CHEMICAL HYGIENE PLAN
VERMONT AGENCY OF TRANSPORTATION
MATERIALS TESTING AND CERTIFICATION SECTION
GEOTECHNICAL ENGINEERING SECTION

2021

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2021 Chemical Hygiene Committee:

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SECTION 1.000—PURPOSE AND SCOPE

1.100 Purpose

This Plan is designed to ensure that the Materials Testing and Certification and Geotechnical Engineering Sections are in compliance with 29 CFR Part 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories". This document was developed to provide employees working under the direction of the Materials and Geotechnical managers' awareness and guidance for working with hazardous chemicals in association with their job functions within their sections. An additional purpose of this Plan is to ensure that employees are not exposed to substances in excess of the Permissible Exposure Limits (PEL) established by the Vermont Occupational Safety and Health Administration (VOSHA), as set forth in 29 CFR Part 1910. *While the Plan establishes work practices to promote chemical safety in the laboratory, each individual has the responsibility of ensuring that good health and safety practices are followed in the laboratory.*

1.200 Scope

It is the policy of the Vermont Agency of Transportation to provide a safe and healthy workplace in compliance with VOSHA regulations, including the Laboratory Standard referenced above. This Plan applies to all laboratories in the Materials Testing and Certification and Geotechnical Engineering sections and all personnel who work, supervise or visit in these laboratories.

SECTION 2.000—DEFINITIONS

Agency: The Vermont Agency of Transportation.

Chemical Hygiene Committee: This committee is composed of the Materials Manager, Geotechnical Engineering Manager, Safety Liaison, Chemical Hygiene Officer and Radiation Safety Officer.

Hazardous Chemical: A chemical substance for which there is statistically significant evidence that acute or chronic health effects may occur in exposed employees.

Laboratory: A work area where use of hazardous chemicals occurs in relatively small quantities, on a non-production basis. Generally, a laboratory will occupy an entire room, but in special circumstances, a specific part of a room where hazardous chemicals are used may be defined as a laboratory area.

PPE: Personal Protective Equipment: Equipment worn to minimize exposure to a variety of hazards, e.g gloves or safety glasses..

Plan: This Chemical Hygiene Plan.

SDS: Safety Data Sheet, which describes hazards and safe use practices for chemicals.

SECTION 3.000—ROLES AND RESPONSIBILITIES

The responsibility to maintain chemical hygiene belongs to everyone; however, there are certain positions that are held responsible for particular aspects of this plan.

3.100 Materials Manager

The Materials Manager has the ultimate responsibility for chemical hygiene within his or her section and must, with other staff, provide continuing support for the Chemical Hygiene Plan. The Materials Manager will also chair the Chemical Hygiene Committee.

3.200 Geotechnical Engineering Manager

The Geotechnical Engineering Manager has responsibility for chemical hygiene within his or her section.

3.300 Chemical Hygiene Officer

The Materials Chemist will be the Chemical Hygiene Officer (CHO). The CHO must:

3.310 Work with the supervisors and other employees to develop and ensure appropriate chemical hygiene policies and practices.

3.320 Monitor procurement, use, inventory and disposal of chemicals.

3.330 See that appropriate audits are maintained.

3.340 Aid the Safety Coordinator in developing ongoing safety training and adequate facilities.

3.350 Know the current regulatory requirements regarding hazardous chemicals.

3.400 Safety Liaison

The Safety Liaison will work closely with the CHO on safety and training issues.

3.500 Unit Supervisors

Unit supervisors have overall responsibility for chemical hygiene in their work areas, including responsibility to:

3.510 Ensure that workers receive proper training, are aware of, comprehend and follow all chemical hygiene rules, as well as ensuring that Personal Protective Equipment is available, used appropriately, and taken out of service if found defective.

3.520 Provide regular, formal chemical hygiene and housekeeping inspections, including routine inspections of emergency equipment.

3.530 Know and understand the current regulatory requirements regarding hazardous chemicals, including the safe handling, labeling and proper storage of all hazardous chemicals that are used in the workplace. This includes management of Safety Data Sheets (SDS's) and understanding the content of SDS's for Chemicals that are used in the workplace.

3.540 Determine the required levels of personal protective equipment as specified in standard operating procedures and SDS's.

3.550 Work with the CHO and Safety Coordinator to ensure that the facilities and training in regard to chemical hygiene are adequate.

3.560 Review and update standard operating procedures in their units.

3.600 Other Employees

Materials Testing and Certification and Geotechnical Engineering Section workers are responsible for:

3.610 Reading the current Chemical Hygiene Plan and SDS's applicable to his or her work area.

3.620 Planning and conducting each operation in compliance with the Chemical Hygiene Plan.

3.630 Developing good personal chemical hygiene practices.

SECTION 4.000--TRAINING REQUIREMENTS

Initial training and provision of information will occur during the orientation period for new employees and prior to changing of work assignments for current employees if new work conditions warrant. The CHO and unit supervisors will discuss the work assignments, chemicals involved, the Chemical Hygiene Plan, Standard Operating Procedures (ASTM/AASHTO test procedures or in-house procedures), SDS's and personal protective equipment with the employee prior to him or her working with chemicals in a laboratory.

Annual refresher training will be provided to reinforce initial training and to advise employees of any changes in documents or procedures. This training is primarily self-guided, with assignments reviewed by the lab supervisor.

The Standard Operating Procedures (SOP's) will incorporate safety and health information to provide the necessary guidance with regard to the safe laboratory use of chemicals. Each laboratory will have its own specific SOP's based on the various tests being performed. ASTM and AASHTO test procedures already contain relevant safety information. In house procedures ("MRD's") must include a safety section.

SECTION 5.000—CHEMICAL SAFETY INFORMATION

5.100 Safety Data Sheets (SDS)

The primary source of chemical safety information at the Materials and Geotechnical Labs is the Safety Data Sheet. An SDS for each hazardous material used in a laboratory is maintained in a "Right to Know" folder located in each laboratory. This folder must be clearly marked and accessible to all personnel at all times. In addition, a master file of SDS's for all laboratories is located in the sample storage room. No one may use a hazardous chemical without first reading the SDS. Personnel working in the field who use hazardous chemicals must also have the relevant SDS's available; it is recommended that a folder be kept in the work vehicle. If an SDS

for a substance used in the workplace is not available, notify the Chemical Hygiene Officer or lab supervisor immediately.

5.200 Standard Operating Procedures (SOP's)

Any unusual or noteworthy chemical hazard inherent in a procedure must be noted in the safety section of the SOP (e.g. highly reactive or flammable chemicals). This safety information is included in AASHTO and ASTM test procedures used at the lab. Methods written in-house ("MRD's") must also include a safety section.

5.300 Additional Information

There are many other sources of chemical safety information that, while not required reading, may contain additional useful information. A large collection of chemical safety literature is located in the Chemistry lab. All are encouraged to examine this material.

SECTION 6.000 --- IDENTIFICATION AND CLASSIFICATION OF HAZARDOUS CHEMICALS

All workers must be aware of the specific chemicals they are working with and the hazards they present. Many chemicals used at this facility are toxic, corrosive, flammable or some combination of these three traits. It is important to understand the hazard and potential routes of exposure for any chemical used in the laboratory.

It is important to recognize that the toxicity of a mixture of two or more substances can be considerably greater than the combined effects of each substance alone ('synergistic effect'). In addition, reactions between two normally nonhazardous chemicals may form toxic reaction products. It must also be emphasized that some chemicals can fall into more than one hazard category; for example, hexavalent chromium is a carcinogen in addition to its corrosive and sensitizing properties.

6.100 Major Classes of Hazardous Chemicals

6.110 Carcinogens: Carcinogens are chemical or physical agents that cause cancer. Generally, carcinogens exhibit chronic toxicity, causing damage after repeated or long duration exposure. In many cases, effects only appear after a long latency period. For example, lung cancer in smokers typically develops after 30 or more years of exposure.

Examples of carcinogens that might be encountered at this facility (not a complete list):

- Phenolphthalein (Chemistry Lab).
- Coal tar (Field samples; old pavement cores).

6.120 Reproductive Toxins: These toxins can affect the reproductive health of both men and women, but pregnant women are at special risk. Effects can include death of the embryo or fetus, malformations and developmental defects. The hazard is most acute during the first trimester,

when a woman might not realize she is pregnant; therefore, any woman who is pregnant or intends to become pregnant must exercise special caution to avoid exposure to this class of toxins.

Examples of reproductive toxins that might be encountered at this facility (not a complete list):

- Mercury and mercury compounds(Thermometers, hydrometers).
- Xylenes(Bituminous Lab) .
- Trichloroethylene(Binder Lab).

6.130 Toxic Compounds: Substances in this category generally have toxic effects on one or more specific organs. The liver, kidneys, nervous system and lungs are particularly vulnerable. Toxic compounds may exhibit acute toxicity, chronic toxicity or both. Effects are related to both level and duration of exposure.

Examples of toxic compounds that might be encountered at this facility (not a complete list):

- Trichloroethylene (Binder Lab).
- Mercury and mercury compounds.
- Sodium oxalate (Chemistry Lab).

6.140 Irritants: Irritants cause reversible inflammation of the skin and other tissue. A wide variety of compounds are irritants, so it is prudent to avoid skin contact with all laboratory chemicals.

Examples of irritants that might be encountered at this facility (not a complete list):

- Sodium acetate (Chemistry Lab).
- Sodium chloride (Many labs, Field Samples).
- Magnesium sulfate (Aggregate Lab).

6.150 Sensitizers: A sensitizer is a substance that causes an allergic reaction in normal tissue after repeated exposure. Once an allergic reaction occurs, subsequent reactions will increase in severity and may become life threatening. It is therefore essential to avoid repeated exposure to sensitizers. After sensitivity has developed, the employee can no longer work with, or near, the offending material. This may mean that he would no longer be able to work in the laboratory.

Examples of sensitizers that might be encountered at this facility (not a complete list):

- Methyl methacrylate (in some adhesives and traffic marking materials).
- Isocyanates (in paint and polyurea markings).

6.160 Corrosive Substances: The chemical action of these substances cause destruction of living tissue at the site of contact. The main categories of corrosives are strong acids, strong bases, dehydrating agents and oxidizing agents. The skin and eyes are affected by corrosive liquid, solid and vapor. Dust and vapor can attack the lungs. In addition to destruction of body

tissue, corrosives can be dangerously reactive with other materials in the laboratory – in some cases, even a container made of the wrong material. It is particularly important to carefully follow safe work procedures when working with corrosives because immediate, permanent injury can be caused by one brief exposure.

Examples of corrosives that might be encountered at this facility (not a complete list):

- Hydrochloric acid (strong acid; Chemistry Lab).
- Sodium hydroxide (strong base; Chemistry Lab).
- Sulfuric acid (dehydrating agent; Chemistry Lab).
- Potassium permanganate (oxidizing agent; Chemistry Lab).

6.170 Flammable and Explosive Substances: These materials are in wide use in some labs. They must not be exposed to flame, sparks or excessive temperatures. Most flammable substances are also toxic, and often emit toxic fumes upon combustion. Many oxidizing substances and strong acids will react explosively with flammables. Highly sensitive explosive peroxides will form in some flammable liquids after long periods of storage, so employees should resist the urge to 'stock up'. Buy only the quantity that will be used in the next 3 to 6 months. Flammables should be stored in specially designed cabinets to minimize the hazard of fire and explosion. Workers also need to be aware of the hazard presented by static electric discharge during periods of cold or dry weather. Make sure that sparking does not occur near flammables.

Examples of flammables that might be encountered at this facility (not a complete list):

- Xylenes.
- Acetone (Chemistry Lab).
- Reagent alcohol (Binder Lab).

6.180 Radioactive Materials: Radioactive materials damage tissue by disrupting its function at the cellular level. Very high exposure can also cause thermal burns. Most radioactive materials are also toxins and carcinogens. Radioactive materials are highly regulated and the restrictions imposed by licensing must be followed scrupulously. Most radioactive materials fall under the control of the Nuclear Regulatory Commission and use is not governed by VOSHA. Questions about radioactive material use should be directed to the Radiologic Safety Officer.

Examples of radioactive materials that might be encountered at this facility (not a complete list):

- Density gauges (Field).
- X-ray tubes (Chemistry Lab or handheld instruments).

SECTION 7.000—GENERAL PROCEDURES FOR WORK WITH HAZARDOUS CHEMICALS

7.100 Preliminary Steps and Procedures

Prior to any work starting, the CHO must approve any operations that involve hazardous chemicals for which there are no approved SOP's available. This requirement does not apply to a revision of an established procedure which does not involve the use of additional hazardous chemicals.

7.110 Determine the hazardous properties of the chemicals to be used in the procedure.

- Identify the chemicals involved and the amounts that will be used.
- Use the SDS to determine toxicity, physical hazards, exposure limits and symptoms of exposure for each chemical.

7.120 Determine required control measures, PPE and work practices to minimize exposure

- Determine likely routes of exposure based on how the chemicals will be used and their properties.
    - Inhalation: risks are highest when gases, volatile liquids or dusts are used or generated. Heating many liquids will increase the potential for exposure.
    - Skin contact: The most likely route of exposure for most chemicals. Many chemicals can be absorbed into the bloodstream through intact skin.
    - Injection/ingestion: Not a normal route of exposure. Most exposure of this type occurs as a result of a laboratory accident (e.g. broken glass or splashing).

- Determine when to use fume hoods.
    - Procedures that use or generate volatile substances or dust should take place in a fume hood or with other suitable exhaust ventilation.

- Determine appropriate personal protective equipment (PPE). See Section 9.000 for more information.

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7.200 Prudent Handling Practices

- **Never** smell or taste any laboratory chemical.
- **Never** use mouth suction to pipet liquids or start a siphon. *A pipet bulb or similar tool must be used to provide suction.*
- Wash hands well with soap and water immediately after working with any laboratory chemicals.
- Eating, drinking, smoking, gum chewing or application of cosmetics or lip balm is not allowed in any laboratory area where hazardous chemicals are used.
- Do not store food, beverages or any eating or drinking utensils in laboratory areas where hazardous chemicals are used or stored.
- Immediately clean up small spills of chemicals on benches or in fume hoods using the appropriate PPE and in accordance with the recommended cleaning and disposal of waste response.
- Use and maintain personal protective equipment properly. PPE should be kept clean and stored in an area where it will not become contaminated. Inspect PPE prior to each use and correct any problems by cleaning, repairing or replacing the item in question.

- Working alone in any laboratory where hazardous materials are in use is not allowed unless there is another person in the building.

7.300 Be Prepared for Emergencies

Before beginning a procedure, know what specific action to take in the event of any accidental release or exposure. Know the location and proper operation of all safety equipment including fire extinguishers, eye wash stations, safety showers and spill control materials.

7.310 Spill Control

7.311 Definition: A *spill* is the release of a hazardous material to an area beyond its intended point of use and control. Unintended release of material within a fume hood, containment berm or similar control structures, or release confined to the work bench top, is not generally considered a spill, but proper cleanup procedures must still be followed.

7.312 Minor Spills

Minor spills that present no immediate threat to health, safety or the environment can be cleaned up by laboratory personnel. A minor spill is one that does not involve highly toxic materials, is not spilled in large quantity, does not represent a significant fire hazard and can be recovered before it is released to the environment. Such a spill can be controlled and cleaned up by one or two people. At a minimum, minor spills should be reported to the laboratory supervisor and the Chemical Hygiene Officer within two hours of the event. Notice of the spill should be posted to prevent other personnel from entering the area until cleanup is complete. Contaminated Spill Clean up materials must be disposed of properly.

Spill Kits

Spill kits are located in laboratory areas where hazardous chemicals are used. They include neutralizers for corrosive materials, absorbent pads for liquid spills and waste containers. Follow instructions in the kits for corrosive spills. Flammable liquids should be cleaned up with absorbent pads or tubes and packaged for disposal. Spills of hazardous solids should be carefully swept up into waste bags. All contaminated material, as well as the hazardous material, must be disposed of as hazardous waste. Coordinate removal of all contained spill waste with the CHO or Hazardous Materials Coordinator as soon as possible.

Mercury Spill Kits

Mercury spills constitute a special hazard due to the difficulty of recovering spills and its ability to absorb into laboratory fixtures and building materials. There are dedicated mercury spill kits in all labs that use mercury. They include special absorbent material and small vacuum pumps for retrieving droplets. Follow the directions in the kit carefully. Use a large amount of absorbent material to assure that the entire spill is captured. It is important to act quickly to minimize dispersal of the mercury. If mercury is spilled down a sink, it can usually be recovered from the drain trap. If this happens, contact the Chemical Hygiene Officer, Hazardous Materials Coordinator, and if desired, maintenance personnel for assistance. Handle captured mercury waste with extreme care and turn over to the Chemical Hygiene Officer for storage and disposal as soon as possible.

7.313 Major Spills

A major spill is generally defined as posing a significant threat to safety, health or the environment. In addition, any spill that requires reporting to environmental regulatory agencies is considered to be a major spill. Generally, any spill of two gallons or more of any hazardous substance must be reported. *Any* release of an *Acutely Hazardous Substance* from the Agency of Natural Resources list is a reportable occurrence. At this time, no Acutely Hazardous Substances are used here and no purchase, storage or use will be permitted without written permission from the Materials Manager.

It is required that any reportable spill be reported to Agency safety and/or hazardous materials coordinators within two hours of occurrence. If, for any reason, they cannot be contacted within two hours, the Agency of Natural Resources must be notified. In addition, the lab supervisor, Safety Liaison, Chemical Hygiene Officer and Materials Manager should be notified as soon as possible. Specific guidance for dealing with reportable spills is posted in each laboratory. These instructions must be followed exactly. These spill procedures are included in the appendix.

7.314 Evacuation

If a spill makes it unsafe to remain in the building, the evacuation procedure must be initiated. In general, if one or two people cannot contain the spill, the building should be evacuated, unless the hazardous material can be confined to one laboratory with no risk of fire or explosion. Evacuation is described in detail in the Emergency Action Plan.

- If there is time, notify the lab supervisor and/or the Materials Manager that an evacuation may be advisable. If they are in agreement, continue with the evacuation procedure.
- If guidance is not available or the situation is urgent, the individual must make the decision whether to evacuate. A high degree of caution is appropriate. An unnecessary evacuation is a small price to pay to avoid possible injury or exposure.
- Activate the fire alarm. Notify the Berlin Fire Department (911 or 223-5555) that there is a hazardous material release. If it is not safe to remain in the building, the fire department should be contacted via cell phone after evacuating.
- Notify the Department of Environmental Conservation at 1-800-641-5005.
- If it is safe to do so, shut down equipment and secure work and records.
- Coordinate removal of all contained spill waste with the CHO or Hazardous Materials Coordinator as soon as possible. Shut doors and windows as you leave.
- Proceed to the Evacuation Assembly Area as described in the Emergency Action Plan. Remain in the assembly area and await further instruction.

SECTION 8.000—ENGINEERING CONTROLS AND SAFETY EQUIPMENT

8.100 Engineering Controls

Engineering Controls are physical changes to the workspace that eliminate or reduce the hazard. Engineering Controls within the Laboratory environment include equipment and Laboratory Components that are designed to Prevent exposure to hazardous materials. Examples include fume hoods, equipment interlocks and glove boxes. The most common engineering control at this facility is the fume hood. Engineering controls are the preferred method for avoiding exposure, as they are usually less likely to fail than personal protective equipment (PPE) and often provide a higher level of protection.

Engineering controls must be in good working order *and must be used* to perform their intended function. If a procedure calls for the use of engineering controls, they must be used – no exceptions. Never attempt to tamper with any engineering control. If a malfunction is suspected, stop work and notify the CHO or Safety Liaison immediately. Do not continue the process until it is confirmed that the engineering control is functioning properly.

8.200 Safety Equipment

8.210 Eyewash Stations

Each laboratory has an eyewash station in case an accidental exposure occurs. If a hazardous material enters the eye, call for help immediately and activate the eyewash station while holding eyelids open and moving the eyes to ensure that the entire eye is washed. If only one eye is affected take care not to contaminate the other eye with the wash water. Wash the eyes for at least 15 minutes or until medical assistance is available. Eyewash stations must be inspected and maintained in accordance with manufacturer recommendations to ensure the quality and availability of the wash fluid.

8.220 Safety Showers

Safety showers are located in the chemistry and asphalt binder laboratories. Showers are to be used when a large area of the body has been exposed to hazardous chemicals. Wash for at least 15 minutes, discarding any clothing that is contaminated or in the way. An exposure significant enough to require use of the shower should be followed by medical screening. Safety Showers must be inspected, activated periodically and maintained in accordance with manufacturer recommendations to ensure proper temperature and water flow.

SECTION 9.000—PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is the last line of defense against exposure to hazardous materials. PPE is designed to provide protection if safe work practices and engineering controls are insufficient, or if they fail, *not to replace them.* Some common types of PPE are briefly discussed below. For more comprehensive information, please refer to the Personal Protective Equipment Plan.

9.100 Gloves

Gloves provide *temporary* protection from many hazardous chemicals and protection from thermal burns. All glove materials will eventually be penetrated by most solvents and corrosive chemicals, so gloves must be frequently changed, as needed, when performing work and glove condition should be observed through out the process. It is important to select the glove material with the best resistance to the chemical in question. The disposable nitrile gloves used in most labs will provide good all-around protection. If more protection is desired, a second pair of gloves can be worn over the disposable gloves. Gloves that are torn or otherwise damaged must be discarded immediately. If hot materials are handled, gloves specifically designed for the task must be worn. The temperature rating of the glove must exceed the temperature of the material being handled.

9.200 Eye Protection

Eye protection is particularly important in the lab because many chemical and thermal hazards can cause permanent injury or blindness.

9.210 Safety Glasses and Goggles

Safety glasses and goggles are the most familiar methods of eye protection. Safety glasses must meet the requirements of ANSI standard Z87, and must have side shields. Goggles provide additional protection when worn over safety glasses. Goggles are not meant to be worn alone. Wearers of prescription glasses may wear goggles over their prescription eyewear.

9.220 Face Shields

Face shields provide additional protection when handling very toxic, reactive or corrosive materials (e.g. sulfuric acid). Glasses must still be worn; face shields are not designed to be used alone.

9.240 *Special Note on Contact Lenses*

While VOSHA no longer prohibits the wearing of contact lenses in the laboratory, *it is strongly recommended that their use be avoided.* Lenses can trap corrosive chemicals on the eyeball and prevent the eyewash from working. Many solvents and solvent vapors can partially dissolve contact lenses and fuse them to the eyeball. A few studies do indicate that contact lenses provide some protection from minor exposure to irritants or hazardous materials but this is not the case in significant exposure, such as a splash that hits the victim in the eyes. Although the NIOSH study(CDC Current Intelligence Bulletin 59: https://www.cdc.gov/niosh/docs/2005-139/pdfs/2005-139.pdf?id=10.26616/NIOSHPUB2005139) that led to the revision of VOSHA rules failed to establish that contact lenses in the laboratory are unsafe, it also failed to establish that they are safe. The rule was changed due to a lack of conclusive evidence one way or another. Until more data becomes available, we should err on the side of caution and continue to regard contact use in the lab as unsafe.

9.300 Protective Clothing

9.310 Lab Coats

Lab coats can temporarily protect skin and clothing from damage but they do not provide barrier protection from large amounts of hazardous materials. If there is a significant splash or thermal hazard, additional protection such as a rubber apron or heat resistant vest should be worn. Contaminated lab coats must be disposed of to avoid future exposure. Carefully place contaminated lab coats in a plastic bag and take to the CHO for disposal.

9.320 Shoes

Steel toed shoes must be worn in any area where there is a significant risk of dropping heavy objects on the foot. For general lab work, street or athletic shoes are acceptable. Sandals or other open toed shoes are not allowed in any laboratory areas.

9.500 Miscellaneous

Each laboratory contains a basic first aid kit, located on the wall near the lab entrance. The asphalt binder lab also has a special burn treatment kit. Employees should take note of the location of these kits in their work areas. First Aid Kits are to be inspected monthly and re-stocked to ensure that they contain adequate supplies.

10.10. Container Labeling:

The CHO and unit supervisors will verify that all containers received will be clearly labeled as to their contents, and be accompanied by a hazard warning listing the name and address of the manufacturer and an SDS, all of which must be made available to employees.

The CHO and unit supervisors will make sure that all secondary containers are labeled with their contents and all appropriate hazard warnings. A copy of the SDS shall also be available in the work area. The Agency's Hazardous Materials and Waste Coordinator may be contacted to provide assistance in labeling.

SECTION 11.000—CHEMICAL STORAGE

Proper storage is an essential component of chemical safety. Chemicals must be properly labeled and stored in a secure area safe from breakage or spillage. In addition, chemicals must be segregated by category so that hazardous reactions cannot occur in the event of a leak or spill. For example, many strong acids and oxidizers can react with flammable liquids to form explosive mixtures.

Most chemicals should be stored in enclosed cabinets with clear labeling of the contents, along with appropriate hazard labels. Flammable materials should be stored in special flameproof cabinets. Compressed gases also merit special storage considerations, as noted in Section 12.

11.100 Compatibility

Care must be taken to avoid storing incompatible chemicals in the same area.

General Guidelines for Chemical Incompatibilities

	Acids, inorganic	Acids, oxidizing	Acids, organic	Alkalis (bases)	Oxidizers	Poisons, inorganic	Poisons, organic	Water-reactives	Organic solvents
Acids, inorganic			X	X		X	X	X	X
Acids, oxidizing			X	X		X	X	X	X
Acids, organic	X	X		X	X	X	X	X	
Alkalis (bases)	X	X	X				X	X	X
Oxidizers			X				X	X	X
Poisons, inorganic	X	X	X				X	X	X
Poisons, organic	X	X	X	X	X	X			
Water-reactives	X	X	X	X	X	X			
Organic solvents	X	X		X	X	X			

(Adapted from CRC Handbook of Laboratory Safety)

For example, *Nitric Acid* (oxidizing acid) is incompatible with *Xylene* (organic solvent). In this case, the xylene could catch fire and/or nitrated xylene could explode if accidental mixing occurs.

This chart is only a general guideline. Other specific incompatibilities may exist between certain chemicals. These incompatibilities will be noted in the SDS of the chemicals in question.

11.200 Inventory

Hazardous chemicals must be stored, labeled and inventoried properly to avoid mistaken identity, to enable separation of incompatibles and to provide information for emergency response personnel. Each laboratory shall conduct an inventory of all hazardous chemicals present at least annually, and this inventory shall be made available to the Chemical Hygiene Committee and administrative personnel.

SECTION 12.000—COMPRESSED GAS CYLINDERS

Compressed gas cylinders merit special consideration due to the extreme hazards that can be created by their misuse. Gas under high pressure that is stored or used incorrectly can result in a hazardous release of energy. A damaged cylinder can become a rocket capable of going through concrete block walls at very high speed. In exceptional cases, people up to several hundred feet away can be in serious danger from a ruptured cylinder. Many compressed gases are also flammable and/or toxic regardless of storage pressure. Gases stored as liquid in the compressed state (e.g. carbon dioxide) cool as they expand and can present a frostbite hazard if used incorrectly. Inert gases can also be dangerous. A large release may cause a suffocation hazard due to displacement of the room air.

12.100 Storing, Transporting and Using Compressed Gas Cylinders

12.110 Storage: Cylinders must be stored upright with their caps firmly attached, and secured in such a manner that they cannot be knocked over. Full and empty cylinders should be stored in separate designated areas and individual empty cylinders must be labeled as such. Cylinders must not be stored where they can be exposed to flames, very high temperatures or mechanical shock. Cylinders should be stored in a well ventilated area.

12.120 Transport: In general, compressed gas cylinders should only be delivered or removed from the building by the supplier. If a cylinder must be transported, it must be upright and capped (i.e. remove regulator and put on the cap when transporting, even a few feet) and secured against movement. Cylinders must never be transported in closed vehicles; only an open truck bed or special carrier is acceptable.

12.130 Usage: Compressed gas cylinders in use must be equipped with the correct regulator and associated fittings. They must be secured in an upright position in a safe location such that they cannot be knocked over. The regulator must be safe from other lab operations that might cause damage. Do not use, or attempt to repair, a damaged or defective regulator. It could expel parts and injure nearby workers or allow a hazardous release of gas. The valve on a gas cylinder connected to lab equipment should be turned off when the equipment is not in use.

SECTION 14.000 – MEDICAL MONITORING AND EXPOSURE ASSESSMENT

14.100 Medical Attention and Consultation

Laboratory employees who work with hazardous chemicals will be provided the opportunity to receive medical attention and consultation when:

- Symptoms or signs of exposure to a hazardous chemical develop.
- Monitoring reveals an overexposure.
- A spill, leak, explosion or other occurrence results in exposure.
- A regulatory standard requires medical monitoring.

Medical examinations will be conducted by a licensed provider and will be provided at a reasonable time and place at no cost to the employee. The employee must be informed of the results of any testing. The medical provider's written report shall not reveal any specific findings unrelated to occupational exposure.

14.200 Recordkeeping

The Materials and Geotechnical laboratories will maintain an accurate record for each employee of any measurements taken to monitor employee exposures and to document any medical consultations and examinations that were performed. These records will be maintained for the duration of employment at the laboratory plus 30 years. Employees will have access to these records upon request. Records of this nature will be retained by the Human Resources Department.

VERMONT AGENCY OF TRANSPORTATION
CONSTRUCTION AND MATERIALS BUREAU, CENTRAL LABORATORY
EMPLOYEE SAFETY ORIENTATION CHECKLIST

Employee's Name:_____ Date:_____

Position:_____

Unit:_____

Supervisor_____

Person Completing Orientation:_____ Title: _____

Employee Safety Rules

- ❑ Provided link to Chemical Hygiene Plan. Z:\Highways\CMB\MatTestingCert\Admin\Safety\Documents

- ❑ Provided link to Personal Protective Equipment Plan. Z:\Highways\CMB\MatTestingCert\Admin\Safety\Documents

- ❑ Provided link to Fire Protection Plan. Z:\Highways\CMB\MatTestingCert\Admin\Safety\Documents

Accidents and Incidents

- ❑ Discussed location and use of emergency eyewash stations.
- ❑ Discussed location of First Aid kits and Defibrillator.
- ❑ Discussed location and use of safety showers.
- ❑ Discussed procedures for hazardous material spills.
- ❑ Discussed use of fire extinguishers and fire alarms.

Reporting Injuries – Z:\Highways\CMB\MatTestingCert\Admin\Safety\Documents\REPORT OF INJURY

Emergency Procedures

- ❑ Identified location and use of emergency telephone numbers.
- ❑ Reviewed procedures for fire/medical emergencies.
- ❑ Reviewed Bomb Threat Checklist.
- ❑ Provided link to Emergency Action Plan.
- ❑ Reviewed Evacuation Plan.

Z:\Highways\CMB\MatTestingCert\Admin\Safety\Documents

Personal Protective Equipment Requirements

- ❑ Footwear
- ❑ Eye Protection
- ❑ Gloves
- ❑ Hearing Protection
- ❑ Hard Hat
- ❑ High Visibility Clothing
- ❑ Issued personal protective equipment.

Housekeeping

- ❑ Discussed common problems/corrective measures.
- ❑ Discussed materials storage areas and practices.

Hazard Communication/Rights to Know Compliance

- ❑ Discussed container labeling and MSDS information.
- ❑ Identified hazardous materials used in the work area.

Driver Safety Orientation

- ❑ Scheduled defensive driving training.
- ❑ Reviewed vehicle use procedures. See Section 5.0 of: Z:\Highways\CMB\MatTestingCert\Admin\Safety\Safety Orientation

Other Safety Concerns/Instruction

- ❑ _____
- ❑ _____

I confirm that I have read and understood the material presented today.

_____ (Employee Signature)

_____ (Print Name)

_____ (Date)

_____ (Supervisor Signature)

Vermont Agency of Transportation
Materials Research Laboratory

Monthly Laboratory Inspection Form

Date: _____

Laboratory: _____

Supervisor's Name (Print): _____

General Laboratory Safety					
	Item	Yes	No	N/A	Comments
	Are room signs present and accurately indicate hazard information?				
	Is the current Chemical Hygiene Plan kept in the lab?				
	Are extension cords being used properly?				
	Is there any exposed wiring or damaged electrical cords?				
	Are floors clear and aisles unobstructed? Is flooring in good condition with no loose or broken flooring?				
	Does equipment have proper guards?				
	Floors dry and free of slip hazards; bench tops (including fume hoods) reasonably organized and clean?				
Hazardous Materials & Waste					
	Item	Yes	No	N/A	Comments
	All containers, including non-hazardous chemicals and wastes, legibly labeled with the full chemical or trade name (note: abbreviations/ formulas are not adequate)?				
	Are the MSDS Sheets available in the lab?				
	Are there any chemicals being stored under the fume hoods and the sashes kept closed when not in use?				
	Are flammable chemicals stored in NFPA approved flammable storage cabinet?				
	Are chemicals stored by hazard class?				
	Are chemical reactions visible (discolored reagents, white haze on bottle)?				
	Are cylinders secured so they can't fall?				
	Are special waste containers properly marked concerning contents?				
	No hazardous materials near sinks or drains unless secondary containment is provided?				
	Is there insufficient storage space (containers stacked on top of each other)?				
	Are there any combustible material stored on top of ovens?				
	Are flammable materials kept away from open flames/heat sources?				

Vermont Agency of Transportation
Materials Research Laboratory

Monthly Laboratory Inspection Form

Laboratory Safety Equipment					
	Item	Yes	No	N/A	Comments
	Is eyewash station operating correctly?				
	Area around fire extinguishers, pull alarms, eyewash/ safety showers, and electrical panels kept clear?				
	Have any of the GFI circuits tripped? Is tripping a reoccurring event?				
	Are all fire extinguishers in place, fully charged, and checked monthly?				
	Are fire extinguisher inspection tags in place? (monthly and annual fire marshal)				
	Are exit routes kept free of obstructions?				
	Are First Aid Kits properly located and adequately stocked?				
	Are Mercury Spill Kits conveniently located and properly stocked?				
	Are PPE kept in clean environment?				
	Does the lab have appropriate PPE for work performed in this lab?				
	Are fume hoods working correctly?				

Other Laboratory Safety Issues & Concerns Noted by the Inspector		
	Item	Comments

Upon completion of the inspection please sign & date below. Inspection forms must be retained for three years. Problems noted on the form will need to be addressed through the M&R Chemical Hygiene Officer, Safety Coordinator and Materials & Research Engineer. This inspection form will be acknowledged as part of the regular safety inspection conducted quarterly by Laboratory Supervisors as required in the M&R Chemical Hygiene Plan.

Supervisor's Signature

Date