget.

B. Clarifying Legal Responsibility: The Role of the Teacher

Assigning a CHO does not remove responsibility from other employees. It is critical to clarify the legal and practical lines of responsibility:

- **School district (employer):** The district is ultimately responsible for providing a safer workplace, which it does by creating the CHP, appointing a CHO, and providing resources.

- **CHO:** The CHO is the program manager and technical expert responsible for developing, implementing, and monitoring the safety program.
- **Teacher (assigned employee):** The teacher in the science laboratory or classroom instructional space is the primary individual responsible for their own safety and the safety of their students and any other instructional space occupants. The teacher is the trained, experienced professional directly supervising the activity. The teacher is legally responsible for following the CHP, implementing the required safety protocols (e.g., standard operating procedures, PPE), and providing direct supervision.
- **Building administrator (principal):** The principal is responsible for ensuring the teacher and CHO are supported in their roles at the building level (e.g., providing time for training, supporting disciplinary actions for noncompliance). The principal is not, however, expected to be the chemical safety expert.

This model ensures that the teacher—as the individual with the direct experience and training—is empowered and held responsible for the safety of their science laboratory or classroom instructional space, while the CHO provides the framework, resources, and oversight to make that possible.

6. State-Level Variations: Verifying Local Standards

The responsibilities outlined represent a possible comprehensive national standard. However, the CHO must also be the district's expert on state and local regulations, which can be more stringent than federal OSHA regulations. Navigating this landscape requires an understanding of three distinct regulatory categories, each of which creates different obligations and a different risk profile for the district.

A. Category 1: Full State Plan States and Territories (Public and Private Sector)

Currently, there are 22 OSHA-approved State Plans that cover both private sector and state and local government workers. These states include Alaska, Arizona, California, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Washington, and Wyoming. In these states, public school districts are legally subject to the state's equivalent of the OSHA Laboratory Standard and its CHO requirement, enforced by a state-level agency rather than federal OSHA.

In some of these states, the State Plan is substantially more stringent than the federal standard. California's plan (Cal/OSHA) is among the most comprehensive occupational safety programs in the nation: It enforces the equivalent of the Laboratory Standard under 8 CCR §5191, and California has additional requirements in areas such as injury and illness prevention programs, which must be maintained by all employers regardless of their covered status under the federal standard (*California Code of Regulations (CCR), Title 8, Section 5191: Occupational Exposure to Hazardous Chemicals in Laboratories*, n.d.). Washington State (Labor and Industries [L&I]/Washington Industrial Health and Safety Act [WISHA]) and Oregon (Oregon OSHA) similarly operate plans that have in some instances adopted standards that are more protective than the federal baseline. In these states, the CHO must be current with the specific state regulatory framework rather than simply relying on the federal standard as their guide.

B. Category 2: Public Sector-Only State Plans

Seven jurisdictions operate OSHA-approved State Plans that cover only state and local government employees, with private sector workers remaining under federal OSHA jurisdiction: Connecticut, Illinois, Maine, Massachusetts, New Jersey, New York, and the U.S. Virgin Islands. Public school employees in these states are covered by their respective State Plans, and the CHO must ensure compliance with those state-specific requirements (Occupational Safety & Administration, n.d.).

New York's Public Employee Safety and Health (PESH) program is particularly noteworthy as a model. PESH enforces a body of public employee safety standards that closely tracks federal OSHA requirements, including the

Laboratory Standard and its CHO mandate (Department of Labor & Development, n.d.). New York also has state-specific right-to-know legislation (the Public Employees' Right-to-Know Law) that independently requires chemical hazard communication programs in public sector workplaces. A CHO working in a New York public school district must be conversant with both the PESH framework and any applicable state right-to-know requirements.

C. Category 3: States and Territories Without State Plans: Better Professional Safety Practice as the Legal Standard

In states and territories without an OSHA-approved State Plan (including Florida, Texas, Georgia, Ohio, Pennsylvania, Illinois for private sector, and others)[WR1.1], public school districts are not subject to OSHA enforcement jurisdiction. However, as detailed in Section 3, this does not mean they operate without legal obligations or risk. Several parallel legal frameworks create real and significant accountability:

- **State hazard communication laws:** Many non-State-Plan states have enacted their own chemical right-to-understand or hazard communication statutes. Texas, for example, maintains the Texas Hazard Communication Act (*Texas Health & Safety Code, Chapter 502: Texas Hazard Communication Act*, n.d.), which requires public employers (including school districts) to maintain chemical inventories, provide SDSs, and train employees on chemical hazards. The CHO must be fully conversant with these state-specific requirements.
- **EPA and environmental regulations:** The EPA's Resource Conservation and Recovery Act (40 CFR Parts 260–270) governs hazardous waste disposal in all states regardless of OSHA jurisdiction (U.S. Environmental Protection Agency, 2026). Schools that generate hazardous chemical waste (which virtually all science programs do) are subject to federal EPA requirements for waste identification, labeling, storage, and disposal. This is a federal obligation that the CHO must manage regardless of the state's OSHA status.
- **Civil liability and the professional standard of care:** In non-State-Plan states, the OSHA Laboratory Standard and the CHO requirement serve as the nationally recognized professional duty and standard of care. Courts evaluating whether a school district or administrator acted negligently or recklessly in the aftermath of a chemical incident will look to what a reasonable employer should have done and to better professional safety standards (including those published by OSHA, NSTA, the National Science Education Leadership Association, and the American Chemical Society) to provide that benchmark (National Science Teaching Association, 2024a). A district that was unaware of the Laboratory Standard or that had failed to designate a CHO would have difficulty arguing that it met its duty and standard of care.

D. The CHO's State Compliance Responsibilities: A Practical Framework

The CHO is responsible for researching and maintaining current knowledge of applicable state standards and ensuring the district's CHP meets or exceeds the most stringent applicable requirements. As a practical matter, this means the CHO should, at minimum, accomplish the following annually:

- Verify your state's current OSHA plan status and the specific state agency responsible for enforcement. (Use the directory at [osha.gov/stateplans](https://www.osha.gov/stateplans) as the authoritative reference.)
- Identify any state-specific laboratory safety standards, right-to-understand laws, or chemical inventory requirements that apply to public school employers in the district's state.
- Confirm current EPA hazardous waste generator status and applicable Resource Conservation and Recovery Act requirements, noting that small quantity generator thresholds may vary based on the volume of chemical waste generated across district buildings.
- Document this regulatory analysis in the district's CHP and ensure that the CHP is explicitly designed to satisfy the most stringent applicable standard (federal, state, or professional) rather than only the minimum enforceable requirement.

This “highest applicable standard” approach is not only the most defensible posture in the event of a legal challenge; it is also the most genuinely protective approach for students and staff.

7. Implementation and Review

A. District Review and Adoption

The CHP and the CHO’s responsibilities are foundational to district safety. The development and any subsequent annual review of the CHP may be conducted by a committee, not by the CHO in isolation. This committee should include the following:

- The CHO (as chair)
- A representative from district-level administration (e.g., assistant superintendent)
- A representative from the facilities/operations department
- At least two science/STEM teachers (e.g., one from high school, one from middle school)
- A school nurse or health representative

This committee should review and recommend the CHP for formal adoption by the school board, which will give the plan the full force of district policy.

B. Flowchart of CHO Responsibilities

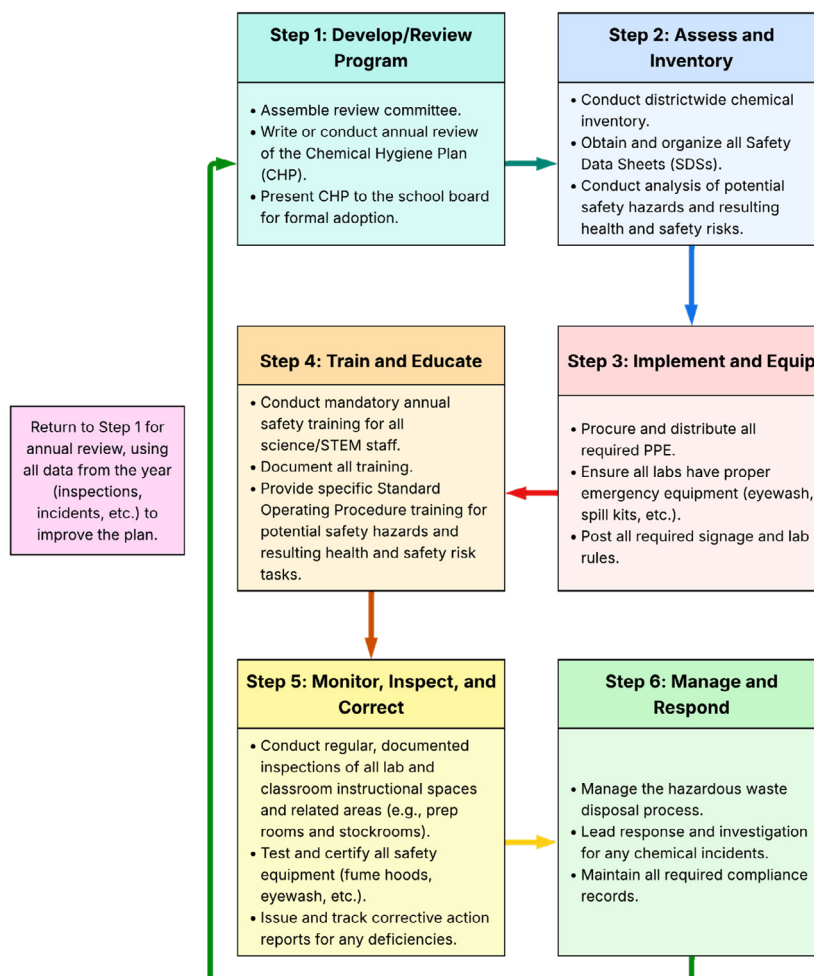


Figure 1. Flowchart showing Chemical Hygiene Officer responsibilities.

8. Conclusion

A dedicated, empowered Chemical Hygiene Officer is not a bureaucratic burden; having someone in this role is the single most effective measure a school district can take to reduce chemical-related safety hazards and resulting health and safety risks, protect its employees, and ensure a safer learning environment for students. By adopting this clear set of responsibilities and the recommended reporting structure, districts can move from a posture of regulatory compliance to a genuine culture of safety.

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