Frequently Asked Questions about

Moderate-Risk Waste Collection Facilities

from Ecology's [Solid Waste and Financial Assistance Program]

Implementation of Chapter 173-350-360 WAC

The definition of Household Hazardous Waste in the new rule says:

"'Household hazardous wastes' means any waste which exhibits any of the properties of dangerous wastes that is exempt from regulation under chapter 70.105 RCW, Hazardous waste management, solely because the waste is generated by households. Household hazardous waste can also include other solid waste identified in the local hazardous-waste-management plan prepared pursuant to chapter 70.105 RCW, Hazardous waste management."

Q1: Is there a more explicit list of what wastes are household-hazardous wastes (HHW)?

A1: Yes. Under Chapter 70.105 RCW Ecology is required to prepare guidelines that include a list of substances identified as hazardous household substances. This list is contained in Appendix A of the Guidelines for Development of Local Hazardous Waste Plans, publication #93-99 (http://www.ecy.wa.gov/biblio/9399.html).

Hazardous household substances that become wastes are commonly called household hazardous waste (HHW). There are six groups of these hazardous substances listed in the local hazardous waste plan guidelines. The six groups and substances in each group are as follows:

1) Repair and Remodeling: **adhesives, glues, cements, roof coatings, sealants, caulkings, epoxy resins, solvent based paints, solvents and thinners, and paint removers and strippers.**

2) Cleaning Agents: **oven cleaners; degreasers and spot removers; toilet, drain and septic cleaners; polishes, waxes and strippers; deck, patio, and chimney cleaners; and solvent cleaning fluid.**

3) Pesticides: **insecticides, fungicides, rodenticides, molluscicides, wood preservatives, moss retardants, herbicides, and fertilizers (which include pesticides).**

4) Auto, Boat and Equipment Maintenance: **batteries; waxes and cleaners; paints, solvents, and cleaners; additives; gasoline; flushes; auto repair materials; and motor oil, diesel oil, and antifreeze.**

5) Hobby and Recreation: **paints, thinners and solvents; chemicals (including photo and pool); glues and cements; inks and dyes; glazes; chemistry sets; pressurized bottled gas; white gas; charcoal lighter fluid; and batteries.**

6) Miscellaneous: **ammunition, asbestos, and fireworks.**

Local governments can add additional substances to this list for any household products which may pose a public health or environmental risk. Examples of these include fluorescent lamps and latex paint.

Q2: **What kind of activities are covered by the rule's requirements regarding flammable or explosive gases? What kind of equipment and maintenance is typically needed to meet the requirement for explosive gas monitoring?**

A2: The primary activity that would call for explosive gas monitoring would be a consolidation process for flammable gases or liquids. The rule does not require explosive gas monitoring at facilities where consolidation or similar activities do not occur unless there is a risk of explosive gas accumulation. Explosive gas monitoring systems are also called "combustible gas detection" systems because the equipment detects the concentration of combustible gases. When flammable liquids or aerosol cans containing flammable liquids are bulked or consolidated they will generate combustible or potentially explosive vapors. These wastes would include, but are not limited to, substances such as non-chlorinated solvents and thinners, gas propellants, gas and liquid fuels, and oil-based paints and stains.

The potentially explosive vapors will not explode if the concentration is too low, that is, below the lower explosive limit (LEL) for that gas. To warn workers when the concentration of vapors may be increasing to hazardous levels, an explosive (combustible) gas monitoring system must detect concentrations below the lower explosive limit. When the concentration exceeds 10 percent of the lower explosive limit, the workers would be alerted by an alarm and can then take actions to prevent the concentrations from increasing to critical (combustible or explosive) levels. Some systems also allow a second alarm level which is set at a higher percent of lower explosive level, often 25 percent. The actions in response to an alarm might include cessation of bulking, covering of any open containers, allowing the ventilation system to clear the accumulated vapors from the area, and notifying the facility safety manager.

There is a wide range of possible flammable liquids and associated vapors that can be generated. A combustible gas sensor typically can detect many types of vapors generated from flammable liquids. Combustible gas sensors have a range of sensitivity depending on the specific flammable gas that is present in the air. On the scale of sensor responses to a wide variety of flammable gases, concentrations of methane result in an average response by most sensors. Consequently, when a variety of miscellaneous flammable gases may be present, methane is often chosen to be the calibration gas for combustible gas sensors.

Because the generation of the potentially explosive flammable vapors is associated with active waste handling, it is most appropriate to have the explosive gas monitoring system permanently installed in that area. A handheld monitor is difficult to use effectively at the same time the flammable liquids are being processed and could require more staff than many facilities have available. Personal monitors may not be in the location where the higher concentrations of vapors are most likely to accumulate and will be unavailable to monitor vapors generated when the employee leaves the area. Typically, a fixed-location sensor is installed low on a wall near the bulking/consolidation point because most flammable liquid vapors are heavier than air and will tend to sink as well as diffuse into the available area. The sensor alarm can be by sound, light, or both and is often installed high on the same or an adjacent wall to the sensor.

In the operating standards for MRW facilities, the new rule says that MRW facilities must:

"manage MRW handling activities . . . so that . . . [f]lammable or explosive gases do not exceed ten percent of the lower explosive limit in the area where MRW is handled. An explosive gas monitoring program shall be implemented to ensure that this standard is achieved."

Multiple explosive (combustible) gas sensors can be used to provide coverage at different heights to provide safety redundancy in case a sensor malfunctions Multiple sensors would also be called for in order to monitor different working locations where explosive vapors may be expected to be generated. Use of multiple sensors typically increases capital costs only marginally when a multi-channel controller is used.

Some flammable gas sensors require periodic calibration and are usually calibrated to methane to represent an average of the broad spectrum of common flammable vapors and gases. Calibration can usually be done by the facility operator and needs to be done in accordance with the manufacturer's specifications. The sensor may be integrated with the alarm, or it may be located in the working area and the monitor and alarm located away from the area expected to have flammable vapors present. The alarm needs to be installed to alert the workers in the consolidation area. Be sure to work with your local fire and building officials for their approval of exact specifications, installation methods, and locations for this equipment.

A brief web search revealed these manufacturers of fixed-location combustible/flammable gas detection/monitoring and alarm systems:

RKI Instruments -- http://www.rkiinstruments.com/pages/fixed.htm

Macurco Gas Detection -- http://www.macurco.com/

Sierra Monitor Corp. -- http://www.sierramonitor.com/

Enmet Corp. -- http://www.enmet.com/

Delphian Corp. -- http://www.delphian.com/chc.htm

Control Instruments Corp. -- http://www.controlinstruments.com/area.html

Omni Controls Inc., -- http://www.omnicontrols.com/lists/gassentinel.html

Thermo Electron Corp. -- http://www.thermo.com/eThermo/CDA/Products/Product_Listing/0,1086,13473-101,00.html

Sentech Industries Inc. -- http://www.sentech-ind.com/crowcon/crowcon.htm

Note: **This list of companies is for information only and should not be assumed to be comprehensive or complete. The Department or Ecology does not evaluate, endorse, or approve equipment manufacturers or their products.**

Q3: What does "sufficiently impervious secondary containment" typically mean regarding construction methods and materials at an MRW fixed facility?

A3: Sufficiently impervious secondary containment depends on the substance that requires containment. For moderate risk wastes (MRW), the substances that need to be contained include hazardous materials from a broad spectrum of chemical types. In 2001 the top seven quantities of MRW collected statewide, excluding used oil collected at used oil collection sites, are shown in the table below.

2001 HHW and CESQG Collected, Except Used Oil sites

Top 7 MRW Types	HHW	CESQG	Total	Percent
Lead Acid Batteries	5,467,759	70,863	5,538,622	33.3%
Latex Paint	2,936,810	53,460	2,990,270	18.0%
Oil-Based Paint	2,521,531	140,807	2,662,338	16.0%
Oil, Noncontaminated	1,662,269	291,022	1,953,291	11.8%
Flammable Liquids	1,591,521	210,847	1,802,368	10.8%
Antifreeze	358,777	82,336	441,113	2.7%
Pesticide/Poisons Liquid	253,268	7,911	261,179	1.6%

The type of secondary containment that would be sufficiently impervious for lead acid batteries could be a sealed/coated asphalt concrete containment pad. Asphalt is relatively impervious to battery acid. However, for oil-based paint, oil, or flammable liquids, asphalt concrete would be inappropriate. These three MRW types, that together represent over 38 percent of the total waste stream (MRW types highlighted in red in the table above), are liquid hydrocarbons (petroleum products) which will dissolve asphalt concrete pavement. Hydrocarbon wastes should not be stored over blacktop because it is not sufficiently impervious. (See image of dissolved asphalt from hydrocarbon spillage below.) In addition, some solvents, which are typically in the flammable liquids category, have been shown to readily pass through cement concrete slabs and into the soils and groundwater below.

The recommended containment at a fixed facility for these liquid hydrocarbon wastes is cement concrete coated with a chemically-resistant coating, usually an epoxy-based product.

In the design standards for MRW fixed facilities the rule states that each facility shall**:**

"Provide secondary containment to capture and contain releases and spills, and … [be] sufficiently impervious to contain leaks, spills, accumulated precipitation, or fire suppression materials until the collected material is detected and removed."

Asphalt dissolved by petroleum products

Ecology has developed guidance that should be used to help determine what would constitute sufficiently impermeable secondary containment. There is a general guidance document for hazardous wastes, which is available on the Ecology website, Guidance for Assessing Dangerous Waste Secondary Containment Systems. An excerpt from this document states some of the basic secondary containment permeability limitations of bare cement concrete.

"Concrete not otherwise protected by application of a coating or sealant is relatively permeable to liquids and is susceptible to chemical attack from releases or spills of liquid dangerous wastes. The porous nature of unprotected concrete will allow any spills or releases of certain dangerous wastes, particularly solvents and various organic chemicals, to readily penetrate through the concrete into the underlying soil. This will result in soil contamination even if the overlying concrete is relatively unaffected."

Pesticide/Poison liquids is another major category of MRW collected, listed seventh in the table above. The pesticide/poison liquid category represents less than 2 percent of the total MRW waste stream by quantity. However, other categories of poisons, including solid pesticides and poisons, and pesticides in combination with flammable liquids or in aerosol containers, add another full 1 percent to the total MRW waste stream. This is typically the most acutely toxic part of the MRW stream and consequently calls for special handling.

Some pesticide products are carried in a flammable liquid media and therefore asphalt is not a sufficiently impervious form of secondary containment. Further, some pesticides will degrade the actual chemical bonds of exposed cement concrete. This causes the concrete structure to crack and crumble. A typical solution is to use cement concrete coated with chemically-resistant epoxy. Chemically-resistant epoxy coatings typically have a limited ability to flex or stretch. Asphalt concrete by its nature is quite flexible and usually not an appropriate base for epoxy coatings. Therefore a properly prepared cement concrete base is the standard for secondary containment.

Before a chemically-resistant epoxy coating is applied to cement concrete, the surface of the slab needs to be prepared properly; otherwise, the epoxy will not effectively adhere to the surface. Epoxy coatings have been placed at MRW facilities without preparing the slab surface. In most cases this has resulting in epoxy separating from the surface in traffic areas. Most manufacturers of epoxy coatings suggest that after the concrete slab is cured, the surface cement layer needs to be removed to allow access to the fine aggregate particles in the slab. This is usually done by specialty coating contractors using machines designed for this purpose. The slab surface is then cleaned of the cement dust and the

epoxy applied, often "built-up" in one or more layers or a base/primer layer followed by finish layer(s).

The top layer of coating often includes additives or is worked to a consistency to increase the traction of the walking surface in case the floor is wet due to a spill or water from normal floor cleaning. Some epoxies need specific temperatures and humidity ranges to properly cure and provide the desired chemical-resistance properties of the coating system. This will be stated clearly by the manufacturer of the product, and their directions should be followed closely by the installer.

Q4: What is expected for sufficient ventilation in MRW fixed facilities?

A4: The requirements for sufficient ventilation depend on the specific operation being performed and the equipment and materials involved. The materials which are common to MRW facilities and need ventilation include airborne dust from absorbents during lab packing and toxic and flammable vapors during packing and bulking operations. Compressed gas containers, such as butane and propane bottles, may also need ventilation and other safety measures according to the fire code. There is also a general need to ventilate work areas. Ventilation performance and specific requirements are related primarily to MRW worker health and fire and explosion hazards. Detailed guidance and rules apply from the Department of Labor and Industries (L&I) and the locally adopted Fire Code and related standards.

According to WAC 296-800-22035, cited on the L&I Web site regarding the storage of materials at the workplace, you must:

- Store materials so they do not create a hazard.
- Keep workplace storage areas free from accumulation of materials that could create hazards from tripping, fire, or explosion.

The accumulation of combustible or explosive vapors from the bulking of flammable liquids could create a hazard of fire or explosion. Activities which can generate these vapors include: bulking oil-based paint, thinners, solvents; evacuation of spray paint aerosol cans; and consolidation of propane containers. One way to mitigate such hazards in the workplace is to provide sufficient ventilation.

For the protection of worker health, WAC 296-62-07102 states when you are allowed to rely on respirators, rather than ventilation, to protect employees from breathing contaminated air.

> "In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, vapors, or aerosols the goal must be to prevent atmospheric contamination. You must use, if feasible, accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, you must use respirators as required by chapter 296-62 WAC, Part E."

In the design standards for MRW fixed facilities the rule states that each facility shall:

"Provide sufficient ventilation to remove toxic vapors and dust from the breathing zone of workers and prevent the accumulation of flammable or combustible gases or fumes that could present a threat of fire or explosion."

Included in the list of air contaminants for which the use of general and local exhaust ventilation can mitigate worker exposure are acetone, petroleum fumes, turpentine, various alcohols, gasoline, toluene and many other common MRW flammable liquid vapors.

The Washington occupational health standards set limits on worker chemical exposure mainly based on acute (short-term) exposure levels. Long-term health effects, also called "chronic" health effects, are less well understood and there is little in rule to limit exposure levels based on these kinds of effects. Consequently, it is prudent to provide a conservative level of employee protection to the extent practical. In that vein it is better to provide more than the minimum ventilation required by law. An additional benefit may be higher worker morale and productivity.

The only numeric performance measure in the solid waste rule is in the operating standards for MRW fixed facilities which require that "[f]lammable or explosive gases do not exceed ten percent of the lower explosive limit in the area where MRW is handled." Adequate ventilation and prudent materials handling practices typically keep the concentration of flammable or explosive gases below this threshold.

There are two basic types of ventilation - area ventilation and local exhaust (spot) ventilation. Because most dust and vapors are generated at a specific work station at MRW facilities, local exhaust ventilation is the primary method that should be used to remove dangerous vapors and dust from the workers' breathing zone and from the work area. This local (spot) ventilation is often accomplished by using a fixed-location exhaust register or a movable articulated-arm ventilator (see image at left). The closer the ventilator can be practically located to the source of the air contaminant, the more effective the removal of that hazard will be. In addition, the ventilation should draw air away from the worker's breathing zone as opposed to through the worker's breathing zone.

HHW Spot Ventilation at Cowlitz County

The design and troubleshooting of industrial ventilation systems should be handled by a qualified ventilation engineer or firms specializing in this field. However, a basic knowledge of how exhaust ventilation systems work and some basic troubleshooting tips are included in a ventilation guideline from the L&I Web site. In addition, the specific rules governing workplace ventilation are part of Washington Administrative Code Chapter 62 - General Occupational Health Standards, Part L. For the more technically inclined, one of the standard references, which is specifically recognized by L&I for ventilation, is the American Conference of Governmental Industrial Hygienists' (ACGIH's) Industrial Ventilation: A Manual of Recommended Practice, 23rd Ed.

Where flammable liquids are stored in drums there are specific safety requirements for ventilation, which can be mechanical or natural (also called gravity ventilation). The L&I rule WAC 296-24-33009 states for ventilation of flammable liquid storage rooms that:

> "Every inside storage room shall be provided with either a gravity or a mechanical exhaust ventilation system. Such system shall be designed to provide for a complete change of air within the room at least six times per hour. If a mechanical exhaust system is used, it shall be controlled by a switch located outside of the door. The ventilating equipment and any lighting fixtures shall be operated by the same switch. A pilot light shall be installed adjacent to the switch if Class I flammable liquids are dispensed within the room. Where gravity ventilation is provided, the fresh air intake, as well as the exhaust outlet from the room, shall be on the exterior of the building in which the room is located." [emphasis added]

This section of the L&I rule contains many other safety and health requirements for the storage of flammable liquids. Some areas of this rule also reinforce or restate similar requirements in the Uniform Fire Code.

The locally adopted version of the Uniform Fire Code will have provisions for ventilation where flammable liquids are being consolidated, indoors or outside, for instance when oil-based paint, thinners, or gasoline are being poured into a 55-gallon drum. This is considered by the Uniform Fire Code to be a "dispensing" or "mixing" activity. Article 79 of the 2000 Uniform Fire Code, Flammable and Combustible Liquids, contains an area-ventilation specification as well as local-ventilation requirements often applied to areas in a building where flammable and combustible liquids are being dispensed or mixed. Section 7903.2.3.4.2 of the Uniform Fire Code states that:

> "[c]ontinuous mechanical ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot of floor area over the design area. Provisions shall be made for introduction of makeup air in such a manner to include all floor areas or pits where vapors can collect. Local or spot ventilation shall be provided when needed to prevent the accumulation of hazardous vapors."

The Uniform Fire Code refers to the Building and Mechanical Codes for other design requirements. In addition, there is an exception where natural ventilation can be shown to be effective for the materials used or dispensed. There is also an exemption for open container quantities up to 60 gallons for some less volatile flammable liquids if the building is protected by an approved automatic sprinkler system. The local fire official is the person who will interpret the locally adopted version of the Uniform Fire Code, including ventilation requirements, on a case-by-case basis.

Meeting all of the various ventilation requirements can be complex. Local fire officials and L&I must be consulted to determine the ventilation system that meets these requirements for an individual facility. To provide a summary of some of the standards mentioned above which have associated numeric values, the following table is provided.

In the operating standards for MRW fixed facilities the rule states that each facility shall and abide by an operations plan including:

"Safety and emergency plans including: A list of all on-site emergency equipment with its capability, purpose, and training requirements …"

Summary of numeric standards cited in the Q&A		
Standard origin	**Numeric performance or design standard**	**Standard or citation**
Solid Waste Rule	**Less than 10 percent LEL for flammable vapors**	**WAC 173-350-360 (6)(a)(xi)**
Labor and Industries	**List of air contaminant concentration limits**	**WAC 296-62-07515**
Labor and Industries	**More than six complete air changes per hour**	**WAC 296-24-33009**
Uniform Fire Code	**One cubic foot of air per minute per square foot of design floor area**	**Section 7903.2.3.4.2 UFC**

Q5: What sorts of training are expected for staff at MRW fixed facilities?

A5: Training requirements are largely contained in regulations of other agencies, such as L&I and the Department of Transportation, and in locally adopted fire codes. The part of the rule cited above is not a complete list of required training for the operation of an MRW fixed facility. Ecology has worked with L&I to establish baseline health and safety training for persons responsible for fixed facility operations. In many cases, it is expected that fixed facility operators will have 24 hours or training similar in extent to that required under L&I requirements for hazardous waste workers (see WAC 296-62-30410). All workers also need to have on-the-job training and understand the operations plan, safety procedures, correct authorized use of safety and production equipment, etc. For limited MRW collection facilities, the training requirements will be much less extensive than for a full-service fixed facility.

In addition, there may be other initial and ongoing training. Some topics that will be needed by some operators include:

- fire extinguisher training,
- forklift safety,
- blood-borne pathogen protection,
- refreshers for training,
- hearing protection,
- PPE selection and use, and
- many other possible periodic general and specific safety training.

Discuss your training needs with your safety officer and health and safety professionals. Labor and Industries also has a list of consulting health and safety professionals that can provide facility-specific advice on how to comply with their rules. These consultations are free and do not involve enforcement citations or penalties, so there is no financial risk.

In addition, anyone who transports (ships) hazardous materials or arranges for such transportation over the roads needs to comply with the hazardous materials transportation training requirements of the Department of Transportation.

Many other trainings may be useful or required depending on the specifics of your operation. Some product vendors offer training in the safe and efficient use of their products. There are private firms that specialize in providing health and safety evaluation and training services. Some counties and cities have developed MRW facility training programs for themselves. They may be able to assist nearby jurisdictions in meeting their training obligations or coordinating the use of a paid trainer for multiple programs.

Q6: How does an MRW facility comply with the Universal Waste Rule?

A6: Moderate Risk Waste (MRW) collection facilities can collect Universal Waste if they comply with the provisions for Universal Waste Handlers under the Dangerous Waste Rule, WAC 173-303-573.

A Universal Waste Handler can accept Universal Waste from any of the three different generator classes:

1) Conditionally Exempt Small Quantity Generators (CESQGs) if they say that they want to have any of their MRW managed as Universal Waste,
2) Medium Quantity Generators (MQGs), or
3) Large Quantity Generators (LQGs)

according to definition of "universal waste handler" in WAC 173-303-040.

Household Hazardous Waste (HHW) is categorically exempt from the Universal Waste part of the Dangerous Waste Rule. CESQGs have two options. They can either direct a facility to manage the waste as Universal Waste or manage it in accordance with CESQG regulations. However, if MRW (HHW or CESQG waste not intended for handling as Universal Waste) is mixed with Universal Waste it loses its exemption and becomes subject to the Universal Waste part of the Dangerous Waste Rule. Consequently, it is recommended that you store all Universal Wastes in separate containers and areas from MRW. In addition, treatment of lamps, such as crushing, or accumulation for disposal by Universal Waste Handlers subject a facility to full regulation under the Dangerous Waste Regulations, WAC 173-303.

There are accumulation quantities of Universal Waste which determine your status as a Small or Large Quantity Handler of Universal Waste, and these differ by waste type. The three waste types are batteries (excluding spent lead-acid batteries), mercury-containing thermostats, and universal waste lamps (typically for designation for mercury and/or lead). If you collect 2,200 pounds or more of universal waste lamps or 11,000 pounds or more of all universal waste types (including the 2,200 pound allowance for lamps) you are considered to be a Large Quantity Handler of Universal Waste (LQHUW). If you are always below these Universal Waste accumulation quantity thresholds the facility is considered a Small Quantity Handler of Universal Waste (SQHUW).

In the MRW applicability section of the new rule it states that it does not apply to:

"Universal waste regulated under chapter 173-303 WAC"

The regulations applicable to Small versus Large Quantity Universal Waste Handlers are similar. The Large Quantity Handlers of Universal Waste have additional requirements to:

1) notify the Dept. of Ecology,
2) ensure employee training, and
3) keep records of shipments for three years.

The notification currently is by using Form 2 available at http://www.ecy.wa.gov/biblio/9128.html. This will be replaced in the future by the Site ID Form. Look for it on the Hazardous Waste and Toxic Reduction Program publications site.

There are additional requirements for waste management of both Small and Large Quantity Handlers of Universal Wastes, which include management of containers, labeling, response to releases and disposal prohibitions.

For more information about the requirements for Universal Waste Handlers see the following publications:

Universal Waste Rule for Batteries and Mercury-Containing Thermostats and Universal Waste Rule for Dangerous Waste Lamps.

Information on this topic can be accessed through Ecology's Web site. The address is: **http://www.ecy.wa.gov/programs/swfa/mrw/answer2.html**

If you require this publication in an alternate format, please contact the Solid Waste and Financial Assistance Program at 360-407-6900 or TTY (for the speech or hearing impaired) at 711 or 800-833-6388.