

# An Employer's Guide to Developing a Hazard Communication or Employee Right-to-Know Program



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Occupational Safety and Health Division

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## Purpose of this guide

This guide is designed to help you develop and implement a Hazard Communication or Employee Right-to-Know (ERTK) program.

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## Section 1: Introduction and overview

The Employee Right-to-Know (ERTK) Act was passed by the Minnesota Legislature in 1983 and is intended to ensure employees are aware of the dangers associated with hazardous substances, harmful physical agents or infectious agents they may be exposed to in their workplaces. The ERTK Act applies to all employers in Minnesota with the exception of federal agencies.

Federal OSHA adopted the Hazard Communication (HAZCOM) standard, 1910.1200, in 1983 as well. Unlike ERTK, HAZCOM covers only hazardous substances. In 2012, the standard underwent a major revision with the alignment with the U.N. Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Minnesota OSHA (MNOSHA) decided to replace the ERTK requirements for hazardous substances with the federal HAZCOM standard, but keep the ERTK requirements for annual refresher training and recordkeeping. The requirements for harmful physical agents and infectious agents under ERTK remain unchanged. Because the intent and content of the two standards are nearly identical, this guide will refer to the HAZCOM requirements when discussing hazardous substances.

To comply with the HAZCOM standard, you must identify the hazardous substances, harmful physical agents and infectious agents that are present in the workplace and provide information and training to employees who are routinely exposed to those substances or agents in either the course of their normal workday or during a foreseeable emergency.

“Exposed” means an employee is subjected, in the course of employment, to a chemical that is a physical or health hazard and includes potential (accidental or possible) exposure. Exposure above the MNOSHA permissible exposure limits (PELs) is not necessary before implementing HAZCOM provisions.

A written HAZCOM program is required and must include:

- a description of how the labeling, safety data sheet and training requirements will be implemented at the facility;
- a list of hazardous substances present in the workplace with a product identifier that is referenced on the safety data sheets; and
- the methods that will be used to inform employees of the hazards of nonroutine tasks and the hazards associated with chemicals contained in unlabeled pipes in their work areas.

If your operation produces, uses or stores hazardous substances in such a way that another organization’s employees are exposed or your employees are exposed to hazardous substances by another employer, your written program must also cover how safety data sheets and precautionary measures will be shared between the two employers and their employees, for both normal and emergency operations.

The following sections of the guide provide more information about each of these elements.

## Section 2: Developing a written HAZCOM program

Employers must develop and implement a *written* HAZCOM program.

### Written program requirements

The written HAZCOM program must contain:

- a description of how the employer will meet the requirements for labeling, safety data sheets and employee training;
- a list of the hazardous chemicals known to be present in the workplaces; and
- the methods the employee will use to inform employees of the hazards of nonroutine tasks and the hazards of chemicals in unlabeled pipes.

### Additional program requirements for multi-employer worksites

In addition, written HAZCOM programs at multi-employer worksites must contain:

- the methods the employer uses to provide the other employers' employees with on-site access to safety data sheets for substances to which they may be exposed;
- the methods the employer will use to inform the other employers about how to protect their employees during normal operating conditions and foreseeable emergencies; and
- the methods that will be used to inform the other employers of the labeling system used in the workplace.

Your written ERTK program can be used in place of a new HAZCOM program as long as it meets the above requirements and is revised as necessary.

### Availability of the written program

The program must be maintained *at the worksite* and must be available to employees or their designated representatives and MNOSHA.

### Periodic review

Because of the changing nature of the workplace, the HAZCOM program will be an ever-changing program. New substances will be introduced and currently used substances will be replaced or totally eliminated from use, etc. The written HAZCOM program should be periodically reviewed. The recommendation is to update the program annually, when the annual HAZCOM update training is conducted, removing outdated information, inserting new information, updating training records, etc. When outdated safety data sheets are removed from the active file to records retention, the dates of active use should be noted on the individual sheets. (See Section 4 regarding retention of safety data sheets.)

**Note:** If employees are exposed to blood as part of their job duties, the Occupational Exposure to Bloodborne Pathogens standard, 29 CFR 1910.1030, requires employers to develop and implement an Exposure Control Plan. If *all* infectious agents to which employees may be exposed are covered as part of the Exposure Control Plan, that plan will be considered as meeting the ERTK requirement for a written program for infectious agents.

## Section 3: Training

### Who needs training?

All employees, including temporary and seasonal employees, who work with or are routinely exposed to hazardous substances, harmful physical agents or infectious agents as part of their job responsibilities **must** receive training.

### Providing training

*The training must be made available by and at the cost of the employer.* If employees are required to attend training at times other than their normal work schedule, they must be compensated for that time (overtime, equivalent time off, etc.). Training must be provided in English or a language understood by employees.

**Note:** Details of the training required for hazardous substances, harmful physical agents and infectious agents is provided in Sections 4, 5 and 6 of this guide.

### Frequency of training

Training must be:

- provided before an employee's *initial* assignment to a workplace where they may be routinely exposed to a hazardous substance, harmful physical agent or infectious agent;
- provided before any new or additional hazardous substance or agent is introduced to which the employee may be routinely exposed; and
- updated **annually** (annual update training may be brief summaries of information included in initial and/or previous training sessions).

### Training records

Training records must be kept for *three* years and must include:

- the dates training was conducted;
- the name, title and qualifications of the person who conducted the training;
- the names and job titles of employees who completed the training; and
- a brief summary or outline of the information that was included in the training session.

### Goals of training

Upon completion of training, employees should:

- be aware of the hazards they are exposed to;
- know the short- and long-term effects of exposure to substances or agents and how to protect themselves from overexposure (for example appropriate personal protective equipment and/or clothing, etc.);
- know how to obtain, read and use information on labels, safety data sheets or other reference materials; and
- know and follow appropriate work practices.

### Audiovisuals and written materials as training

Training must include an opportunity for employees to ask questions to ensure they understand the information presented to them.

The following *are not acceptable forms of training*:

- giving an employee a data sheet, package insert, reference manual or other printed material to read; or
- having an employee watch a video that does not include specific information about the substances and agents the employee is exposed to in the workplace as the only method of training.

The following may be acceptable if they are supplemented by specific information related to the employees' job duties and related exposures:

- audiovisuals, interactive videos, printed materials, etc.

### **Exceptions**

**Farms** – Farming operations that employ 10 or fewer employees are exempt from all provisions of ERTK with the exception that label information must be provided to employees or their representatives. Farming operations employing more than 10 employees or operating a temporary labor camp and employing any of its residents, must comply with the Farming Operations Training Plan standard, Minnesota Rules 5206.1300 to 5206.1900 and 1910.1200 Hazard Communication.

**Waste service employers** – Workers handling nonhazardous solid waste must be trained in accordance with HAZCOM and be covered by the written program. Hazardous waste as defined by the Solid Waste Disposal Act and the Resource Conservation Recovery Act is exempt.

**Note:** The exemption from ERTK requirements for waste service employers *does not* extend to any other OSHA standard. For example, waste service employers must comply with the Occupational Exposure to Bloodborne Pathogens standard, 29 CFR 1910.1030, if employees have the potential for exposure to blood as a result of their job responsibilities.



## Section 4: Training and information requirements for hazardous substances

### Step 1. Inventory for hazardous substances

- Conduct an inventory, or survey, to identify and list all hazardous substances your employees may use or come in contact with in your facility. Include hazardous substances that are generated in the work operation but are not in containers (welding fume, wood dust, carbon monoxide generated by propane or gas powered vehicles, or nitrogen dioxide from diesel powered vehicles).
- Develop procedures to keep your list current. When new substances are used, add them to your list. Conversely, when substances are no longer used they should be removed from the list. (See note below.)

### Step 2. Safety data sheets

- Request safety data sheets (SDSs) from the chemical manufacturer or distributor of all the hazardous substances identified in the inventory. (Manufacturers and distributors are required to provide an SDS at the time of the first shipment and whenever the information on the SDS changes.)
- Develop a routine procedure for requesting SDSs each time a new substance is ordered. Remove SDSs for substances that are no longer used or available in the workplace.

**Note:** Safety data sheets are considered to be “exposure records” under 29 CFR 1910.1020(c)(5)(iii), Access to Employee Exposure and Medical Records, and, must be retained for 30 years. However, in lieu of keeping all SDSs for 30 years, the intent of 29 CFR 1910.1020 can be met by keeping three key pieces of information: (1) the identity (chemical name, etc.) of the substance or agent; (2) where it was used; and (3) when it was used. Employers may wish to consider including this information as part of the hazardous substance list, retain the list for 30 years and discard the SDS.

- SDSs must be current and accurate, and all required sections on the SDS must be completed.
- SDSs must be readily accessible to employees in their work areas. If desired, SDS information may be made available on computer, display terminals, etc., as long as employees know how to access the information.
- In those workplaces where employees are required to handle or mix drugs in powder or liquid form in the course of assigned job duties, the package insert that generally is included in the drug package may be substituted for the SDS *if* that package insert includes all information needed for training as outlined in Step 4.
- It is not necessary to obtain SDSs for:
  - products employees bring into the workplace for their personal use;
  - consumer products or products sold or used in retail establishments if they are used in a manner that is comparable to typical consumer use (same frequency, concentration, etc.);
  - articles that contain a hazardous substance in solid form that is not released (hardware, equipment, etc.);
  - substances bound and not released under normal conditions of use (adhesive tape, vinyl upholstery, tires, etc.);
  - hazardous waste material regulated under the Solid Waste Disposal Act and the Resource

Conservation and Recovery Act;

- cosmetics that are packaged for sale or intended for personal use;
- substances present in a physical state, volume or concentration that does not present a hazard (very small quantity, solids, diluted substances that present no adverse health effects, etc.); and
- food or alcoholic beverages that are sold, used or prepared in a retail establishment or intended for personal consumption in the workplace.

A master file should be maintained if individual SDSs are placed in particular departments or areas.

### Step 3. Labeling

- Check all incoming shipments of hazardous substances to be sure they are labeled. Labels on containers received from manufacturers or importers must include:
  - a product identifier;
  - a signal word, either “danger” or “warning”;
  - hazard statements assigned to a hazard class and category that describe the nature of any hazards of a chemical, including, where appropriate, the degree of hazard;
  - one or more pictograms;
  - precautionary statements, meaning a phrase that describes recommended measures to be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling; and
  - the name, address and telephone number of the chemical manufacturer, importer or other responsible party.
- Stationary process containers within a work area that have similar contents and hazards may be labeled by use of signs, placards or other alternative identification means as long as the method used identifies the substance in the container and provides the appropriate hazard warning. Under HAZCOM, the process container must have the product identifier and any words, pictures, symbols or a combination thereof that provides at least general information about the hazards of the chemical.

### Exceptions

Immediate-use containers (test tubes, beakers, graduates, vials, pitchers, pails or similar containers that are routinely used and reused) do not have to be labeled if they are used only to transfer a hazardous substance from a labeled container, they remain under the control of the person who transferred the substance and they are only used during the work shift in which the transfer takes place.

Also, the following chemicals or materials do not have to be labeled:

- pipes or piping systems, but their contents must be included in employee training;
- pesticides covered by the Federal Insecticide, Fungicide and Rodenticide Act;
- chemicals covered by the Toxic Substances Control Act;
- distilled spirits, wines or malt beverages covered by the Federal Alcohol Administration Act;
- consumer products or hazardous substances covered by the Consumer Product Safety Act or the Federal Hazardous Substances Act;
- agricultural or vegetable seeds treated with pesticides covered by the Federal Seed Act and the U.S. Department of Agriculture; and
- foods, food additives, color additives, and drug, cosmetic or medical or veterinary devices or products (including flavors and fragrances) covered by the Federal Food, Drug and Cosmetic Act or the Virus-Serum-Toxic Act and the U.S. Food and Drug Administration or Department of Agriculture.

**Note:** Where labeling is not practical or feasible, such as for carbon monoxide from lift trucks or welding operations, the employer must ensure employees are trained regarding these hazards.

#### **Step 4. Employee training**

- Information that must be contained in the training program includes:
  - a summary of the HAZCOM standard and the employer's written HAZCOM program;
  - the operations in the work area where hazardous chemicals are found;
  - the methods and observations to detect the presence or release of the chemicals;
  - the physical, health, simple asphyxiation, combustible dust and pyrophoric gas hazards of the chemicals in the work area and the measures and work practices employees can use to protect themselves against them; and
  - a written copy of all of the above information (for example the safety data sheets) is located in the work area or facility and how employees can access that information.
  
- Training can be conducted about each specific substance found in the workplace or it may be conducted by categories of hazards (carcinogens, sensitizers, organic solvents, acutely toxic agents, etc.). This approach to training may be especially useful when training employees about the types of hazards they may encounter at another employer's worksite.
  
- Employees who work in operations where they handle *only* sealed containers (such as warehousing) are exempt from the training requirements. However, if a spill or leak of a hazardous substance occurs, any employee involved in its cleanup must be trained.

## Section 5: Training and information requirements for harmful physical agents

### Step 1. Identify all physical agents

- Coverage is limited to four physical agents because the Employee Right-to-Know Act restricts coverage to those agents for which a separate standard has been adopted. Exposures must be near either the action level or permissible exposure limit at some time during the year.
- The four harmful physical agents subject to ERTK coverage are the following.
  - **Noise** – Conduct initial evaluations to identify employees who are exposed to noise at or above 85 decibels (db) averaged over eight working hours. (If noise levels exceed 85 db, compliance with the Occupational Exposure to Noise standard, 29 CFR 1910.95, is required.)
  - **Heat** – List areas of potential excessive heat exposure, considering: temperature of the work environment, season of the year and work activity. (See Appendix D for more information and exposure limits.)
  - **Ionizing radiation** – List all potential sources of X-rays and radioactive materials. The most common uses of ionizing radiation occur in hospitals and dental offices with X-ray equipment and radioactive sources for nondestructive testing of welded seams, such as in pipes. (See OSHA standard 29 CFR 1910.1096.)
  - **Nonionizing radiation** – List all sources of nonionizing radiation. (See OSHA standard 29 CFR 1910.97 and Appendix C, Industrial sources of nonionizing radiation.)

### Step 2. Labeling

- Ensure all equipment or work areas that generate harmful physical agents at a level that may be expected to approximate or exceed the permissible exposure limit or applicable action level are labeled.

The label shall include the name of the physical agent and appropriate hazard warning.

Examples of labels or signs for a physical agent:

- for equipment or a work area where there is a reasonable potential for exposure to heat at a level that may be expected to approximate or exceed the heat stress standard – “POTENTIAL HEAT STRESS AREA – TRAINING REQUIRED”; and
- for equipment or work areas where there is a reasonable potential for exposure to noise at a level that may be expected to approximate or exceed the permissible exposure limit or action level – “HIGH NOISE AREA – TRAINING REQUIRED” or “HIGH NOISE AREA – HEARING PROTECTION REQUIRED” or “HIGH NOISE AREA – HEARING PROTECTION RECOMMENDED.”

### Step 3. Training

- Manufacturers of equipment that generate a harmful physical agent must provide the purchasing employer with information necessary to comply with the training requirements. This information must be provided at the time of purchase.
- Employers must conduct initial and ongoing evaluations to determine if employees are routinely exposed to harmful physical agents at levels that approximate or exceed the permissible exposure limit or applicable action level and provide training to those employees.
- ERTK requires the following information to be included in training about harmful physical agents:

- the name or names of the physical agent, including any commonly used synonym;
- the level at which exposure to the physical agent has been restricted;
- known synonyms;
- appropriate emergency treatment;
- known proper conditions for exposure to the physical agent;
- the name and phone number, and address if appropriate, of a manufacturer of the equipment that generates the harmful physical agent; and
- where a written copy of all of the above information is kept in the work area. (Written information must be available to employees in the area or areas in which the harmful physical agent is present and where the employees may be exposed to the agent through use, handling or otherwise.)

The following are examples of information that should be included for each of the harmful physical agents covered under ERTK.

**Noise:**

- when noise levels exceed 85 db over an eight-hour period;
- identity of areas of potential over-exposure;
- the effects of noise on hearing;
- the purpose of hearing protection, advantages and disadvantages of various types;
- instructions about selection, fitting, use and care of hearing protection; and
- purpose of audiometric testing and test procedures.

**Heat stress:**

- identification of heat disorders and how to avoid them;
- symptoms of over-exposure;
- cause of heat stress; and
- prevention measures the employer has implemented (including engineering controls and work/rest patterns).

**Ionizing/nonionizing radiation:**

- identity of sources;
- exposure limits;
- health effects of exposure;
- emergency procedures;
- safety procedures and control measures; and
- personal protective equipment.

## Section 6: Training and information requirements for infectious agents

### Step 1. Identify all infectious agents

- Employers must evaluate the workplace for the presence of infectious agents employees may be exposed to at work. Infectious agents include bacterial, viral, fungal, parasitic and rickettsial agents.

A list of infectious agents is included in the ERTK standard (Minnesota Rules 5206.0600, subpart 4) and includes the most common infectious agents that may be encountered in Minnesota.

- Infectious agents requirements of ERTK apply to all employers that have employees routinely exposed to infectious agents. This means infectious agents training must be provided to employees of correctional facilities and group homes, to firefighters and law enforcement personnel, and to employees who are assigned to a first aid or first responder team.

### Step 2. Labeling

- Labeling of infectious waste (for example labeled with the biohazard symbol) must comply with the requirements of the Occupational Exposure to Bloodborne Pathogens standard, 29 CFR 1910.1030, and the Minnesota Infectious Waste Control Act.

### Step 3. Training

- Information required as part of the ERTK infectious agents training program is identical to training for employees exposed to blood required by the Occupational Exposure to Bloodborne Pathogens standard, 29 CFR 1910.1030.
  - An employer may conduct one training program that covers all infectious agents to satisfy both standards.
- Information that *must* be included in the training for infectious agents includes an explanation of:
  - the employer's ERTK program for infectious agents;
  - the epidemiology and symptoms of infectious diseases, including hazards to special at-risk employee groups;
  - appropriate methods of recognition of tasks and other activities that may involve exposure to infectious agents, including blood and other infectious materials;
  - the chain of infection, or infectious disease process, including agents, reservoirs, modes of escape from reservoirs, modes of transmission, and modes of entry into the host and host susceptibility;
  - the use and limitations of control methods that prevent or reduce exposure, including universal precautions, engineering controls, appropriate work practices, personal protective equipment and housekeeping;
  - the basis for selection of personal protective equipment, including its use, types of equipment available, location of equipment, and decontamination and disposal;
  - the proper procedures for clean-up of blood or body fluids;
  - recommended immunization practices;
  - procedures to follow if an exposure incident occurs, including when, how and to whom the incident should be reported, and post-exposure evaluation and medical followup that will be available;
  - the appropriate actions to take and people to contact in an emergency involving potentially infectious materials;
  - signs, labels, tags or color coding used to denote biohazards; and

- where employees can find a written copy of the above information (for example, reference documents such as “The Control of Communicable Diseases in Man”), the employer’s written ERTK program, the ERTK standard and the person to contact with questions.
- Training sessions must allow employees an opportunity for interactive questions and answers with the person conducting the training session.

## Safety data sheets

The 2012 amendments to the HAZCOM standard also changed the name of these information sheets from material safety data sheet (MSDS) to safety data sheet (SDS). The SDS is a detailed information bulletin prepared by the manufacturer or importer of a chemical that describes the physical and chemical properties, health hazards, routes of entry, precautions for safe handling and use, emergency and first-aid procedures, and control measures. This information is helpful in selecting appropriate products and provides employers and employees with the facts they need to use, store or dispose of the substance safely and to respond to an emergency.

- *Employers* must maintain a complete and accurate SDS for each hazardous substance used in their facility and are entitled to obtain this information automatically upon purchase of the material.
- *Manufacturers* (anyone that produces, synthesizes, extracts or otherwise makes, processes, blends, packages or repackages) of hazardous substances or equipment that generates a harmful physical agent are required to provide employers that use their products with complete, up-to-date SDSs.
- When an employer is unable to obtain a SDS from a supplier or manufacturer, he or she should submit a written complaint, with complete background information, to the nearest Minnesota OSHA office. (Visit [www.dli.mn.gov/MnOsha.asp](http://www.dli.mn.gov/MnOsha.asp) for location information.)
- When new and significant information becomes available concerning a product's hazards, chemical manufacturers, importers or distributors must add it to their SDS within three months and provide it to their customers with the next shipment of the product.

**Note:** If the name or identity of a hazardous substance is considered proprietary (trade secret) by the manufacturer, that information can be registered as a trade secret with the Department of Labor and Industry. Formulations and procedures are automatically considered trade secret and need not be registered. Information about registering trade secrets may be obtained from any Minnesota OSHA office.

To meet the intent of the Employee Right-to-Know standard, the SDS must meet all requirements of the federal OSHA Hazard Communication standard, 29 CFR 1910.1200. This standard prescribes the precise format for the SDS and the information that must be provide.

To meet the requirements of 29 CFR 1910.1200, the SDS must: be in English or a language understood by employees; must be current, accurate and complete (all sections); and must include the following information.

### Section 1. Identification

The information for this section must include:

- a product identifier used on the label;
- other means of identification;
- recommended use of the chemical and restrictions on that use;
- the name, address and telephone number of the chemical manufacturer, importer or other responsible party; and
- and emergency telephone number.



## Section 2. Hazard identification

The information for this section must include:

- the classification of the chemical in accordance with paragraph (d) of § 1910.1200;
- a signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of § 1910.1200 (hazard symbols may be provided as graphical reproductions in black and white or the name of the symbol, such as flame, skull and crossbones, etc.);
- a description of any hazards not otherwise classified that have been identified during the classification process; and
- a statement of X percent of the mixture consists of an ingredient(s) of unknown acute toxicity where an ingredient with unknown acute toxicity is used in a mixture at a concentration of greater than or equal to 1 percent and the mixture is not classified based on testing of the mixture as a whole.

<p><b>NOTE:</b> For mixtures, if the employer assumes the mixture has the same hazards as its hazardous components (i.e., no test data exists on the mixture as a whole), the SDS for each component will satisfy the requirements for a data sheet for the mixture. The SDSs must be attached to one another and identified so they can be cross-referenced with the label. In addition, the SDSs must include the PEL, TLV, and other exposure limits for <u>each</u> ingredient that is determined to be a health hazard.</p>
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## Section 3. Composition of and information about ingredients

Except as provided for in paragraph (i) of 1910.1200 about trade secrets, the information for this section must include the following. (For all chemicals where a trade secret is claimed, a statement is required that the specific chemical identity and exact percentage (concentration) has been withheld as a trade secret.)

For substances:

- the chemical name;  
the common name and synonyms;
- the CAS number and other unique identifiers; and
- impurities and stabilizing additives that are themselves classified and contribute to the classification of the substance.

For mixtures (in addition to the information required for substances):

- the chemical name and concentration (exact percentage) or concentration ranges of all ingredients that are classified as health hazards in accordance with paragraph (d) of 1910.1200 and are present above their cut-off or concentration limits or are present below the cut-off or concentration limits; and
- the concentration (exact percentage) when there is batch-to-batch variability in the production of a mixture or for a group of substantially similar mixtures with similar chemical composition, in these cases concentration ranges may be used.

## Section 4. First-aid measures

The information for this section must include:

- a description of necessary measures, subdivided according to the different routes of exposure, such as inhalation, skin and eye contact, ingestion);
- the most important symptoms or effects, acute and delayed; and
- an indication of immediate medical attention and special treatment needed, if necessary.

### **Section 5. Fire-fighting measures**

The information for this section must include:

- suitable (and unsuitable) extinguishing media;
- specific hazards arising from the chemical, such as the nature of any hazardous combustion products; and
- special protective equipment and precautions for fire fighters.

### **Section 6. Accidental release measures**

The information for this section must include:

- personal precautions, protective equipment and emergency procedures; and
- methods and materials for containment and clean up.

### **Section 7. Handling and storage**

The information for this section must include:

- precautions for safe handling; and
- conditions of safe storage, including any incompatibilities.

### **Section 8. Exposure controls and personal protection**

The information for this section must include:

- the OSHA permissible exposure limit, American Conference of Governmental Industrial Hygienists threshold limit value and any other exposure limit used or recommended by the chemical manufacturer, importer or employer preparing the safety data sheet, where available;
- appropriate engineering controls; and
- individual protection measures, such as personal protective equipment.

### **Section 9. Physical and chemical properties**

The information for this section must include the:

- appearance (physical state, color, etc.);
- odor;
- odor threshold;
- pH;
- melting point and freezing point;
- initial boiling point and boiling range;
- flash point;
- evaporation rate;
- flammability (solid, gas);
- upper and lower flammability or explosive limits;
- vapor pressure;
- vapor density;
- relative density;
- solubility or solubilities;
- partition coefficient – n-octanol/water;
- auto-ignition temperature;
- decomposition temperature; and
- viscosity.

### **Section 10. Stability and reactivity**

The information in this section must include:

- reactivity;
- chemical stability;
- possibility of hazardous reactions;
- conditions to avoid, such as static discharge, shock or vibration;
- incompatible materials; and
- hazardous decomposition products.

### **Section 11. Toxicological information**

The information in this section must include:

- the likely routes of exposure, such as inhalation, ingestion, and skin and eye contact;
- symptoms related to the physical, chemical and toxicological characteristics;
- delayed, immediate and chronic effects from short- and long-term exposure;
- numerical measures of toxicity, such as acute toxicity estimates; and
- whether the hazardous chemical is listed in the National Toxicology Program's Report on Carcinogens (most recent edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer's Monographs (most recent edition) or by OSHA.

### **Section 12. Ecological information (nonmandatory)**

Information in this section may include:

- ecotoxicity (aquatic and terrestrial, where available);
- persistence and degradability;
- bioaccumulative potential;
- mobility in soil; and
- other adverse effects, such as it is hazardous to the ozone layer.

### **Section 13. Disposal considerations (nonmandatory)**

Information in this section may include:

- a description of waste residues and information about their safe handling and methods of disposal, including the disposal of any contaminated packaging.

### **Section 14. Transport information (nonmandatory)**

Information in this section may include:

- U.N. number and proper shipping name;
- transport hazard class or classes;
- packing group, if applicable;
- environmental hazards, such as whether it is a marine pollutant;
- transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code); and
- special precautions that a user needs to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises.

### **Section 15. Regulatory information (nonmandatory)**

Information in this section may include:

- safety, health and environmental regulations specific for the product in question.

### **Section 16. Other information**

Information in this section must include:

- the date of preparation or most recent revision.



## Industrial sources of nonionizing radiation\*

Sources	Uses	Comments
Broadcast	AM radio FM radio  VHF TV UHF TV	535-1605 kHz 88-108 MHz  54-72, 76-88, 174-216 MHz 470-890 MHz
Cathode-ray tubes	Information processing systems such as CRT-based video display terminals; CRT-TV monitors	10-50 kHz
Communications	Fixed systems; tropospheric scatter; satellite communication; microwave point-to-point (relay); high-frequency radio  Mobile systems; CB radios; walkie-talkies	0.8-15 GHz; generally well controlled  27-800 MHz; may produce high field strengths near antennae
Diathermy	Shortwave microwave	13.56 and 27.12 MHz; 915 and 2450 MHz; may be continuous wave (CW) or pulsed wave (PW); consider duty cycle and leakage fields
Dielectric heaters	Seal/emboss plastics; cure glues, resins, particle boards and panels; bake sand cores; mold appliance covers and auto parts; heat paper products	1-100 MHz; mainly 27.12 MHz; may produce high E and/or H fields
Electronic equipment	Switching regulator in copying machines, microcomputers, etc.	Usually shielded
Electronic security systems	Intrusion alarms; theft detection; speed sensors; distance monitor; motion detection	Usually microwave frequencies
Electro-surgical devices	Cauterizing or coagulating tissues	May be CW or PW; solid state or spark-gap design
Hyperthermia	Same frequencies as diathermy	Applicators may be implantable
Induction heaters	Deep hardening; forging; welding; soft soldering; brazing; annealing; tempering metals and semiconductors; heat and draw optical fibers; epitaxial growth; plasma torching	250-500 kHz and ELF; may produce high E and/or H fields
Lasers	Etching/engraving, welding, optical and other medical surgery, communications, research	Gas, crystalline liquid and semi-conductor lasers
Microwave heaters (including microwave ovens)	Drying wood, paper, film, inks; thawing, cooking, baking, dehydrating, pasteurizing and sterilizing foodstuffs; curing plastics; solvent desorption	915 and 2450 MHz
Plasma processors	Chemical milling; nitriding steel; polymerization; modifying polymer surfaces; depositing and hardening coatings and films; etching, cleaning or stripping photoresist	0.1-27.12 MHz; consider potential for exposure to plasma gases
Radar	Acquisition and tracking; air and auto traffic control; marine uses; surveillance	1-15 GHz; usually PW
Spectroscopic instruments	Excite emissions from lamps/phototubes used in quantitative analysis	2.45 GHz
Welding	Production of pipe, tube and beam; spot welding	RF-stabilized; 0.4-100 MHz with harmonics

\*Not all sources shown in this table are in the electromagnetic frequencies covered by the Employee Right-to-Know Act.



## Heat stress evaluation

Heat stress may occur year-round in areas with heat-producing equipment, such as in foundries, kitchens or laundries. In Minnesota, high temperature and humidity are common during the summer, with daily temperatures routinely varying up to 30 degrees. This variation does not always allow people to become acclimatized and stay acclimatized, thereby increasing the risk of heat stress.

Heat stress results from a combination of internal heat production from doing work and external heat exposure from the environment. Both aspects need to be addressed properly to control heat stress.

Two commonly used instruments to obtain heat stress measurements are the heat stress monitor and a sling psychrometer. The heat stress monitor measures several temperatures simultaneously and accounts for radiant heat and air movement. The sling psychrometer is a much cheaper and simpler device, but does not take into account radiant heat, and air movement must be determined separately.

The measurements obtained from either of these instruments are converted to one value, the wet bulb globe temperature (WBGT), for determining compliance with Minnesota Rules. WBGT is an index of heat stress indicating relative comfort. It considers temperature, humidity and air movement. The calculated value can then be compared to those found in Minnesota Rules 5205.0110, subp. 2 (see page 2 of this Appendix).

Minnesota Rules 5205.0110, subp. 2, is the Minnesota OSHA standard for heat exposure. The standard is based on wet bulb globe temperature and level of work activity. One can determine the WBGT by using a heat stress monitor. (More information about measuring and calculating heat stress can be found in the MNOSHA *Heat Stress* booklet available on the MNOSHA website.) If the heat stress limit is approached or exceeded, Employee Right-to-Know requirements specified in Minnesota Rules 5206.0700, subparts 1 and 3, Training Program for Harmful Physical Agents, and Minnesota Rules 5206.1100, Labeling Harmful Physical Agents; Label Content, also apply.

## Minnesota Rules 5205.0110 Indoor ventilation and temperature in places of employment

Subp. 2. Heat conditions. The requirements of this subpart cover employee exposure to indoor environmental heat conditions.

- The following definitions apply when assessing and controlling health hazards associated with indoor climate.
  - (1) “Wet bulb globe temperature index” or “WBGT” means a measure of the combined effects of air temperature, air speed, humidity and radiation.  $WBGT = 0.7T_{nwb} + 0.3T_g$ .
  - (2) “Natural wet-bulb temperature” or “ $T_{nwb}$ ” means temperature measured by a thermometer which has its sensor covered by a wetted cotton wick, exposed to air movement.
  - (3) “Globe temperature” or “ $T_g$ ” means temperature measured by a thermometer with its sensor inside a matte black globe, exposed to radiant heat, Vernon Globe or equivalent.
  - (4) “Heavy work” means 350 or higher kcal/hr (kilocalories per hour), for example: heavy lifting and pushing, shovel work.
  - (5) “Moderate work” means 200 to 350 kcal/hr, for example: walking with moderate lifting and pushing.
  - (6) “Light work” means up to 200 kcal/hr, for example: sitting or standing performing light hand or arm work.
- Employees shall not be exposed to indoor environmental heat conditions in excess of the values listed in Table 1. The values in Table 1 apply to fully clothed acclimatized workers.

**Table 1. Two-hour time-weighted average permissible heat exposure limits**

<b>Work activity</b>	<b>WBGT, °F</b>
Heavy work	77
Moderate work	80
Light work	86

- Employees with exposure to heat shall be provided training according to part 5206.0700, subparts 1 and 3.



## Sources of information

### Minnesota OSHA offices

Questions concerning the Employee Right-to-Know standard may be directed to the following Minnesota OSHA offices:

Minnesota OSHA Compliance 443 Lafayette Road N. St. Paul, MN 55155 Phone: (651) 284-5050 Toll-free: 1-877-470-6742 Email: <a href="mailto:osha.compliance@state.mn.us">osha.compliance@state.mn.us</a>	Minnesota OSHA Workplace Safety Consultation 443 Lafayette Road N. St. Paul, MN 55155 Phone: (651) 284-5060 Toll-free: 1-800-657-3776 Email: <a href="mailto:osha.consultation@state.mn.us">osha.consultation@state.mn.us</a>
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### Minnesota OSHA rules and standards

The most recent copy of the Minnesota Department of Labor and Industry's Occupational Safety and Health Rules – which includes the Employee Right-to-Know standard – is available from:

Minnesota's Bookstore  
Department of Administration  
660 Olive Street  
St. Paul, MN 55155  
Phone: (651) 297-3000  
Toll-free: 1-800-657-3757  
Web: [www.minnesotasbookstore.com](http://www.minnesotasbookstore.com)

### Federal OSHA standards

The federal OSHA standards – which includes 1910.1200 Hazard Communication and 1910.95 Occupational Exposure to Noise – may be accessed on the federal OSHA website at [www.osha.gov](http://www.osha.gov), ordered from Minnesota's Bookstore (address above), ordered from the U.S. Government Printing Office at <http://bookstore.gpo.gov> or ordered by phone at 1-866-512-1800.

### Federal OSHA resources for 1910.1200 Hazard communication

Hazard Communication  
[www.osha.gov/dsg/hazcom](http://www.osha.gov/dsg/hazcom)

#### OSHA Quick Cards

- *Hazard Communication Safety Data Sheets*  
[www.osha.gov/Publications/OSHA3493QuickCardSafetyDataSheet.pdf](http://www.osha.gov/Publications/OSHA3493QuickCardSafetyDataSheet.pdf)
- *Hazard Communication Standard Labels*  
[www.osha.gov/Publications/OSHA3492QuickCardLabel.pdf](http://www.osha.gov/Publications/OSHA3492QuickCardLabel.pdf)
- *Hazard Communication Standard Pictogram*  
[www.osha.gov/Publications/OSHA3491QuickCardPictogram.pdf](http://www.osha.gov/Publications/OSHA3491QuickCardPictogram.pdf)

#### OSHA Briefs

- *Hazard Communication Standard: Labels and Pictograms*  
[www.osha.gov/Publications/OSHA3636.pdf](http://www.osha.gov/Publications/OSHA3636.pdf)
- *Hazard Communication Standard: Safety Data Sheets*  
[www.osha.gov/Publications/OSHA3514.pdf](http://www.osha.gov/Publications/OSHA3514.pdf)

*Model Plans and Programs for the OSHA Bloodborne Pathogens and Hazard Communications Standards*  
[www.osha.gov/Publications/osha3186.pdf](http://www.osha.gov/Publications/osha3186.pdf)

## **Resources for hazardous substance and harmful physical agent information**

If additional information about hazardous substances and harmful physical agents is needed, the following documents may be useful.

*Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (most recent edition), available from:

American Conference of Governmental Industrial Hygienists (ACGIH)  
Phone: (513) 742-2020  
Web: [www.acgih.org](http://www.acgih.org)

*Workplace Environmental Exposure Level (WEEL) Guides*, available from:

Occupational Alliance for Risk Science  
Toxicology Excellence for Risk Assessment  
Phone: (513) 542-7475  
Web: [www.tera.org/OARS](http://www.tera.org/OARS)

- In 2013, the development of WEELs was transferred from the American Industrial Hygiene Association (AIHA) to the Occupational Alliance for Risk Science (OARS), which is managed by Toxicology for Risk Assessment (TERA). AIHA will also continue to post WEEL values on its website as they are updated by OARS, at [www.aiha.org](http://www.aiha.org).

*Recommendations for Occupational Safety and Health Standards*, available on the National Institute for Occupational Safety and Health (NIOSH) website at [www.cdc.gov/niosh](http://www.cdc.gov/niosh) or by calling 1-800-232-4636.

*Monographs on the Evaluation of the Carcinogenic Risks to Humans and Their Supplements*, prepared by the International Agency for Research on Cancer (IARC), available online at [www.iarc.fr](http://www.iarc.fr).

*Report on Carcinogens* (most recent edition) by the National Toxicology Program (NTP), available at <http://ntp.niehs.nih.gov/ntp/roc/toc11.html>.

### **Additional resources for heat stress information**

Minnesota OSHA, Heat stress  
[www.dli.mn.gov/OSHA/HeatStress.asp](http://www.dli.mn.gov/OSHA/HeatStress.asp)

Federal OSHA, Heat stress  
[www.osha.gov/SLTC/heatstress](http://www.osha.gov/SLTC/heatstress)

Federal OSHA, Campaign to prevent heat illness in outdoor workers  
[www.osha.gov/SLTC/heatillness](http://www.osha.gov/SLTC/heatillness)

NIOSH, Heat stress  
[www.cdc.gov/niosh/topics/heatstress](http://www.cdc.gov/niosh/topics/heatstress)

### **Additional resources for noise information**

Federal OSHA, Noise and hearing conservation  
[www.osha.gov/SLTC/noisehearingconservation](http://www.osha.gov/SLTC/noisehearingconservation)

NIOSH, Noise and hearing loss prevention  
[www.cdc.gov/niosh/topics/noise](http://www.cdc.gov/niosh/topics/noise)

### **Additional resources for radiation information**

Minnesota Department of Health  
Environmental Health Division  
Radiation Control (ionizing)  
Phone: (651) 201-4545  
Web: [www.health.state.mn.us/divs/eh/radiation](http://www.health.state.mn.us/divs/eh/radiation)

Federal OSHA, Non-ionizing radiation  
[www.osha.gov/SLTC/radiation\\_nonionizing](http://www.osha.gov/SLTC/radiation_nonionizing)

Federal OSHA, Radiofrequency and microwave radiation  
[www.osha.gov/SLTC/radiofrequencyradiation](http://www.osha.gov/SLTC/radiofrequencyradiation)

Federal OSHA, Ionizing radiation  
[www.osha.gov/SLTC/radiationionizing](http://www.osha.gov/SLTC/radiationionizing)

Federal OSHA, Laser hazards  
[www.osha.gov/SLTC/laserhazards](http://www.osha.gov/SLTC/laserhazards)

### **Resources for infectious agents information**

The following are available from the Centers for Disease Control and Prevention (CDC) at [www.cdc.gov](http://www.cdc.gov).

- *Biosafety in Microbiological and Biomedical Laboratories*, fifth edition
- *Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health Care Settings, 2005*
- *Guideline for Infection Control in Health Care Personnel, 1998*
- *Guidelines for Infection Control in Dental Health Care Settings, 2003*
- *Prevention and Control of Tuberculosis in Correctional and Detention Facilities: Recommendations from CDC, 2006*



## Glossary of terms and abbreviations

**ACGIH** – American Conference of Governmental Industrial Hygienists, Inc.

**Acidosis** – a condition of decreased alkalinity of the blood

**Action level** – the exposure level that triggers some but not all requirements in certain OSHA standards

**Acute toxicity** – the adverse effects resulting from a single dose of or exposure to a substance

**Alkali** – any compound having highly basic properties

**Anesthesia** – loss of sensation or feeling

**Asphyxia** – lack of oxygen and, thus, interference with the oxygenation of the blood

**Asphyxiant** – a vapor or gas that can cause unconsciousness or death by suffocation

**Boiling point, B.P.** – the temperature at which the vapor pressure of a liquid is equal to the surrounding atmospheric pressure

**B.Z.** – breathing zone

**Carcinogen** – a chemical that has been demonstrated to cause cancer in humans

**CAS number (Chemical Abstracts Service number)** – an assigned number used to identify a material; the numbers have no chemical significance

**Ceiling value, C.** – the concentration that should not be exceeded during any part of the working exposure

**CFM** – volume of air flow, cubic feet per minute

**Chemical pneumonitis** – inflammation of the lungs due to chemical irritation

**CNS** – central nervous system

**CO (carbon monoxide)** – a colorless, odorless, highly poisonous gas formed by the incomplete combustion of carbon or a carbonaceous material, including gasoline; a chemical asphyxiant, it reduces the blood's ability to carry oxygen

**CO<sub>2</sub> (carbon dioxide)** – a colorless, odorless, incombustible gas formed during respiration, combustion and organic decomposition, and used in food refrigeration, carbonated beverages, inert atmospheres, fire extinguishers and aerosols; high concentrations can create hazardous oxygen-deficient environments that can cause asphyxiation

**Combustible** – OSHA defines combustible liquid within the hazard communication law as any liquid having a flash point at or above 100°F (38°C), but below 200°F (93.3°C)

**Conjunctivitis** – inflammation of the conjunctiva, the delicate membrane that lines the eyelids

**Corrosive** – a chemical that causes visible destruction of or irreversible alterations in living tissue

**Cutaneous** – pertaining to the skin

**Dermal** – used on or applied to the skin

**Dermatitis** – inflammation of the skin

**Dyspnea** – a sense of difficulty in breathing; shortness of breath

**Edema** – an abnormal accumulation of clear, watery fluid in the tissues

**Evaporation rate** – the rate at which a particular material will vaporize from the liquid or solid state to the gas state

**f/cc** – fibers per cubic centimeter of air

**Flammable** – any solid, liquid or gas that will ignite easily and burn rapidly

**Flash point** – the lowest temperature at which a flammable liquid gives off sufficient vapors to form an ignitable mixture

**FPM** – velocity of air flow, feet per minute

**GHS** – Globally Harmonized System of Classification and Labeling of Chemicals

**Grounding** – a safety practice to conduct an electrical charge to the ground

**Hazardous material** – a substance or mixture of substances having properties capable of producing adverse health or safety effects

**Hematuria** – the presence of blood in the urine

**HEPA (high-efficiency particulate air-purifying) filter** – the most efficient mechanical filter commonly available

**IARC** – International Agency for Research on Cancer

**IDLH** – immediately dangerous to life and health

**Jaundice** – yellowish discoloration of tissues

**LC 50** – the lethal concentration of a material in air that on the basis of laboratory tests is expected to kill 50 percent of a group of test animals

**LD 50** – the lowest published lethal dose that will kill 50 percent of a group of test animals

**LEL (lower explosive limit)** – refers to the lowest concentration of gas or vapor that will burn or explode if an ignition source is present

**LFM or lfm** – velocity of air flow, linear feet per minute

**mg/m** – milligrams of material per cubic meter of air

**MSDS** – material safety data sheet

**Mutagen** – a chemical or physical agent that induces genetic mutations

**Narcosis** – stupor or unconsciousness produced by a narcotic drug or chemical

**NFPA** – National Fire Protection Association

**NIOSH** – National Institute for Occupational Safety and Health

**NTP** – National Toxicology Program

**Odor threshold** – the lowest concentration of a materials vapor in air that can be detected by smell

**Particulate** – small, separate pieces of an airborne material

**Peak** – maximum instantaneous allowable exposure for hazardous substances

**PEL (permissible exposure limit)** – an exposure limit established by OSHA

**pH** – the value that represents the acidity or alkalinity of an aqueous solution; (pH 7 = neutral, pH 0 = strong acid, pH 14 = strong alkaline)

**ppb (parts per billion)** – parts of material per billion parts of air

**ppm (parts per million)** – parts of material per million parts of air

**Psychotropic** – acting on the mind

**Pulmonary edema** – fluid in the lungs

**Pyrophoric** – a material that will ignite spontaneously in air below 130°F (54°C)

**Reactivity** – a description of the tendency of a substance to undergo chemical reaction either by itself or with other materials with the release of energy

**Reproductive health hazard** – any agent that has a harmful effect on the adult male or female reproductive system or the developing fetus or child

**SDS** – safety data sheet

**Sensitization** – an immune-response reaction state in which further exposure elicits an immune or allergic response

**Silicosis** – a condition of massive fibrosis of the lungs causing shortness of breath

**Skin** – notation used to indicate possible exposure to a chemical by absorption through the skin

**STEL** – short-term exposure limit

**Subcutaneous** – beneath the skin

**Target organ effects** – chemically caused effects upon specifically listed organs and systems

**Teratogen** – an agent or substance that caused physical defects in a developing embryo

**Threshold limit value (TLV)** – a term established by ACGIH to express the airborne concentration of a material to which nearly all workers can be exposed day after day without adverse effects

**Time-weighted average (TWA)** – the expression for average exposure that accounts for fluctuating levels during a given time period

**Unstable** – tending toward decomposition or other unwanted chemical change during normal handling or storage

**Upper explosive limit (UEL)** – the highest concentration of a material in air that will produce an explosion

**Vapor density** – the weight of a vapor or gas compared to the weight of an equal volume of air

**Vertigo** – a feeling of revolving in space; dizziness, giddiness

**Viscosity** – measurement of the flow properties of a material

**Water reactive** – a chemical that releases a hazardous gas, often violently, upon contact with water