# OVERVIEW

# OF

# HAZARDOUS WASTE

# RULES AND REGULATIONS

STATE OF MINNESOTA

Regulations available in

Environmental Approvals Branch

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## I. INTRODUCTION

America is a nation of consumers. Industrial prosperity has brought it a life-style of comfort and convenience. Most Americans, however, fail to realize that for every product produced and consumed, there is an accompanying waste generated. The bulk of these wastes are called "Solid Waste" and 1.5 billion tons per year are produced. Household garbage, cans, tires and cardboard are characteristic componenets of the solid waste stream. These solid wastes are routinely picked up and taken to sanitary landfills for burial. However, a small percentage (approximately 40 million tons per year) of the solid waste stream, called "Hazardous Waste", are too dangerous to be collected and delivered to a sanitary landfill. Thousands of cases have been documented nation-wide describing loss of life, property and degradation of the environment as a result of mismanagement of bazardous waste.

For example, a bulldozer operator at a landfill in Burnsville was critically burned and disfigured when he backed his vehicle into a group of barrels containing hazardous, flammable paint waste. The barrels of waste had been dumped illegally at the landfill the night before. Hazardous chemical wastes, are not always taken to a sanitary landfill but often are indiscriminately buried. In Perham, Minnesota, eleven employees of a company became seriously ill in the course of a few weeks. They experienced vomiting, severe diarrhea and abdominal pain. Two ere hospitalized and one lost the use of his legs for six months. State officials discovered that the new well supplying drinking water to the company had been contaminated by arsenic from insecticide waste dumped and buried nearby forty years earlier.

What are hazardous chemical wastes? How can they be identified? How are these wastes currently being disposed? Hazardous waste generally include those wastes which are toxic, flammable, explosive and corrosive. Minnesota each year generates approximately 150,000 tons of hazardous waste, of that total, 102,000 tons originate in the seven metropolitan county area.

Some of these wastes are properly managed. They are transported to out-state permitted hazardous waste facilities and subjected to chemical treatment to recover valuable components contained in the waste or are properly disposed. However, the majority of hazardous waste generated in Minnesota is unregulated and improperly managed. Many wastes are indiscriminately dumped in holes, pits and ponds, while others find their way to our streams, rivers and sewage systems. These are environmentally unacceptable disposal practices. Current environmental legislation does not provide criteria for the identification of a waste as hazardous or nonhazardous. Subsequently, much of the hazardous waste generated is not being regulated. The Minnesota Pollution Control Agency (MPCA) Hazardous Waste Rules and Regulations will provide a system by which all hazardous waste will be properly identified and managed. In the seven metropolitan county area, the regulations will be implemented by the counties.

## II. HAZARDOUS WASTE MANAGEMENT PROCESS

The hazardous waste regulations require all generators to evaluate their waste. Certain wastes are exempt from the regulations, however, all nonexempt wastes must be evaluated. Wastes are evaluated according to standards provided in the regulations (see Figure 1). If the waste fails to meet one of these standards, it is classified as a hazardous waste. A generator who produces hazardous waste prepares a plan to manage the waste. The plan, called a disclosure, is submitted to the MPCA for approval.

A disclosure defines how the hazardous waste will be handled from the time of generation through disposal. A generator identifies the hazardous waste facility which will receive, treat or dispose of the company's waste. A facility must be permitted by the state to accept these wastes. The waste should be transported to the hazardous waste facility by a registered transporter. Prior to transportation, the generator must place the waste in containers approved by the MPCA. Appropriate labels must be

placed on all hazardous waste containers. The disclosure also identifies areas in which the hazardous waste will be stored, while awaiting shipment. When shipments of hazardous wastes are executed, they must be accompanied by shipping papers which meet the requirements of the regulations for content. Copies of shipping papers are retained by the generator, transporter and hazardous waste facility operator. Additional copies may have to be sent to the MPCA or counties.

In summary, the regulations provide a total system for handling hazardous waste. They place prime responsibility for proper treatment or disposal of the waste on the generator. To make sure that generators meet this responsibility, state and county officials will monitor the process at certain points. The regulations set specific standards for each step in the process and these standards are the basis for monitoring the activities.

## III. THE REGULATIONS

The remainder of this paper will spell out the procedures and standards given in the regulations. Also, the rationale as to how these standards were derived will be presented.

### (A) Exempt Waste

There are certain specific wastes which have been excluded from the requirements of these regulations. These exempt wastes can either be handled by routine waste management practices or are controlled by other state or federal programs. Most of the exempt wastes listed are readily identifiable, however, one exempt waste, waste waters formed in municipal sewer systems, requires further examination. This waste is under the control of the Metropolitan Waste Control Commission in the seven metropolitan county area or a similar regulatory authority out-state. However, it is important to note that this exemption does not include any of the individual waste streams which produce the waste water in the sewer system.

Only the composite waste water discharged from the pipe directly to the sewer system is exempt. This distinction was made to prevent a generator from diluting his waste to meet state regulations for point source discharge to a surface water or sewer system. Many of the hazardous wastes, which have been discharged to sewer systems via dilution, cannot be treated when received at the waste water treatment plant and are ultimately discharged to a surface water. An evaluation of each waste stream which is part of the composite waste water to be discharged to the sewer system, guarantees that all hazardous waste, which cannot be treated by the waste water treatment plant, will be kept out of the sewer system.

(B) Identification/Evaluation

If wastes produced by a generator are not exempt wastes, the first step of the hazardous waste management process is to decide whether these wastes are hazardous. To do this, regulations given three types of criteria which are: 1) lists; 2) tests; and 3) generic descriptions. First, a generator should determine whether the waste contains any of the chemicals given on the two lists in the second section of the regulations. If the waste has one or more of these chemicals above the given concentrations, then the waste is hazardous. A generator must also state whether the waste is toxic, irritative, corrosive, flammable, oxidative and explosive. The generator may have to conduct specific types of tests, given in Section 2, to measure these properties. Alternatively, the generator has the option to use soft data to evaluate his waste. Soft data is information obtained from the literature, from experience or other sources. If sufficient soft data is not available, then actual tests of a sample of the waste must be conducted. The third criteria is certain generic categories of waste, such as petroleum waste, which are hazardous by definition. The important task of the generator is to identify, using one or more of these criteria, all of the hazardous properties of the waste.

(B-1) Lists

The two lists in the regulations set limits on the amounts of certain chemicals that a waste may contain. If the waste exceeds these limits, it is a hazardous waste. List One includes known or suspected carcinogens. The list does not contain all carcinogens or cancer causing chemicals (there are over 5,000 chemicals which are suspected carcinogens) but only those where a strong case exists. The selection was based on criteria studies done by the National Institute of Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA). The maximum limits, for all but two of these chemicals, are based on OSHA limits for handling these chemicals in a workroom environment. The limits are very conservative because no safe level of exposure exists for these chemicals. The limits for two chemicals, polychlorinated biphenyls (PCB) and lead, come from other standards. The MPCA has set standards for PCB's and the lead standard is one set by the Consumer Product Safety Commission for lead-free paint.

List Two contains bio-accumulative chemicals. Bio-accumulative chemicals build up in the body when ingested over a long period of time. Eventually, these chemicals can cause various disorders and possibly death. The chemicals in List Two have been identified by the Environmental Protection Agency as being bio-accumulative. Bio-accumulative chemicals deposited on land may wash through the soil during rainfall and enter groundwater supplies. This filtration process is called leaching. If one or more of the bio-accumulative chemicals in List Two leach from the waste through the soil and enter the groundwater and the concentration for the chemicals exceeds those given in List Two, then the water will be unfit for consumption by human, animal or fish.

(B-2) Tests

After evaluating the waste for suspected chemicals in List One or Two, the generator evaluates each waste relative to the hazardous properties: flammable, corrosive, irritative, toxic, explosive and oxidative. Tests are provided in the regulations to perform these evaluations. In most cases, there is more than one test which can be used to identify hazardous property. However, once a positive result is obtained for a given hazardous property, additional tests for that property need not be conducted. In place of test, data from the literature or personal experience with the waste may be used. However, if the MPCA determines that this soft data does not adequately identify the hazardous property of the waste, tests will then be required.

(B-2.a) Flammability

The flammability of the waste is measured by determining the temperature at which the waste will ignite. This temperature is called the flash point. Several testing methods are provided in the regulations for determining flash points. Generally, a waste with a flash point less than 200°F is flammable. This limit was selected because waste deposited in sanitary landfills may be exposed to temperatures up to 200°F. These temperatures can be generated as a result of the decomposition of the buried waste or contact of exposed waste with hot machinery.

(B-2.b) Corrosive

There are three tests which may be used to determine if a waste is corrosive. The waste is corrosive if it damages tissues when applied to the skin of a rabbit or corrodes a strip of steel emersed in the waste, or if the waste has a pH greater than 12 or less than 3. A pH greater than 12 would be corrosive to animal tissue and a pH less than 3 corrosive to steel. Also, highly acidic or basic solutions are toxic for fresh water aquatic life. These tests are based on current methods used by the Department

of Transportation and the Consumer Product Safety Commission to measure corrositivity.

(B-2.c) Irritative

Evaluation of a waste to determine if it is irritative can be accomplished from practical experience with the waste in which exposures have caused second degree burns, or by observing the degree of burns caused by the application of the waste to the skin of a rabbit. A generator may select either one of these two methods.

(B-2.d) Toxic

Through experience, man has found that certain substances, principally of plant origin, if taken into the body, produce varying degrees of illness or cause death, while other substances cause no effects. All materials can either be placed in two classes, one which is safe and the other harmful. The word toxic is the term used to describe those materials or chemicals that were distinctly harmful to the body. However, a clear line cannot be drawn to separate all of the harmful materials and chemicals from those that are safe. There are degrees of harmfulness and degrees of safeness for any chemical. One factor that determines the degree of harmfulness of a compound is the concentration of that compound which the body can tolerate. Any substance, such as sugar, if taken into the body in too large amounts, can cause illness and death. It would be toxic.

Another key factor in measuring the toxicity of a compound is the length of time the biological organism is exposed to that compound. Some toxic compounds will cause serious illness or death within a short exposure time (hours or days), while other compounds will not cause any ill effects for several years.

Tests which are given in the regulations to measure the toxicity of a waste provide for the amount of the waste to be given to a test animal, and the length of time over

which the test animals will be observed. The results are measured by the number of test animals which have died at the end of a given time interval with a single dose of the waste given to each of the animals. The toxicological tests in the regulations are only addressing the number of rats, rabbits or fish that will die over a short period of time when given a large single dose of the waste. This dose may be called the Lethal Dose (LD) or Lethal Concentration (LC) of the waste. There are four tests provided in the regulations to measure the toxicity of a waste. The tests are: (1) the oral $LD_{50}$; (2) the dermal $LD_{50}$; (3) the inhalation $LC_{50}$; and (4) the aquatic $LC_{50}$. The terms "$LD_{50}$" and "$LC_{50}$" give the dose or concentration of the waste which resulted in a 50% kill of the population of test animals observed. The primary difference between the four tests is the way in which the waste enters the body of the test animals. For example, in the oral $LD_{50}$ test, white rats drink a mixture of the waste in water. Whereas, the inhalation $LC_{50}$ test, waste at a given concentration is in the form of a gas, dust or mist and the test animal is put into a controlled environment where it must breath this gas or mist. Therefore, the physical properties of the waste will determine which of the four toxicity tests will be used. The generator can select the toxicity test which is most appropriate for his waste.

The regulations indicate a limit of 500 mg/kg for the oral $LD_{50}$. This means that if the test animal, in this case a white rat, weighed 1 kg, it could be given up to 500 mg of waste in a single feeding. If, as a result of consuming this waste, 50% of the test animals died, the waste would be hazardous. The maximum limit of 500 mg/kg was selected for the oral $LD_{50}$ test based upon hypothetical cases which would occur if the waste was improperly disposed. For example, toxic waste, if disposed on land, could filter through the soil and enter the groundwater. Groundwater

serves as a reservoir in many communities for drinking water. If a sufficient amount of the toxic waste reached the groundwater, it could contaminate the drinking water supply and cause illness or death. The worst hypothetical case would result in a drinking water supply containing 20,000 parts per million of the contaminant. A 100 kg man consumes 2.5 liters of water per day. At this rate, he would consume enough water in one day to equal 500 mg of the contaminant per kg of his body weight.

The dermal $LD_{50}$ is a measure of the toxicity of a waste when spread on the skin of a test animal. The regulations specify that for each kg of body weight of a test animal, up to 1,000 mg of waste will be applied to the animal's skin. If 50% of the test animals die as a result of this application, the waste is hazardous. A 1,000 mg per kg maximum limitation was selected by considering a hypothetical case in which a man is doused with a waste which covered half of his body. An accident of this nature could occur while handling the waste.

The hazardous waste which is in the form of a gas, mist or vapor could be carried by the wind at a hazardous waste landfill or storage area. To protect the hazardous waste facility operator and the public downwind of the storage and landfill site, a maximum $LC_{50}$ of 2,000 mg of the gas per cubic meter of air has been established. This limit was selected based upon the current concentration limits for toxic gases set by the Occupational Safety and Health Administration for a workroom environment.

The aquatic $LC_{50}$ is the concentration of a waste, when diluted in water, which will cause 50% of the fish population to die. An upper limit of 100 mg of waste per liter of water has been set for the $LC_{50}$. This value was obtained by considering the impact of a hazardous waste entering a surface water. Standards set provide for the worst possible case of pollution of the hazardous waste to the surface water.

(B-3) Generic Waste

Waste which can be recognized as hazardous based solely on its name or origin can be classified generically. Explosive, oxidative, petroleum waste and used crankcase oil, are all defined generically as hazardous waste. These wastes are readily identifiable. The Department of Transportation has accumulated lists of explosives and oxidative materials which can be used as a reference for their hazard classification. The identification of petroleum waste and used crankcase oil is self-evident.

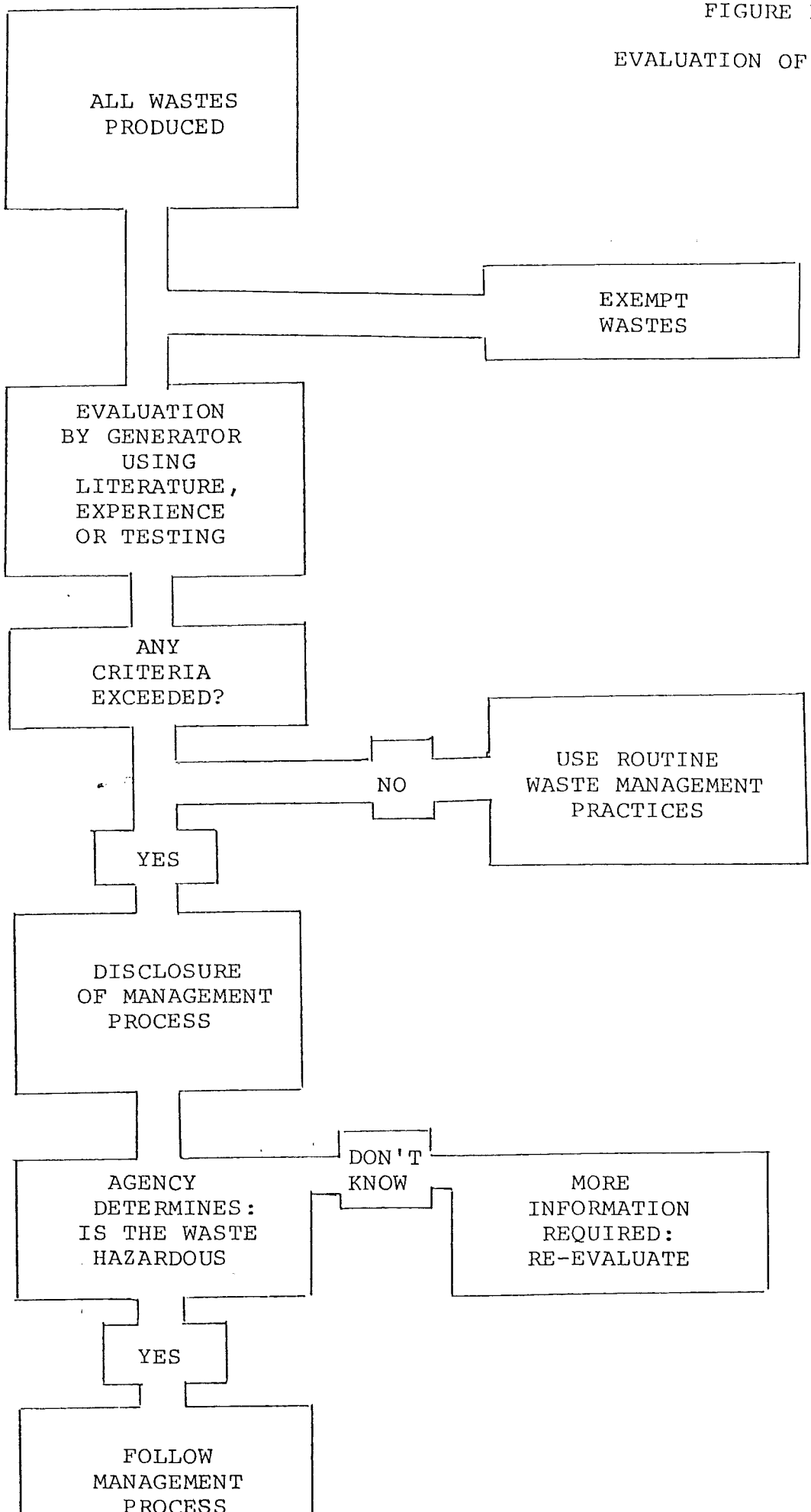
(C) Generator's Responsibilities

Section 3 of the regulations outlines the duties of a generator of hazardous waste. The generator is the key person in the regulations and has the responsibility not only to identify the hazardous waste produced but also to arrange for its proper management. The generator becomes a part of the hazardous waste management program by submitting a disclosure (management plan) to the appropriate regulatory agency. The disclosure contains the results of the evaluation and the generator's plan for the 'cradle to grave' management of the hazardous waste. The disclosure also lists all non-exempt waste that has been determined by the generator to be nonhazardous. This list must include the type of waste and the source or process in which the waste was produced.

All generators must evaluate their nonexempt waste (see Figure 1). Those generators whose wastes are found to be hazardous, must submit disclosures. The Agency can at any time request of those generators who have nonexempt, nonhazardous waste, to submit the results of their evaluation of those wastes to the Agency. All hazardous waste must be treated or disposed at a permitted hazardous waste facility. Section 5 of the regulations establishes criteria for the loading and transportation of the hazardous waste. In order to control the hauling of hazardous waste, transporters in Minnesota must obtain a registration number from the MPCA.

FIGURE I

EVALUATION OF WASTES



Compliance by the generator and transporter with Section 5 will minimize risk to humand health and the environment. In addition to these regulations, the Department of Transportation has responsibilities to regulate hazardous materials while they are in the lanes of commerce. However, there are wastes which would be classified as hazardous by the MPCA regulations but would not be identified as hazardous materials by the Department of Transportation. Section 5 was written to fill this gap that all hazardous waste is properly containerized, stored, labelled, placarded and transported. The hazardous waste regulations do not replace the Department of Transportation's rules and regulations for transportation of hazardous materials. The Department of Transportation's regulations must be complied with by all transporters carrying hazardous waste, which also are classified as hazardous materials by the Department of Transportation.

(D) Shipping Papers

Section 8 establishes the requirements for the preparation of hazardous waste shipping papers by the generators. The shipping paper will allow both the generator and the Agency to keep track of hazardous waste and verify its final disposition. All shipments of hazardous waste must be accompanied by the hazardous waste shipping paper, except: (1) used crankcase oil; (2) transport to an on-site hazardous waste facility; and (3) discharge of hazardous waste to a sewer system or to a surface water, pursuant to a state permit.

The shipping paper contains information which demonstrates the generator's compliance with the disclosure. The hazardous waste and its properties must be properly identified on the shipping paper. The transporter must be identified and registered with the MPCA. Finally, the waste must be delivered to a permitted hazardous waste facility for final disposition. Shipping papers will also provide

information for dealing with the waste in the event of a spill or accident.

The shipping papers must accompany the waste from the time it leaves the generator's shipping dock until final treatment or disposal. The generator, transporter and hazardous waste facility operator must sign the shipping papers. The distribution of the shipping papers from generator to transporter to hazardous waste facility is provided in Figure 2. Copies of the shipping papers must be retained by the generator, transporter and hazardous waste facility operator for a period of five years.

(E) County Involvement

Section 9 establishes procedures for Agency review of County actions. The counties in the metropolitan area will be adopting the MPCA hazardous waste regulations. Each county will be responsible for the administration and implementation of the program. Under Section 9, the counties cannot begin implementation until the Agency has approved the County Hazardous Waste Ordinance. Additionally, the counties are required to submit monthly reports to the Agency concerning hazardous waste licenses and permits, and a yearly summary report of the hazardous waste management program in the County.

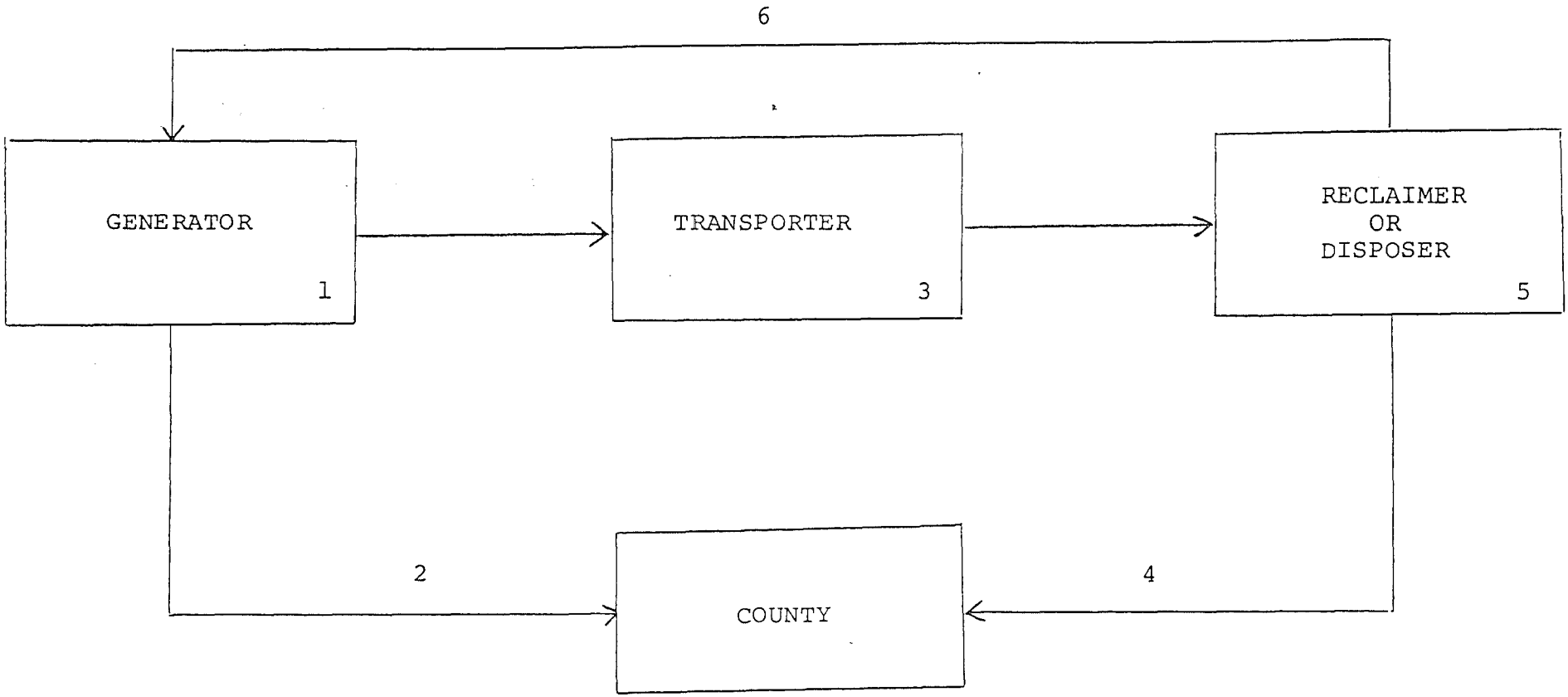
(F) Spills and Accidents

Section 10 defines the responsibilities of a person who has a hazardous waste spill or leak. All spills must be reported to the MPCA's twenty-four hour notification service. Once reported, the person who owns the waste has the responsibility to recover the hazardous waste as rapidly and thoroughly as possible.

FIGURE 2

SHIPPING PAPER

DISTRIBUTION SYSTEM




(1) Generator retains copy after signed by transporter. (2) Generator sends additional copy to County. (3) Transporter retains copy after signed by disposer/reclaimer upon receipt of waste. (4) Disposer/reclaimer sends copy to County after receiving shipment from transporter. (5) Disposal reclaimer retains copy after ultimate disposition of waste and (6) sends copy to generator.