# CHEMICAL HYGIENE PLAN
# VERMONT AGENCY OF TRANSPORTATION
# MATERIALS AND RESEARCH SECTION

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Appendices

## SECTION 100.000--PURPOSE

Development of this plan will allow Materials and Research to comply with 29 CFR Part 1910.1450. This document was developed to provide employees working under the direction of the Materials and Research Engineer awareness and guidance when working with hazardous chemicals in association with their job functions within the Materials and Research (M&R) Section. In addition, this plan is to ensure that employees of the Materials and Research Section will not be exposed to substances in excess of the Permissible Exposure Limits (PEL) as set forth in 29 CFR Part 1910 established by the Occupational Safety and Health Act (OSHA).

## SECTION 100.005--DEFINITIONS

In addition to the definitions listed in 29 CFR 1910.1450(b) [See Appendix A], the following applies to this document:

Agency - Vermont Agency of Transportation

## SECTION 100.010--RESPONSIBILITIES

The responsibility to maintain chemical hygiene belongs to everyone within the M&R Section; however, there are certain positions that must be held responsible for particular aspects of this plan.

The responsibilities listed below conform to the suggestions found in 29 CFR 1910.1450, Appendix A. These may change in the future after implementation has taken effect.

A. The Materials and Research Engineer has the ultimate responsibility for chemical hygiene within M&R and must, with other staff, provide continuing support for the Materials and Research Section Chemical Hygiene Plan.

B. The Research and Testing Engineer, the Materials Engineer and the Soils and Foundations Engineer will be responsible for chemical hygiene in their respective areas.

**SECTION 100.010--RESPONSIBILITIES (continued)**

C. The Materials & Research Section Chemist will be the Chemical Hygiene Officer (CHO). The CHO must:

i. Work with the supervisors and other employees to develop appropriate chemical hygiene policies and practices for presentation to the Chemical Hygiene Committee (see 'G' of this section for committee makeup) for approval and subsequent implementation;

ii. Monitor procurement, use, inventory and disposal of chemicals used in M&R;

iii. See that appropriate audits are maintained;

iv. Aid the Safety Coordinator to develop precautions, ongoing safety training and adequate facilities; and

v. Know the current regulatory requirements regarding hazardous chemicals.

D. The Safety Coordinator will work closely with the CHO in regard to safety and training issues. The Safety Coordinator will also chair the Chemical Hygiene Committee.

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

i. Ensure that workers are aware of and follow the chemical hygiene rules, that personal protective equipment is available and in working order and is used, and that appropriate training has been provided;

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

iii. Know the current regulatory requirements regarding hazardous chemicals including the safe handling, labeling, and proper storage of all hazardous chemicals; and the maintaining, and understanding of all Materials Safety Data Sheets (MSDS);

**SECTION 100.010--RESPONSIBILITIES (continued)**

iv. Determine the required levels of personal protective equipment. Appendix B provides a listing of the personal protective equipment requirements for each laboratory within the Materials and Research Section;

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

vi. Review and update standard operating procedures in their units.

F. Materials and Research Section workers are responsible for:

i. Reading the current Chemical Hygiene Plan and MSDSs in his or her work area and signing the verification forms;

ii. Planning and conducting each operation in accordance with the Chemical Hygiene Plan; and

iii. Developing good personal chemical hygiene practices.

## SECTION 100.015--STANDARD OPERATING PROCEDURES

The Standard Operating Procedures (SOPs) will incorporate safety and health information to provide the necessary guidance in regard to the safe laboratory use of chemicals. Each laboratory will have its own specific SOPs based on the various tests being performed. Appendix B provides a reference to the SOPs.

In general, all laboratories should abide by the "Basic Rules and Procedures for Working with Chemicals", presented in Appendix C. All hazardous chemicals should not only be stored in proper receptacles and containers, but also be kept locked up during non-working hours.

## SECTION 100.020--CRITERIA FOR USE OF CONTROL MEASURES TO REDUCE EXPOSURE TO HAZARDOUS CHEMICALS

Minimizing the employee's exposure to hazardous chemicals in the workplace should be the Agency's and M&R's main goal in reference to this Chemical Hygiene Plan. M&R will measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

## SECTION 100.023--MAINTENANCE OF ENGINEERING CONTROLS

A laboratory inspection and maintenance sheet has been developed, (see Appendix E) for each lab. Each unit supervisor will use the sheet to perform quarterly inspections to ensure that all mechanical systems are functioning adequately. The maintenance form is designed to log dates of inspection, deficiencies and corrective actions taken.

## SECTION 100.025--TRAINING AND PROVISION OF INFORMATION

Initial training and provision of information will occur during the orientation period for new employees and prior to changing or shifting of work assignments for current employees. The CHO, Safety Coordinator and unit supervisors will discuss the work assignments, chemicals involved (including action levels, permissible exposure limits, signs and symptoms), the Chemical Hygiene Plan, SOPs, MSDSs, personal protective equipment, etc. with the employee prior to him or her working with chemicals in a laboratory. Documentation of this initial training will be distributed to all the parties involved, with the CHO responsible for the recording, distributing, and filing of this

**SECTION 100.025--TRAINING AND PROVISION OF INFORMATION continued**

documentation. Additional training may evolve from the monthly safety meetings, separate safety and training courses, as well as from refresher courses offered throughout the year.

G. The Chemical Hygiene Committee shall consist of the Safety Coordinator, the Research and Testing Engineer, the Chemical Hygiene Officer, the AOT Hazardous Material and Waste Coordinator and the AOT Safety Officer, with the Safety Coordinator acting as the chairperson. This committee will be responsible for the following:

i. Perform an annual review of the Chemical Hygiene Plan and act on presentations regarding chemical hygiene policies, procedures and practices submitted by the CHO;

ii. Present major facility modifications and other expenditures to the Materials and Research Engineer that are necessary for M&R to be in compliance with 29 CFR 1910.1450;

iii. Process employees' requests for medical exams under the provisions of 29 CFR 1910.1450; and

iv. Perform any other review functions that may develop. throughout the year.

The CHO and Safety Coordinator will develop a training program regarding chemicals used in the laboratories. The unit supervisors will be responsible for conformance with the SOPs for his or her particular area.

**SECTION 100.030--PRIOR APPROVAL FOR SPECIFIC LABORATORY OPERATIONS**

Prior to any work starting, the CHO must approve any operations that involve hazardous chemicals for which there are no approved SOPs available. The affected unit will have to present SOPs that address all elements of chemical safety in the laboratory to the Chemical Hygiene Committee for review and approval at its next scheduled meeting. Once the Committee has approved the SOPs, they will be included in the Chemical Hygiene Plan

## SECTION 100.035--MEDICAL CONSULTATION AND EXAMINATION

A. The Agency shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

i. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

ii. Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

iii. Whenever an event takes place in the work area such as a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for a medical examination.

B. All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

C. Information provided to the physician. The Agency shall provide the following information to the physician:

i. The identity of the hazardous chemical(s) to which the employee may have been exposed;

ii. A description of the conditions under which the exposure occurred, including quantitative exposure data, if available; and

iii. A copy of the MSDS for the chemical(s) in question.

iv. A description of the signs and symptoms of exposure that the employee is experiencing, if any.

## SECTION 100.035--MEDICAL CONSULTATION AND EXAMINATION continued

D. Physician's written opinion. For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

i. Any recommendation for further medical follow-up;

ii. The results of the medical examination and any associated tests;

iii. Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and

iv. A statement that the employee has been informed by the physician of the results of the consultation or medical examination, and of any medical condition that may require further examination or treatment.

The written opinion shall not reveal specific findings or diagnoses unrelated to occupational exposure.

## SECTION 100.040--HAZARD IDENTIFICATION

A. Container Labeling:

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

The CHO and unit supervisors will make sure that all secondary containers are labeled with either an extra copy of the original manufacturer's label or with generic labels which have a block for identity and blocks for the hazard warning. Stationary process containers will have a sign indicating the appropriate hazard warning, and a copy of the MSDS shall
also be posted in the work area. The Agency's Hazardous Materials and Waste Coordinator may be contacted to provide assistance in labeling.

## SECTION 100.040--HAZARD IDENTIFICATION continued

B. Material Safety Data Sheets

The CHO has the responsibility of maintaining the MSDS system for M&R. The master listing will be kept in a yellow three ring binder, labeled "MATERIAL SAFETY DATA SHEETS" in the Administrative Unit (Main Office). In addition, a copy of a pertinent MSDS will be kept in the appropriate laboratory, for each chemical in that area.

Before any hazardous chemical is accepted within M&R, the MSDS shall be included with, or accompanied by, the container. In addition, products submitted for evaluation by M&R shall include return shipping labels and postage so that the material may be returned to the original owner. The CHO will check the MSDS against the current listing noting any changes. The CHO will then request that the MSDS be read by the employee(s) and will provide a copy for the work area. The employee(s) will then sign the verification form after the employee(s) has read and understood the relevant sections of the MSDS.

## SECTION 100.045--RECORD KEEPING

M&R 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 in accordance with Section 100.035.

## SECTION 100.050--CONSUMPTION OF FOOD AND BEVERAGES

No employee or visitor shall be allowed to consume food or beverages in any laboratory areas where chemicals are used or stored. (Reference OSHA Subpart J, Standard 1910.141, (g) (2)).

## SECTION 100.055--SPILLS, ACCIDENTS, AND WASTE DISPOSAL

Please refer to the AOT Central Garage Hazardous Waste Material Emergency Contingency Plan & Emergency Response Plan. A copy can be acquired from the Chemical Hygiene Officer (CHO) and the Safety Coordinator in the Materials & Research Section.

## APPENDIX A PAGE A1

### Occupational Safety and Health Administration (OSHA) Standard 1910.1450

### OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES

Synopsis of OSHA regulations:

A. Scope and application - Applies to all employers engaged in the laboratory use of hazardous chemicals.

B. Abridged definitions -

Action Level: A concentration level for a specific substance which initiates certain required activities such as exposure monitoring and medical surveillance.

Assistant Secretary: Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor.

Chemical Hygiene Officer: Designated by employer, qualified by training or experience.

Chemical Hygiene Plan: A written program developed and implemented by the employer.

Combustible liquid: Any liquid having a flashpoint at or above $100^{o}$ F. ($37.8^{o}$C) but below $200^{o}$F ($93.3^{o}$C).

Compressed gas: 1) A gas or mixture of gases having an absolute pressure exceeding 40 psi at $70^{o}$F.
2) A gas exceeding 104 psi at $130^{o}$F.
3) A liquid having vapor pressure exceeding 40 psi at $100^{o}$F

Emergency: Any occurrence which results in an uncontrolled release of a hazardous chemical into the workplace.

## OSHA Standard 1910.1450
## OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES (continued)

Employee: Any individual employed in a laboratory workplace who may be exposed to hazardous chemicals, in the course of his or her assignments.

Explosive: A chemical that causes a sudden release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Flammable: A chemical that falls into one of these categories: aerosol flammable, gas, flammable, liquid flammable.

Flammable Liquid: Any liquid having a flashpoint below $100^{o}$ F ($37.8^{o}$ C).

Flashpoint: Minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite.

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

Permissible ExposureLimit (PEL):The maximum concentration (defined by OSHA), of a chemical averaged over 8 hours, to which 95% of healthy adults can be repeatedly exposed 8 hours per day, 40 hours per week. If the PEL is exceeded, respiratory protection is mandatory.

Threshold Limit Value (TLV): The concentration of a chemical in air to which nearly all individuals can be exposed 8 hours per day over extended periods of time without adverse effects.

C. Permissible exposure limits: The employer shall assure laboratory employees' exposures to hazardous substances do not exceed the permissible exposure limits specified in 29 CFR Part 1910, Subpart Z.

## OSHA Standard 1910.1450
## OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES
## (continued)

D. Employee exposure determination: If there is reason to believe that exposure levels exceed the permissible exposure limits, the employer shall conduct an initial monitoring of any substance regulated by a standard, conduct periodic monitoring if the exposure exceeds the PEL, terminate the monitoring, and notify the employee of the monitoring results.

E. Chemical hygiene plan - General: The employer shall develop and carry out the provisions of a written chemical hygiene plan.

F. Employee information and training: The employer shall provide employees with information and training to ensure they are aware of hazards of chemicals present.

G. Medical consultation and medical exams: The employer shall provide all employees who work with hazardous chemicals medical attention including follow-ups.

H. Hazard identification: This includes labels and material safety data sheets.

I. Use of respirators: Where it is necessary to maintain exposure below permissible exposure limits, the employer shall provide proper respiratory equipment and training in its use. This is in accordance with 29 CFR 1910.134.

J. Record keeping: The employer shall keep accurate records for all employees of any measurements taken to monitor employee exposures, including any medical records.

K. Dates: This section became effective May 1, 1990.

**Note:** A complete copy of OSHA Standard 1910.1450- "Occupational Exposure to Hazardous Chemicals in Laboratories" is available from the Chemical Hygiene Officer (CHO) in the M&R Section.

## References for Standard Operating Procedures (SOP) and Hazard Assessment:



**Reference for Hazard Assessment Codes:**

**Personal Protective Equipment and Other Protective Measures**

| CODE | DESCRIPTION |
|---|---|
| FW | Full Coverage Footwear |
| GH | Hot Gloves |
| GR | Rubber Gloves |
| GRE | Insulated Rubber Gloves (Voltage Rated) |
| GN | Nitrile Gloves |
| GW | Work Gloves |
| H | Hearing Protection |
| HH | Hard Hat / Orange Cap |
| Hood | Hood |
| LC | Lab Coat |
| NO | No Loose Clothing |
| Radiation Badge | Radiation Badge |
| RESP | Respirator |
| STB | Steel-Toed Boots |
| SG | Safety Glasses / Goggles |
| SGF | Safety Face Shield (worn over glasses or goggles) |
| TV | Tyvek Suit |
| V | Vest |
| Vent | Ventilation |

## APPENDIX B PAGE B2

## ADMINISTRATIVE OFFICE AREA

**MATERIALS / CHEMICALS USED (Trade Name)**

Accuduster
Expo Cleaner For Dry Erase Surfaces
Liquid Paper Correction Fluid
Rubber Cement
Stamp Pad Inks
Toner, Copier & Fax & Printer
Toner, Color Printer
UniSan Dry Air Freshener
X-Stamper Ink

**APPENDIX B PAGE B3**

**AGGREGATE LAB**

**TESTS**

- AASHTO T2 / ASTM D75
- AASHTO T11 / ASTM C117
- AASHTO T19 / ASTM C29
- AASHTO T21 / ASTM C40
- AASHTO T27 / ASTM C136
- AASHTO T37 / ASTM D546
- AASHTO T84 / ASTM C128
- AASHTO T85 / ASTM C127
- AASHTO T96 / ASTM C131
- AASHTO T104
- AASHTO T112 / ASTM C142
- AASHTO T248 / ASTM C702
- AASHTO T255 / ASTM C566-89
- VAOT - MD 22
- VAOT - MD 23

**CHEMICALS (Trade Name)**

- Barium Chloride
- Crystalline Silica (aggregate samples)
- Ferrous Sulfate
- Hydraulic Oil (in Gilson testing shaker)
- Mercury
- Sodium Hydroxide
- Sodium Sulfate

## APPENDIX B PAGE B4

## AGGREGATE LAB

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 2-91 | Sampling of Aggregates | Quarries, Heavy Objects, Noise | HH, STB, GW, H |
| T 11-91 | Materials Finer than 75mm (No.200 Sieve) in Mineral Aggregates by Washing | Oven, Dishwasher Detergent | GH, SG, LC |
| T 19-93 | Unit Weight and Voids in Aggregate | Oven, Heavy Objects | GH, GW, STB |
| T 21-91 | Organic Impurities in Fine Aggregates for Concrete | Sodium Hydroxide | SG, GN |
| T 27-93 | Sieve Analysis of Fine and Coarse Aggregates | Oven, Dust, Heavy Objects, Noise | GH, H, STB, Vent |
| T 37-95 | Sieve Analysis of Mineral Filler for Road and Paving Materials | Oven, Dust, Heavy Objects, Noise | GH, H, STB, Vent |
| T 84-95 | Specific Gravity and Absorption of Fine Aggregate | Oven, Glass | GH |
| T 85-91 | Specific Gravity and Absorption of Coarse Aggregate | Oven | GH |
| T 96-92 | Resistance to Abrasion of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine | Moving Drum, Noise, Heavy Objects, Oven, Dust | STB, H, GH, NO, Vent |
| T 104-92 | Soundness of Aggregate by use of Sodium Sulfate or Magnesium Sulfate | Sodium Sulfate or Magnesium Sulfate, Barium Chloride | SG, GN |
| T 112-91 | Clay Lumps and Friable Particles in Aggregate | Oven | GH |
| T 248-95 | Reducing Field Samples of Aggregate to Testing Size | Heavy Objects, Dust | STB, Vent |
| T 255-92 | Total Moisture Content of Aggregate by Drying | Oven | GH |
| VT AOT MRD 22 | Determination of Thin and/or Elongated Particles in Coarse Aggregate | | |
| VT AOT MRD 23 | Determination of Coarse Aggregate Particles with Fractured Faces | Thermometers, Mercury | SG, GR, Vent |

**Appendix B Page B5**
**Analytical Lab**

TESTS: AASHTO T-105, T-288, T-289, T-290, T-291, T-299.
ASTM D562, D711, D1155, D1214, D1475.

CHEMICALS USED:

Acetic acid
Acetone
Acid Fuchsin stain
Ammonium carbonate
Ammonium chloride
Ammonium hydroxide
Ammonium nitrate
Ammonium oxalate
Ammonium phosphate
Bacdown hand soap
Barium chloride
Calcium carbide
Calcium carbonate
Calcium chloride
Clayton Yellow stain
Copper metal
Copper sulfate
Ethanol, denatured
Ethylene glycol
Formaldehyde
Glycerin
Hexanes
Hydrochloric acid
Indigo Carmine stain
Iron metal (powder)
Latex paint
Lead acetate
Lead metal
Magnesium metal
Malachite Green stain
Mercuric chloride
Mercury metal
Methyl Orange stain
Methyl Red stain
Nickel metal
Nitric acid
No Count decontamination spray
pH buffer solutions
Phenolphthalein
Portland cement
Potassium chloride
Potassium chromate
Potassium hydroxide
Potassium nitrate
Potassium permanganate
2-Propanol (Isopropanol)
Rhodamine B Base stain
Silver nitrate
Sodium carbonate
Sodium chloride
Sodium cobaltinitrite
Sodium hydroxide
Sodium oxalate
Sparkleen detergent
Stannous chloride
Staticide solution
Sulfuric acid
Talc (powder)
Tetrahydroxyquinone stain
Tin metal
Toluene
Trichloroethylene
Uranyl acetate
X-Ray Mix powder
Xylenes
Zinc metal

**ANALYTICAL LAB (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| AASHTO T-105 | Chemical Analysis of Portland Cement | Muffle furnaces, open flames, cement dust, strong acids, strong Bases, oxidizers, flammable liquids, Irritating fumes. | Vent, SG, LC, Hood, GN, FW |
| AASHTO T-288 | Minimum Soil Resistivity | Dust. | Vent, GN, LC, |
| AASHTO T-289 | Soil pH | Dust, pH buffers. | Vent, GN, LC, SG |
| AASHTO T-290 LC,SG | Sulfate in Soil | Dust, Barium chloride, Muffle furnace. | Vent, Hood, |
| AASHTO T-291 | Chloride in Soil | Dust, Silver nitrate. | Vent, LC, GN, SG |
| AASHTO T-299 | ASR in Concrete-Uranyl Acetate Method | Dust, Uranyl Acetate | Vent, LC,GN, SG |
| ASTM D562 | Viscosity of Paint | Latex Paint | LC, GN, SG |
| ASTM D711 | No-Pickup Time | Latex Paint | LC, GN, SG |
| ASTM D1155 | Roundness of glass Spheres | Dust | LC, GN, SG |
| ASTM D1214 | Sieve Analysis of Glass Spheres | Dust | LC, GN, SG |
| ASTM D1475 | Density of Paint | Latex Paint | LC, GN, SG |

**APPENDIX B PAGE B7**
**STILL ROOM**

| TEST | NAME | HAZARDS | PPE CODES |
|---|---|---|---|
| Xylene Reclamation by Distillation | | Flammable liquids, Heat, Xylene vapor | LC, Vent, LG, RG, SG |

## ASPHALT CEMENT LAB

**TESTS**

- AASHTO T40
- AASHTO T44/ ASTM D2042
- AASHTO T48/ ASTM D92
- AASHTO T49/ ASTM D5
- AASHTO T50/ ASTM D139
- AASHTO T53/ ASTM D36
- AASHTO T59/ ASTM D244
- AASHTO T72/ ASTM D88
- AASHTO T164/ASTM D2172
- AASHTO T170/ASTM D1856
- AASHTO T228/ASTM D70
- AASHTO T240/ASTM D2872
- AASHTO PP1
- AASHTO TP1
- AASHTO TP5
- AASHTO TP48

**CHEMICALS USED (Trade Name)**

- Acetone
- Ammonium Carbonate
- Antifreeze (in ATS DSR)
- Asphalt Cements, All Grades
- Asphalt PG Graded Binders
- Carbon Dioxide Gas
- Chromerge Solution
- Dura Board-fiberfrax
- Formaldehyde
- Glycerin
- HG Absorb (in spill kit)
- P-Xylene
- Mercury
- Mineral Oil
- Reagent Alcohol (in Bending Beam Apparatus)
- Talc
- Trichloroethylene

**ASPHALT LAB**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 40 | Sampling Bituminous Materials | Hot Asphalt, Work Area, Anti-strip Additives | HH, STB, GH, LC, SGF,GN |
| T 44 | Solubility of Bituminous Materials | Hot Asphalt, Trichloroethylene, Oven | GN, GH, SGF, LC |
| T 48 | Flash and Fire Points by Cleveland Open Cup | Hot Asphalt, Open Flame, Anti-strip Additives | LC, SGF, GH, GN |
| T 49 | Penetration of Bituminous Materials | Hot Asphalt, Anti-strip Additive | LC, SGF, GH, GN |
| T 50 | Float Test for Bituminous Materials | Hot Asphalt, Anti-strip Additive | LC, SGF, GH, GN |
| T 53 | Softening Point of Bitumen by Ring and Ball Apparatus | Glycerin, Ethylene Glycol, Silicon, Asphalt | GN, GH, SGF, LC |
| T 59 | Testing Emulsified Asphalts | Xylene, Asphalt | GN, SGF, LC |
| T 72 | Saybolt Viscosity | Xylene, Hot Asphalt | GN, GH, SGF, LC |
| T 164 | Quantitative Extraction of Bitumens From Bituminous Paving Mixtures | Anti-strip Additives, VOC's, Trichloroethylene, Oven, Ammonium Carbonate | GH, GN, SGF, LC, SG, Hood |
| T 170 | Recovery of Asphalt from Solution by Abson Method | Trichloroethylene, Asphalt, Anti-strip Additives, Open Flame, Explosion | SGF, LC, GH,GN, Hood |
| T 228 | Specific Gravity of Semi-Solid Bituminous Materials | Hot Asphalt, Oven | SGF, LC, GH |
| T 240 | Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test) | Hot Asphalt, Oven | SGL, LC, GH |
| PP-1 | Pressure Aging Vessel | Hot Oven, Hot Asphalt | GH, SGF, LC |
| TP-1 | Bending Beam Rheometer | Reagent Alcohol, Glycerin, Talc | GN, SGF, LC |

**BITUMINOUS CONCRETE LAB**
**(Continued)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| TP-5 | Dynamic Shear Rheometer | Hot Asphalt, Oven | GH, SGF, LC |
| TP- 48 | Rotational Viscometer | Hot Asphalt, Oven | GH, SGF, LC |

**BITUMINOUS CONCRETE LAB (FIELD AND CENTRAL)**

**TESTS**

- AASHTO T-2
- AASHTO T-11
- AASHTO T-27
- AASHTO T-30
- AASHTO T-40
- AASHTO T-84
- AASHTO T-85
- AASHTO T-96
- AASHTO T164/ASTM D2172
- AASHTO T-166
- AASHTO T-168
- AASHTO T-170
- AASHTO T-176
- AASHTO T-209
- AASHTO T-245
- AASHTO T-269
- AASHTO TP-4
- VAOT MRD 1
- VAOT MRD 6
- VAOT MRD 10
- VAOT MRD 13
- VAOT MRD 14
- VAOT MRD 15
- VAOT MRD 22
- VAOT MRD 23

**CHEMICALS USED (Trade Name)**

- Asphalt Cements, All Grades
- Calcium Chloride
- Dishwasher Detergent (Calgon)
- Formaldehyde
- Hydrated Lime/Slaked Lime (CaOH)
- Hydrochloric Acid 36-37%
- Mercury
- Motor Oil
- 2-Propanol
- Reagent Alcohol
- Trichloroethylene
- WD-40
- P-Xylene

**BITUMINOUS CONCRETE LAB (FIELD AND CENTRAL) (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 2 | Sampling Aggregates | Quarries, Heavy Objects, Noise | HH, STB, GW, H |
| T 11 | Materials Finer than 75mm (No.200 Sieve) in Mineral Aggregates by Washing | Oven, Dishwasher Detergent | GH, SG, LC |
| T 27 | Sieve Analysis of Fine and Coarse Aggregates | Oven, Dust, Heavy Objects, Noise | GH, Hood, STB, H |
| T 30 | Mechanical Analysis of Extracted Aggregate | Oven, Dust, VOC's, Heavy Objects, Noise, Dishwasher Detergent | GH, Hood, H, SG, LC STB |
| T 40 | Sampling Bituminous Materials | Work Area, Hot Asphalt, Splashing, Noise | SGF, LC, STB, HH, GH, H |
| T 84 | Specific Gravity and Absorption of Fine Aggregate (C) | Oven | GH |
| T85 | Specific Gravity and Absorption of Coarse Aggregate (C) | Oven | GH |
| T 96 | Resistance to Abrasion of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (C) | Moving Drum, Noise Heavy Objects, Oven | STB, H, NO, GH |
| T 164 | Quantitative Extraction of Bitumen from Bituminous Paving Mixtures | Anti-strip Additives, Hot Bituminous Concrete VOC's, Trichloroethylene | SG, GH, GN, Hood, LC, SGF |
| T 166 | Bulk Specific Gravity of Compacted | | |

| | | | |
|---|---|---|---|
| | Bituminous Mixtures Using Saturated Surface-Dry Specimens | | |
| T 168 | Sampling Bituminous Paving Mixtures | Hot Asphalt, Anti-strip Additives, Oven, Noise | SG, H, HH, GH, STB, LC |



**BITUMINOUS CONCRETE LAB (FIELD AND CENTRAL) (CONTINUED)**

| | | | |
|---|---|---|---|
| T 170 | Recovery of Asphalt from Solution by the Abson Method | Trichloroethylene, Asphalt, Anti-strip Additives, VOC's Heat, Explosion | SGF, LC, (C)GH, GN, Hood, |
| T 176 | Plastic Fines in Graded Aggregates and Soil by use of Sand Equivalency Test | Calcium Chloride, Formaldehyde | GN, SG, LC |
| T 209 | Maximum Specific Gravity of Bituminous Paving Mixtures | Hot Asphalt, Anti-strip Additives, Oven | SG, GH, LC |
| T 245 | Resistance to Plastic Flow of Bituminous Mixtures using Marshall Apparatus | Oven, Asphalt, Anti-strip Additives, Heavy Objects, Noise | SG, STB, GH, H, LC |
| T 269 | Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures | | |
| TP-4 | Preparing and Determining the Density of HMA using the SHRP Gyratory Compactor | Oven, Hot Asphalt, Heavy Objects | GH, SG, STB, LC |
| VT AOT MRD 1 | Vermont Test for Stability of Anti-strip Additive in Asphalt Cement - 96 Hour Method | Oven, Hot Asphalt | SG, GH, LC |
| VT AOT MRD 6 | Vermont Test for Acid Insoluble Residue | Oven, Hydrochloric Acid | SGF, GH, GR, LC |
| VT AOT MRD 10 | Effectiveness of Anti-Strip Additive in Asphalt Cement - Boiling Method | Anti-strip Additives, Hot Water, Open Flame, Hot Asphalt, Oven | SG, GH, LC |
| VT AOT MRD 13 | Quantitative Extraction of Bitumen from Bituminous | Asphalt, Xylene, Oven, Hot Bituminous Concrete | SG, GN, GH, LC |

Paving Mixtures

| | | | |
|---|---|---|---|
| VT AOT MRD 14 | Mechanical Analysis of Extracted Aggregate | Oven, Dust, VOC's, Heavy Objects, Noise | GH, Hood, STB, H |

## APPENDIX B PAGE B14

**BITUMINOUS CONCRETE LAB (FIELD AND CENTRAL) (CONTINUED)**

| | | | |
|---|---|---|---|
| VT AOT MRD 15 | Sieve Analysis | Oven, Dust, Heavy Objects, Noise | GH, Hood, STB, H |
| VT AOT MRD 22 | Determination of Thin and/or Elongated Particles in Coarse Aggregate | Dust, Heavy Objects | Vent, STB |
| VT AOT MRD 23 | Determination of Coarse Aggregate Particles with Fractured Faces | Dust, Heavy Objects | Vent, STB |
| ASTM 4791 | Test Method for Elongated and Flat Particles | Dust, Heavy Objects | Vent, STB |
| ASTM D5821 | Determining the Fractured Particles in Coarse Aggregate | Dust, Heavy Objects | Vent, STB |

## CEMENT LAB AND TINIUS ROOM

### TESTS

- AASHTO T129 / ASTM C187
- AASHTO T131 / ASTM C191
- AASHTO T-27 / ASTM C-136
- AASHTO T137 / ASTM C185
- AASHTO T153 / ASTM C204
- AASHTO -- / ASTM C778
- AASHTO T154 / ASTM C266
- AASHTO T106 / ASTM C109
- AASHTO T107 / ASTM C151
- AASHTO T162 / ASTM C305
- AASHTO T186

### CHEMICALS USED

- Calcium Hydroxide (used to prepare saturated lime solution)
- Crystalline Silica (Ottawa Sand)
- Flake Graphite
- Fly Ash
- Form Coating
- Mercury
- Paraffin Wax
- Phenolphthalein
- Portland Cement, All Types
- 2-Propanol
- Red Reader Glymol
- Silica Fume Cement and Slurry
- Sodium Hydroxide
- WD-40
- Vacuum Grease

## CEMENT LAB AND TINIUS ROOM

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 22-92 | Compressive Strength of Cylindrical Concrete Specimens | Capping Compounds, Heavy Objects, Flying Debris, Noise | SG, GH, GR, STB, LC, H |
| T 27-93 | Sieve Analysis of Fine and Coarse Aggregates | Oven, Dust, Heavy Objects, Noise, Sodium Hydroxide | GH, Hood, STB, H |
| T 68-96 | Tension Testing of Metallic Materials | Heavy Objects, Noise, Flying Metal, Sharp Edges, Band Saw | SG, H, STB, GW, NO |
| T 80-93 | Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials | Pinch Point | NO |
| T 106-92 | Compressive Strength of Hydraulic Cement Mortar (Using 2in. 50mm Cube Specimens) | Mixer, Cement Dust, Cement Paste, Splashing, Heavy Objects, Flying Debris | NO,SG, GR, STB, LC |
| T 107-91 | Autoclave Expansion of Portland Cement | Steam, High Pressure, Flake Graphite | GH, SG, LC, GR |
| T 127-90 | Sampling and Testing of Hydraulic Cement | Cement Dust, Cement Paste, Work Zones | SG, GW, STB |
| T 129-88 | Normal Consistency of Hydraulic Cement | Cement Dust, Cement Paste, Work Zone | SG, GW, STB |
| T 131-93 | Time of Setting of Hydraulic Cement by Vicat Needle | Mixer, Cement Dust, Cement Paste, Splashing | SG, GR, LC, NO |
| T 137-93 | Air Content of Hydraulic Cement Mortar | Mixer, Cement Dust, Cement Paste, Splashing | SG, GR, LC, NO |

| | | | |
|---|---|---|---|
| T 153-93 | Fineness of Portland Cement by Air Permeability Apparatus | Cement Dust, Red Reader Glymol | SG, GR, LC |



**CEMENT LAB AND TINIUS ROOM (CONTINUED)**

| | | | |
|---|---|---|---|
| T 154-91 | Time Setting of Hydraulic Cement by Gilmore Needles | Mixer, Cement Dust, Cement Paste, Splashing | SG, GR, LC, NO |
| T 162- 92 | Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency | Mixer, Cement Dust, Splashing, Cement Paste | SG, GR, LC, NO |
| T 186-97 | Early Stiffening of Hydraulic Cement | Mixer, Cement Dust, Splashing, Cement Paste | SG, GR, LC, NO |
| T231-90 | Capping Cylindrical Concrete Specimens | Hot Pot, Splashing Sulfur, Fumes | GH, GW, SG,LC Hood, Vent |
| T 244-92 | Mechanical Testing of Steel Products | Heavy Objects, Noise, Flying Metal, Sharp Edges, Band Saw | SG, H, STB,GW, NO, SG, GR |

**APPENDIX B PAGE B18**

**CONCRETE LAB - STRUCTURAL**

**TESTS**

AASHTO T-2 / ASTM D-75
AASHTO T-19 / ASTM C-29
AASHTO T-21 / ASTM C-40
AASHTO T-22 / ASTM C-39
AASHTO T-23 / ASTM C-31
AASHTO T-24 / ASTM C-42
AASHTO T-27 / ASTM C-136
AASHTO T-68 / ASTM E-8
AASHTO T-80 / ASTM E-18
AASHTO T-84 / ASTM C-128
AASHTO T-85 / ASTM C-127
AASHTO T-96 / ASTM C-131
AASHTO T-97 / ASTM C-78
AASHTO T-106 / ASTM C-109
AASHTO T-107 / ASTM C-151
AASHTO T-119 / ASTM C-143
AASHTO T-121 / ASTM C-138
AASHTO T-126 / ASTM C-192
AASHTO T-127 / ASTM C-183
AASHTO T-129 / ASTM C-187
AASHTO T-131 / ASTM C-191
AASHTO T-137 / ASTM C-185
AASHTO T-141 / ASTM C-172
AASHTO T-152 / ASTM C-231
AASHTO T-153 / ASTM C-204
AASHTO T-154 / ASTM C-266
AASHTO T-155 / ASTM C-156
AASHTO T-161 / ASTM C-666
AASHTO T-177 / ASTM C-293
AASHTO T-196 / ASTM C-173
AASHTO T-197 / ASTM C-403
AASHTO T-231 / ASTM C-617
AASHTO T-244 / ASTM A-370
AASHTO T-248 / ASTM C-702
AASHTO T-255 / ASTM C-566

AASHTO T-277
ASTM C-567
ASTM C-642
ASTM C-805
ASTM C-1064
VT AOT-MRD 22
VT AOT-MRD 23
VT AOT-MRD 40
Rapid Chloride Permeability



**CHEMICALS USED**

Air Entraining Admixtures
Accelerating Admixtures
Admixtures
Capping Compound
Cement, All Types
Cementitious Repair Material (Grouts & Mortars)
Curing Compounds
Drierite
Epoxies
Fly Ash
Form Coating
High Range Water Reducing Admixtures
Hydrochloric Acid
Methyl Ethyl Ketone
Mercury
Paraffin Wax
Phenolphthalein
Portland Cement, All Types
2 Propanol (Isopropyl Alcohol)
Ready Mixed Concrete
Retarding Admixtures
Silica Fume
Silicone Lubricant
Sodium Chloride
Sodium Hydroxide
Water Reducing Admixtures
WD-40

**CONCRETE LAB- STRUCTURAL (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 2-91 | Sampling of Aggregates | Quarries, Heavy Objects, Noise | HH, STB, GW, H |
| T 19-93 | Unit Weight and Voids in Aggregate | Oven, Glass Plate, Heavy Objects | GH, GW, STB |
| T 21-93 | Organic Impurities in Fine Aggregates for Concrete | Sodium Hydroxide | SG, LC, GR |
| T 22-92 | Compressive Strength of Cylindrical Concrete Specimens | Heavy Objects, Flying Debris, Noise | STB, SG, H |
| T 23-93 | Making and Curing Concrete Test Specimens in the Field | Construction Area, Splashing Concrete, Noise, Heavy Objects, Traffic | HH, V, STB, SG, H, GW |
| T 24-93 | Obtaining and Testing Drilled Cores and Sawed Beams of Concrete | Drill, Saw, Heavy Objects, Flying Debris Noise, Traffic | HH, V, STB, SG, H |
| T 27-93 | Sieve Analysis of Fine and Coarse Aggregates | Oven, Dust, Heavy Objects, Noise, Sodium Hydroxide | GH, Hood, STB, H |
| T 68-96 | Tension Testing of Metallic Materials | Heavy Objects, Noise, Flying Metal Sharp Edges, Band Saw | SG, H, STB, GW, NO |
| T 80-93 | Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials | Pinch Point | |
| T 84-95 | Specific Gravity and Absorption of Fine Aggregate | Oven | GH |
| T 85-93 | Specific Gravity and Absorption of Coarse Aggregate | Oven | GH |

| | | | |
|---|---|---|---|
| T 96-92 | Resistance to Abrasion of Coarse Small Size Aggregate by Abrasion & Impact in the Los Angeles Machine | Moving Drum, Noise, Heavy Objects, Oven | STB, H, NO, GH |
| T 97-86 | Flexural Strength of Concrete (Simple Beam with Third Point Loading) | Heavy Objects, Flying Debris | SG, STB |



**CONCRETE LAB- STRUCTURAL (CONTINUED)**

| | | | |
|---|---|---|---|
| T 106-92 | Compressive Strength of Hydraulic Cement Mortar | Cement Dust, Heavy Objects, Flying Debris | GR, STB, SG, LC |
| T 107-91 | Autoclave Expansion of Portland Cement | Steam, High Pressure, Flake Graphite | GH, SG, LC, GR |
| T 119-93 | Slump of Hydraulic Cement Concrete | Splashing Concrete, Work Zone, Admixtures, Noise, Heavy Objects, Traffic | STB,SG, HH, V, GW |
| T 121-94 | Weight Per Cubic Foot, Yield, & Air Content Gravimetric) of Concrete | Splashing Concrete, Work Zone, Heavy Objects, Traffic | SG, HH, V, GW, H, STB |
| T 126-93 | Making and Curing Concrete Test Specimens in the Laboratory | Cement Dust, Splashing Concrete, Admixtures, Noise, Heavy Objects | GW, STB, SG, H |
| T 127-90 | Sampling and Amount of Testing of Hydraulic Cement | Cement Dust, Cement Paste, Work Zone | SG, STB, GW |
| T 129-88 | Normal Consistency of Hydraulic Cement | Cement Dust, Cement Paste, Work Zone | SG, GW, STB |
| T 131-93 | Time of Setting of Hydraulic Cement by Vicat Needle | Cement Dust, Cement Paste, Splashing | HH, V, STB, GW |
| T 137 | Air Content Of Hydraulic Cement Mortar | Miter, Cement Dust, Cement Paste, Splashing | SG GR, LC, NO |
| T 141-93 | Sampling Freshly Mixed Concrete | Splashing Concrete, Work Zone, Admixtures, Heavy Objects, Traffic, Noise | SG, HH, V, STB, GR, GW, H |
| T 152-93 | Air Content of Freshly | Splashing Concrete, Work Zone, | SG HH,V,STB GW, H, |

| | | | |
|---|---|---|---|
| | Mixed Concrete by the Pressure Method | Admixtures, Heavy Objects, Traffic, Noise | GR |
| T 153-93 | Fineness of Portland Cement by Air Permeability Apparatus | Cement Dust, Red Reader Glymol | SG, GR, LC |
| T 154-91 | Time Setting of Hydraulic Cement by Gilmore Needles | Mixer, Cement Dust, Cement Paste, Splashing | SG, GR LC, NO, |
| T 155-91 | Water Retention of Concrete Curing Materials | Splashing Chemicals | SG, STB, GR |



**CONCRETE LAB- STRUCTURAL (CONTINUED)**

| | | | |
|---|---|---|---|
| T 161-93 | Resistance of Concrete to Rapid Freezing and Thawing | Heavy Objects, Sodium Chloride | GR, SG, LC, STB |
| T 177-81 | Flexural Strength of Concrete (Simple Beam with Center Point Loading) | Heavy Objects, Flying Debris | STB, SG |
| T 196-95 | Air Content of Freshly Mixed Concrete by the Volumetric Method | Splashing Concrete, Work Zone, Heavy Objects | SG, STB HH, V H, |
| T 197-93 | Time of Setting of Concrete Mixtures by Penetration Resistance | Cement Dust, Splashing Concrete, Heavy Objects | SG, STB GR, |
| T 231-90 | Capping Cylindrical Concrete Specimens | Hot Pot, Splashing Sulfur, Fumes | GH, GW, SG, LC, Hood, Vent |
| T 244-92 | Mechanical Testing of Steel Products | Heavy Objects, Noise, Flying Metal, Sharp Edges, Band Saw | SG, H, STB, GW, NO |
| T 248-95 | Reducing Field Samples of Aggregate to Testing Size | Heavy Objects, Dust | SG, STB |
| T255-92 | Total Moisture Content of Aggregate by Drying | Oven | STB, Hood, Vent, GH |
| T 277-93 | Rapid Chloride Permeability of Concrete | Heavy Objects, Sodium Chloride, Sodium Hydroxide | STB, SG, GN, LC |
| ASTM C- 567 V, H | Standard Test Method for Unit Weight of Structural Lightweight Concrete | Splashing Concrete, Work Zone, Heavy Objects | SG, STB, HH, |

| | | | |
|---|---|---|---|
| ASTM C- 642 | Standard Test Method for Density, Absorption, Voids in Hardened Concrete | Oven, Boiling Water | GH, STB, SG |
| ASTM C- 805 | Standard Test Method for Rebound Number of Hardened Concrete | Rebound Hammer, Work Zone | STB, HH, SG, GR |
| ASTM C- 1064 | Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete | Splashing Concrete, Work Zone | STB, HH, SG, GR |



**CONCRETE LAB- STRUCTURAL (CENTRAL AND FIELD) (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| VT AOT MRD 22 | Determination of Thin and/or Elongated Particles in Coarse Aggregate | | |
| VT AOT MRD 23 | Determination of Coarse Aggregate Particles with Fractured Faces | Dust, Heavy Objects | STB |
| VT AOT MRD 40-86 | Vermont Standard Procedure for Determination of PCC Pavement Thickness for Final Acceptance and Payment | Work Zone, Coring Machine, Heavy Objects, Noise | STB, V, H, HH,SG, GW |

**DRILLERS**

**TEST**

- AASHTO 203
- AASHTO 206
- AASHTO 207
- AASHTO 223
- AASHTO 225
- AASHTO 251
- AASHTO 254

**CHEMICALS USED**

Anti-freeze
Brake Cleaner
Diesel Fuel Additive
Drilling Fluids - Baroid Quik-Gel
Electric Detonators - Dyno Nobel
Explosives - Kinepak
Fire Extinguisher - ABC
Grease - Durashield 80
Grease - Threadtex
Hydraulic Oil
Kerosene & Diesel #1
Marking Paints - All Colors
Portland Cement
Propane
Silica, Crystalline Quartz
Solid Marker - Markal Paintstik
Sparkleen
Tar Solvent

Unleaded Gasoline
Waterless Handcleaner - Mac s
Windshield Washer
Zn-Grease



**DRILLERS(CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 203-82 | Soil Investigation and Sampling by Auger Borings | Drill Rig, Heavy Objects, Contaminated Soil, Traffic, Noise, Zn-Grease | HH, V, SG, GW, GN, STB, H, TV, GRE |
| T 206-82 | Penetration Test and Split-Barrel Sampling of Soils | Drill Rig, Heavy Objects, Traffic, Noise, Zn-Grease, Contaminated Soil | HH, V SG, GW, H, TV, GN, STB, GRE |
| T 207-87 | Thin Walled Tube Sampling of Soils | Drill Rig, Heavy Objects, Contaminated Soil, Traffic, Noise, Zn-Grease | STB, SG, HH, V, GW, GR, H |
| T 223-76 | Field Vane Sheer Test in Cohesive Soil | Drill Rig, Heavy Objects, Traffic, Noise, Zn- Grease | HH, GW, H, V, SG, STB |
| T 225-83 | Diamond Core Drilling for Site Investigation | Drill Rig, Heavy Objects, Contaminated Soil, Traffic, Noise, Zn-Grease | SG, GW, HH, V, GN, STB, GRE, H, TV |
| T 251-77 | Soil Investigation and Sampling by Hollow Stem Auger Borings | Drill Rig, Heavy Objects, Contaminated Soil, Traffic, Noise, Zn- Grease | GN, STB, GRE, HH, V, SG, GW, H, TV |
| T 254-80 | Installing, Monitoring and Processing Data of the Traveling Type Slope Inclinometer | Drill Rig, Heavy Objects, Contaminated Soil, Traffic, Noise, Zn-Grease | HH, V, SG, GW, GN, STB, GRE, H, TV |
| T 306-98 | Auger Borings for Geotechnical Investigations | Drill Rig, Heavy Objects, Contaminated Soil, Traffic, Noise, Zn-Grease | GN, STB, GRE, HH, V, SG, GW, |

| | | |
|---|---|---|
| | | H, TV |
| Soil Investigation by Hand Probe | Metal Chips, Impact | GW, HH, SG, STB |
| D 5092-02 Monitoring Well Installation | Drill Rig, Heavy Objects, Traffic, Noise Contaminated Soil & Ground Water | HH, V, STB, SG, GW, H, GN, GRE, GR, TV |



**INDEPENDENT ASSURANCE**

**TESTS**

- AASHTO T2
- AASHTO T11
- AASHTO T23
- AASHTO T27
-AASHTO T30-93
- AASHTO T99/T180
- AASHTO T119
- AASHTO T121
- AASHTO T141
- AASHTO T152
-AASHTO T164-01
- AASHTO T166
- AASHTO T168
- AASHTO T180
- AASHTO T191
- AASHTO T196
-AASHTO T209-99
- AASHTO T217
-AASHTO T-245
-AASHTO T248
-AASHTO T269-97
-AASHTO T308-01
- AASHTO T310-3
-AASHTO T312-03

**CHEMICALS USED**

- Admixtures (Portland Cement Concrete)
- Anti-strip Additives
- Asphalt Cements, All Grades
- Calcium Carbide
- Crystalline Silica --Ottawa Sand
- Form Coating Oil
- Isopropyl Alcohol
- Mercury
- Portland Cement, All Types
- Radioactive Sources (i.e. Cesium Americium)
- Ready Mixed Concrete
- Silicone Lubricant
- WD-40



**INDEPENDENT ASSURANCE (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 2-91 | Sampling of Aggregates | Quarries, Heavy Objects, Noise | HH, STB, GW, H |
| T 11-91 | Materials Finer than 75um (No.200 Sieve) in Mineral Aggregates by Washing | Oven | |
| T 23-93 | Making and Curing Concrete Test Specimens in the Field | Construction Area, Splashing Concrete, Noise, Heavy Objects, Traffic | HH, V, STB, SG, H, GW |
| T 27-95 | Sieve Analysis of Fine and Coarse Aggregates | Oven, Dust, Heavy Objects, Noise | GH, Hood, STB, H |
| T30-93 | Mechanical Analysis of Extracted Aggregate | Oven, Dust, Heavy Objects, Noise, Detergent, VOC's, Anti-strip Additives | GH, STB, H, SG, LC, Hood |
| T 99-95 | Moisture-Density Relations of Soil using a 5.5 lb Rammer and 12 in Drop | Oven, Heavy Objects, Dust, Flying Debris | STB, GH SG |
| T 119-93 | Slump of Hydraulic Cement Concrete, | Splashing Concrete, Work Zone, Admixtures, Noise, Heavy Objects, Traffic | SG, HH, V,STB GW |
| T 121-94 | Weight Per Cubic Foot, Yield, & Air Content (Gravimetric) of Concrete | Splashing Concrete, Work Zone, Heavy Objects, Traffic | SG, HH, V, STB, GW, H |

| | | | |
|---|---|---|---|
| T 141-93 | Sampling Freshly Mixed Concrete | Splashing Concrete, Work Zone, Admixtures, Heavy Objects, Traffic | SG, HH, V, STB, GR, GW, H |
| T 152-93 | Air Content of Freshly Mixed Concrete by the Pressure Method | Splashing Concrete, Work Zone, Admixtures, Heavy Objects, Traffic, Noise | SG, HH, V,STB GW, H, GR |
| T 164-01 | Quantitative Extraction of Bitumen from Bituminous Paving Mixtures | Anti-strip Additives, Hot Bituminous Concrete, VOC's, Trichloroethylene, Xylene | SG, GH, GN, Hood, LC, SGF |
| T 166-93 | Bulk Specific Gravity of Compacted Bituminous Mixtures using Saturated Surface Dry Specimens | Asphalt, Anti-strip Additives, Oven, Noise | SG, GH, Hood |



**INDEPENDENT ASSURANCE (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 168-96 | Sampling Bituminous Paving Mixtures | Hot Asphalt, Anti-strip Additives, Hot Materials, Noise, Work Area | H, HH, GH, SG, STB |
| T 180-95 | The Moisture-Density Relations of Soils using a 10 lb Rammer and an 18 in. Drop | Heavy Objects, Flying Debris, Oven | STB, SG, GH |
| T 191-93 | Density of Soil In-Place by the Sand Cone Method | Oven, Work Zone | GW, HH, V, STB |
| T 196-95 | Air Content of Freshly Mixed Concrete by the Volumetric Method | Splashing Concrete, Work Zone, Heavy Objects | STB, HH, V, SG, H |
| T209-99 | Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixture | Hot Asphalt, Anti-strip Additives, Oven | SG, GH, LC |
| T 217-87 | Determination of Moisture in Soils by means of a Calcium Carbide Gas Pressure Moisture Tester | Calcium Carbide, Work Zone | GW, HH, V, STB, SG |
| T 245-94 | Resistance to Plastic Flow | Oven, Asphalt, Anti-strip Additives, | SG, STB, GH, H, LC |

| | | | |
|---|---|---|---|
| | of Bituminous Mixtures using Marshall Apparatus | Heavy Objects, Noise | |
| T 248-95 | Reducing Field Samples of Aggregate to Testing Size | Heavy Objects, Dust, Mercury Thermometers | STB, Hood, SG, GR, Ventilation |
| T 269-97 | Percent Air Voids in Compacted Dense and open Bituminous Paving mixture | Anti-strip Additives | SG |
| T 308-01 | Asphalt Binder Content of Hot Mix Asphalt by the Ignition Method | Hot Asphalt, Dust, Heavy Objects, VOC'S, Oven | GH, SG |
| T 310-03 | In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Method | Radiation, Heavy Objects, Work Zone, Anti-strip Additives | STB, HH, V |



**INDEPENDENT ASSURANCE (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 312-03 | Preparing and Determining the Density of Hot Mix Asphalt Specimens by Means of the Superpave Gyratory Compactor | Hot Asphalt, Heavy Objects, Anti-strip Additives, Compactor | SG, GH, NO, STB |

**RESEARCH & DEVELOPMENT UNIT AND FIELD TESTING**

- VAOT-MRD 35
- VAOT-MRD 37
- VAOT-MRD 41
- ASTM D913-03
- VAOT-MRD 42
- VAOT-MRD 46
- ASTM E1710-97

**CHEMICALS USED**

- Copper Sulfate crystals (used in bridge deck meter for testing corrosion activity)
- Copper Sulfate Anti-Freeze Solution

**MATERIALS USED**

- Crystalline Silica (Ottawa Sand)
- Highway Marking Paint
- Pavement Markings (Paint, Epoxy, Tape, Thermoplastic)
- Polyurethane Sealer
- Sheet Waterproofing Membrane



**RESEARCH & DEVELOPMENT UNIT AND FIELD TESTING (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| ASTM E1710-97 | Test Method for Measurement of Retroreflective Pavement Markings with CEN Prescribed Geometry Using a Portable Retroreflectometer. | Traffic, Noise | GW, HH, STB, V |
| ASTM D913-03 | Test Method for Evaluating Degree of resistance to Wear of Waterborne Paint. | Traffic, Noise | GW, HH, STB, V |
| VT AOT MRD 35 | Vermont Test for Obtaining Samples of Pulverized Core Drill Concrete for Chloride Analysis | Traffic, Noise | GW, STB, SG, H, HH, V, |
| VT AOT MRD 37 | Method of Test for Locating and Measuring Delaminations in Concrete Bridge Decks | Traffic | V, HH, STB, SG |
| VT AOT MRD 41-88 | Method of Test for Determining Corrosion Activity in Reinforced Concrete | Core Drill, Copper Sulfate, Traffic | SG, GR, H, HH, V, STB |

| | | | |
|---|---|---|---|
| VT AOT MRD 42-88 | Method of test for Determining Corrosion Activity on Membrane Waterproofed Bridge Decks | Core Drill, Copper Sulfate, Traffic | SG, GR, H, HH, V, STB |
| VT AOT MRD 46 | Vermont Test Procedure for Inspection of Durable Pavement Markings | Hot Pavement Markings,Traffic | GW, HH, V, STB |

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**APPENDIX B PAGE B31**

**SOILS LAB**

**TESTS**

- AASHTO T87
- AASHTO T88
- AASHTO T89
- AASHTO T90
- AASHTO T99
- AASHTO T100 / ASTM D854
- AASHTO T180
- AASHTO T193
- AASHTO T208 / ASTM D2166
- AASHTO T216 / ASTM D2435
- AASHTO T265 / ASTM D 2216
- AASHTO T267
- AASHTO T296
- AASHTO T297
- ASTM D1140

**CHEMICALS USED**

- Mercury
- Sodium Hexametaphosphate

- WD-40
- Zinc Grease



**SOILS LAB (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| T 87-00 | Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test | Oven, Dust | GH, Hood |
| T 88-00 | Particle Size Analysis of Soils | Dispersing Agents, Buffers, Splashing | SG, GR, LC, GH |
| T 89-02 | Determining the Liquid Limit of Soils | Oven | GH |
| T 90-00 | Determining the Plastic Limit and Plasticity Index of Soils | Oven | GH |
| T 99-01 | The Moisture-Density Relations of Soils using a 5.5 lb Rammer and a 12 in. Drop | Heavy Objects, Flying Debris, Oven | STB, SG, H,H |
| T 100-03 | Specific Gravity of Soils | Oven | GH |
| T 180-01 | The Moisture-Density Relations Soils using a 10 lb Rammer | Heavy Objects, Flying Debris, Oven | STB, SG, GH, H of |

| | | | |
|---|---|---|---|
| | and an 18 in. Drop | | |
| T 193-03 | The California Bearing Ratio | Heavy Objects, Flying Debris, Oven | STB, SG, GH |
| T 208-00 | Unconfined Compressive Strength of Cohesive Soil | Heavy Objects | STB |
| T 216-03 | One-Dimensional Consolidation Properties of Soils | Heavy Objects | STB |
| T 265-00 | Laboratory Determination of Moisture Content of Soils | Oven | GH |
| T 267-00 | Organic Content in Soils by Loss on Ignition | Oven | GH, SG, H |



**SOILS LAB (CONTINUED)**

| TEST | NAME | HAZARD | PPE CODE |
|---|---|---|---|
| | | Triaxial Compression | |
| T 297-00 | Consolidated Undrained Triaxial Compression Test on Cohesive Soils | Oven, compression | GH |
| D1140-00 | Amount of Material in Soils Finer than #200 Sieve | Oven | GH |

**Basic Rules and Procedures for Working with Chemicals, 1910.1450 (E) (1).**

(a) *Accidents and spills*:

*Eye Contact*: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention.
*Ingestion*: Contact Vermont Poison Control Center, Burlington 1-802-658-3456. Encourage the victim to ingest large amounts of water.
*Skin Contact*: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention.
*Clean-up*: Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal.

(b) *Avoidance of routine exposure*: Develop and encourage safe habits. Avoid unnecessary exposure to chemicals by any route. Do not smell or taste chemicals. Vent apparatus which may discharge toxic chemicals into local exhaust devices. Inspect gloves before use.

(c) *Choice of chemicals*: Use only those chemicals for which the quality of the available ventilation system is appropriate.

(d) *Eating, smoking, etc.*: Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present. After using lab chemicals, wash hands before conducting these activities. Avoid usage of refrigerators, ovens or utensils for food or beverages if they are also used for laboratory operations.

(e) *Equipment and glassware*: Handle and store laboratory glassware with care to avoid damage. Do not use damaged glassware. Use equipment only for its designed purpose.

(f) *Exiting*: Wash areas of exposed skin well before leaving the laboratory.

(g) *Horseplay*: Avoid practical jokes or other behavior which might confuse, startle or distract another worker.

(h) *Mouth suction*: Do not use mouth suction for pipetting or starting a siphon.



(i) *Personal apparel*: Confine long hair and loose clothing. Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or cloth sneakers.

(j) *Personal housekeeping*: Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored. Clean up the work area on completion of an operation or at the end of a day.

(k) *Personal protection*: Assure that appropriate eye protection is worn by all persons, including visitors, where chemicals are stored or handled. Wear appropriate gloves when the potential for contact with toxic materials exists. Inspect the gloves before each use, wash them before removal if necessary, and replace them periodically. Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls, inspecting the respirator before use. Use any other protective and emergency apparel and equipment as appropriate. Avoid use of contact lenses in the laboratory unless necessary. If they are used, inform supervisor so special precautions can be taken. Remove laboratory coats immediately upon significant contamination.

(l) *Planning*: Seek information and advice about hazards, plan appropriate protective

procedures, and plan positioning of equipment before beginning any new operation.

(m) *Unattended operations*: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service to an unattended operation.

(n) *How to use a hood*: Use the hood for operations which might result in release of toxic chemical vapors or dust. As a rule of thumb, use a hood or other local ventilation when working with any appreciably volatile substance with a threshold limit value (TLV) of less than 50 ppm. Confirm adequate hood performance before use. Keep hood closed at all times except when adjustments within the hood are being made. Keep materials stored in hoods to a minimum and do not allow them to block vents or air flow. Leave the hood On when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is off.



**Basic Rules and Procedures for Working with Chemicals, 1910.1450 (E) (1) (continued)**

(o) *Vigilance:* Be alert to unsafe conditions and see that they are corrected when detected.

(p) *Waste disposal*: Assure that the plan for each laboratory operation includes plans and training for waste disposal. Deposit chemical waste in appropriately labeled receptacles. Do not discharge to the sewer concentrated acids or bases, highly toxic, malodorous, or lachrymatory substances, or any substance which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow.

(q) *Working alone*: Avoid working alone in a building. Do not work alone in a laboratory if the procedures being conducted are hazardous.

## Inspection / Maintenance Forms

| Equipment | Date Inspected | Inspected by | Deficiencies | Corrective Action Taken |
|---|---|---|---|---|
| 1. Hoods | | | | |
| 2. Eye Wash | | | | |
| 3. Soak Hose | | | | |
| 4. Safety Cans | | | | |

5. Fire Extinguishers

6. First Aid Kit

7. Mercury Spill Kit

8. Lab Area Clean

9. Exit Lights

10.Lab Area Free of
Trip Fall Hazards

11.Other



## Explanation of MATERIAL SAFETY DATA SHEETS (MSDS)

Material safety data sheets are comprised of written or printed material concerning a hazardous chemical. These MSDS's are prepared in accordance with paragraph (9) of Section 1910.1200 of hazard communications of VOSHA - Safety and Health Standards of General Industry.

The master MSDS listing is kept in a yellow three ring binder, labeled "MATERIAL SAFETY DATA SHEETS", in the Administrative Unit (Main Office) of the M&R Section. In addition, MSDS files for each specific laboratory are prominently displayed in that particular laboratory. All new chemicals coming into the M&R Section must be accompanied by an MSDS. The master file and the individual file in the laboratory receiving the new chemical will be updated with a new MSDS.