



Transportation Safety

Pesticides are transported from manufacturers to distributors and dealers, from retailers to end users, and from storage and mixing locations to application sites. Accidents can happen at any point in the chain, even when transport distances are short. Careless handling of containers, incorrectly maintained equipment, and unforeseen accidents can lead to pesticide leaks and spills during transport. Such events have the potential to injure or even kill humans and animals, pollute the environment, and lead to financial losses and legal actions. Preparing to prevent transportation mishaps and properly responding when they do occur could mean the difference between an annoying inconvenience and a community-scale disaster. Every pesticide user needs to understand the potential hazards associated with the chemicals they are transporting and the regulations affecting over-the-road transport of hazardous materials.

Transporting Pesticides in Pennsylvania

Safety Recommendations and Legal Requirements

Transport vehicle

Pesticide transport vehicles for road and field vary widely in design and use, from bulk tankers and box trucks to pickup trucks and station wagons as well as self-propelled and pull-type sprayers. Some vehicles carry only formulated concentrates for delivery; others incorporate application equipment with premixed spray solutions; others handle both. All, however, share basic common characteristics that affect safety and emergency response capabilities. First and foremost, in Pennsylvania the pesticide business license number (BU) must be prominently displayed on all vehicles involved in the pesticide application phase of the business. The numbers must be at least 3 inches high and placed on both sides of the vehicle in a readily visible location.

Transport vehicles should be in good mechanical condition, including power train, chassis, and any onboard bulk tanks and associated plumbing. Make sure that safety and control

components such as brakes, tires, and steering are in good working order. A poorly maintained vehicle is a safety risk, and transporting pesticides just increases the risk of additional injury or contamination should a mishap occur. If application equipment is mounted on transport vehicles, regularly inspect sprayer tanks, fittings and lines (especially those under pressure), and booms and nozzles. Look for structural defects, cracks, punctures, and other causes of leaks or failure.

Pesticides should never be carried in the passenger compartment of a vehicle because hazardous fumes and spilled chemicals can seriously injure occupants. In addition, spilled pesticides can be difficult or impossible to remove completely from interior upholstery. If pesticides must be carried in a station wagon, utility van, or similar enclosed vehicle, properly ventilate the cargo and passenger compartments and keep passengers away from pesticides during transport. A safety barrier between the passenger and cargo areas is recommended because cargo can shift during transport.

The cargo area should securely hold containers and provide protection from tears, punctures, or impacts that could lead to container damage. Enclosed, locked cargo boxes provide the greatest protection and offer added security from curious children, careless adults, or vandals; however, they are not always practical. Open truck beds are more convenient for loading and unloading, but precautions must be taken to minimize the possibility of losing or tipping containers during transport. Flatbed trucks should have side and tail racks and tie-down rings, cleats, or racks to help secure the load. Inspect the cargo area for nails, stones, and sharp edges or objects that could damage containers. Metal beds or synthetic bed liners are preferable to wood because they are more easily cleaned if a spill should occur.

This PDF version of the fact sheet does not include the color insert titled “DOT Chart 13: Hazardous Materials Marking, Labeling, and Placarding Guide” on pages 9–12. One free copy of the entire fact sheet can be ordered from the Publications Distribution Center by calling 814-865-6713. A copy of just the insert may be purchased by calling 202-366-2301 or ordering online at https://hazmatonline.phmsa.dot.gov/services/Pub_Sale.aspx.

Vehicle operator

Both the business owner and the operator of the transport vehicle can be held responsible, in most cases, for any injuries, contamination, or damage resulting from a chemical release. The vehicle operator should be knowledgeable and capable of handling the responsibilities that are required to transport any pesticides. The vehicle operator is the best—and maybe the only—person capable of reacting to a spill or other mishap and most likely will need to assist or instruct first-response emergency personnel as they arrive on the scene.

At a minimum, the vehicle operator should understand the nature and hazards of the pesticides being transported and the safe and proper procedures for handling them. The operator should also be trained in basic emergency response procedures such as spill control and emergency notification procedures.

Operators of pesticide transport vehicles may be required to have special motor vehicle training and licensing and possibly other additional training and certification. If the pesticides are labeled for agricultural use, the provisions of the EPA Worker Protection Standard (WPS) require that drivers of vehicles transporting pesticides in anything but factory-sealed containers be trained as WPS pesticide handlers or be certified applicators. If the load meets the U.S. Department of Transportation (DOT) definition of a hazardous material or hazardous substance, then special driver training and, in some instances, commercial driver licensing is required. These requirements are discussed later.

Other safety precautions

Place product labels and material safety data sheets (MSDS) for each product being transported in the vehicle prior to leaving the loading area. These contain information about active ingredients; how to use the product including personal protective equipment; human, environmental, and other hazards; first aid; storage and disposal; precautions needed for emergency personnel; and emergency telephone numbers. Having this information in the transport vehicle will help guide the operator and/or emergency personnel responding to a spill or release of pesticide. In addition, shipping papers—also called a vehicle manifest—may be required for products that are regulated as hazardous materials.

A phone number should be in the vehicle for 24-hour emergency assistance (spill cleanup and so on). With increased availability of cellular phone service, a mobile phone unit is a worthwhile investment for those routinely involved in the transport of pesticides or working alone in remote locations. Carry personal protective equipment appropriate for the pesticides in transit and a spill kit, either a commercial or self-assembled version. Operators must be trained to use this equipment properly. Be familiar with the travel route to anticipate and avoid problems.

Containers should be in serviceable condition, with legible and attached labels (preferably the original label), tight closures, and pesticide-free outside surfaces prior to loading. Handle containers carefully during loading to avoid rips and punctures. Packing or shipping containers can be used to provide extra protection and secondary containment. Where practical, cover

the floor and sides of the cargo area (especially truck beds) with a synthetic liner or tarpaulin, which can provide containment and easier cleanup of spilled materials. Organize the load to maximize stability while maintaining access to containers for unloading during the course of the day or the delivery route. The fewer times containers are handled, the less likely they are to be damaged. Secure the load with tarps, ropes, brace bars, or other appropriate devices to prevent containers from shifting in the cargo area, and secure anything else that could damage a container during transport.

Protect chemicals from temperature extremes and moisture during transit. Extremely high or low temperatures (<40°F or >110°F) can alter the stability or effectiveness of some chemical formulations. Moisture can destroy paper and cardboard and promote rusting of metal containers. A waterproof cover can provide protection from the weather.

Do not allow people, pets, or livestock to ride in a cargo area loaded with pesticides. Food, livestock feed, seed, veterinary supplies, and plant materials should be kept separate from pesticides because contamination may render them unusable or result in a poisoning incident. When possible, herbicides should be kept separate from fertilizers and other pesticides because of the potential for cross-contamination. When pesticides must be transported with other materials in a single cargo area, elevate the other products in the load to reduce the possibility of contaminating these products with pesticides in the event of an onboard leak or spill. For example, place the non-pesticide products on pallets.

Never leave your vehicle unattended when transporting pesticides in an open vehicle. The owner and operator of the vehicle are responsible if curious children, careless adults, or vandals are poisoned or release pesticides that result in contamination or injury to other persons or the environment. If the cargo area cannot be locked, covering the load with a tarp can reduce the likelihood of tampering by unauthorized individuals.

Emergency procedures

If a spill or accident occurs, control the flow of material and contain it to prevent further spread as soon as possible. Be sure to wear the appropriate protective equipment to clean up the spill. Always dispose of any waste materials properly. The Pesticide Safety Fact Sheet *How to Handle Chemical Spills* outlines response procedures for handling chemical spills. It is available at www.pested.psu.edu or your local county extension office.

If the spill is large or potentially dangerous, do not leave the site unattended; have someone else get help. Operators should have radio or telephone communication available in the vehicle should they need to call for assistance. County emergency management offices can provide or coordinate assistance and regulatory compliance (dial 911 or check the blue pages of a phone directory) and are the first contact to be made in an emergency. Many pesticide manufacturers list a 24-hour emergency number on the label or MSDS, but these are almost exclusively for that company's products. Such a number would not be acceptable for loads containing products from more than one manufacturer.

CHEMTREC, a service provided by the Chemical Manufacturers Association and its members, provides first responders, the transportation industry, medical professionals, and others with access to response information and technical assistance from chemical industry experts for incidents involving hazardous materials. However, depending on the circumstances, this is a for-fee service that must be contracted from CHEMTREC. Their emergency phone number is

1-800-424-9300, which is restricted for emergency assistance only.

Several governmental agencies require notification of spills under certain circumstances. The Pennsylvania Department of Agriculture (PDA) requires that significant spills be reported to them. If spilled pesticides can potentially contaminate surface water, groundwater, or other waterway, the Pennsylvania Department of Environmental Protection and the Pennsylvania Fish and Boat Commission require notification. The local emergency planning coordinator must also be notified if the pesticide spilled is listed as an extremely hazardous substance and exceeds the reportable quantity as defined by the Emergency Planning and Community Right-to-Know Act of 1986, Title III of the Superfund Amendments Reauthorization Act (SARA), as shown in Table 1. Information found in Table 1 can also be located at www.myregs.com/dotrspa/. Once you reach this site, select Sub-Chapter C, then Part 172, and then 172.101 App.A.

Department of Transportation Regulations Affecting the Transport of Pesticides on Public Roadways

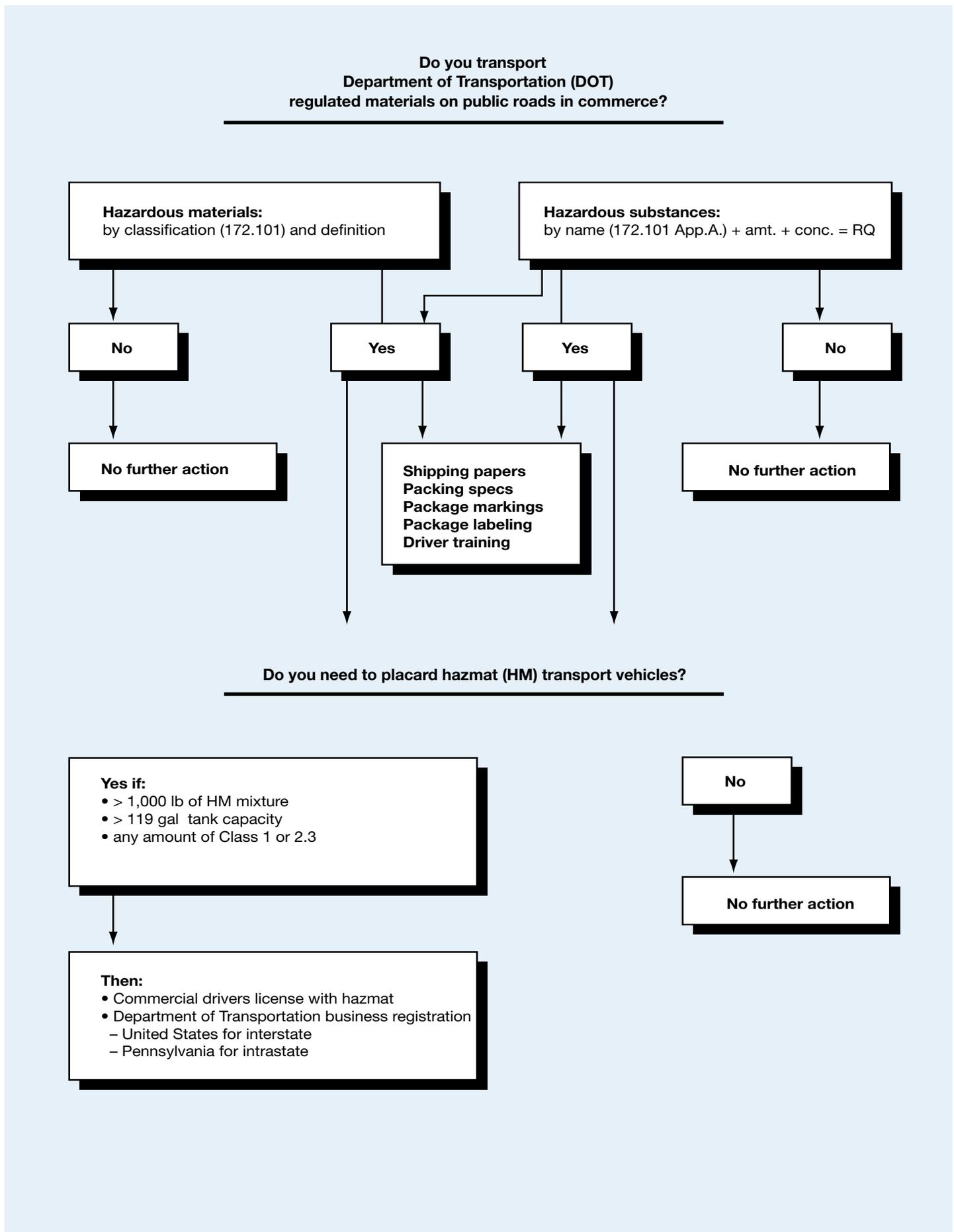
Most regulations affecting pesticides fall under the authority of the amended Federal Insecticide, Fungicide, and Rodenticide Act of 1947. However, some pesticides meet the definition of U.S. DOT hazardous materials (HM, hazmat) or SARA Title III hazardous substances and are subject to the special requirements of DOT hazardous materials regulations (49 CFR Parts 171–180) when being transported on public highways.

The DOT regulations are extensive and complex, addressing everything from live munitions to biological organisms to nuclear waste. The portions of the DOT regulations that most often apply to pesticide applicators and transporters are those that require training for vehicle operators. This training should prepare operators to avoid and react to chemical spills and, at the same time, educate them to communicate information to first-response emergency personnel to prevent their exposure or injury when responding to an incident. This fact sheet will outline the regulations and suggest a monitoring program to help meet these regulatory requirements. However, this publication is not intended to be a complete DOT hazmat reference or to eliminate the need to understand the regulation in its entirety. Figure 1 outlines the process for determining your own DOT hazmat compliance requirements.

Do you carry DOT-regulated materials?

The first and most important step is to determine if the product(s) being transported is a product or commodity being interchanged between parties and meets the requirements of a U.S. DOT-regulated material. Products used for personal use around the home or hobby farm (no income generated) are exempt from these requirements. Regulated materials are defined as either hazardous materials by DOT or hazardous substances by EPA in SARA Title III. Pesticides are just a few of the many materials that are DOT-regulated. Therefore, even if the pesticides being transported do not meet these definitions, other products in the load, such as solvents, fuels, or fertilizers, should be evaluated regarding possible DOT regulation.

Figure 1. Flow chart for determining Department of Transportation regulatory requirements (excludes hazardous waste).



Hazardous substances

Hazardous substances are those listed by EPA, but are regulated only if carried in both a quantity and concentration that exceeds EPA's specifications. Table 1 lists most of the pesticide active ingredients that EPA recognizes. The table also lists the minimum quantity and concentration for each that would qualify them as a hazardous substance. Check the product label for the list of active ingredients and percentage composition of each active ingredient. The following example illustrates how to use the information in Table 1 to determine if the pesticides being transported are considered a hazardous substance.

Example

Guthion 2L is a restricted-use insecticide labeled for many fruit and vegetable crop uses. According to the label, Guthion 2L contains 2 pounds of active ingredient (lb ai) per gallon, a 22 percent solution. The Guthion 2L label suggests spray solutions between 0.03 percent and 1.0 percent. The minimum regulated amount and concentration for Guthion 2L listed in Table 1 are 1.0 pound of active ingredient and a 0.002 percent (20 ppm) concentration. Both of these criteria must be met for the load to be DOT-regulated.

If you are transporting undiluted 22 percent concentrate, which exceeds the 0.002 percent concentration standard, then any amount at or above 0.5 gallon (1 lb ai) is a DOT-regulated hazardous substance, because

$$\frac{1 \text{ lb ai (from Table 1)}}{2 \text{ lb/gal formulation}} = 0.5 \text{ gal}$$

If a mixed spray solution is being transported, then calculate the concentration and amount of active ingredient in the tank and compare to Table 1 to determine if the load is regulated. When mixed according to label directions, the concentration of the spray solution will be between 0.03 percent and 1.0 percent active ingredient, and this entire range is above 0.002 percent. If the concentration of the solution is known, then the amount of active ingredient in the tank can be calculated by the following formula:

$$\text{lb ai} = \frac{\% \text{ ai} \times \text{gallons of solution} \times 8.34 \text{ lb/gal H}_2\text{O}}{100}$$

For 100 gallons of 0.03 percent solution,

$$\frac{0.03\% \text{ ai} \times 100 \text{ gal} \times 8.34 \text{ lb/gal H}_2\text{O}}{100} = 0.25 \text{ lb ai}$$

Alternatively, the amount of active ingredient in the tank can be calculated by simply multiplying the product formulation (2 lb/gal) by the amount of product added to the mix (1 pint, or 0.125 gal, in 100 gal) to get the same answer.

$$2 \text{ lb/gal formulation} \times 0.125 \text{ gal product} = 0.25 \text{ lb ai}$$

In either case, 0.25 pound is below the 1 pound threshold, so this load would not be regulated. For 100 gallons, this mixture would need to be at least four times as concentrated (4 x 0.03%, or 0.12%) to be regulated (> 1 lb ai). Similarly, 4 x 100 gallon (400 gal) of 0.03 percent solution would also be regulated because the total active ingredient is 4 x 0.25 (or 1.0) lb ai. If the amount of active ingredi-

ent added to the spray mix is known, the concentration of the solution can be calculated in a similar fashion by dividing the amount (weight) of the active ingredient by the weight of the water carrier and multiply by 100.

$$\% \text{ ai} = \frac{\text{lb ai}}{\text{gal of water} \times 8.34 \text{ lb/gal H}_2\text{O}} \times 100$$

Hazardous materials

Hazardous materials are broadly classified by their toxicity, reactivity, flammability, and/or corrosivity characteristics. With few exceptions, pesticide products that are classified as hazardous materials carry that designation because of their flammability (particularly emulsifiable concentrates or ECs) or toxicity characteristics.

Table 2 lists some of the pesticides and a few fertilizers and fuels that pesticide applicators commonly carry that are often recognized by DOT as a hazardous material. Pesticides are often listed in the table of hazardous materials by chemical family rather than a specific active ingredient. Also, the category "pesticides, n.o.s. (not otherwise specified)" includes any product with an EPA registration number.

Hazardous materials are classified by the characteristics of the formulation of the material being transported—for instance, mixed spray solution, impregnated fertilizer, formulated concentrate—not the active ingredient. For example, undiluted EC formulations of insecticides are often classified as hazardous materials because of their flammability or toxicity characteristics. These same products, when diluted in water according to label directions, often no longer meet the definition of a hazardous material.

Table 3 includes the abbreviated descriptions of various hazardous material classifications that apply to pesticides. This table also includes the characteristics that require them to be classified as hazardous materials. Some hazardous material classes are further broken down into hazard zones and packing groups. This additional breakdown further defines the degree of danger associated with specific products and the precautions that should be observed when handling them.

Determining the regulatory status for the products being transported requires some research. Many MSDSs include DOT shipping requirements, usually in the last section of the MSDS. However, the manufacturer is not required to include this information on the MSDS. If the MSDS does not contain this information, contact the manufacturer or retailer directly. Since both transport the product, they should be able to supply the required transportation shipping information. If neither of these sources provide the needed information, check the chemical and physical data on the MSDS against the hazard class characteristics in Table 3 to determine the regulatory status of your product. If the product concentration changes because spray solutions or pesticides have been altered in any way, the regulatory status for this new concentration must also be determined.

All regulated hazardous substances are automatically defined as class 9 miscellaneous hazardous materials if they do not meet the definition of another specific hazard class. For example, Table 2 lists both organo-phosphorous and carbamate pesticides with the potential hazmat (HM) classification of 3, which is a flammable/combustible liquid, or HM classification 6.1

poisonous material. Triazine pesticides also carry similar classifications. In comparison, gasoline carries a hazmat classification of 3. The determination of hazardous substance, hazardous material, or both is important because this information must be entered on the shipping paper. The exact HM classification can be determined by the defining characteristics listed in Table 3. For example, a carbamate pesticide in liquid form that has an oral LD50 of less than 500 would have an HM classification of 6.1. If the oral LD50 of this liquid product was greater than 200 but less than 500, it would also require a packing group III designation.

By determining the legal status of transported chemicals, an important step in complying has been taken to meet the complex DOT regulations. If the product being transported is not regulated by DOT under the HM regulations, then no further action is necessary. However, this process must be repeated for each new product that requires transportation. If it is determined that the product being transported on public roads is a regulated substance, the next section describes the basic responsibilities of all hazmat transporters and briefly outlines additional requirements for transporters of especially large or dangerous loads.

Basic requirements for HM transporters

Pesticides that meet the definition of U.S. DOT hazardous materials or SARA Title III hazardous substances are regulated under 49 CFR Parts 171–180 when being transported on public highways. All transporters of hazardous materials (including hazardous substances) must comply with these basic requirements. The parts of these DOT regulations most important for transporters of hazardous substances and hazardous materials are commonly known as Part 172.700 (driver training) and Part 172.200 (shipping procedures). Part 172.700 describes which employees must be trained, the content of their training program, the timing and frequency of training, and record-keeping responsibilities. Shipping procedures regulated under Part 172.200 include proper shipping papers, access to 24-hour emergency assistance, and proper packaging, including marking and labeling, for the product in question.

Reminder: This section is not an official or complete summary of the DOT regulations. Therefore, it should not substitute for official documentation from DOT. These federal regulations were adopted by Pennsylvania for reference. Therefore, official documentation must be requested from a U.S. government printing office. In Pennsylvania, locations include Philadelphia 215-363-1900 and Pittsburgh 412-395-5021. An online version is available at: www.myregs.com/dotrspa/.

Part 172.700: Driver training program outline

Part 172.700 requires that any employee who prepares, loads, transports, sells, tests, packages, or performs similar activities with a hazardous material receive hazardous materials transportation training. This regulatory requirement is designed to increase safety awareness and improve emergency preparedness for responding to transportation incidents and accidents. The hazmat training may be done in-house or by an outside source. Basic requirements for hazmat training include:

- General awareness training including hazmat regulations, recognition of hazardous materials, and understanding hazard communication requirements, label directions, MSDSs, and shipping forms. The DOT hazard communication requirement establishes uniform standards for vehicle placarding, package labeling and marking, and shipping papers. Note: these standards are not the same as the Occupational Safety and Health Administration (OSHA) requirement.
- Each employee must have specific training to comply with hazmat regulations for each task performed, such as a truck driver responding to a spill.
- Employee awareness of risks associated with hazardous materials that they may be exposed in the work place, including specific measures to protect themselves from exposure.
- Emergency response training, including emergency response procedures and first aid, for all

employees who handle or transport packages containing hazardous materials (such as warehouse workers and drivers).

- Basic safety training for vehicle drivers will cover package handling, exposure precautions, and other nonemergency chemical safety procedures.

In addition, employers must maintain records of their employees' training for the previous three years. Records must include the employee's name, date of training, detailed description of training materials, the name and address of the trainer, and the certification that hazmat training and testing has been completed.

Numerous state and national associations as well as commercial sources provide additional training programs designed to teach compliance with these regulatory requirements. A list of these programs can be found at: hazmat.dot.gov/thirdpty.htm.

Part 172.200: Shipping procedures

In addition to the training requirement, transporters of DOT-regulated materials must follow specific procedures for completing and carrying shipping papers, identifying 24-hour emergency contacts, and correctly choosing shipping materials, including their marking and labeling. Each vehicle operator must have available at all times a shipping paper, which has a log of the hazardous materials originally loaded on the vehicle. The shipping paper can also log unregulated materials. DOT does not require the driver to update the shipping paper throughout the day to reflect delivery or partial off-loading. The shipping

paper must be within sight and hand's reach of the driving position with the seat belt fastened. Acceptable locations are on the seat or in the pocket of the driver's door, while in the glove compartment or under the seat are not acceptable locations for the shipping paper.

When a hazardous material is required to be included on a shipping paper, the following requirements must be met. When hazardous materials and nonregulated materials are on the same shipping paper, the hazardous materials must either be listed first, highlighted, or identified with an "X" (or an "RQ" when appropriate) placed before the proper shipping name in a column captioned "HM" to differentiate them from the nonregulated materials. A nonhazardous material may not be offered for transportation or transported when its description on a shipping paper includes a hazard class or identification number listed in the 171.101 Table. Exceptions include those materials in the United Nations (UN) recommendations, the International Civil Aviation Organization (ICAO) Technical Instructions, or the International Maritime Dangerous Goods (IMDG) Code (found in Part 171.7 of this regulation).

The shipping paper must be legible, printed in English, and, unless specifically authorized or required by the regulations, may not contain abbreviations or codes. While no specific form for the shipping paper is required by DOT, a generic sample shipping paper that can be adapted appears at the end of this publication (Figure 2). The following information must be included and kept for 375 days after the material has been accepted by the initial carrier:

1. Proper shipping name of the material from the hazardous materials table (49 CFR Part 172.101)
2. The hazard class or division number
3. The four-digit identification number as found in 49 CFR Part 172.101
4. Packing group in Roman numerals
5. The total quantity of material on board by weight or volume including the unit of measurement
6. Company name, address, and contact person, the vehicle ID number, and the date
7. The type of packaging and destination marks may be entered in an appropriate manner before or after items 1 through 4, which provide the basic description
8. A 24-hour emergency number

In most cases, the information in items 1 through 4 must be shown in sequence with no additional information included. For example, “Gasoline, 3, UN1203, PG II” indicates that the proper shipping name is Gasoline, the hazard class is 3, the identification number is UN1203, and the packing group is II. The technical and chemical group name can be listed in parentheses between items number 1 and 2 or after item number 4. For example, “Flammable liquids, n.o.s. (contains Xylene and Benzene), 3, UN1993, II.” The necessary information to complete the shipping paper requirements for the first four items can be found in the hazardous materials table of 49 CFR Part 172.101. This table is also located at www.myregs.com/dotrspa/. Once you reach this site, select Sub-Chapter C, then Part 172, and then select 172.101 Hazardous Material Table. This information may also be available from the MSDS sheet or the manufacturer.

The 24-hour emergency number must have a knowledgeable person standing by at all times. An answering machine or answering service is not adequate. As mentioned earlier, many pesticide manufacturers list a 24-hour emergency number on the label or MSDS, but these are almost exclusively for that company’s products. For loads containing products from more than one manufacturer, emergency numbers must be available for each manufacturer of all products on the load. However, establishing communication with several manufacturers at the same time while at the scene of an incident would be difficult if not impossible. For this reason, many commercial transporters use CHEMTREC, a 24-hour emergency response service, as their 24-hour contact. If their number is used without authorization, the operator will be in violation of DOT regulations and considered not in compliance. CHEMTREC does provide emergency response information to emergency responders at no charge as a public service.

DOT also requires that basic emergency response information (for example information contained on the MSDS) be carried in the vehicle with the shipping paper(s). This information must include the basic description and technical name of the product (as it appears on the shipping paper), acute health hazards, basic first aid procedures, and emergency response procedures for incidents both with and without fire.

With the exception of most premixed pesticide solutions transported in small, manually operated sprayers, the packaging of hazardous products is also regulated by DOT. This includes specifications for container

design and construction, and proper marking and labeling of packages. A container refers to any vessel holding a DOT-regulated product, whether it is a 1-liter plastic bottle or a stainless steel tank hauled by a tractor-trailer. Container specifications become more exact as the hazards associated with a particular product or use increase as indicated by the different packing groups referenced in Table 3. Once loaded in the proper container, packages must be appropriately marked and/or labeled so the hazards associated with their contents are easily determined just by looking at them. Package marking and labeling requirements vary, but generally include proper shipping names, identification numbers, hazard classes, package orientation (e.g., “This side up”), specific hazards (oxidizer, flammable, and so forth), and other important safety or hazard information all properly placed.

Due to the variation in marking and labeling requirements for the many pesticide products transported, this document cannot provide the details of those topics. Most shippers of regulated products have professionally trained staff to ensure that packages are properly marked and labeled as required by DOT. The use of original containers with original marking and labeling as provided by shippers and manufacturers is strongly encouraged. An example would be transporting bottles or jugs in their original cases rather than loose. When individual loose containers are transported, carefully reproduce all marking and labeling present on the original case or, in the case of agricultural operations, refer to 49 CFR Part 173.5 for the specific exemptions allowed.

Concentrated pesticide formulations should be transported in their original containers to ensure compliance with DOT container design and construction specifications. When purchasing large-volume tanks for mixed pesticide solutions, have the dealer provide evidence of DOT approval for the tank and its intended use. The DOT designation will be stamped somewhere on the tank. Do not purchase the tank if the seller cannot provide this evidence. If constructing a tank, refer to 49 CFR Part 173 for specifications applicable to its intended use.

Vehicle placarding and commercial driver licensing

The DOT regulations previously discussed apply to all transporters of hazardous products, regardless of quantity, hazard class, or any other technical consideration. Additional requirements, specifically vehicle placarding and related procedures, apply to transporters of large quantities of hazardous materials or of any quantities extremely dangerous substances. Placards are simply rectangular signs that identify the hazard class code and its associated hazard, such as 6.1 Poisonous. The regulations specify placard size, shape, color, symbol, location on the vehicle, and other important requirements. Vehicle placarding is required if transporting any of the following:

- Greater than 1,000 lb (454 kg) in a single container/package of any hazardous material or of any mixture containing a hazardous material
- Any quantity of hazardous material in a permanently fixed tank with a capacity of greater than 119 gal (450 l)

- Any quantity of a class 1 (explosive) or class 2.3 (poisonous gas) hazardous material. (While these classifications rarely apply to pesticides, fumigants containing methyl bromide are classified as 2.3 poisonous gases.)

If the load contents require placards on the vehicle, then the operator is automatically required to possess a commercial driver license (CDL) with hazmat endorsement. In addition, the business must register with either the state DOT or the U.S. DOT if the vehicle crosses state lines at any time. Other circumstances might require a CDL, such as gross vehicle weights in excess of 26,000 pounds or the operation of an articulating vehicle. Even if the operator already possess a CDL, the additional hazmat endorsement must still be obtained.

Because they rarely apply to most pesticide applicators, the details of placarding, CDLs, and DOT registration are not covered in this publication. Contact the state DOT for additional information when transportation activities require compliance with these regulations. In Pennsylvania, contact the Pennsylvania Department of Transportation, Hazardous Materials Section, Motor Carrier Safety Division at 717-787-7445.

Security Training

The Department of Transportation issued new regulations in 2003 requiring shippers and carriers of hazardous materials, including certain agrichemicals, to develop and implement security plans and also require security training for hazmat employees. Not included in these new regulations were requirements to list the name and address of the shipment consignor and consignee on shipping documents. A description of the materials being shipped is required on a shipping paper, but companies do not have to list who is shipping the material, where it is being shipped from, or who will be receiving the material.

Transporting pesticides and other hazardous materials is serious business with potentially serious consequences for those who do not know proper procedures or do not follow the law. Accepting responsibility as an operator and instilling those values in employees is the key to preventing dangerous mishaps on the road.

Table 1. Pesticides classified as U.S. DOT hazardous substances (from 49 CFR Part 172.101).

Pesticide active ingredients	Reportable quantities (RQ)	
	lb (kg)	% by wt (ppm)
2,4,5-TP	100 (45.4)	0.2 (2000)
2,4-D	100 (45.4)	0.2 (2000)
Acrolein	1 (0.454)	0.002 (20)
Aldrin	1 (0.454)	0.002 (20)
Aluminum phosphide	100 (45.4)	0.2 (2000)
Captan	10 (4.54)	0.02 (200)
Carbaryl	100 (45.4)	0.2 (2000)
Carbofuran	10 (4.54)	0.02 (200)
Carbon disulfide	100 (45.4)	0.2 (2000)
Carbon tetrachloride	10 (4.54)	0.02 (200)
Chlordane	1 (0.454)	0.002 (20)
Chlorine	10 (4.54)	0.02 (200)
Chloroform	10 (4.54)	0.02 (200)
Chlorpyrifos	1 (0.454)	0.002 (20)
Coumaphos	10 (4.54)	0.02 (200)
Creosote	1 (0.454)	0.002 (20)
Diallate	100 (45.4)	0.2 (2000)
Diazinon	1 (0.454)	0.002 (20)
Dicamba	1000 (454)	2 (20,000)
Dichlobenil	100 (45.4)	0.2 (2000)
Dichloropropane	1000 (454)	2 (20,000)
Dichlorvos	10 (4.54)	0.02 (200)
Dicofol	10 (4.54)	0.02 (200)
Dieldrin	1 (0.454)	0.002 (20)
Dimethoate	10 (4.54)	0.02 (200)
Diquat	1000 (454)	2 (20,000)
Disulfoton	1 (0.454)	0.002 (20)
Diuron	100 (45.4)	0.2 (2000)

Pesticide active ingredients	Reportable quantities (RQ)	
	lb (kg)	% by wt (ppm)
Endosulfan	1 (0.454)	0.002 (20)
Endrin	1 (0.454)	0.002 (20)
Ethion	10 (4.54)	0.02 (200)
Famphur	1000 (454)	2 (20,000)
Formaldehyde	100 (45.4)	0.2 (2000)
Guthion	1 (0.454)	0.002 (20)
Heptachlor	1 (0.454)	0.002 (20)
Lindane	1 (0.454)	0.002 (20)
Malathion	100 (45.4)	0.2 (2000)
Maleic hydrazide	5000 (2270)	10 (100,000)
Methomyl	100 (45.4)	0.2 (2000)
Methoxychlor	1 (0.454)	0.002 (20)
Methyl bromide	1000 (454)	2 (20,000)
Methyl parathion	100 (45.4)	0.2 (2000)
Mevinphos	10 (4.54)	0.02 (200)
Naled	10 (4.54)	0.02 (200)
Napthalene	100 (45.4)	0.2 (2000)
Parathion (ethyl)	10 (4.54)	0.02 (200)
Phenyl mercuric acetate (PMA)	100 (45.4)	0.2 (2000)
Phorate	10 (4.54)	0.02 (200)
Pronamide	5000 (2270)	10 (100,000)
Pyrethrins	1 (0.454)	0.002 (20)
Thiram	10 (4.54)	0.02 (200)
Toxaphene	1 (0.454)	0.002 (20)
Trichlorfon	100 (45.4)	0.2 (2000)
Warfarin and salts	100 (45.4)	0.2 (2000)
Zinc phosphide	100 (45.4)	0.2 (2000)

Table 2. U.S. DOT hazardous material classifications for pesticides (from 49 CFR Part 172.101).

Compound	HM Classification	
Ammonium nitrate fertilizers	5.1	Oxidizer
Anhydrous ammonia	2.2 2.3	Nonflammable compressed gas Poisonous gas
Arsenical pesticides	3 6.1	Flammable/combustible liquid Poisonous material
Benzoic acid derivative pesticides	3 6.1	Flammable/combustible liquid Poisonous material
Bipyridilium pesticides	3 6.1	Flammable/combustible liquid Poisonous material
Cacodylic acid	6.1	Poisonous material
Cadmium compounds	6.1	Poisonous material
Calcium arsenate	6.1	Poisonous material
Calcium hypochlorite	5.1	Oxidizer
Carbamate pesticides	3 6.1	Flammable/combustible liquid Poisonous material
Carbon dioxide	2.2	Nonflammable compressed gas
Carbon disulfide	3	Flammable/combustible liquid
Carbon tetrachloride	6.1	Poisonous material
Chloropicrin	6.1	Poisonous material
Chloropicrin/methyl bromide mixtures	2.3	Poisonous gas
Chloropicrin mixtures, not otherwise specified (n.o.s.)	6.1	Poisonous material
Compounds, tree or weed killing	3 8 6.1	Flammable/combustible liquid Corrosive material Poisonous material
Consumer commodities	ORM-D	Other regulated material
Copper-based pesticides	3 6.1	Flammable/combustible liquid Poisonous material
Coumarin-derived pesticides	3 6.1	Flammable/combustible liquid Poisonous material
Diesel fuel	3	Flammable/combustible liquid
Dithiocarbamate pesticides	3 6.1	Flammable/combustible liquid Poisonous material
Environmentally hazardous substance	9	Miscellaneous
Ethylene dibromide (EDB)	6.1	Poisonous material
Ethylene dibromide (EDB)/Methyl bromide	6.1	Poisonous material
Ethylene dichloride	3	Flammable/combustible liquid

continued on next page

Table 2. continued

Compound	HM Classification	
Formaldehyde solutions	3	Flammable/combustible liquid
	8	Corrosive material
Gasoline	3	Flammable/combustible liquid
Insecticide gases	2.1	Flammable gas
	2.2	Nonflammable compressed gas
	2.3	Poisonous gas
Maneb (>60%)	4.2	Spontaneously combustible
	4.3	Dangerous when wet material
Mercury-based pesticides	3	Flammable/combustible liquid
	6.1	Poisonous material
Methyl bromide	2.3	Poisonous gas
Nicotine compounds	6.1	Poisonous material
Organochlorine pesticides	3	Flammable/combustible liquid
	6.1	Poisonous material
Organophosphorous pesticides	3	Flammable/combustible liquid
	6.1	Poisonous material
Organotin pesticides	3	Flammable/combustible liquid
	6.1	Poisonous material
Parathion and compressed gas mixtures	2.3	Poisonous gas
Pesticide, n.o.s.	3	Flammable/combustible liquid
	6.1	Poisonous material
Phenoxyacetic acid derivate	3	Flammable/combustible liquid
	6.1	Poisonous material
Phenyl urea pesticides	6.1	Poisonous material
Phosphine	2.3	Poisonous gas
Sodium hypochlorite	5.1	Oxidizer
Sodium pentachlorophenate	6.1	Poisonous material
Substituted nitrophenyl pesticides	3	Flammable/combustible liquid
	6.1	Poisonous material
Sulfur	4.1	Flammable solid
	9	Miscellaneous
Triazine pesticides	3	Flammable/combustible liquid
	6.1	Poisonous material
Zinc phosphide	4.3	Dangerous when wet material

Table 3. Defining characteristics of U.S. DOT hazardous materials that include pesticides.*

HM class codes	HM class name	Defining characteristics
2.1	Flammable gas	Ignites in standard atmospheric conditions
2.2	Nonflammable, nonpoisonous compressed gas	> 41 PSI at room temperature
2.3	Poisonous gas by inhalation	LC50 < 5000mL otherwise known toxins
	Hazard zone A	LC50 ≤ 200 ppm
	Hazard zone B	200 < LC50 ≤ 1000 ppm
	Hazard zone C	1000 < LC50 ≤ 3000 ppm
	Hazard zone D	3000 < LC50 ≤ 5000 ppm
3	Flammable liquid	Flash point < 141°F
	Combustible liquid	141°F < flash point < 200°F
	Packing group I	Initial boiling point ≤ 95°F
	Packing group II	Flash point < 73°F and initial boiling point > 95°F
	Packing group III	73°F ≤ flash point ≤ 141°F and initial boiling point > 95°F
4.1	Flammable solid	
	Packing group I	Ignites samples ≤ 10 minutes
	Packing group II	Ignites samples ≤ 5 minutes
	Packing group III	5 < Ignites samples < 10 minutes
4.2	Spontaneously combustible material	
	Packing group I	Pyrophoric liquids and solids
	Packing group II	Self-heating material
	Packing group III	According to standard chemical tests*
4.3	Dangerous when wet material	
	Packing group I	Spontaneously flammable when wet
	Packing group II	Flammable or toxic gases when wet
	Packing group III	Reacts slowly with water
5.1	Oxidizer	
	Packing groups I/II/III	According to standard chemical tests*
6.1	Poisonous material	Liquid w/oral LD50 < 500 mg/kg
		Solid w/oral LD50 < 200 mg/kg
		Dermal LD50 < 1000 mg/kg
		Inhalation (dust/mist) LD50 < 10 mg/L
	Packing group I	Oral LD50 ≤ 5 mg/kg
		Dermal LD50 ≤ 40 mg/kg
		Inhalation LD50 ≤ 0.5 mg/L
	Packing group II	5 < oral LD50 ≤ 50 mg/kg
		40 < dermal LD50 ≤ 200 mg/kg
		0.5 < inhalation LD50 ≤ 2 mg/L
	Packing group III	Solids: 50 < oral LD50 ≤ 200 mg/kg
		Liquids: 50 < oral LD50 ≤ 500 mg/kg
		200 < dermal LD50 ≤ 1000 mg/kg
		2 < inhalation LD50 ≤ mg/L

continued on next page

Table 3. continued

8	Corrosive material metal Packing group I Packing group II Packing group III corrosivity tests	Irreversible skin damage (ISD) or severe corrosivity on metal ISD with < 3 minutes of exposure ISD with 3 to up to 60 minutes of exposure ISD with 1 to up to 4 hours of exposure or by std. metal
9	Miscellaneous hazardous material	Indicate by column 5 of 172.101 Table
ORM-D	Other regulated material	Consumer commodities Presents limited hazard due to its form, quantity, and packaging

* Additional information regarding classifications can be found at www.myregs.com/dotrspa in 49 CFR Part 173 Subpart D.

Figure 2. A generic sample shipping paper that you can adapt to your own needs.

Sample Shipping Paper

Page 1 of #

Company Name

Company Address

Emergency response information: 24-hour telephone number

HM	Basic description	Amt	Comments
X	Proper shipping name (+ technical name for n.o.s. materials), hazard class/division, UN ID#, packing group in Roman numerals		
X or RQ	RQ, environmentally hazardous substance, liquid/solid n.o.s. (+ hazardous substance name), 9, UN ID#, III		
X or RQ	RQ, proper shipping name (+ hazardous substance name if applicable), hazard class/division, UN ID#, packing group in Roman numerals		
	Other unregulated materials		

Pesticide Safety Fact Sheets are produced by the Pesticide Education Program in Penn State's College of Agricultural Sciences. Topics covered in the series include

- pesticide laws and regulations
- handling chemical spills
- personal protective gear
- pesticides in the environment
- equipment care and cleaning
- pesticide toxicity and health effects

For a complete list of fact sheets and electronic copies or for more information about the Pesticide Education Program, visit www.pested.psu.edu on the Web.

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