



Cereal Processing

Level II

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LG #13

LO #1- Prepare for application of pest control measures

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Legal and workplace requirements for fumigation.
- Manufacturer's/customer instructions
- Fumigation/spray applications of silo and cereal storage.
- Confirmation of written documents by site measurements and observations.
- Legislation and workplace instructions
- Access of site specific safety requirements.
- Workplace requirements and manufacturers specifications
- Equipment checking for conformance
- Storage Checking for gas-proofing and workplace instructions.

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Follow legal and workplace requirements for fumigation.
- Know Manufacturer's/customer instructions
- Determine fumigation/spray applications of silo and cereal storage.
- Confirm written documents by site measurements and observations.
- Know Legislation and workplace instructions
- Access site specific safety requirements.
- Apply workplace requirements and manufacturers specifications
- Check equipment for conformance
- Check storage for gas-proofing and workplace instructions.



Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”



Information Sheet 1- legal and workplace requirements for fumigation

1.1 Introduction

Fumigation is the act of releasing and dispersing a toxic chemical so it reaches the target organism in a gaseous state. Chemicals applied as aerosols, smokes, mists, and fogs are suspensions of particulate matter in air and are not fumigants.

1.2 legal and workplace requirements for fumigation

It is the responsibility of the homeowner to have all tasks on this checklist done before the crew arrives. Failure to do so may postpone the fumigation. Confirm necessary activities and timing with your pest management professional.

The ideal fumigant would have the following characteristics:

- Easily and cheaply generated
- Easily detected by human senses
- Easily diffuses and rapidly penetrates commodity
- Harmless to foods and commodities
- Highly toxic to the target pest
- Inexpensive
- Insoluble in water
- Non explosive
- Nonflammable
- Non persistent
- Nontoxic to plants and vertebrates (including humans)
- Stable in the gaseous state (will not condense to a liquid)

Unfortunately, no one fumigant has all the above properties, but those used by the Animal and Plant Health Inspection Service (APHIS) and Plant Protection and Quarantine (PPQ) have many of these characteristics. The toxicity of a fumigant depends on the respiration rate of the target organism. Generally, the lower the temperature, the lower the respiration rate of the organism which tends to make the



pest less susceptible. Fumigation at lower temperatures requires a higher dosage rate for a longer exposure period than fumigation at higher temperatures.

Fumigants vary greatly in their mode of action. Some kill rapidly while others kill slowly. In sub-lethal dosages, some fumigants may have a paralyzing effect on the pest while others will not allow the pest to recover. Some fumigants have no effect on commodities, while others are detrimental even at low concentrations. Commodities vary in their sorption of fumigants and in the effort required to aerate the commodities after fumigation.

Due to the reduction in number of labeled fumigants, there is seldom a choice in selecting fumigants. When there is a choice, factors such as the commodity to be treated, pest and stages present, type of structure, and cost should be considered in selecting a fumigant.

The only authorized chemical fumigants are:

- Methyl bromide (MB)
- Phosphine (PH) (There are two chemicals used for phosphine: AP–aluminum phosphide; and
- MP–magnesium phosphide)
- Sulfuryl fluoride (SF) (Vikane)

However, Common chemicals used in fumigation include phosphine gas (e.g. tablets of aluminum phosphide, which release phosphine gas on contact with moisture in the air), and ethylene dibromide, methyl bromide and carbon tetrachloride (volatile liquid fumigants available in various combinations and formulations). Capsules and sachets are available for small-scale applications and pressure cylinders for large-scale operations.

- Fumigate with aluminum phosphide (3-g tablets at a rate of 3 tablets per tonne) for ≥ 7 days to achieve desired mortality.
- Provide airtight conditions for ≥ 3 days when applying aluminum phosphide (or 1 day for Ethylene dibromide) after adding the chemical.



- Adjust the concentration of gas (+ 50%) when fumigating mite eggs, which have higher tolerance than insects.
- Consult qualified personnel prior to application, because these products are highly toxic.
- Adopt fumigation for seed in closed containers or for bagged produce (if covered by tarpaulin or plastic sheets) – it is crucial to protect grain from re-infestation as fumigation is effective only at the time of application.

While working with fumigation process, personal protective equipment such as safety goggles, safety shoes, safety clothes, gloves, ear protection, etc are required.

1.3 Types of seed storage (workplace) requirements for fumigation main Storage techniques

The grain production has increased all over the world over last decades, as the grain is the essential consumer goods for human and modulating economy. That is, grain production is the key part of the economic and social development. A grain stored properly must be equivalent to a grain produced. During storage, significantly qualitative and quantitative losses occur due to several factors, such as environmental factors (temperature, moisture content of grains, pH, humidity, etc), type of storage structure used, length and purpose of storage, method of storing grains, and biological factors (insects, pests, microorganisms and rodents). Nowadays, the grains are stored using the improved methods, such as in bags, silos, sheds, containers and even in piles on the ground managed as man-made ecosystems [Said and Pradhan, 2014]. Traditionally, there are two approaches employed for grain storage: temporary storage and long-term storage methods [Mishra, et al., 2012].

Under temporary storage, aerial storage, storage on the ground or on drying floors and open timber platforms which is normally done at farm level, are followed, whereas under long term storage methods, storage baskets (cribs) made exclusively of plant materials, calabashes, gourds, earthenware pots, jars, solid wall bins, and underground storage can be employed [Mishra, et al., 2012]. Modernly, warehouses are scientific storage structures especially constructed for the protection of the quantity and quality of stored



products. Under bulk storage, sealing and aeration play an important role. Aeration may be ambient or refrigerated on base of the requirement. Thus, improved storage structures and scientific storage of grains in form of warehouses are the need of the hour to strengthen traditional means of storage with modern inputs and to provide cheaper storage facility to farmers as well as to prevent enormous storage losses [Mishra, et al., 2012]. As traditional or modern, there are five main storage methods for the cereals, i.e., bulk storage, storage in underground pit, storage in sack, storage in warehouse and storage in silo. Each has many advantages and disadvantages during storage period of grains.

1.3.1 Advanced Storage Methods

Storage technologies for grains have been advanced with innovations on the main systems, such as aeration, refrigerated storage, modified atmospheric storage, hermetic storage systems in many developed countries [Said and Pradhan, 2014].

Grain Aeration is the most common non-chemical alternative for storage of cereals is the use of aeration systems during the winter [Navarro and Navarro, 2016]. Aeration is supplied by the forced movement of ambient air of suitable quality, or suitably conditioned air, through a grain bulk for improvement of grain storage. It is an acceptable practice to reduce the commodity temperature and is achieved by using mechanical aeration by means of fans. This system is suitable especially for low humid environment. On commercial scale, forced aeration plays important and effective role to preserve grains [Said and Pradhan, 2014]. In the study of silo automation control system with fuzzy logic controller, the grain can be stored at appropriate temperature and humidity [Fidan and Satuk, 2011].



Fig. 1. Inside of steel silo

- Refrigerated Storage



The main objective of refrigerated aeration in the summer time is to achieve temperatures of less than 18 °C to reduce insect activity [Navarro and Navarro, 2016]. In this method, ambient air is cooled and then passed over the bulk grains via existing aeration system. The initial investment for refrigerated storage system is comparatively higher, but together with the dehumidified air method, it could provide answers to the practicability of aeration for safe commercial storage in tropical climates [Said and Pradhan, 2014]. In this way, cold centered silo design has been studied [Erbaş, 2016].

- Modified Atmosphere Technology

In warm climates, for cereal grain stored in bags or in bulk, a new gaseous application technology, modified atmospheres, has successfully replaced fumigants [Navarro and Navarro, 2016]. Modified atmosphere (MA) and controlled atmosphere (CA) treatments have been proved not only to control insects but also to preserve the quality of the commodity with no residues after treatment. They offer alternative to the use of conventional residue producing chemical fumigants for controlling insect pests attacking stored grain, oilseeds, processed commodities and some packaged foods [3, 14]. An integrated pest management (IPM) control program could be integrated for insect monitoring, aeration in winter, chilling with refrigerated air in summer in grain silos, bio-generated MAs, for insect control and for quality [Navarro and Navarro, 2016].

- Hermetic Storage

Hermetic storage is based on bio-generated atmospheres. The generation of oxygen-depleted and carbon dioxide-enriched interstitial atmosphere is a result of the respiration of the aerobic organisms living in the commodity [Navarro, and Navarro, 2016]. The method enables insects and other aerobic organisms in the grain or the grain itself to generate the modified atmosphere by reducing O₂ and increasing CO₂ concentrations through respiratory metabolism. Respiration activity of the living organisms creates an atmosphere containing about 1%-2% O₂ and about 20% CO₂. Insect control success due to the hermetic storage treatment is comparable to conventional fumigants (over 99.9% kill), and losses due to insect activity are minimal.



Low O₂ and high CO₂ environment kills insect and mite pests, and prevents aerobic fungi from growing [Said and Pradhan, 2014].

A wide variety of techniques are available to control insect pests in stored produce, from simple techniques at the traditional farm level to more sophisticated measures adopted by companies handling large volumes of seed. In general, the cost of storage facility per unit of seed stored increases in line with storage requirements. The type of storage required depends mainly on the expected duration of storage, classified into five categories:

- ✓ Short-term storage of farm-saved seed or community seed banks
- ✓ Short-term storage of early-generation seed stocks (breeder and foundation seed)
- ✓ Short-term storage of commercial seed stocks (certified seed)
- ✓ Storage of carryover seeds (both early-generation and commercial seed)
- ✓ Long-term storage of germ plasm seeds (genetic resources)

Once an infestation is underway, take curative measures to control the activity of the grain insect pests in the storage facility. Curative control measures may be non-chemical or chemical.

- Require legal fumigation guidelines

The following fumigation guidelines are commonly used. Blowers or fans should be operated as follows:

- ✓ For all bulk material, forced recirculation is required, check for uniform gas distribution by taking gas readings at four or five locations, including at least three from the commodity
- ✓ For propagative material (T200-series schedules), the entire period of exposure, whether NAP or vacuum
- ✓ Under tarpaulin (and vacuum fumigation for other than propagative material), fans should operate for 30 minutes after gas introduction or until an APHIS-approved gas detection device indicates uniform gas distribution. Notice: Phosphine fumigations do not require fans.



- ✓ Dosages are listed by weight in the treatment schedules. If liquid measures are needed, convert from weight to volume using the conversion figures.
- ✓ Dosage rate is based on 1,000 cubic feet of enclosure space, whether chamber, tarpaulin, van, freight car, ship hold, etc. Calculate dosage from the volume of the trapped fumigation enclosure.
- ✓ All chamber fumigations should be conducted in USDA-approved chambers.
- ✓ Methyl bromide treatment schedules are indicated as “MB.” MB generally refers to any methyl bromide label. Specific MB label restrictions are noted in this manual for the “Q” label. Always check the label of the fumigant to be sure the commodity is listed on the label. Commodities that are not listed on the fumigant’s label are not authorized for fumigation with the manufacturer’s gas.
- ✓ Ounces per 1,000 cubic feet (oz/1,000 ft³) are equal to milligrams per liter (mg/liter) and are equal to grams per cubic meter (g/m³).
- ✓ Specified vacuum should be held throughout the exposure period
- ✓ Volume of commodity being treated should not exceed two-thirds of enclosure volume unless otherwise specified in the treatment schedule

The purpose of this rulemaking is to implement new statutory authority to adopt safety procedures for the clearance of residential structures after fumigation. The effect will be improved structural fumigation safety, etc.



- Physical Properties of Fumigants

Table 1. Properties of gaseous phases of fumigants

Properties	Methyl bromide	Phosphine	Sulfuryl fluoride
Chemical Formula	CH ₃ Br	PH ₃	SO ₂ F ₂
Boiling Point	3.6 °C (38.5 °F)	-87.7 °C (-125.9 °F)	-55.2 °C (-67 °F)
Vapor Density ¹	3.3	1.17	3.7
Flammability Limits in Air (v/v%)	10-15 percent by volume	>1.79 percent by volume	Nonflammable
Odor	Odorless	Garlic-like	Odorless
Effects on Metals	Reacts with aluminum, may damage electronic equipment	Copper, brass, gold, and silver severely damaged; electronic equipment damaged, other metals slightly affected in high humidity.	Non-corrosive

Vapor density is the weight of gas in air, with '1' as the weight of air. During storage period, proper aeration of grains, regular inspection of grain stock, cleaning and fumigation of stored grains need to be performed, because these requirements have great importance on the safe and scientific storage [Mishra, *et al.*, 2012]. The store chosen appropriately must satisfy the grain to be kept dry, kept at a uniform temperature and protected from insect, rodents and birds [Mrema, *et. al.*, 2011]. There are many researches and applications for storage of cereals.



Self-check 1	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (4 point)

1. From the given choose which one is an example of gaseous fumigant?
A. Methyl bromide B. Phosphine C. A & B D. None
2. From the given choose which one is personal protective equipment.
A. Safety goggles and Safety shoes B. Clothes and gloves C. Ear protection
D. all

Test II: Short Answer Questions

1. List properties of gaseous phases of fumigants (5 point).
2. Write the three requirements need to be performed during storage period. (3 point)
3. Write at least four characteristics of ideal fumigant. (3points)
4. Curative control measures may be _____ or _____ ?
(2point)
5. _____ is the act of releasing and dispersing a toxic chemical so it reaches the target organism in a gaseous state. (2point)
6. What are the only authorized chemical fumigants? (2point)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points



Information Sheet 2- Manufacturer's/customer instructions

2.1 Introduction

Before you start the treatment, make the customer/manufacturer aware of his or her responsibilities as it pertains to the specific material, personal protective equipment and health hazard and safety concerns that will be needed to perform the treatment procedure or instruction. All required materials and equipment must be available at the time of treatment.

Good plant protection practice (GPPP) provides the basis for the proper and appropriate use of plant protection products (PPPs). GPPP includes principles relating to the use of individual PPPs in the context of overall plant protection strategies. While GPPP places a legal obligation on professional users to ensure that product is used in accordance with the conditions of use (specified on the product label), it also places legal obligations on the professional users in relation to the safe disposal of empty packaging and unused or obsolete product. Such prescribed disposal must be in strict accordance with national and local waste disposal regulations. Additionally, GPPP confers responsibilities on professional users to act in a responsible and sympathetic way in relation to PPP use adjacent to residents and other property owners.

The terms of authorization and the conditions of use of a PPP are detailed on the product label and are referred to as the good agricultural practice ("GAP"). The final step in the authorisation of a PPP involves the approval of a product label. This approved label contains the necessary information to enable end users to use the product safely and in conformity with both European Union and national law. However, where certain use scenarios exist whereby it is not economically justified to produce comprehensive efficacy data, competent authorities may grant approvals which do not necessarily appear on the PPP label.

2.2 General principles



The general principles of GPPP must be read in conjunction with the general principles of Integrated Pest Management. It should be noted that in addition to GPPP there are other legal requirements in relation to the safe use of PPPs which must be complied with.

2.2.1 Conditions of authorization of plant protection products

The PPP authorization procedure establishes the acceptable conditions of use for each individual PPP. However, it is frequently the case that acceptable levels of crop protection can be achieved by using lower rates of application or fewer applications of PPPs. When the use of a PPP is the required crop protection solution, professional users are required to use as little PPP as possible but as much as is absolutely necessary.

It can be considered GPPP to:

- Vary the choice of active substances and formulations to control certain pests,
- Reduce, • the individual dose applied to the crop, and/or • the number of applications to be used,
- Increase,
 - ✓ the interval between applications,
 - ✓ the interval between last application and harvest.

It is illegal and therefore never considered GPPP to:

- Exceed,
 - ✓ the maximum individual dose (MID) permissible (for a particular crop),
 - ✓ the maximum number of applications permissible (for a particular crop).
- Reduce,
 - ✓ the interval between PPP applications,
 - ✓ the interval between the last PPP application and harvest- pre harvest interval (PHI).
- Apply a PPP via application equipment not specified in the authorisation document or on the PPP label.



The concept of GPPP relates to all PPPs, including those formulated with micro-organisms and macro-organisms. Where, PPPs containing either macro or micro-organisms are used, professional users should be aware of the interaction between these products and chemical products. Professional users are obliged to apply the principles of Integrated Pest Management, and it is GPPP to apply such principles and seek to derive maximum benefit from natural control elements as well as cultural control elements.

2.2.2 Choice of PPP dosage

The maximum individual dose (MID) of a PPP is specified on each product label. However, use of reduced dose is permitted if the prevailing agronomic conditions allow. It is not GPPP to use higher doses (as they are not authorized and such use is therefore illegal)

2.2.3 Choice of water volume

For all crops, it is important to apply sprays with the correct water volume. Frequently product labels prescribe a range of water volumes. For some crops (tall crops of some protected crops) PPP dose will be specified as a concentration (amount of PPP in specific quantity of water). It is not considered GPPP to apply PPPs in a concentration which is considered on the label to be too high or indeed too low.

2.2.4 Number, timing and frequency of applications

It is GPPP to apply only as many treatments as are absolutely necessary to achieve effective and sufficient control of the target pest. The number of treatments necessary may vary considerably between seasons and/or locations. The timing of the first, and if necessary subsequent applications, should be based on the current pest pressure, anticipated future pest pressure and prevailing environmental conditions. Forecasting and early warning systems exist for some crop pest combinations and can facilitate optimum timing of PPP application. In addition, account should be taken of local experience from farmers and agronomists as well as timely visual observations.



Prophylactic use of PPPs can be considered GPPP in instances where certain crop pests have the ability to inflict significant damage to both crop yield and crop quality. Such treatment may be applied in a fixed program of calendar dates, phenological growth stages of the crop or on first identification of target pest. The timing of the last application is determined by pest pressure and the pre-harvest interval prescribed on the PPP label.

2.2.5 Tank mixing

It is GPPP to use products in tank mixes, provided the timing and rate of the application is consistent with the conditions of use, for each product when applied separately. By reducing the number of spray applications, operator exposure, fuel use, passages through the crop, etc., can be reduced. However, it is not GPPP to use products which are chemically or physically incompatible in a tank mixture or where their individual efficacy or safety is compromised. Some product labels may contain specific tank mix recommendations, e.g. for control of PEST X use in tank mix with PRODUCT Y. Other product labels may contain more general recommendations for tank mixing, e.g. for resistance management purposes. In situations not specifically addressed on product labels, it is considered GPPP to use products in a tank mix, where on the basis of historic field use and/or field trial evidence generated by the approval holder, or on the advice of an advisor, their compatibility and continued efficacy has been established.

2.2.6 Use of adjuvants

Adjuvants are chemicals that may improve the action of a pesticide or change the characteristics of a pesticide formulation or a spray mixture. Before using any adjuvant, consult the pesticide product label. Some products have very specific recommendations or prohibitions for adjuvants.

It is considered GPPP to use an adjuvant with particular PPPs or in particular use scenarios. Such use should not be counter to the conditions of the authorizations concerned. It is the case that in certain circumstances satisfactory efficacy of particular PPPs can only be achieved by the inclusion of a particular adjuvant.



It is not considered GPPP to use an adjuvant with a PPP in such a manner that results in unacceptable residues of the PPP being present at harvest, following storage, or where such use is explicitly precluded on the PPP label.

2.2.7 Equipment and method of application

It is GPPP to select equipment and application conditions which ensure that a high proportion of the PPP applied reaches its target. Many factors must be taken into consideration e.g. nozzle type, pressure, spray volume, droplet size, speed, etc., when selecting the equipment and method of application to be used. However, in making such selections, for each PPP, care must be taken to ensure that efficacy is maintained. It is especially important that the equipment used be properly calibrated and that the calibration be regularly checked, to ensure that the correct dosage is applied.

2.2.8 Use of plant protection products and water

Water is one of our most important resources. The Earth's freshwater is stored in lakes, rivers, and streams, or below ground in aquifers. Water collecting on the ground, or in a stream, river, lake, sea or ocean, is called surface water. Groundwater on the other hand is below the soil surface and develops from the seepage or infiltration of water into the ground. As water moves, both on the surface, and under the ground, suspended or dissolved substances such as PPPs can move with it.

PPPs which are water soluble, volatile or have poor soil adsorption qualities often have a higher risk of appearing in water. In addition, when PPPs are being applied, the application can sometimes be less accurate than desired, resulting in drift from the treatment area, which if adjacent to surface water can lead to contamination.

To help mitigate any contamination of surface or indeed ground water, the conditions of use of an increasing number of PPPs may include a “buffer zone” where no application of the PPP may take place. Where a PPP label does not prescribe a specific buffer zone, a minimum distance of 1m of untreated area must be maintained between the treated area and the water course.



2.2.9 Storage of plant protection products

Professional end users of PPPs shall store PPPs in a safe and responsible way, at very least complying with the following requirements:

The structure of the storage facility shall be such that:

- ✓ It is not connected to a pack-house or area where food products are present,
- ✓ It is a dedicated chemical store and is not used for any purpose other than storage of plant protection and biocidal products and other chemicals,
- ✓ It is enclosed and of sound construction,
- ✓ It has a secure lock,
- ✓ In the case of walk-in stores, it is well ventilated,
- ✓ It is well lit,
- ✓ Its construction is such that leakages or spillages are retained within the store,
- ✓ Shelving provided is made from non-absorbent materials, and
- ✓ A warning sign is displayed on the entrance to the store.

Facilities that shall be available and used, as appropriate, shall include at least:

- ✓ A list of key emergency contact numbers displayed near the entrance of the store (e.g. doctor, fire service),
- ✓ Recommended protective clothing and equipment, clean and properly maintained,
- ✓ Appropriate PPP measuring devices (e.g. scales, measuring jugs, etc.),
- ✓ Facilities for soaking up small spillages or leakages (e.g. bucket of sand or peat).



Self-check 2	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I. Choose the best answer (4 point)

1. From the given choose which one is not characteristics of structure of the storage?
 - A. It is not connected to a pack-house or area where food products are present.
 - B. Shelving provided is made from non-absorbent materials.
 - C. It is enclosed and of sound construction with a secure lock.
 - D. Used for any purpose other than storage of plant protection and biocidal products and other chemicals.
2. From the given choose which one is often have a higher risk of an appearing in water?
 - A. Soluble and Volatile PPPs; B. Poor soil adsorption PPPs; C. none; D. all

Test II: Short Answer Questions

1. Discuss on the conditions of authorization of plant protection products. (5 point).
2. Write at least three hygiene measures that prevent the spreading of harmful organisms (3 point)
3. Write at least four of general principles of integrated pest management. (3points)
4. All pesticide application equipment must be tested by registered inspectors periodically except _____ sprayers). (2point)
5. _____are chemicals that may improve the action of a pesticide or change the characteristics of a pesticide formulation or a spray mixture. (2point)
6. It is not considered Good Plant Protection Ppractice to apply Plant Protection Products in a concentration which is considered on the label to be ____high or indeed _____ low. (2point)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points



Information Sheet 3-Fumigation/spray applications of silo and cereal storage

3.1 Introduction

Fumigation is a method of pest control that completely fills an area with gaseous pesticides or fumigants to suffocate or poison the pests within. It is used to control pests in buildings (structural fumigation), soil, grain, and produce, and is also used during processing of goods to be imported or exported to prevent transfer of exotic organisms.

3.2 Message related to silo and storage fumigation or spray:

- Successful grain storage is achieved by combining regular grain monitoring, good hygiene, aeration cooling, correct fumigation practices and use of grain protectants when appropriate
- In larger silos (150 – 2000t) recirculation of fumigation gases within the sealed silo, using a small fan, ensures rapid and uniform distribution of phosphine gas
- Without recirculation, it can take 2-5 days before the fumigant gas reaches all areas in a large silo, resulting in significant volumes of grain and insect pests being exposed to lower amounts of gas
- A significant R & D gap is the inability to effectively 'monitor grain' in the now common, large flat bottom silos. A simple, robust system for monitoring grain temperature, relative humidity, gas concentrations during fumigation and detection of the start of insect infestations is needed
- For grain protectant treatments, prior to applying, always read the label, check with potential grain buyers and seek advice if in doubt. Set up grain protectant spray application equipment to achieve good coverage and correct dose rate.

3.3 Successful on-farm storage results

Fumigations and strategic use of grain protectant insecticides are only two of the five key tools used to maintain grain quality and achieve reliable pest control. These five practices (outlined below), when combined, form the foundation for successful grain



storage. With a clear focus on these, a producer builds a reputation with grain buyers and end-users as a reliable supplier of quality grain.

3.4 Top five practices for successful grain storage

- **Aeration:** Correctly designed and managed, it provides cool grain temperatures and uniform grain moisture conditions. Aeration reduces storage problems with moulds and insect pests, plus maintains a range of grain quality attributes including germination, pulse seed colour, oil quality and flour quality.
- **Hygiene:** A high standard of storage facility hygiene is crucial in keeping background pest numbers to a minimum and reducing the risk of grain infestation.
- **Monitoring:** To prevent nasty surprises undertake monthly checking of grain in storage for insect pests (sieving / trapping) as well as checking grain quality and temperature. Keep monthly storage records, including any grain treatments applied.
- **Fumigation:** In Australia, only fumigant gases (e.g. phosphine) are registered to deal with insect pest infestations in stored grain. To achieve effective fumigations the storage/silo must be sealable – gas-tight (AS2628) to hold the gas concentration for the required time.
- **Grain protectants:** Used on specific parcels of grain like planting seed held on farm, or bulk grain where potential grain buyers have agreed to its use, grain protectant sprays provide another line of defence against storage pests.

3.5 Fumigation of large silos (150 t or larger)

First, ensure “gas-tightness of storage”. Gases are the registered products we can now use to control live insect pests when detected in grain. The most commonly used fumigant is a range of phosphine products (aluminium phosphide formulations) such as tablets or blankets. Other gases for grain pest control include sulfuryl fluoride (ProFume®), ethyl formate (Vapormate®) and methyl bromide.

The controlled atmosphere method is also effective, making use of either carbon dioxide or nitrogen gas. These are most commonly used for pest control in organic grains.



For any fumigation to be effective at controlling storage pests, the insects need to be exposed to a sufficient gas concentration (C), for a specified length of time (T). If this “C x T” exposure requirement is not achieved during the fumigation, insect survival is likely, especially of tolerant stages such as eggs and pupae. With fumigation failures, insects reappear in the grain within days or weeks. Therefore, it is critical for Australian grain producers who store grain for more than a month, to have at least two sealable storages that meet the Australian silo sealing standard (AS2628).

A storage that is not gas-tight does not allow the fumigation “C x T” exposure level to be reached in all parts of a silo, whether large or small. Achieving reliable pest control results is not possible with gas leakage and air dilution. As well as not killing the pests, poor fumigation attempts also select for resistant insect populations. To achieve effective fumigations, silos must be pressure tested to check they are sealed and gas-tight. This ensures they can hold high gas concentrations for the required time to kill pests.

3.6 Checking a large silo is ready for fumigation – useful equipment for pressure testing

- Portable leaf blower or small aeration fan - used to add air to silo for pressure tests. High volume, low pressure air is required. Standard air compressors are generally not suited to this task (see Figure 1).
- 50 mm poly fitting including a 50 mm shut-off valve - fitted into the external section of silo aeration ducting. This is used to blow air into the silo.
- The silo's pressure relief valve, or a clear U tube manometer, or better still, a digital manometer (e.g. Extech HD 755 Differential pressure manometer 0 – 0.5 psi) - Units seek to measure pressure changes within the 0 - 4 inches water gauge (w.g.) (0 - 1000 Pa) range. (see Figure 2)
- Spray bottle containing water & detergent - used to check for leaks. Often you can hear or feel air leaks from large silos during the pressure test.



Fig. 1

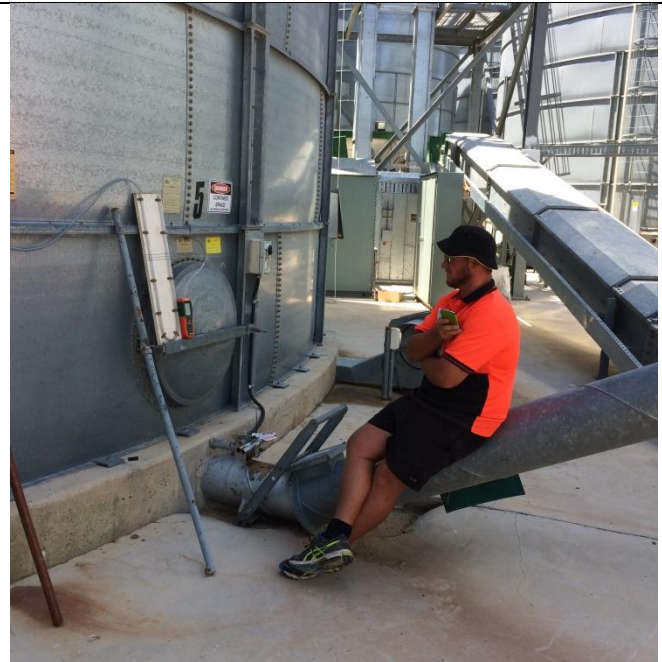


Fig.2

Fig. 1. Leaf blower and 50 mm gate valve fitted to aeration ducting used to pressurize a 1400 tonne silo for testing.

Fig. 2. Using a U tube manometer to pressure test a silo.

3.7 Pressure test methods

New silos should be pressure tested by the silo supplier or manufacturer when completed on site. They should pass the Australian standard test (AS2628) to show they are sealable to a standard to allow for effective fumigation. Sealable silos should then be pressure tested at least once a year to check for suitability for fumigations. Ideally, conduct a pressure test when a silo is full of grain. This places grain pressure on all silo surfaces and outlets, which is the condition the silo is in when you are fumigating.

Pressure tests should not be conducted when the sun is heating the silo's external steel surfaces and warming / expanding the air inside the silo. Testing late in the afternoon when hot air in the silo is cooling is also a problem. A strong windy day is difficult, as silo surfaces are pushed around. Pressure test results under these conditions are meaningless. Ideally test in the early morning before sunrise, or on a completely overcast day. In this way the air inside the silo is not heating or cooling (expanding or



contracting) due to external conditions. For small silos the pressure tests can be carried out by using a short burst (5 – 15 seconds) from the small aeration fan fitted to the silo. For larger silos a portable leaf blower to push air into the silo via a 50 mm fitting can be used to initially pressurise the silo for a test (Fig. 1). The pressure decay time (250 Pa down to 125 Pa) can be checked using one of three options: the silo's relief valves, a length of 15 mm diameter clear plastic tube in a "U" shape with water in it (manometer), or a digital manometer connected to the silo. See Figure 2. Also see GRDC Fact Sheet: "Pressure testing sealable silos"

3.8 Common leakage points for large sealable silos

- Silo roof vents not sealing – maintenance or design problems
- Silo grain fill point at top of silo not sealing – damaged rubber seals on lid or sealing plate
- Grain outload auger at base of silo – leaking seal plate
- Bottom silo access manhole into silo - damaged seals, or poor design
- Sealing plate covers for the aeration fan's intake, often poor design
- External aeration fan ducting, or the aeration fan itself not well sealed
- For some cone-based silos, weight of grain in the silo can break the seal of the bottom outlet – poor design

3.9 Importance of large silo fumigation

During fumigation, phosphine gas is typically liberated over 4 - 6 days from tablets or blankets that have been placed in the silo. This gas however, only moves slowly through the grain. If fumigating a medium to large silo (150 – 2000 t), the gas may take 2 - 5 days to reach all parts of the silo. In large silo fumigations, this may result in some grain at the furthest distance from tablets, only getting 6 days of phosphine gas, instead of the required 10 days or longer exposure period. Six days is not enough time to kill all pest life cycle stages (especially tolerant eggs or pupae). Figures 3 and 4 below show the difference in phosphine distribution speed in a silo with and without a fan. Phosphine concentrations required to kill all pests is a minimum of 200 ppm phosphine gas concentration for at least 10 days (horizontal blue line in Figures 3 and 4 below).

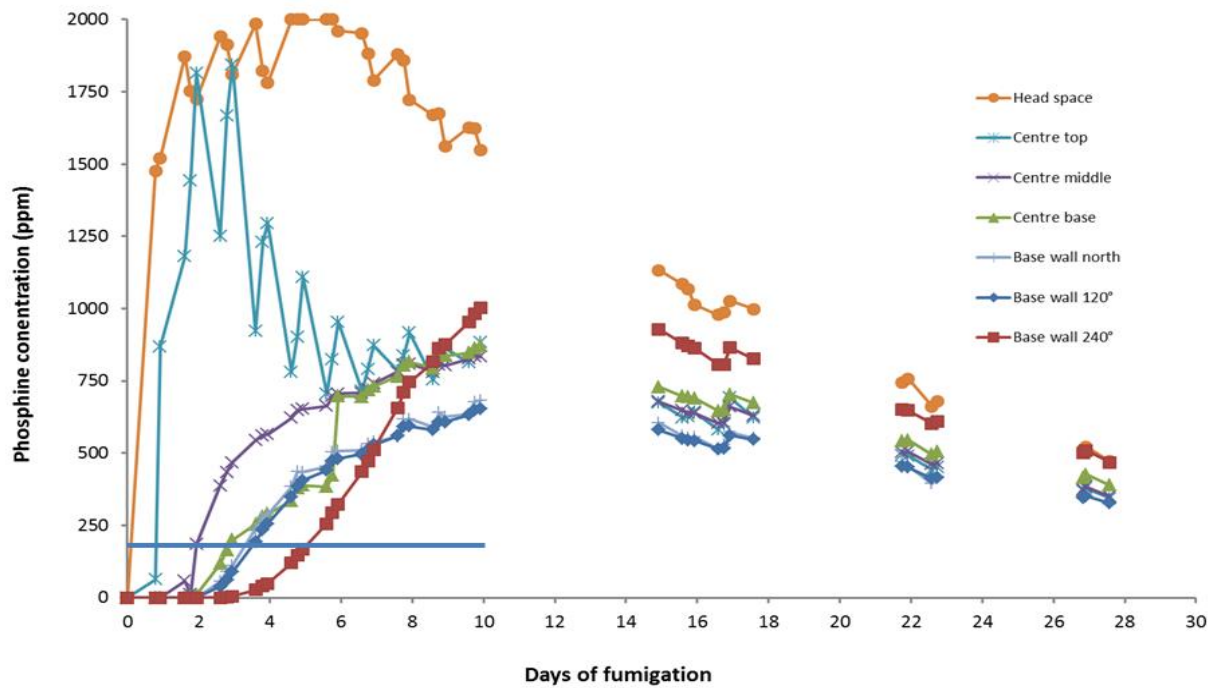


Fig. 3. Phosphine gas concentrations at 7 points in a silo during fumigation of 1420 t of wheat.

Phosphine blankets were placed in the silo headspace with no recirculation. It took up to 5 days for all grain at the silo base to reach at least 200 ppm gas concentration.

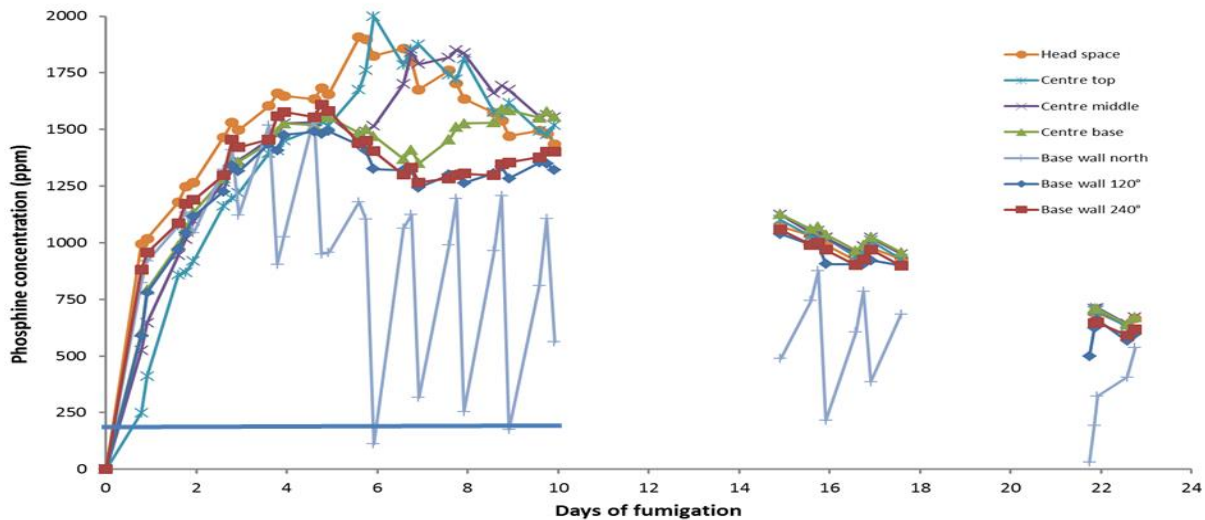


Figure 4. Phosphine gas concentrations in a silo (1420 t wheat)'.

A small fan was used to draw gas from blankets in the silo headspace and pump it into the silo base via aeration ducts for the first 5 days of fumigation. Gas concentration in all areas of the silo reached over 800 ppm within the first 24 hrs.



Fig. 5. A small fan (F370 – 0.37 kW) used during the first 5 days of fumigation to recirculate phosphine to give rapid uniform gas distribution in 1423 t wheat. See Figure 4.

3.10 Application options for fumigation recirculation

- For all fumigation recirculation systems, the sealable silo needs to be gas-tight so there is no gas leakage during fumigation. In Figure 4, “Base wall north” shows the impact of a leak at the silo manhole, causing large daily fluctuations in gas concentrations,
- Phosphine blankets or tablets can be placed in the ‘silo headspace’. A small fan, sitting at the silo base, is connected to the headspace via 90 mm pipe plumbing coming down the silo wall from the roof. Phosphine gas is drawn from the headspace and pumped into the base of the silo via both aeration ducts (see Figure 5),
- For ground level application of tablets or blankets, a sealable ‘phosphine box’ can be plumbed into this system, either a moveable box, or mounted permanently on each silo,
- Using a fan to force the phosphine gas movement around in silos during fumigation is generally recommended, rather than relying on a passive



'thermosiphon' approach and especially for medium and large silo fumigations (150 t or greater) or silos storing smaller grain sizes (e.g. millets, canola or lentils) that reduces air movement. Fan forced recirculation provides rapid gas distribution that is helpful where the grain type (e.g. oilseeds) typically absorbs higher amounts of phosphine during fumigation

3.11 Equipment for fumigation recirculation

- Sealable silo, gas tight, that passes a pressure test,
- Plumbing pipes (90 – 100 mm) from silo roof to ground level. Use quality pipe, fittings and seals that will ensure many years of safe, gas- tight fumigations,
- Small fan (e.g. Downfield F370 - 0.37 kW) to recirculate air. In most case this fan size will be suitable for both small & large silos. In trials (Figure 4 & 5) this fan size provided a complete silo air change every 12 hours for a full silo holding 1420 t of wheat,
- Fittings for fan intake and outlet. Flexible hoses (50 – 100mm) couplings and gate valves,

3.12 Fumigation notes

There are benefits to using the silo 'headspace' to locate the phosphine blankets or tablets. The large surface area of grain in the headspace provides safe, easy access for liberated gas to penetrate and diffuse into the grain. Licenced fumigators may choose to use 'bottled gas' formulations of phosphine to undertake fumigations in large silos and other storage types, rather than using the solid phosphine formulations of blankets or tablets. An example is Cytec's ECO2FUME® containing 20 g/kg phosphine in carbon dioxide handled in 31 kg liquefied gas cylinders. While applying the full dose of phosphine gas on day one into storage has benefits, in most cases the use of recirculation systems is still recommended to provide rapid, uniform gas distribution throughout the storage.

Warning: Always seek advice from a suitably qualified professional before fitting fumigation recirculation systems to silos / storages. Some systems that are currently sold are not recommended because of unsafe design features. Phosphine is not only a



toxic gas but can be flammable and explosive if restricted in a small area or used in a manner that causes gas concentrations to rise quickly to high levels. Follow label directions and seek advice.

Research & Development (R & D) gap: One of the significant R&D gaps is the inability to effectively 'monitor grain' in the now very common, large flat bottom silos. We require simple but robust equipment to monitor grain temperatures, relative humidity, gas levels during fumigation and also clever ways of detecting the start of insect infestations in storages. Products such as OPI grain cables are a good starting point, however in previous research trials in Australia we found OPI moisture cables fitted to silos failed after a standard phosphine fumigation. We assume the corrosive phosphine gas had entered via the relative humidity orifice on cable sensors. We need regular, reliable monitoring of grain in these large storages.

3.13 Grain protectant sprays

Grain protectant spray is a chemical prepared grain insect protectant that is applied directly to grain. Storcide protects your stored grain against the costly damage caused by insect pests, including the lesser grain borer. Example. Storcide ® II*

3.14 When to use grain protectants

- Grain protectant sprays are not to be used to disinfest grain. When live insects are detected, fumigation in a sealed silo is required for effective control,
- Typically, protectant sprays are applied to cereal grain at harvest time as grain is augered into storages, providing storage pest protection for 3 - 9 months. Protectants are effective at controlling insects as they invade the grain during storage, or the immatures (eggs, larvae or pupae) produced by such insects,
- With many domestic and export markets seeking grain supplies which are "pesticide residue free" (PRF), always talk to potential grain buyers / traders prior to applying grain protectant sprays,
- Except for some chlorpyrifos-methyl products in lupins in Victoria only, NO protectant sprays can be applied to pulses and oilseeds.



3.15 Common 'on-farm' uses for grain protectants

- Planting seed held on-farm – wheat, barley, oats
- Grain held for an extended time in non-sealable storages (not suited for fumigation) and when the grain buyer has agreed to grain protectant use that is in line with directions for use on the registered product label
- Grain held on-farm as feed for livestock with agreement from livestock agent or buyer and is in line with directions for use on the registered product label

3.16 Grain protectant choices

Examples of two products, which include a partner product, to control the main storage pest species:

- Conserve Plus™ Grain Protector – a.i. 100 g/L spinosad, 100 g/L s-methoprene. Used in combination with a compatible organophosphate (OP) product such as chlorpyrifos-methyl (Reldan™), or fenitrothion.

Conserve Plus™ Grain Protector Recommendations

- ✓ Always add the OP partner to Conserve Plus so the rice weevil (*Sitophilus oryzae*) is controlled
- ✓ Spray equipment calibration and application care are critical to achieve correct dose and uniform coverage on grain
- ✓ If treated grain is exposed to light, for example a semi open grain shed, cover the grain surface with a tarp or 80 - 90% shade cloth. Sunlight breaks down Conserve Plus over time
- ✓ Take care to read notes on the web site (above) and seek advice when purchasing Conserve Plus
- K-Obiol® EC Combi, synergised grain protectant – a.i. 50 g/L deltamethrin, 400 g/L piperonyl butoxide. Used in combination with an organophosphate (OP) partner e.g. chlorpyrifos-methyl or fenitrothion. K-Obiol® EC Combi, synergised grain protectant recommendations:



- ✓ To control rice, maize and granary weevils (*Sitophilus* spp.) add a recommended OP partner (e.g. chlorpyrifos-methyl or fenitrothion) to the tank mix
- ✓ To ensure effective pest control and that MRL's are not exceeded, calibrate spray equipment to achieve correct dose rate & uniform coverage on grain
- ✓ Grower users are required to complete a brief (approx. 60 minutes) online training course to be an 'approved user' prior to purchase of K-Obiol® EC Combi. See above website

3.17 Insect resistant management

If possible, aim to rotate chemical active ingredients for storage pest control at your storage facility. Example, for two years use Conserve Plus™ product combination, followed by one or two years of K-Obiol® EC Combi. Please read and follow all label recommendations and ensure that the product is registered for use in your state prior to application of any product.

3.18 Application for grain protectants

- Grain protectant application requires care to achieve the correct dose and uniform grain coverage. This leads to effective pest control results and ensures MRL's are not exceeded. See Figure 7 below.
- Auger's grain transfer rate. Ensure you have good understanding of the grain flow rate, tonnes per hour, for the height the auger will be operating at
- Calibrate your spray application unit with water and check appropriate nozzles and spray pressure are used to achieve the required application of 1 litre of spray mixture per tonne of grain



Fig.7. Spray application equipment designed for good coverage by applying treatment at two points in the auger



Self-Check – 3

Fumigation/spray applications of silo and cereal storage

Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List examples of two products or grain protectants, which include a partner product, to control the main storage pest species. (3 point)
2. Define fumigation, and explain the differences between fumigation and grain protectant sprays? (2 point)
3. Why aim to rotate chemical active ingredients for storage pest control at your storage facility? (2 point)
4. What are the equipment used for fumigation recirculation? (2 point)
5. What are the application options for fumigation recirculation? (2 point)
6. List and explain the top five practices for successful grain storage. (5point)
7. Checking a large silo is ready for fumigation; explain on the useful equipment for pressure testing. (2 point)
8. There are application options for fumigation recirculation. Explain them. (2 point)

Note: Satisfactory rating - 4 points Unsatisfactory - below 4 points

You can ask you teacher for the copy of the correct answers.



Information Sheet 4: Confirmation of written documents by site measurements and observations

4.1 Introduction

In the process of compliance, the Integrated Pest Management (IPM) Checklist will help you inspect your early care and education (ECE) building and grounds for the presence of pests and conditions that provide them with food, water and shelter. This IPM Checklist will also help you monitor your IPM program annually, semi-annually, or more frequently as needed. Each item in the IPM Checklist helps you remember to keep pests out and remove food, water and shelter that may attract pests.

4.2 Compliance Instructions

4.7.1 Collect the helpful tools to complete the inspection

4.7.1 Complete the IPM Checklist

- ✓ Check the “yes,” “no” or “N/A” (not applicable) box beside each item. “Yes” means your environment is less likely to have pests. “No” responses require further attention.
- ✓ Do not check “yes” unless the ECE facility meets all the parts of the item. Window screens are free of damage (for example, holes); if one window doesn’t have a screen, you should check “no” even if all the other windows have screens. Make a note in the comment section where the window is located.
- ✓ The comment section after each item can include follow-up notes, things that need to be improved or changed, and things to be discussed with program staff or action plans.

4.7.1 Under each subsection, you will identify any evidence of pests and the damage they cause. Check the box “yes” if you notice evidence of pests (for example, mouse droppings). Leave the box unchecked if there is no evidence of pests.

4.7.1 Review the completed IPM Checklist with the ECE director and IPM Coordinator.



4.3 Helpful tools for an IPM inspection

4.7.1 Building map or floor plan to mark areas that may need follow-up management or regular inspection.

4.7.1 Standard flashlight and UV flashlight (good for detecting rodent urine stains, which fluoresce under UV light).



UV flashlight

4.7.1 Knife or flat spatula to put into narrow cracks and crevices to reveal where pests like to hide and where they seek shelter and food. If a spatula fits in a crack in concrete, baseboards, wallboards or underneath chalkboards, pests can hide there.

4.7.1 Hand lens or jeweler's loupe magnifying glass for insect identification.

4.7.1 Vial for collecting collecting any pests you might want identified.

4.7.1 Telescoping mirrors lengthen from around 6 to 36 inches – perfect for seeing behind or under hard-to-reach place



Telescoping Mirror

4.7.1 Pest information sheets from the IPM Statewide web site at www.ipm.ucdavis.edu

4.4 Evidence of pests or damage they cause

Ants: Look for large trails of ants or just a few stragglers. Look for ant trails around windows, electrical or plumbing lines and building edges. Look for holes or cracks in the foundations or walls that provide entry points to buildings. Stragglers are usually



scouts randomly searching for food or nesting sites. When you spot ant trails, try to follow the ants to where they're entering the building and, if possible, to the nest.

Cockroaches: Look for evidence of cockroaches such as droppings (dark spots or smears), cast skins and dead roaches. They especially like warm (70°–75°F), humid areas close to food and waste— kitchens, bathrooms, food preparation and storage areas. Place traps in several locations and inspect them regularly. You'll need to identify the cockroach species you have.

Fleas: If you suspect a flea invasion indoors, pull on some light-colored knee socks and walk around. Any fleas will hop on to the socks. Then get out a vacuum cleaner and vacuum the area 2–3 times daily until the infestation is controlled.

Flies: Look for house flies around windows and signs of rotting food and garbage (where maggots thrive).

Mice and rats: Look for burrows, gnawing on garbage receptacles and droppings. Look at packaged food, doors, windows, baseboards and electrical cords for chewed spots, tooth marks, woodchips or shavings. Check near walls, food supplies and pathways for droppings. Old droppings are hard, or gray and brittle. Fresh droppings are dark and soft, possibly a sign of a current infestation. Check for freshly dug earth near holes around foundations and walls. Check for rub marks along walls—these are dark smears where dirt and oil from rodent fur mark pipes, beams, hallways, edges of stairs or around gnawed holes. Fine, shredded paper or similar materials are common nest-building materials.

Mold and mildew: Look for mold in indoor places that smell musty, and in areas that are often wet or damp, such as bathrooms, laundry or utility rooms and basements. Moldy or damp odors should be noted because they suggest that water may be present and mold growth is likely. Also note staff complaints of odors and health problems. Mold comes in many colors, not just black, and does not need light to grow. It can grow in dark areas and on hidden surfaces, such as the backside of drywall, wallpaper and paneling; the top side of ceiling tiles; and the underside of carpets and pads.

Mosquitoes: Where is there standing water? Water tends to accumulate in clogged gutters, buckets and other toys left outside. Look for mosquitoes resting on walls or hovering near people.



Snails and slugs: Look for irregular holes with smooth edges in leaves and flowers. Look for their silvery trails to confirm slugs or snails caused the damage and not other garden pests.

Spiders: Look for cobwebs and spiders in dark areas of the building. Spiders are almost always harmless. If you find a black widow spider, you can swat it with a rolled-up piece of paper and then step on it. Brown recluse spiders do not live in California.

Weeds: Look for lawn weeds such as clover, which attracts honey bees. The bees could pose a problem if children use the lawn as a play area.

Yellow jackets: Look for yellow jackets. Nests can be found in rodent burrows, in the ground, in voids in walls and ceilings of buildings.

Other: Look for evidence for other pests—often in the form of droppings—such as raccoons, gophers, pigeons and squirrels.



4.5 Integrated pest management checklist

MONTH / DAY / YEAR					PERSON COMPLETING FORM
ECE PROGRAM					
Outdoor Areas					
Garbage Storage: Garbage Cans and Dumpster		Comment			
Storage Area(s)					
1	Clean, organized and free of clutter	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
2	Buckets are rinsed and mops are hung up to dry	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
3	Dry and free of standing water or moisture	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
4	Cracks and crevices around cabinets are sealed or plugged	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
5	Items are stored in plastic bins that have sealed lids whenever possible	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
6	Pests (evidence of the pest, damage or the pest itself)	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	oAnts oCockroaches oFlies oMice Rat oMold, mildewoSpiders oOther, specify



4.6 Pesticide use and integrated pest management practices

MONTH / DA / YEAR					PERSON COMPLETING FORM
ECE PROGRAM					
Outdoor Areas					
Garbage Storage: Garbage Cans and Dumpster		Comment			
Storage Area(s)					
1	Written pest management policy is in place and includes IPM practices implemented by facility	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
2	Written records of pesticide applications are kept	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
3	IPM coordinator is designated	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
4	Parents are notified 72 hours before pesticides are applied	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
5	Warning signs are posted 24 hours before and stay in place 72 hours after pesticides are applied	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	
6	Tracking system is used for follow-up when pests are reported	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>	



4.7 Explanation of some items listed in IPM checklist

4.7.1 Storage Area: Clean, organized and free of clutter WHY?

- ✓ Buckets are rinsed and mops are hung up to dry WHY? Keeping mops and buckets dry prevents mold growth.
- ✓ Dry and free of standing water or moisture WHY? Moisture allows mold and mildew to grow and provides water necessary for pests to survive..
- ✓ Cracks and crevices around cabinets are sealed or plugged WHY? Pests commonly enter a building through holes, cracks, gaps and crevices in between pipes, vents, roofs, floors, windows, walls, baseboards, cabinets and mirrors. If you can fit a dime or pencil into the hole, then a mouse or rat can fit through the gap, too.
- ✓ Items are stored in plastic bins that have sealed lids whenever possible WHY? Roaches feed on cardboard and glue. Store playthings (e.g., puzzles, blocks, dress-up clothes) in sturdy plastic boxes with lids..

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Self-Check – 4	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. In Storage area items are stored in plastic bins that have sealed lids whenever possible, Why? (2 point)
2. Where look for, why should be noted and where check for mold and mildew? (2 point)
3. What are the main purposes of Integrated Pest Management Checklist? (5 point)
4. Write down some of the sit measurements and observation instructions of pest control action. (2 point)
5. What are the main standard tools for an integrated pest management inspection? (2 point)
6. What is Cockroach and how does damage it cause`s differ from rates damage? (2 point)
7. Explain why Integrated Pest Management has an important process in pest control process? (3 point)
8. What are the common items listed in IPM checklist of storage area? (2 point)
9. Based on the IPM checklist, list down the quality standard of storage area? (2 point)
10. Consider mice and rat; then discuss their evidence or damage they cause. (2 point)

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points



Information Sheet - 5 **Safety legislation and workplace instructions**

5.1 Introduction

Work health and safety involves the management of risks to the health and safety of everyone in the workplace. This includes the health and safety of anyone who does work for you as well as your customers, visitors and suppliers.

5.2 Work place health and safety procedures

Workplace health and safety is the responsibility of every business and any individual with controlling power over a work area. Safe a work starts with effective, known and understood safety procedures across all levels of staff. Procedures provide workers, supervisors and officers with steps that they must follow in specific environments or situations, or when utilising pieces of equipment for work tasks.

5.3 Safety procedures in the workplace

Health and safety procedures in the workplace are a core of any Health Service Executive management system. The procedures provide systematic steps for complying and performing tasks in compliance with company policies, Health Service Executive management system and the Work Health and Safety Act . You can consider these procedures a set of actionable steps for managing risks and creating a safer work environment.

Work health and safety procedures outline the requirements for complying with both external and internal compliance requirements. Company policies are often published and distributed to workers; ensuring that everyone understands his or her role in following the accepted work procedures. Some of the areas covered may include high-risk activities, such as Hazardous chemicals procedures

5.4 Safety Policies and Procedures

The primary goal of safety policies is to protect workers from foreseen or unforeseen risks. Every organization has at least some form of a policy in place for assessing the safety of a work site and dealing with potential hazards. Along with these policies, there



are governmental regulations that also need to be followed. For many years, businesses followed the Occupational Health and Safety laws in their States or Territories. Due to variations between these laws, the government has developed a 'harmonized' process within the Work Health and Safety Act. The Act provides greater consistency in establishing workplace safety procedures for the identification and mitigation of risks.

The Work health safety Act also creates specific requirements for all types of businesses. Every person conducting a business or undertaking has a responsibility to identify hazards and mitigate or eliminate risks. Safety policies and workplace procedures assist workers and organizations fulfill their legislative responsibilities under the Act.

5.5 Keep workplace safe

A detailed health and safety management system provides the most effective method of complying with health and safety regulations and keeping workers safe. The Work Health and Safety laws provide a framework for effective policy and procedure decisions within an organisation. However, organisations also need to implement their own health safety executive management systems for monitoring and improving their internal procedures. Policies and procedures are just one part of keeping workers safe.

A 'standard' safety management process includes:

- Effective safety plans,
- Policies and procedures,
- Training and information

5.6 Monitoring, supervision, and reporting of hazards and risks

A typical set of procedures may include health and safety practices for assessing the conditions of a work site before work begins. For example, workers may follow specific steps for hazard identification and then implement the best method for reducing risks based on the hierarchy of control. These procedures may also include conditions and processes for the reporting of hazards and workplace issues. Besides minimising hazards, organisations should aim to improve the overall level of risk within their work



areas. This is completed through detailed work area monitoring and supervision. Workers at every level should be involved in this process.

Workers that directly deal with the hazards are often best equipped to analyse the situation and find ways to either remove or reduce the risk. Health and safety representatives can also assist in addressing the needs of the workers, ensuring that they receive the resources required to manage risks. However, it is up to senior management to implement procedures to ensure that every worker follows the same protocols.

5.7 Providing Information and Training to Workers

An integral component of a detailed safety management process is providing workers with necessary training to identify the risk in the first place. Some procedures can be followed without specialized training. However, there are many situations that require strict adherence to recommended Work Health Safety codes of practice.

To comply with the regulatory and legislative requirements of the Work Health and Safety Act, Work Health Safety training courses are often required. These courses cover the standards and recommended practices for dealing with specific conditions, including high-risk areas or areas deemed as 'hazardous'. Whilst training is often needed, organizations also need to provide relevant information to workers to allow for risks to proactively identify. The company procedures should be printed in a set of policies, guiding workers in proper behavior in the workplace. Promoting safe work conditions should be the primary focus of these procedures. Every business should strive to eliminate or mitigate workplace hazards and comply with the regulatory framework of the Work Health Safety laws. Keeping a workplace safe starts with initial assessment and identification of hazards. Employees need to understand the health or safety risks in their work environment. After assessing the risks, they can take steps to eliminate or reduce the risk.

5.8 Duties related to personal protective equipment

Handler employers must do all of the following:



- Provide handlers with the appropriate personal protective equipment (PPE) in clean and operating condition.
- Make sure the handlers wear the PPE correctly and use it according to the manufacturer's instructions.
- Make sure that any respirator used fits the handler correctly.
- Inspect all PPE before each day of use for leaks, holes, tears, or worn places, and repair or discard any damaged equipment.
- Provide handlers with clean places away from pesticide storage and pesticide use areas,

Store personal clothing not in use.

- Put on PPE at the start of any exposure period.
- Take off PPE at the end of any exposure period.
- Take any necessary steps to prevent heat illness (too much heat stress) while PPE is being worn.
- Do not allow any handler to wear home or take home PPE contaminated with pesticides

5.9 Cleaning and Maintaining PPE

Handler employers must do all of the following:

- Keep pesticide-contaminated PPE away from other clothing or laundry and wash it separately.
- If PPE will be reused, clean it before each day of reuse according to the instructions from the PPE manufacturer unless the pesticide labeling specifies other requirements.
- If there are no instructions or requirements, wash PPE thoroughly in detergent and hot water.
- Thoroughly dry the clean PPE before it is stored or put it in a well-ventilated place to dry.
- Store clean PPE separately from personal clothing and away from pesticide-contaminated areas.



Replacing Respirator Filters, Cartridges or Canisters

- Handler employers must replace dust/mist respirator filters:
- When breathing resistance becomes excessive.
- If the filter is damaged or torn.
- When the respirator manufacturer or pesticide labeling says to replace them.
- At the end of each day's work period, if no other instructions or indications of service life are available.

Handler employers must replace gas- and vapor-removing respirator cartridges or canisters:

- At the first indication of odor, taste or irritation.
- When the respirator manufacturer or pesticide labeling says to replace them.
- At the end of each day's work period, if no other instructions or indications of service life are available.

Disposal of PPE and Instructions for Persons Who Clean PPE

Handler employers must discard coveralls or other absorbent materials that have been drenched or heavily contaminated with an undiluted pesticide that has the signal word "DANGER" or "WARNING" on the labeling. These contaminated items must not be reused.

Handler employers must comply with any applicable federal, state, tribal and local regulations when disposing of PPE that cannot be cleaned correctly.

Handler employers must inform people who clean or launder PPE:

- That the PPE may be contaminated with pesticides.
- Of the potentially harmful effects of exposure to pesticides.
- How to protect themselves when handling contaminated PPE.
- How to clean PPE correctly.

5.10 Exceptions to PPE Requirements

Handler employers may allow handlers to omit some of the PPE listed on the pesticide labeling for a handling task if the handlers are:

- Using a closed system.



- In an enclosed cab.
- In a cockpit.

For more information about when these exceptions apply and the associated requirements, see Chapter 5 of the How to Comply Manual.

Prohibitions

- No person shall apply a commercial class or restricted class pesticide unless that person holds a valid certificate of qualification.
- No person shall sell or store for gain or reward a commercial class or restricted class pesticide unless that person holds a valid certificate of qualification.

5.11 Storage requirements

No owner, operator or person responsible for a vendor pesticide storage facility shall store a commercial class or restricted class pesticide unless the area where the pesticides are stored is a separate locked room or compartment that is partitioned from the floor to the ceiling with building materials that conform with fire and building codes and has no openings except those required for ventilation and entrances;

- all permanent storage racks or shelves are constructed of non-combustible material that can be easily cleaned;
- all pesticides are stored according to the label storage requirements provided by the manufacturer;
- all pesticides are stored at least 10 cm above the floor;
- all herbicides, insecticides and fungicides are stored separately from each other in the facility;
- all pesticides are separated from any flammable materials by a fire resistant barrier or enough space to minimize risk of combustion of the pesticides;
- all pesticides are stacked in a manner that enables the pesticides to be readily inspected; and
- foodstuffs, including feed, are not stored in the facility.

5.12 Access to site



No person shall own, operate or be responsible for a vendor pesticide storage facility unless

- the facility has sufficient outside lighting to be of use to emergency service personnel;
- any windows in the facility are locked to prevent unauthorized access when authorized personnel are not present;
- the facility has doors that remain closed and locked at all times when authorized personnel are not present; and
- access to the facility is restricted only to authorized personnel.

5.13 Safety measures

No person shall own, operate or be responsible for a vendor pesticide storage facility unless

- protective clothing including gloves, hats, coveralls, boots, eye protection, a first aid kit and a respirator appropriate for use with the pesticide being stored are readily available, are properly maintained, and functional at all times at the facility and are free from pesticide contamination;
- eye wash and emergency showers are readily available at the facility;
- the chief of the local fire department or the chief's designate is provided annually with a list of pesticides stored in the facility and the estimated quantities normally held in storage and the chief or the designate is notified of any significant changes in stocks which occur during the year;
- a placard is affixed and maintained on the outside of each door leading into the room where the pesticide is stored bearing the words "WARNING - CHEMICAL STORAGE - AUTHORIZED PERSONNEL ONLY" or words to like effect in block letters which are clearly visible; and
- emergency phone numbers are displayed in the facility including the telephone numbers of the fire department, hospital, poison control centre, Department, police and Emergency Management Office.
- Clause 29(1)(e) amended: O.I.C. 2013-17, N.S. Reg. 14/2013.



- Every owner, operator or person responsible for a vendor pesticide storage facility shall ensure that no smoking signs are prominently displayed in an area where pesticides are being stored.
- No person shall use an open flame to conduct welding, burning, cutting, melting, heating or any other activity in a vendor pesticide storage facility unless appropriate safety measures are taken.
- Every owner, operator or person responsible for a vendor pesticide storage facility shall post or make readily available to employees or other persons any material safety data sheets that have been compiled and supplied by the manufacturer of the pesticide.
- No owner, operator or person responsible for a vendor pesticide storage facility shall place a pesticide in that facility unless it is equipped with a fully-operative fire alarm system;
- fire extinguishers which are approved by the fire department and are placed in strategic positions in and around the pesticide storage facility; and
- materials for containment and clean-up as required by an Administrator.
- Unless an Administrator directs otherwise in writing, every owner, operator or person responsible for a vendor pesticide storage facility shall ensure there is unobstructed access to the facility for emergency equipment and personnel.



Self-Check – 5	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Define the following terms: (4 point)
A. Safety measures; b) Safety policy; c) Workplace; d) Compliance
2. How do you protect health and safety in the workplace? (2 point)
3. What are the laws and legislations in the workplace? (3 point)
4. What are the instructions provided by the employer regarding health and safety? (2 point)
5. What is the role of safety monitor in the workplace? (2 point)

Note: Satisfactory rating - 3 points Unsatisfactory - below 3 points

You can ask you teacher for the copy of the correct answers.



Information Sheet - 6 Access of site specific safety requirements

6.1 Introduction

The safety requirements are those requirements that are defined for the purpose of risk reduction. Like any other requirements, they may at first be specified at a high level, for example, simply as the need for the reduction of a given risk. Then they must be refined so that their full details are provided to designers. The totality of the safety requirements for all risks forms the safety requirements specification.

6.2 Health and safety requirements

The contractor is responsible for safety at the construction or work site. The contractor is also responsible for preparation of a safety plan and for carrying out the safety plan. The contractor staff shall maintain conformance to the health and safety plan throughout the course of work. A Site Specific Safety Plan is a document that is written to outline how a general contractor will manage the risk on a specific project site and the health and safety requirements for that project. The goal of the Site Specific Safety Plan is zero accidents.

6.3.1 Areas to be covered by a Safety Statement

They include:

- ✓ Specify the manner in which the safety, health and welfare of all employees will be secured and managed.
Specify the hazards identified and the risks assessed.
- ✓ Give details of how the site/service manager is going to manage his or her safety, health and welfare obligations, including:
 - Commitment to comply with legal obligations,
 - The protective and preventive measures taken and the resources provided for protecting safety health and welfare at the place of work to which the safety statement relates.
 - The resources provided for safety health and welfare at the workplace, and
 - The arrangements made to fulfil these responsibilities.



Specific items to be included are:

- The plans and procedures to be used in the event of an emergency or serious danger.
- Duties of staff including the co-operation required of them on safety health and welfare matters.
- Names and job titles of people being appointed to be responsible for safety health and welfare or
- for performing the tasks set out in the Safety Statement.
- Arrangements made for appointing Safety Representatives and for consulting with and the participation by employees on safety health and welfare matters, including the names of the safety representatives and the members of the safety committee, if appointed.

The Safety Statement must be written in a form, manner and language that will be understood by all and have regard for the relevant safety health and welfare legislation.

6.3.2 Communicating the Safety Statement

Every site/service manager shall bring the safety statement, in a form, manner and, as appropriate, language that is reasonably likely to be understood, to the attention of:

- ✓ his or her employees, at least annually and, at any other time, following its amendment,
 - ✓ newly recruited employees upon commencement of employment and
 - ✓ other persons at the place of work e.g. agency staff and contractors who may be exposed to any specific risks to which the safety statement applies.
-
- ✓ Where specific tasks are carried out which pose a serious risk to safety health and welfare the risk assessment and protective and preventive measures to be taken must be brought to the attention of those affected. In discharging this responsibility managers can combine written and verbal means for communicating with staff and others including:



- Ensuring the availability of the Safety Statement at or near every place of work
- Distributing the Safety Statement or relevant sections of it to all staff and others when first prepared and whenever significant changes are made
- Verbal communication of the terms of the Safety Statement or particular risk assessments.
- Inclusion of the relevant parts of the Safety Statement and risk assessments in employees' handbooks or manuals.
- Through ongoing training.
- As part of the contracts management process including Service Level Agreements.

6.3.3 Safety Statement

Safety Policy

The general statement of policy spells out the policy in relation to overall safety, health and welfare performance; provide a framework for managing safety, health and welfare, and lists relevant objectives. As this is an organisational policy the wording of this section must be the same as appears in the Corporate Safety Statement and therefore should not be subject to amendment in the site/service specific safety statement.

6.3.4 Declaration of Intent

The Safety Statement should contain a declaration signed by the site/service manager (e.g. Hospital Manager, Health Centre Manager) who has responsibility within their area for the safety, health and welfare of staff and others. The declaration should give a commitment to ensuring that a workplace is as safe and healthy as reasonably practicable and that all statutory requirements will be complied with.

6.3.5 Hazard Control Service



Arrangements i.e. Explanation of how the Safety Statement will take account of the general duties of employers.

This section of the Safety Statement should outline how it is proposed to ensure that the following general duties of employers are met, so far as is reasonably practicable.

- ✓ A safe place of work
- ✓ Safe means of access and egress
- ✓ Safe plant, equipment and machinery
- ✓ Safe systems of work
- ✓ Provision of appropriate information, instruction training and supervision
- ✓ Provision of suitable protective clothing and equipment where hazards cannot be eliminated
- ✓ Provision and revision of emergency plans
- ✓ Designation of staff having emergency duties
- ✓ Prevention of risk to health from an article or substance
- ✓ Provision and maintenance of welfare facilities
- ✓ Provision, where necessary of a competent person to advise and assist in securing that safety, health and welfare of staff, service users and visitors

6.3.6 Risk management process

The Risk Management Process as outlined in Figure 1 below comprises of Hazard Identification, Risk Assessment and Control of Risks and involves the following steps:

Step 1 Identification of the Hazard

Step 2 Identify the Risks associated with the hazard

Step 3 Assess (i.e. Rate) the risks

Step 4 Identify any additional control measures (if any) required (i.e. Evaluate and Treat the Risks)

- ✓ Communicate and Consult

Communication and consultation in relation to the risk assessment process is essential. This should occur throughout the development process with communication of the safety statement and its contents being a feature of staff engagement starting with the

induction of new employees and continuing as part of the normal management process of a service. Such engagement can help to embed the management of safety health and welfare as a normal part of the way services operate. Communication efforts must be focused on consultation, rather than one way flow of information from decision makers to stakeholders

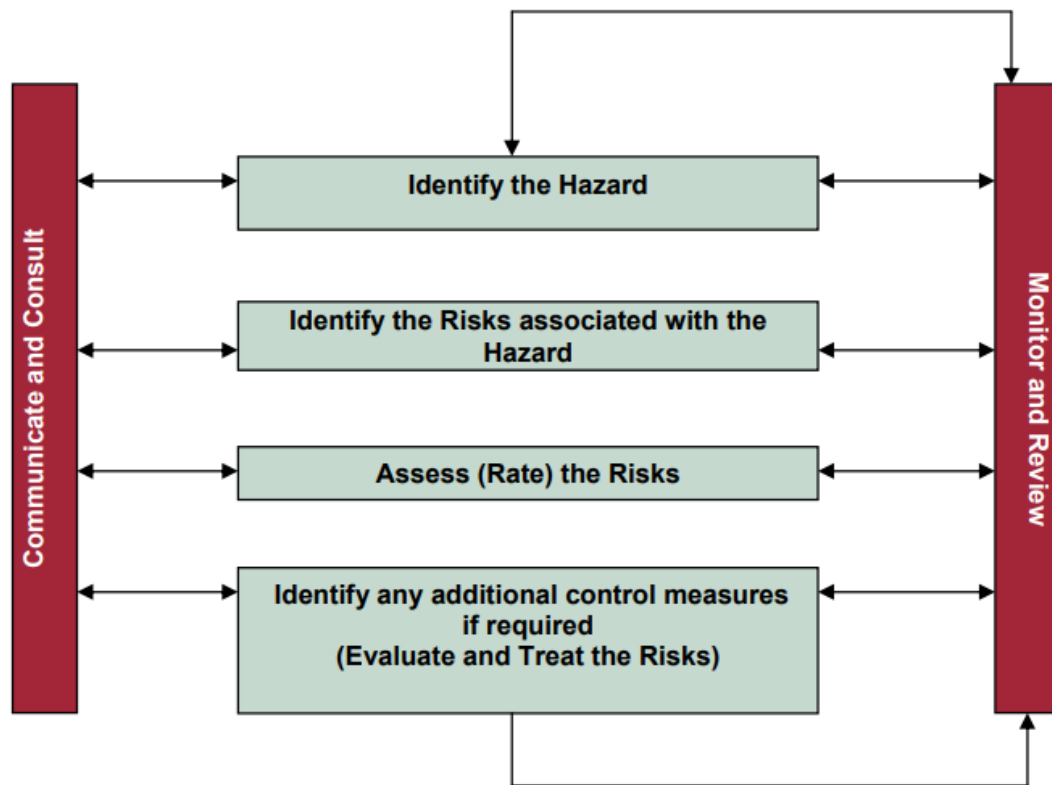


Fig.1 Risk management process

The General Principles of Risk Prevention are as follows:

- ✓ The avoidance or risks.
- ✓ The evaluation of unavoidable risks.
- ✓ The combating of risks at source.
- ✓ The adaptation of work to the individual, especially as regards the design of places of work, the choice of work equipment and the choice of systems of work, with a view, in particular, to alleviating monotonous work and work at a predetermined work rate and to reducing their effect on health.



- ✓ The adaptation of the place of work to technical progress.
- ✓ The replacement of dangerous articles, substances or systems of work by non-dangerous or less dangerous articles, substances or systems of work.
- ✓ Recording your Risk Assessment

The results of the risk assessment must be documented in accordance with legislative requirements (see sample Hazard Identification and Control form.

- ✓ Monitoring and Review

Once control measures have been developed and implemented a systematic and regular review must be implemented to ensure that the control measures are working effectively. Control measures must be monitored and evaluated on a regular basis. Sooner or later new equipment, procedures or substances will be introduced that could lead to new hazards – if there is any significant change the risk assessment should be amended to take account of these new hazards and brought to the attention of the relevant personnel. All assessments should be reviewed on an annual basis.

6.3.7 Consultation and Information

The Safety Statement must specify the arrangements in place. It should also give details of the information that staff are entitled to and where such information can be located, in addition to information regarding the arrangements for training in safety, health and welfare provided for both management and staff Section 26 of the Safety, Health and Welfare at Work Act 2005 requires that consultative structures must be established to facilitate participation by management, staff delegates and Safety Representatives.

The Safety, Health & Welfare at Work Act 2005 states that the Safety Representative may:

- ✓ Make representations to their employer on any aspects of safety, health and welfare at the place of work.



- ✓ Inspect the place of work after giving reasonable notice to their employer. The frequency and schedule of inspections must be agreed between the Safety Representative and the employer in advance.
- ✓ Inspect the place of work in the event of an accident, dangerous occurrence or a situation of imminent danger or risk to health and safety.
- ✓ Investigate accidents and dangerous occurrences provided they do not interfere with or obstruct any person fulfilling their legal duty.
- ✓ After giving reasonable notice to their employer, investigate complaints made by employees whom they represent.
- ✓ Accompany a Health and Safety Authority (H.S.A.) Inspector on a tour of inspection.
- ✓ At the discretion of the H.S.A. Inspector, accompany the Inspector while they are investigating an incident or dangerous occurrence.
- ✓ Make oral or written representations to the H.S.A. Inspectors on matters relating to safety health and welfare at the place of work.
- ✓ Receive advice and information from the H.S.A. Inspectors on matters relating to safety health and welfare at the place of work.
- ✓ Consult and liaise with other Safety Representatives appointed in the organisation.
- ✓ Safety Representatives shall be given reasonable time off, without loss of remuneration, to discharge their functions as a Safety Representative and to acquire appropriate knowledge and training.
- ✓ Safety Representatives shall be given relevant information to allow them fulfil their function properly, this will include information on risks assessments, information on reportable accidents and dangerous occurrences and information resulting from experience of applying protective and preventative measures required under the relevant statutory provisions.
- ✓ Safety representatives must be notified by management when management becomes aware that a H.S.A. Inspector is visiting the site for the purpose of an inspection.



6.3.8 Resources

The Safety Statement must give the details of the resources provided by sites / services in terms of time, people, and finance to manage the safety health and welfare of staff services users and visitors.

Details of the process by which the Safety Statement will be brought to the attention of staff and safety representatives.

This section should clearly set out how that Safety Statement is to be brought to the attention of staff, the Safety Representative or other people in the workplace who might be affected by the Statement.

6.3.9 Access to the safety statement

All staff of the Health Service Executive (HSE), including the Safety Representative should be made aware of the Safety Statement and have access to it. The Statement must also be brought to the attention of any other persons in the workplace who may be affected by risks to safety, health and welfare and who therefore needs to be aware of necessary safety precautions. This could include temporary workers, non-HSE employees, contractors, students, service users, self-employed persons, etc.

✓ Guideline review and performance measurement

This guideline will be reviewed every two years or when there have been any legislative amendments. The performance of sites/services will be monitored in terms of compliance.



Self-Check – 6	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List it down and explain the risk management process. (3 point)
2. Define what risk is?
3. What are the health and safety requirements? (2 point)
4. What is a safety inspection? (1 point)
5. How do you act safely on construction sites? (2 point)
6. What is a site specific safety plan? (2 point)
7. Explain the system access to the safety equipment. (3 point)

Note: Satisfactory rating - 4 points

Unsatisfactory - below 4 points

You can ask your teacher for the copy of the correct answers.



Information Sheet 7 - Workplace requirements and manufacturers specifications

7.1 Introduction

Worker safety regulations or requirements specify safe work practices for employees who handle pesticides or work in treated fields (field workers, early-entry field workers). This information sheet summarizes your responsibilities as an employer to assure that you provide the required personal protective equipment for your employees.

7.2 Employer responsibilities

- Pesticide Safety Training for Employees Handling Pesticides
- Pesticide Safety Training for Fieldworker-Employees Working in Treated Fields
- Pesticide Emergency Medical Care
- Pesticide Decontamination Facilities
- Pesticide Personal Protective Equipment
- Display of Required Information
- Pesticide Worker Safety Regulation

7.3 What you need to do

Cover the following subjects in a manner the handler-employees and early entry field worker employees can understand:

- Pesticides used.
- Pesticide safety hazards.
- Personal protective equipment.
- Other equipment used.
- Work procedures.
- Pesticide worker safety regulations.



7.4 Pesticide personal protective equipment

Personal Protective Equipment (PPE) may be required by pesticide product labeling, regulations, or restricted material permit conditions.

- Assure that all PPE is inspected before each day of use for leaks, holes, tears, or worn parts.
 - ✓ Repair or discard and replace damaged or heavily contaminated PPE
- Assure that employees wear appropriate protective eyewear when mixing, loading, or applying pesticides by hand or ground rig, and when exposed to application, mixing, or loading equipment that contains or is contaminated with pesticide.
- Assure that protective eyewear provides brow and temple protection that conforms to the curvature of the face and side protection to the eyes and marked as meeting the American National Standards Institute's Standards for Occupational and Educational Personal Eye and Face Protection Devices (ANSI Z87.1-2010).

Use of a respirator with a full-face mask will satisfy the protective eyewear requirement, unless it is prohibited by pesticide labeling.

- Assure that appropriate chemical-resistant gloves are worn when required by pesticide product labeling, regulations, or permit conditions; and whenever employees are mixing, loading, or applying pesticides by hand or ground rig, and when they are exposed to application equipment that contains or is contaminated with pesticide.

If the barrier material is specified by a category on the product labeling, the required glove material must be:



Label code	Materials Required by Law	Material Code
A	1,2,3,4,5,6,7,8	1 Laminate
B	1,2	2 Butyl
C	1,2,3,4,7,8	3 Nitrile
D	1,2	4 Neoprene
E	1,3,4,8	5 Natural
F	1,2,3,8	6 Polyethylene
G	1,8	7 PVC
H	1,8	8 Viton

All but Laminate and Polyethylene must be 14 mils or thicker.

All gloves must be 14 mils or thicker except:

- Laminate and polyethylene materials; or
- When chemical-resistant gloves are used to make fine adjustments to equipment or other activities that require high dexterity and motor control skill, the gloves must be made of an appropriate barrier material, as listed above, used only once for a maximum of 15 minutes, and then discarded.

Separable glove liners made of cotton or other absorbent material may be worn under chemical resistant gloves unless expressly prohibited by labeling. The liners must not extend beyond the end of the glove, and liners must be disposed of at the end of the workday, or immediately if any portion of the liner comes in contact with pesticide. Leather gloves may be worn over chemical-resistant gloves when required by working conditions. Once leather gloves have been used for this purpose, they must only be worn over chemical-resistant gloves. If chemical-resistant gloves are brought into the cockpit of an aircraft that has been used to apply pesticides, the gloves must be stored in an enclosed chemical-resistant container.

- Assure that you provide the PPE required by pesticide labeling and the worker safety regulations for the particular handling or early-entry activity:
 - ✓ Employees wear the required PPE until the handling or early-entry activity is complete, and



- ✓ Employees use the required PPE correctly.

Know when certain label-required PPE may be substituted when using certain engineering controls (closed-systems, closed cabs, soluble bags).

- remove their PPE at the end of their exposure period.
- Provide clean towels, soap, and sufficient water to allow for thorough washing.
- Assure that PPE remains under your control and that employees do not take home potentially contaminated PPE.
- Assure that any PPE to be reused is clean before each day of reuse according to instructions from the PPE manufacturer, or absent any instructions, wash in detergent and hot water:
 - ✓ Potentially contaminated PPE is kept and washed separately from other clothing and laundry, and
 - ✓ Clean PPE is either dried thoroughly before being stored or is put in a well-ventilated place to dry.
- Assure that any person or firm assigned or hired to clean or repair potentially contaminated PPE is protected and informed of the hazards of the pesticides they may encounter.
- Assure that employees use approved respiratory equipment when handling pesticides where respirators are required by label, restricted material permit condition, or regulation.
- Assure that in any workplace where respirators are required by label, restricted material permit condition, regulation, or employer, a written respiratory protection program is established with work site specific procedures. Update the program whenever changes in workplace conditions affect respirator use.
- Assure that the respiratory protection program provides:
 - ✓ Procedures for selecting respirators;
 - ✓ Medical evaluations of employees required to use respirators;



- ✓ Fit testing procedures for tight-fitting respirators;
 - ✓ Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;
 - ✓ Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and managing respirators;
 - ✓ Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;
 - ✓ Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations, including Immediately dangerous to Life or Health atmospheres, if appropriate; and
 - ✓ Training of employees in the proper use of respirators, including putting on and removing them, limitations on their use, and their maintenance.
- Assure that required respirators, training, and medical evaluations are provided at no cost to the employee.

7.5 What If You Don't Comply?

The Ethiopia Department of Pesticide Regulation (EPR) and the County Agricultural Commissioners enforce Ethiopia pesticide laws and regulations. It is your responsibility to assure that employees handle and use pesticides in accordance with the requirements of law, regulations, and pesticide product labeling requirements.

If you follow the worker safety requirements, you protect your employees' health, the environment, and yourself. If you do not comply, you violate federal and state law. DPR and the County Agricultural Commissioners have the authority to levy substantial penalties on persons who violate pesticide laws.

7.6 Duties of suppliers/manufacturers

7.6.1 Duties of suppliers

- ✓ A supplier is anyone who supplies a hazardous chemical that may be used at a workplace. This includes intermediaries in the supply chain such as



distributors, on-sellers and wholesalers. Suppliers of hazardous chemicals must: Make sure, so far as is reasonably practicable, that chemicals they supply are without *risks* to health and safety.

- ✓ Provide safety data sheet with hazardous chemicals. In addition they must not supply hazardous chemicals to workplaces if they know, or ought reasonably to know that the chemicals are not correctly labelled.

7.6.1 Duties of manufacturers or importers

Manufacturers or importers include anyone who manufactures or imports chemicals that are classified as hazardous under the model WHS Regulations. Under the Regulations, a business that packages or re-labels a hazardous chemical with its own product name is a manufacturer and has the same duties as other manufacturers.

Manufacturers or importers of hazardous chemicals must:

- ✓ Make sure, so far as is reasonably practicable, that chemicals they manufacture or import are without *risks* to health and safety.
- ✓ Correctly classify the chemicals that they import and/or manufacture, and prepare correct labels and *SDS* for those chemicals.

The Hazardous Chemical Information System is a web-based information system that helps you to find *GHS* classification information on chemicals.



Self-Check – 7	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List down duties of suppliers while setting up work. (2 point)
2. Write down the duties of manufacturers and importers of chemicals. (3 point)
3. Write five examples of employer responsibilities? (3points)
4. Why and where we use respiratory protection? (1 point)
5. What is the common personal protective equipment in the field of chemical spray? (2 point)
6. What are the subjects in a manner the handler-employees and early entry field worker employees can understand? (2 point)

Note: Satisfactory rating - 3 points Unsatisfactory - below 3 points

You can ask you teacher for the copy of the correct answers.



Information Sheet 8- Equipment checking for conformance

8.1 Introduction

To strengthen the conditions for placing goods on the European market, the New Legislative Framework was adopted in 2008 with an aim to protect consumers and workers from unsafe products and boost the quality of conformity assessment. CE marking is an administrative marking that indicates conformity with health, safety, and environmental protection standards for products sold within the European Economic Area. CE Marking on a product is a manufacturer's declaration that a product meets the applicable health, safety, and environmental requirements outlined in the appropriate European product legislation and has undergone the relevant conformity assessment procedure.

8.2 New approach directives

The New Approach Directives define the essential requirements that products must meet when they are put on the market, but they do not give technical specifications to meet those requirements. Manufacturers may choose to use harmonized standards or another standard to comply with the essential requirements of the directive. Some products may require compliance to more than one directive.

The following is the current list of New Approach Directives:

- Gas appliances – Directive 2009/142/EC Regulation (EU) 2016/426 (Effective April 21, 2018)
- Personal protective equipment - Regulation (EU) 2016/425

8.3 Manufacturers, importers and distributors responsibilities.

For example, manufacturers must identify the applicable directive and verify the product meets the requirements, including having the product tested to check its conformity. The manufacturer must also determine if an independent conformity assessment is required. The manufacturer is responsible for affixing the CE marking, compiling a technical file (which includes all the documents that prove that the product conforms to the technical



requirements), and drafting an EU Declaration of Conformity stating that the product meets all legal requirements.

A component or subassembly of machinery (per Machinery Directive only) that cannot be CE marked in its delivered state require a Declaration of Incorporation that states which aspects of the equipment the component/subassembly manufacturer is responsible for and which essential requirements have been fulfilled by them. Compliance with the other essential requirements is the responsibility of the manufacturer that assembles and CE marks the complete machine. A Declaration of Conformity is required from the final manufacturer/assembler for the completed product.

The EU Declaration of Conformity should contain key information including:

- Product Identification
- Name and full address of the manufacturer or his representative
- A statement that the declaration is issued under sole responsibility of the manufacturer or authorized representative
- List of product safety directive it complies with
- List of harmonized standards or other applied technical standards and specifications
- Name and identification for the notified body, if applicable.
- Signature of representative of the organization placing it on the EU/EEA market.
- The date of declaration

The technical documentation and the EU Declaration of Conformity must be kept for 10 years after the product has been placed on the market or for the period specified in the directive.

Manufacturers are responsible for affixing the CE marking unless the importer or distributors market the product under its own name. In this case, the importer or distributor takes on the responsibilities of the manufacturer.



8.4 Conformity Assessment

Conformity assessment is the process carried out by the manufacturer for demonstrating whether specified requirements relating to a product have been fulfilled. A product is subjected to conformity assessment both during the design and production phase and is the responsibility of the manufacturer, even if the manufacturer subcontracts the design or production.

Depending on the applicable legislation, there are many different conformity assessment options for manufacturers. *The 'Blue Guide' on the implementation of EU product rules 2016* provides an overview of options for conformity assessment. Some of those options are:

- The manufacturer issues a Declaration of Conformity after carrying out all required controls and checks, establishing the technical documentation, and ensuring the conformity of the production process.
- An accredited in-house conformity assessment body that forms a part of the manufacturer's organization performs the conformity assessment. However, this in-house body must not have any activities other than conformity assessment and must be independent from any commercial, design, and production entities. It has to demonstrate the same technical competence and impartiality as external conformity assessment bodies, through accreditation.
- A third-party, external conformity assessment body conducts the conformity assessment. They are referred to as Notified Bodies. Such a body must be impartial and fully independent from the organization or the product it assess. For some products, such as those covered under the Gas Applicant Directive, this is mandatory. These bodies are authorized by national authorities and officially notified to the European Commission.

In addition, a technical file must be maintained by the manufacturer or EU representative if the manufacturer is outside the EU, and be available to the national authorities for inspection and control purposes. The technical file contains all information that is necessary to demonstrate the conformity of the product to the applicable requirements.



8.5 Harmonized Standards

Harmonized standards are voluntary standards that can be used to demonstrate compliance to the essential requirements of the directives. Below are links to pages for regulations or directives for topics that have harmonized standards. The applicable harmonized standards are listed on these pages. It is not mandatory to use these standards, but manufacturers must prove the product complies with essential requirements of the applicable Directive.

Table 2. Regulation/Directives and Harmonized Standards

Topic	Regulation/Directives and Harmonized Standards
Chemicals	Chemical substances (REACH)
	Explosives for civil uses
	Pyrotechnic articles

8.6 Conformity assessment procedures

- Where Community harmonisation legislation requires conformity assessment to be performed in respect of a particular product, the procedures which are to be used shall be chosen from among the modules set out, in accordance with the following criteria:
 - ✓ whether the module concerned is appropriate to the type of product;
 - ✓ the nature of the risks entailed by the product and the extent to which conformity assessment corresponds to the type and degree of risk;
 - ✓ where third party involvement is mandatory, the need for the manufacturer to have a choice between quality assurance and product certification modules.
 - ✓ the need to avoid imposing modules which would be too burdensome in relation to the risks covered by the legislation concerned.



- Where a product is subject to several Community acts within the scope of this Decision, consistency among conformity assessment procedures shall be ensured by the legislator.
- The modules referred to in paragraph 1 shall be applied as appropriate to the product concerned and in accordance with the instructions set out in those modules.
- For custom-made products and small series production, the technical and administrative conditions relating to conformity assessment procedures shall be alleviated.
- When applying the modules referred to this sheet, and wherever applicable and relevant, the legislative instrument may:
 - ✓ regarding technical documentation, require information additional to that which is already stipulated in the modules;
 - ✓ regarding the time for which the manufacturer and/or notified body are obliged to keep any kind of documentation, alter the period stipulated in the modules;
 - ✓ specify the manufacturer's choice as to whether the tests are carried out either by an accredited in-house body or under the responsibility of a notified body chosen by the manufacturer;
 - ✓ where product verification is performed, specify the manufacturer's choice as to whether the examinations and tests to check the conformity of the products with the appropriate requirements will be carried out, by examination and testing of every product, or by examination and testing of the products on a statistical basis;
 - ✓ provide for the EC-type examination certificate to have a period of validity;
 - ✓ regarding the EC-type examination certificate, specify relevant information relating to conformity assessment and in-service control to be included in it or its annexes;
 - ✓ provide for different arrangements regarding the obligations of the notified body to inform its notifying authorities;



- ✓ if the notified body carries out periodic audits, specify their frequency.
- When applying the modules referred to in paragraph 1, and wherever applicable and relevant, the legislative instrument shall:
 - ✓ where product checks and/or verification are performed, determine the products concerned, the appropriate tests, the adequate sampling schemes, the operational characteristics of the statistical method to be applied and the corresponding action to be taken by the notified body and/or the manufacturer;
 - ✓ where EC-type examination is performed, determine the appropriate manner (design type, production type, design and production type) and the specimens required.



Self-check 8	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below.

1. List down the key information the EU Declaration of Conformity should contain. (2 point)
2. Explain the responsibilities of manufacturers, importers and distributors related to health and safety conformance of equipment and chemicals. (3 point)
3. What is conformity assessment procedure? (1 point)
4. What are the different types of conformance testing? (2 point)
5. Can conformance be tested? (1 point)
6. How is conformance measured? (2 point)
7. What are the International conformance testing standards? (2 point)



Information Sheet 9- Storage Checking for gas-proofing and workplace Instructions

Introduction

Material Safety Data Sheets (MSDSs) contain general recommendations for the safe storage of a hazardous product. These recommendations provide a good starting point for deciding where and how the product should be stored. The storage conditions in your workplace should be based on workplace-specific factors: the hazards of the product (health, fire and reactivity), the amounts in storage, types of containment (bulk or smaller containers), and the way the product is used.

9.1 General safe storage guidelines engineering controls

- Keep storage areas well ventilated and away from sources of heat and direct sunlight.
- Use chemically-resistant structural materials in the storage area and ventilation system (e.g. corrosion-resistant).

9.2 Storage Practices

- Use approved containers. Be aware of any special venting requirements (e.g. for flammables, corrosives).
- Do not store incompatible materials together. Dangerous combinations include:
 - ✓ Acids + Bases
 - ✓ Flammables + Oxidizers
 - ✓ Water Reactives + Aqueous Solutions
 - ✓ Chemicals in alphabetical order, except within a grouping of compatible chemicals.
 - ✓ Materials in a fume hood unless the hood is dedicated to that purpose.
 - ✓ chemicals in a domestic refrigerator or freezer

9.3 Administrative Controls

- Keep an inventory of materials in storage and their amounts and locations.
- Keep storage area separate from work areas and emergency exits.



- Ensure all stored materials are properly labeled.
- Ensure everyone is aware of emergency procedures.
- Ensure appropriate spill control and fire protection equipment is readily available in or near the storage area.
- Use secondary containment trays to contain potential spills.
- Keep empty containers closed. Empty containers may contain hazardous residue.
- RESTRICT access to chemical storage areas to authorized personnel only. Keep highly hazardous materials under lock and key.
- Maintain good housekeeping and minimize clutter.
- Inspect storage area and containers regularly for signs of leaks, corrosion or other damage. Report damaged containers for removal by specialists.

9.4 Examples of Hazard-Specific Guidelines

- Corrosives (Acids/Bases)
 - ✓ Use only the type of container recommended by the manufacturer.
 - ✓ Store acids and bases separately.
 - ✓ Store oxidizing acids (e.g. nitric, per chloric) away from other acids.
- Flammables
 - ✓ Eliminate sources of ignition.
 - ✓ Bond and ground metal containers/cylinders.
 - ✓ Store in approved flammable storage cabinet, fridge or freezers, according to the fire code and as recommended by the manufacturer.
 - ✓ Keep away from oxidizing materials.
- Compressed Gases
 - ✓ Secure cylinders to a wall or rack in an upright position.
 - ✓ Store empty cylinders in a separate location, clearly marked “empty”.
 - ✓ Protect cylinder bottoms from corrosion by keeping area dry.
 - ✓ Do not store for extended periods of time.



Self-check 9	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below.

1. List down the workplace-specific factors on which storage conditions should be based on. (4 points)
2. What is a workplace safety procedure? (2 points)
3. List down the incompatible materials not allowed to store together. (3 points)
4. Discuss on general safe storage guidelines engineering controls. (4 points)
5. Write at least three examples of Hazard-Specific Guidelines. (2 points)



Operation sheet 2. Fumigation/spray applications of silo and cereal storage

For general principles of integrated pest management

- Prevent and/or suppress harmful organisms by:
 - ✓ prevent the spreading of harmful organisms by hygiene measures (e.g. by regular cleansing of store, machinery and equipment),
 - ✓ Protect and enhance important beneficial organisms (e.g. by adequate plant protection measures or the utilization of ecological infrastructures inside and outside production sites).
- Monitor Harmful organisms by adequate methods and tools, where available. Such adequate tools should include:
 - ✓ observations in the workplace as well as scientifically sound warning,
 - ✓ forecasting and early diagnosis systems, where feasible,
 - ✓ use of advice from professionally qualified advisors.
- Decide whether and when to apply plant protection measures. Robust and scientifically sound threshold values are essential components for decision making. For harmful organisms threshold levels defined for the region, specific areas, crops and particular climatic conditions must be taken into account before treatments, where feasible.
- Prefer sustainable biological, physical and other non-chemical methods to chemical methods if they provide satisfactory pest control.
- Apply pesticides shall be as specific as possible for the target and shall have the least side effects on human health, non-target organisms and the environment.
- Apply available anti-resistance strategies to maintain the effectiveness of the products where the risk of resistance against a plant protection measure is known and where the level of harmful organisms requires repeated; means use of multiple pesticides with different modes of action.
- check the success of the applied plant protection measures based on the records on the use of pesticides and on the monitoring of harmful organisms

For legal requirements in relation to the safe use of plant protection products (PPPs)



- require appropriate training/qualification to apply professional use PPPs.
- registered as a professional user of PPPs
- PPPs as prescribed by the Manufacturers or customers (Minister).
- use registered PPPs as directed on the label.
- aware of the restrictions in using PPPs in areas used by the general public and Natura 2000 sites.
- maintain records of purchases, disposals and use.
- use PPPs in a way that conforms with the principles of Integrated Pest management (IPM).

For Pesticide Application Equipment:

- Test all pesticide application equipment registered periodically.
- Calibrate all pesticide application equipment regularly (at least once per annum).



Operation sheet 3 -	Fumigation/spray applications of silo and cereal storage
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1. Perform pressure test the silo to check for leaks
2. Follow all label directions and place tablets / blankets in the 'headspace' or 'phosphine box'
3. Run small recirculation fan for first 5 days of fumigation.
4. Leave silo sealed for remaining days of fumigation exposure period as label requires (e.g. 7, 10, 20 days)



**Operation sheet -4 Confirmation of written documents by site measurements
and observations**

1. Collect the helpful tools to complete the inspection
2. Complete the IPM Checklist
3. Check the “yes,” “no” or “N/A” (not applicable) box beside each item.
4. Do not check “yes” unless the early care and education facility meets all the parts of the item.
5. After each item put follow-up notes, things that need to be improved or changed, and things to be discussed with program staff or action plans.
6. Identify any evidence of pests and the damage they cause under each subsection.
7. Check the box “yes” if you notice evidence of pests (for example, mouse droppings).
8. Leave the box unchecked if there is no evidence of pests.
9. Review the completed Integrated Pest control Management (IPM) Checklist with the early care and education director and IPM Coordinator.
10. Prepare Helpful tools for an IPM inspection- UV flashlight
11. Prepare floor plan to mark areas that may need regular inspection and Telescoping Mirror.
12. Prepare pest information sheets



Operation sheet -5 Safety legislation and workplace instructions

Let you be act as handler employers in the cleaning and maintaining personal protection equipment, do the following:

1. Keep pesticide-contaminated Personal Protective Equipment (PPE) away from other clothing or laundry and wash it separately.
2. If PPE will be reused, clean or wash thoroughly in detergent and hot water it before each day of reuse •
3. Thoroughly dry the clean PPE before it is stored or put it in a well-ventilated place to dry.
4. Store clean PPE separately from personal clothing and away from pesticide-contaminated areas.
5. Replace dust/mist respirator filters when breathing resistance becomes excessive.
6. Replace gas- and vapor-removing respirator cartridges



Operation sheet 6– Access of site specific safety requirements

Exercise the risk management process (assessment and control of risks) as presented below:

Step 1 Identify the Hazard

Step 2 Identify the Risks associated with the hazard

Step 3 Assess (i.e. Rate) the risks

Step 4 Identify any additional control measures (if any) required (i.e. Evaluate and Treat the Risks)

Step 5 Communicate and Consult

Step 6 Record the risk assessed

Step 7 Monitor and review



Operation sheet 7 - Workplace requirements and manufacturers specifications

Below are steps what you need to do in a manner the handler-employees and early entry field worker employees can understand:

- Step 1 Identify the pesticide used,
- Step 2 Identify the pesticide safety hazards
- Step 3 Ready with personal protective equipment.
- Step 4 Identify and follow work procedure.



Operation sheet 9- Storage Checking for gas-proofing and workplace Instructions

Techniques of administrative controls:

- Keep an inventory of materials in storage and their amounts and locations.
- Keep storage area separate from work areas and emergency exits.
- Ensure all stored materials are properly labeled.
- Ensure everyone is aware of emergency procedures.
- Ensure appropriate spill control and fire protection equipment is readily available in or near the storage area.
- Use secondary containment trays to contain potential spills.
- Keep empty containers closed. Empty containers may contain hazardous residue.
- RESTRICT access to chemical storage areas to authorized personnel only.
 - Keep highly hazardous materials under lock and key.
- Maintain good housekeeping and minimize clutter.
- Inspect storage area and containers regularly for signs of leaks, corrosion or other damage.
- Report damaged containers for removal by specialists.



LAP TEST	Performance Test
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Name..... ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

Task	Test
1	Perform required legal fumigation guidelines.
2	Perform the storage facility structure required for legal fumigation guidelines.
3	Show the steps of conserve Plus™ Grain Protector Recommendations.
4	Prepare integrated pest management checklist and pesticide use practices.
5	Practically show the stapes of cleaning and maintaining personal protective equipment.



LG #14

LO #2- Apply pest control measures

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Hazards in the work area
- Personal protective equipment and hazard control engineering
- Fumigant and spray application pest control
- Placing warning signs following legislative and workplace requirements
- Monitoring effectiveness of regulated and legislated operation
- Returning and disposing empty fumigant containers
- Placing legislation and manufacturers instruction based prepared baits

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Identify hazards in the work area
- Apply personal protective equipment and hazard control engineering
- Guide fumigant and spray application pest control
- Place warning signs following legislative and workplace requirements
- Monitor effectiveness of regulated and legislated operation
- Return and dispose empty fumigant containers
- Place legislation and manufacturers instruction based prepared baits

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the Information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the "LAP test"



Information Sheet 1 - Hazards in the work area

1.1. Introduction

Hazard is described as any situation, condition or extreme events (natural or caused) with a certain degree of probability of having adverse consequences on safety or health of workers. Workplace hazard expresses any activity having potential to adversely or negatively impact (affect) human health, property, or the environment within the workplace. Such hazards could cause harm, injury or death in extreme cases.

1.2. Classes of hazard

Hazard can be classified as either safety hazard or health hazard. Safety hazards refer to those circumstances that can cause immediate injury to a worker. For example, if electrical equipment are not properly grounded, could become energized and possibly electrocute an employee. Or, if a worker's hands were to contact a saw blade, he or she could have one or more fingers cut off instantly. Sources of safety hazards include:

- Machine/machinery such as:
 - ✓ Point of operation,
 - ✓ Rotary and reciprocating movements,
 - ✓ In-running nip points (pinch points) etc,
- Kickbacks from machine due to sudden loading and impact,
- Flying chips, material etc. such as flying stone propelled by mower blade etc,
- Tool projection e.g. anvil edge, projecting object in load vehicles tec,
- Fire and explosion hazards, and
- Electrical hazards as a result of exposed or un-insulated live wire

Health hazards are associated with long term exposure to certain substances or to excessive noise levels or vibrations. Health hazards can cause both immediate (acute) and longer-term (chronic) health effects. For example, exposure to turpentine, a chemical used in some furniture waxes and finishes, can result in a range of health effects, from temporary irritation of the eyes and skin to kidney and bladder damage.

Sources of health hazards include:

- Excessive noise,



- Vibration from machine operation,
- Wood dust—carcinogens, and
- Chemicals—from exposure to coatings, finishing, adhesives, solvent

1.3. Workplace hazards

Workplace hazards include those points, areas, materials, or situations that could endanger, harm, injure, or cause death in extreme cases to man within the workplace. Such conditions include moving parts of machinery, working at heights, slipper personal protective equipment surfaces, electrical energy, excessive noise, toxic substances, and lifting of heavy objects.

Many of these hazards leading to fatal or non-fatal incidents had similar circumstances and common associated factors, regardless of the working category or location of the work in which they were included. These circumstances and contributing factors are with emphasis on the type of fatal events, rather than the working category of the affected persons. Imminent/potential hazard: This is any activity or situation that is likely to result in serious injury, death, or significant environmental or property damage.



Self-Check – 1	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

11. Write down all the sources of safety hazards.
12. Write three examples of Hazards in the parts of machines?
13. What are sources of health hazards?
14. Discuss on workplace hazards.

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points
You can ask you teacher for the copy of the correct answers.



Information Sheet 2- Personal protective equipment and hazard control engineering

2.1 Introduction

When an injury occurs in the workplace, not only does the worker suffer but the costs medical and time loss payments, loss in productivity, costs for a replacement worker, and potential increase in insurance premium costs ñ can be great. You can protect your workers and prevent work place injuries and resulting costs.

As an employer, you are required by Ethiopian occupational safety and health rules to provide a safe and healthful work place for your employees. You must identify and anticipate hazards your workers are or may be exposed to, and provide appropriate protective measures. One type of protective measure is personal protective equipment. personal protective equipment is equipment or a device that protects a workers' body from hazards and any harmful conditions (existing and potential) that may result in injury, illness, or possibly death. Personal Protective equipment may be an item worn on the body, such as gloves, or a device, such as a protective shield or barrier.

Personal Protective equipment is the least effective way to protect workers because it does not eliminate or reduce the hazard; it only places a barrier between the worker and the hazard. If the personal protective equipment fails or is not used, then the worker is not protected from the hazard. Therefore, try considering more effective methods to control the hazard before resorting to personal protective equipment. Use a system of strategies, called the "Hierarchy of Controls," which prioritizes control methods that try to remove or reduce the hazard:

Hierarchy of Controls:

- Engineering Controls
- Work Practice Controls Administrative Controls
- Personal protective equipment

If engineering, work practice, and/or administrative controls do not adequately protect your employees and Personal protective equipment is used, you must comply with the



safety and health requirements. The next section tells you what you must do if your employees need personal protective equipment.

Table 1. Example of some personal protective equipment

Body part	Example of personal protective equipment	Example of hazard/ hazardous condition
Head	hard hat	contact from falling object
Face	face shield	impact from flying wood chips
Eyes	safety glasses	liquid chemical splash
Body (torso)	leather apron	burn from molten metal work
Arms, hands	puncture-resistant metal mesh gloves	cut from shellfish processing
Legs, feet	knee guards	awkward posture, pressure from carpet laying
Potentially life-threatening	*body harness/personal fall Protective system	drowning from falling into water
		*fall from roof
Ears	*ear plugs	*loud noise from machinery
Lungs	*face mask with cartridge	*vapors from cleaning with solvent

2.2 Personal protective equipment

When hazards cannot be engineered completely out of normal operations or maintenance work, and when safe work practices and other forms of administrative control cannot provide sufficient additional Protective, use personal protective equipment as a supplementary method of control. Personal protective equipment is the least effective way to protect workers because it does not eliminate or control the hazard itself, but rather places a barrier between the worker and the hazard. Personal protective equipment devices alone should not be relied on to provide Protective against hazards; if the equipment fails, the worker is immediately exposed to the hazard.

Ask these questions:

- What personal protective equipment is available to deal with this kind of hazard?
- How intense is the hazard?

For example,

- ✓ Will the personal protective equipment prevent penetration of the projectile?
- ✓ Will the gloves be harmed by this chemical through absorption or disintegration?
- ✓ How long will the personal protective equipment last before it wears out?

- ✓ What type of hazard is it, how severe is it, and what capabilities must the personal protective equipment have? Select the appropriate personal protective equipment based on the answers to these questions.
- ✓ What is the minimum Protective required? Then provide a greater Protective than the minimum so that it will be adequate under less than optimum conditions and will have a reasonably long life.

2.3 Types of personal protective equipment

The following contain information about different types of personal protective equipment to help you in selecting appropriate and effective protective:

- Head Protective
 - Eye and face Protective
 - Hand and arm Protective
 - Foot and leg Protective
 - Torso (body) Protective and
 - Protective from drowning hazards
- Head Protective

A head injury can occur by

- ✓ an object impacting with a person
- ✓ a person making contact with an object
- ✓ contacting an electrical source
- ✓ getting hair caught and pulled into machinery with revolving or moving parts.



Long hair that was caught in moving machine part.



Keeping the hair back by using a cap or other device would have prevented such an incident.

Provide your employees with the appropriate head Protective if they are exposed ñ or likely to be exposed ñ to any of the following hazards or hazardous situations that may result in potential head injury:

Wear hair net, hat, or cap if

- ✓ length of hair is twice as long as the circumference of the exposed revolving shafts or tools in fixed machines
- ✓ length of hair is as long as the radius of the pressure rolls with exposed in-running nip points

Wear hair covering of solid material if exposed to an ignition source, e.g.

- ✓ welding
- ✓ cutting with a torch
- ✓ working with a flame or hot surface that could ignite the hair and if the potential exists to run into a combustible/flammable atmosphere, such as class-1 flammable liquid (e.g., ether, benzene)
- combustible atmosphere



Prescription safety glasses with side shields.

Generally,

- Safety glasses/goggles are the primary protection for eyes
 - Side shields (such as clip-on or slide-on side shields) are required for flying objects



A face shield is not sufficient protection for both the face and eyes. If eye protection is required, appropriate eye PPE must also be worn.

- Masks and face shields are the primary protection for the face; secondary protection for the eyes

Be aware that you may need to protect against more than one hazard at the same time. E.g., welding rays and flying particles.



Whenever possible, consider using engineering controls before resorting to personal protective equipment.

For example,

- The barrier is an engineering control that will prevent splashes back toward the worker.
 - ✓ A face shield may be needed if there is a potential for material to still strike the worker despite the barrier.
- In a machine shop, the clear barrier over the wheel of a grinder would be the engineering control designed to control small metal particles.
 - ✓ However, since its effectiveness is dependent upon how well it is adjusted, safety glasses would still be needed.
 - ✓ Sometimes face shields would also need to be worn.

2.4 What contributes to eye injuries at work?

- Not wearing eye Protective

The BLS reported that nearly three out of every five workers injured were not wearing eye Protective at the time of their accident.

- Wearing the wrong kind of Protective for the job

About 40 percent of the injured workers were wearing eyeglasses without side shields, although some injuries still can occur when full-cup and flat-fold side shields are worn. Tight-fitting goggles offer the most complete Protective and should be worn for liquid chemical hazards.

- Flying particles

The Labor Departments' Bureau of Labor Statistics (BLS) found that almost 70 percent of the accidents studied resulted from flying or falling objects striking the eye. Injured workers estimated that nearly 60 percent of the objects were smaller than a pin head.

Contact with chemicals caused about 20 percent of the injuries. Other accidents were caused by objects swinging from a fixed or attached position ñ such as tree limbs, ropes, and chains or tools that contacted the eye while the worker was using them

2.5 Where do accidents occur most often?

- Craft work/industrial equipment operation



Potential eye hazards can be found in nearly every industry, but the BLS reported that more than 40 percent of the injuries studied involved craft workers such as mechanics, repairers, carpenters and plumbers.

More than a third of the injured workers were operatives such as assemblers, sanders and grinding machine operators. Laborers suffered about 20 percent of the eye injuries.

2.6 Eye injuries prevention

- Always wear effective eye Protective
- Better training and education
- Hand And Arm Protective

Hazards requiring hand Protective Provide your employees with the appropriate hand Protective if they are exposed ñ or likely to be exposed ñ to any of the following hazards that may result in potential hand injury:

- ✓ Severe cuts, lacerations, or abrasions
- ✓ Punctures
- ✓ Thermal burns
- ✓ Harmful temperature extremes
- ✓ Chemical hazards
 - Absorption of harmful substances
 - Chemical burns
 - Rashes, irritation
- Foot and Leg Protective

Provide your employees with appropriate Protective if they are exposed to hazards that could injure their feet, such as

- ✓ Objects which could
 - Fall (impact hazard)
 - Roll (compression hazard)
 - Pierce or cut the sole or upersonal protective equipments (puncture hazard)
- ✓ Electrical hazards
- ✓ Chemical hazards
- Torso/Body Protective

Provide your employees with appropriate Protective if they are exposed to hazards that could injure their torso, such as

- ✓ Intense heat
- ✓ Splashes of hot metals and other hot liquids



- ✓ Impacts from tools, machinery, and materials
- ✓ Cuts
- ✓ Hazardous chemicals
- ✓ Contact with potentially infectious materials, like blood
- ✓ Radiation

2.7 What is a hazard?

A hazard is an existing (or potential) hazardous or unsafe condition or work practice that, by itself or in combination with other conditions, could cause injury, illness, or death to workers, as well as cause property damage.

Hazards may exist from

- Processes/procedures
 - ✓ Any series of actions or operations (manufacturing, equipment, product flow, etc., and handling) that convert raw material into a product
- Unsafe equipment, machinery, or tools
 - ✓ For example damaged tools, unguarded blades or unguarded moving parts, etc.
- Unsafe work practices
 - ✓ Allowing untrained workers to perform hazardous tasks, taking unsafe shortcuts, being distracted, working long shifts, etc.

2.8 Hazards control

To control hazardous and unsafe conditions and work practices, use the most effective control methods feasible at your work place. Try to reduce employee exposure by implementing effective controls that do not primarily rely on individual employee behavior. Follow a system of strategies, called the "Hierarchy of Controls," which prioritizes control methods that try to remove or reduce the hazard:

Hierarchy of Controls (most to least effective)

- Eliminate/reduce the hazard - Engineering Controls
- Reduce the hazard - Work Practice Controls
- Administrative Controls
- Put barrier between worker and hazard if needed - Personal protective equipment

Controls that depend on successful employee behavior (for example, depending on an



employee's work technique to minimize exposure) are a last resort since they are less reliable than controls that don't allow the employee to be exposed to the hazard. Controls that are designed and implemented to prevent or reduce employee exposure (such as engineering controls) require less reliance on behavior to be effective.

2.9 Engineering Controls

Engineering controls are the best and the "first line of defense" against injury/illness, because they focus on the hazard itself and have the potential to completely eliminate the hazard or to reduce the probability of harmful exposure. This may be done by removing the employee from the hazard or providing distance between the worker and the hazard. If you can physically change the machine or work environment to prevent employee exposure to the potential hazard, then you have eliminated the hazard with an engineering control.

Engineering controls also do not rely on human behavior to be effective. For example, instead of requiring employees to wear respiratory Protective which must be monitored, inspected, trained, and managed, it is much more effective to install a ventilation system that does not require any of those management activities.

In general, when considering engineering controls, follow these principles:

- If feasible, design the facility, equipment, or process to remove the hazard and/or substitute something that is not hazardous or is less hazardous.
- If removal is not feasible, enclose the hazard to prevent exposure in normal operations.
- If complete enclosure is not feasible, establish barriers or local ventilation to reduce exposure to the hazard in normal operations.



Self-Check 2 -

Written test

Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short Answer Questions:

1. List down only four personal protective equipment and discuss them.
2. What is hazard? Why it occurs?
3. What happened when injury occurs in the work place?
4. Write down some about "Hierarchy of control".
5. What do you know about engineering control?
6. What is personal protective equipment?
7. What is the use of PPE in engineering?
8. Does PPE reduce the workplace hazard?
9. What is PPE protection?

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

You can ask you teacher for the copy of the correct answers.



Information Sheet 3 - Pest control activities of cereals

3.1 Introduction

Losses of grain in storage due to insects are the final components of the struggle to limit insect losses in agricultural production. These losses can exceed those incurred while growing the crop. Losses caused by insects include not only the direct consumption of kernels, but also include accumulations of Frass, exuviae, webbing, and insect cadavers. High levels of this insect detritus may result in grain that is unfit for human consumption. Insect-induced changes in the storage environment may cause warm, moist 'hotspots' that are suitable for the development of storage fungi that cause further losses. Worldwide losses in stored products, caused by insects, have been estimated to be between five and ten percent. Heavier losses occurring in the tropics may reach 30%, and the net value of losses in storage in the United States has been placed at over \$200 million annually. Limiting insect infestation in grain storage must be a primary consideration beginning at the time of harvest. Economically speaking, storage insects and, to a lesser degree, fungi reduce the quality and value of grain, while losses due to rodents and birds are typically quite infrequent and minor.

While several procedures to manage pests are used at storage facilities before storage, those that minimize pest invasion into storage structures include:

- Cleaning bins, harvest and loading equipment prior to harvest and after bin emptying,
- Applying "empty-bin" insecticides to the inside of the structures,
- Sealing structures,
- Cleaning up grain spills on the grounds,
- Removing weeds close to structures.
- Since higher moisture can encourage mold and insect development, additional management techniques also include:
 - ✓ Storing sufficiently dry wheat (less than 13%),
 - ✓ Aerating the stored grain with fans to cool the wheat thus slowing insect development,
 - ✓ Close monitoring of grain temperature and insect populations.



There are limited options for managing insects in the grain itself. Grain protectants are expensive and thus used infrequently.

In general, warm grain temperatures at harvest and during storage, combined with grain moisture content of 12-13%, are favorable to growth of insect populations. Insect populations increase during the autumn, peak during late fall or early winter, with reproduction declining through the remainder of winter. The following spring, population growth resumes as the grain warms once again.

3.1 Identification of parts of insect

Head - The head includes the antennae, eyes, and mouthparts. Antennae vary in size and shape and can aid in identifying some pest insects. Insects have compound eyes made up of many individual eyes. These compound eyes enable insects to detect motion, but they probably cannot see clear images. Mouthparts are also used to identify insects. The four general types of mouthparts are: Chewing - Cockroaches, ants, beetles, caterpillars, and grasshoppers. Piercing/sucking - stable flies, sucking lice, bed bugs, mosquitoes, true bugs, and aphids Sponging - flesh flies, blow flies, and house flies Siphoning - butterflies and moths **Thorax** - The thorax contains the three pairs of legs and (if present) the wings. The various sizes, shapes, and textures of wings and the pattern of the veins are also used to identify insect species.

The forewings take many forms. In the beetles, they are hard and shell-like; in the grass hoppers, they are leathery. The fore-wings of flies are membranous; those of true bugs are part membranous and part hardened. **Abdomen** - The abdomen is usually composed of 11 segments, but 8 or fewer segments may be visible. Along each side of most of the segments are openings (called spiracles) through which the insect breathes. In some insects, the tip end of the abdomen has a tail-like appendage. Insects, unlike some other types of animals, have no backbones. They have an outer supporting structure called an exoskeleton. Therefore they are called invertebrates. Organisms with an internal support structure (endoskeleton) which is characteristic of most large animals, are termed vertebrates identifying insect species.



3.2 Stored Grain Insects

In addition to obvious identifying characteristics, the feeding habits of storage insect pests are used to separate them into two classes: Primary pests and secondary invaders. Primary pests are those that are capable of penetrating and infesting intact kernels of grain, and have immature stages that can readily develop within a kernel of grain. Secondary invaders cannot infest sound grain but feed on broken kernels, debris, higher moisture weed seeds, and grain damaged by primary insect pests. In general, the immature stages of these species are found external to the grain. It is often thought that secondary invaders cannot initiate an infestation. This is untrue as in almost any storage situation there will be adequate amounts of broken grains and debris to support an infestation by secondary invaders. Moreover, secondary invaders contribute directly to grain spoilage after establishment, just as primary pests do. However, the most damaging insect types are those that feed within the kernel itself, causing insect-damaged-kernels (IDK).

3.3 Critical IPM issues

The integrated pest management (IPM) approach that protects stored grain includes:

- Sanitation
- Frequent monitoring
- Aeration
- Biological control
- Pesticide treatments

IPM techniques should be considered as tools in a toolbox; not all of them are needed every time, such as pesticides, but still need to be available.

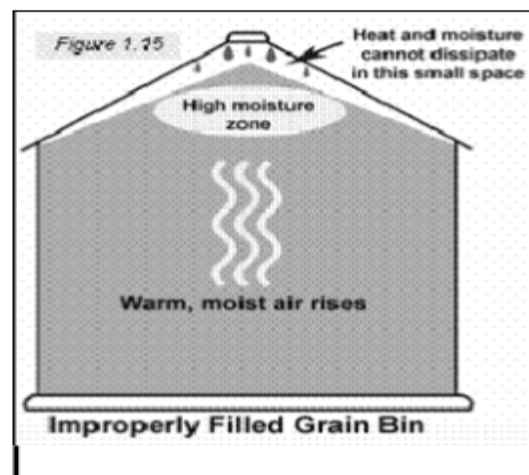
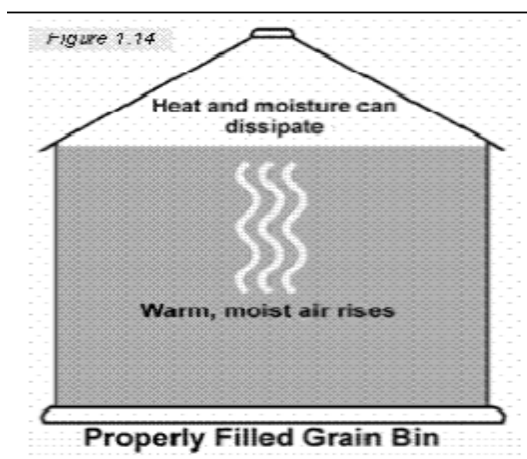
3.4 Sanitation and grain leveling

The key to preventing insect infestations is to continually clean and properly maintain the storage structure. Stored grain insects breed readily in residual grain. They also live and feed on cracked grain, grain trash, or left over grain from previous crop. Both birds and rodents are also attracted to spilled grain. Rodents and pest insects find harborage and food in mature weeds surrounding the facility. The following are standard

sanitation practices used for empty storage facilities. Clean harvest and transportation equipment before the harvest. Storage structures are emptied of old grain. Never store a new crop on top of old grain. Floors and walls inside empty bins are swept of old grain and debris. Weeds around the bins are removed. Remove spilled grain outside the storage structure. All grain handling equipment is repaired and kept in good condition before harvest. For additional Protective, the inside and outside surfaces, foundations and floor of a storage facility should be treated with a residual insecticide, four to six weeks prior to harvest. This will kill any insects that were not removed during cleaning and those that migrate into the bin.

Improper storage results in moisture wicking up the peaked grain and accumulating in the grain mass in this peak. Storage fungi can readily establish in this area, leading to spoilage, the development of hot-spots, and providing a very favorable environment for a large population of storage insects.

The process of leveling the grain requires the judicious use of the grain auger and a brief period of physical labor using a grain shovel. The level surface is well suited for monitoring with pitfall traps, and for the proper application of fumigants.



3.5 Monitoring



Pest monitoring is an important component in the IPM post-harvest practice for stored grain. Inspections should be done frequently, especially after first storage. Initially, grain is inspected for insects weekly until the baseline insect numbers are known. Then the grain is monitored every 2-3 weeks during throughout the autumn until the grain is cooled to 50-55°F or below, and monitored monthly for the remainder of the storage period. Grain managers should carefully monitor the following:

- Grain quality
- Grain temperature
- Insects and insect density
- Hot spots
- mold growth
- Any “off odor”

3.6 Insecticide treatments/Spray

Empty bin treatments include residual insecticides applied in and around the fan, aeration ducts, auger, door openings, and hatch covers, or fumigants, before bins are filled at harvest. Commercial facilities must comply with the Occupational Safety and Health Administration (OSHA) bin entry permits.

Table 2. Pesticides available for treating empty bins



Insecticides Labeled for Use as Empty Bin Treatments		
Active Ingredient (a.i.)	Example Brands	Comments / Usage
Cyfluthrin	Tempo Sc Ultra Premise Spray®	Most effective residual as compared with malathion and chlorpyrifos-methyl.
Chlorpyrifos-methyl	Reldan 4E®	Can only be applied from outside of bin and sprayed downward into the bin. Degrades on hot surfaces.
Diatomaceous earth (DE)	Insecto, Protect-it®	Excellent empty bin treatment. Special grade required for grain use. Must use DE labeled for grain.
Malathion	Malathion	No longer recommended for empty grain bins because of high insect resistance and rapid degradation in warm, relatively moist grain.
Chlorpyrifos-methyl + cyfluthrin	Storcide®	Can only be applied from outside of bin and sprayed downward into bin. It is not recommended for grain intended for export.
Chloropicrin	Chlor-o-pic®	Empty bin fumigant, under false floor, aeration tubes, and tunnels.
Methyl bromide	Brom-o-gas®	Empty bin fumigant; seldom used.

Grain protectants are insecticides applied directly onto grain going into the storage or already in storage. Grain protectants do not kill insects inside the kernels. Following are insecticides labeled as protectants.

For direct application on wheat at first storage, there are limited circumstances where the use of a protectant is necessary.

Table 3. Liquid insecticides labeled for use as grain protectants



Liquid Insecticides Labeled for Use as Grain Protectants		
Active Ingredient	Example Brands	Comments
Chlorpyrifos-methyl	Reldan 4E®	Reldan does not control lesser grain borer. Can only be applied to the grain stream as it is moved (augered) into the bin. Use limited to existing stocks.
Malathion	Malathion 5EC	Existing stocks are available but label has been withdrawn. Most stored grain insects are resistant.
DDVP	Vapona®	Also as strips. Used in the head space against Indianmeal moth.
Methoprene	Gentrol, Diacon II®	Kills developing insects only, slow kill of larvae, no kill of adults though causes sterility. High cost and must use other products before sale. Newly marketed.
Chlorpyrifos-methyl + cyfluthrin	Storcide®	Can only be applied to the grain stream as it is moved (augered) into the bin. It is not recommended for grain intended for export.
Pyrethrins	Pyrenone®	Expensive, short residual life.

Table 4 Dust insecticides labeled for use as grain protectants

Dust Insecticides Labeled for Use as Grain Protectants		
Active Ingredient	Example Brands	Comments
Malathion	Big 6 Grain Protector®, Agrisolutions 6% Malathion Grain Dust	Top-dress treatment. Insects are resistant in many areas. Millers resist purchasing grain with strong malathion odor.
Diatomaceous earth (DE)	Protect-It™, Insecto®	Can lower the test



Self-Check – 3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Can exterminators remove pesticides?
2. Should you clean after pest control treatment?
3. How pest control can benefit the environment?
4. What to do after applying pesticides?

You can ask you teacher for the copy of the correct answers

Note: Satisfactory rating - 4 points

Unsatisfactory - below 4 points



Information Sheet 4 - Manufacturers, workplace and consultative instructions of fumigant and spray

4.1 Fumigation application

Fumigants are a frequently-used type of insecticide for stored grain insects in Montana and include chloropicrin and phosphine. Chloropicrin has limited use in empty bins only. Phosphine is highly effective, remedial, and relatively inexpensive, leaves no residual product, and when used correctly, is safe around workers and the environment. Even though, several procedures to manage pests are used at storage facilities, this information sheet only focused on fumigant and spray applications in accordance with manufacturers, workplace instructions and consultative processes.

In order to kill grain pests at all stages of their life cycle (egg, larva, pupa, adult), phosphine gas needs to reach, and be maintained at, a concentration possible only in a gas-tight storage. Properly conducted fumigation will stop insect infestation and grain degradation from getting progressively worse. When fumigation is effectively conducted in late fall, pest populations can be drastically reduced. Fumigation is recommended if:

- Grain samples reveal the presence of insect-damaged-kernals (IDK).
- Samples or traps capture harmful insects (lesser grain borer, granary weevil).
- Trapping or sampling indicates that a population of secondary pests like the rusty grain beetle is expanding rapidly.

Fumigants registered for use are phosphine, either released from aluminum or magnesium phosphide or directly as a gas, methyl bromide, and chloropicrin (used for empty bin treatment only). Tablets or pellets of aluminum or magnesium phosphide are sold under Weevilcide®, Fumitoxin®, and Phos-toxin® trade names. Phosphine gas mixed with carbon dioxide is sold in gas cylinders as ECO2-Fume®. Methyl bromide is expensive, difficult to use properly on raw grain, kills the germ, and is not recommended for stored grain, especially seed wheat. In addition, methyl bromide use is being phased out due to its status as ozone deplete under the Montreal protocol. The phosphide pellets or tablets release phosphine gas as they are exposed to moisture in



the air. In a large storage facility, phosphide pellets or tablets are often added to infested grain as it is moved from one silo to another silo, bin, railcar, or truck.

4.2 Key points

To control insects at all life stages the only option is to fumigate in a gas-tight storage.

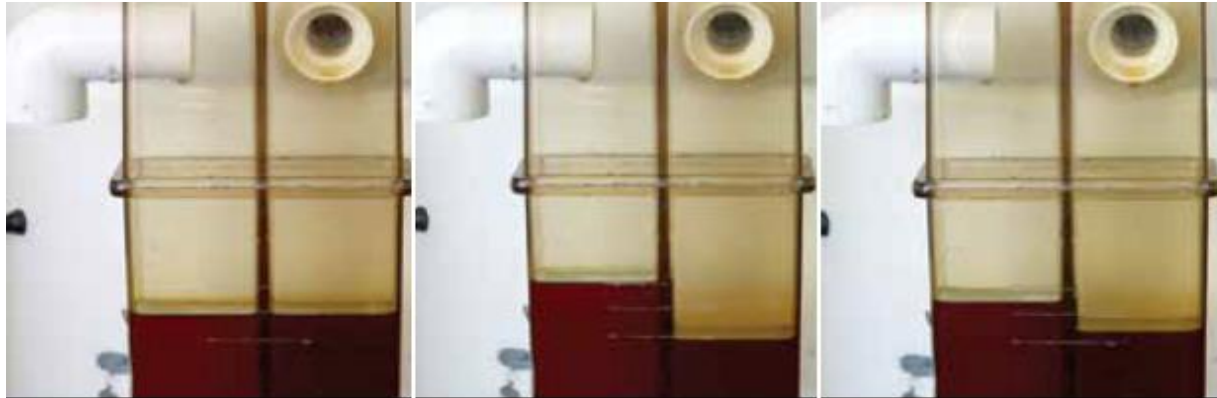
Cool grain temperatures require a longer fumigation period. Aeration fans fitted on gas-tight silos provide a number of benefits including a shorter ventilation period following fumigation.

4.3 Where to apply fumigation and spray

Arrange the tablets where as much surface area as possible is exposed to air, so the gas can disperse freely throughout the grain stack. Spread phosphine tablets evenly across trays before hanging them in the head space or placing them level on the grain surface inside a gas-tight, sealed silo. Hang bag chains in the head space or roll out flat on the top of the grain so air can freely pass around them as the gas dissipates. Bottom-application facilities must have a passive or active air circulation system to carry the phosphine gas out of the confined space as it evolves. Without air movement, phosphine can reach explosive levels if left to evolve in a confined space.

4.4 Gas venting

Following fumigation, ventilate silos so grain can be delivered free from harmful gas residues. With tablet residue or bag chains removed, leave silos open for no less than five days, or no less than one day with aeration fans operating. The final step is to hold grain for a further two days after ventilation before using for human consumption or stock feed.



PHOTOS: CHRIS WARRICK, KONDININ GROUP

Start a pressure test with equal oil levels on the middle marker.

Pressurise silo to create a difference in oil levels of 25mm.

The time taken for the oil levels to drop from 25mm apart to 12mm apart must be no less than five minutes on new silos. For older silos, three minutes is acceptable.

PHOSPHINE FUMIGATION PERIOD

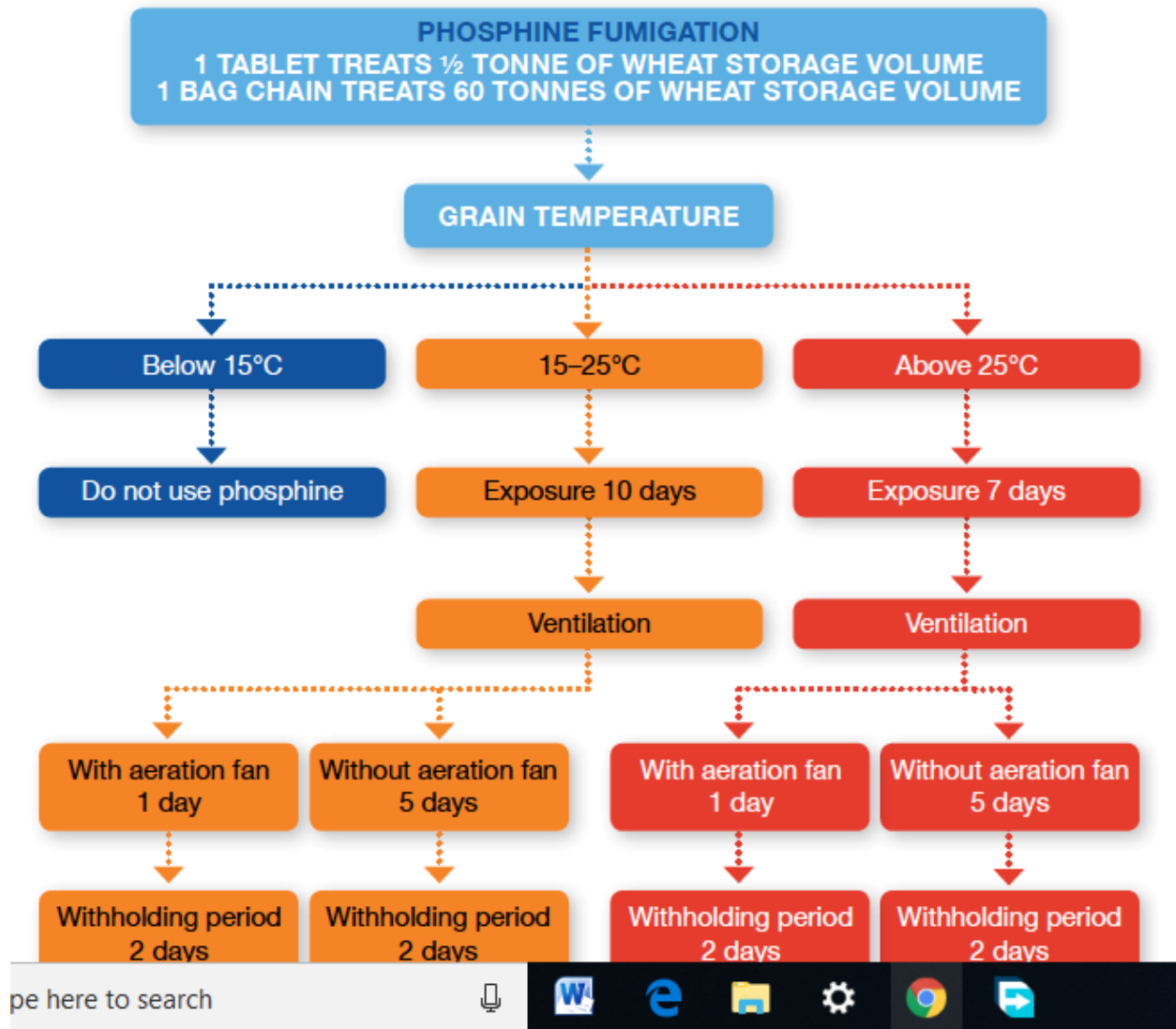


Fig. 3 Phosphine fumigation period



Self-Check – 3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. How effective is fumigation for pest control?
2. What is pesticide fumigation?
3. What to do after spraying for pest control?

You can ask you teacher for the copy of the correct answers

Note: Satisfactory rating 4 points	Unsatisfactory below 4 points
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Information Sheet 5- Placing warning signs following legislative and workplace requirements

5.1 Introduction

The objective of this sheet is to provide consistent and specific standards regarding the use and implementation of construction protective barriers, warning signs and tags and to ensure that each Centennial employee and subcontractor is adequately trained and fully aware of safety procedures associated with protective barriers, warning signs and tags. This sheet establishes requirements for a uniform visual system of identification of hazards in the work environment. It provides for the design, application and use of signs, tags and temporary barriers by all Centennial employees and subcontractors. Signs are warning of hazard, temporarily or permanently affixed or placed at locations where hazards exist. Whereas Signal is signal moving signs, provided by workers such as flaggers or by devices such as flashing lights to warn of possible or existing hazards. Similarly Tag is refers to temporary signs usually attached to a piece of equipment or part of a structure to warn of existing or immediate hazards.

5.2 General requirements

Below are some of the general requirements that apply to the use and placement of temporary barriers, signs and tags on centennial project sites:

- Safety signs and barriers are a supplement to, but not a substitute for, engineering and additional administrative controls when mitigating hazards
- Safety signs and barriers shall be strategically and prominently placed to alert and inform a viewer in sufficient time so that the viewer can take appropriate evasive action to avoid potential harm from the demarcated hazard
- Safety signs and barriers shall be placed and constructed in a manner that they are legible, non-distracting and do not, of themselves, become hazardous
- Safety signs and barriers shall be displayed with illumination or retro-reflective qualities to ensure visibility and legibility under normal working conditions; when illumination is inadequate, supplemental illumination shall be provided to ensure that safety signs shall be legible and the color-coding is not distorted

- Safety signs and barriers shall be promptly removed or covered when a hazard no longer exists
- Accident prevention tags shall be used only as a temporary means of notifying employees of an existing hazard, such as defective tools, equipment, etc.

5.3 Construction limit barriers

Construction areas shall be barricaded and posted “Construction Area” with a physical boundary (such as fencing where practical) to control access and warn of potential hazards.

Below are some examples of appropriate construction site signage:



5.4 Minimum requirements for project site postings

Centennial project sites shall have a “job board” with all applicable postings complying with all regulatory posting requirements and contract specific posting requirements. The minimum project site postings include:

- Minimum requirements for personal protective equipment on the project site
- The four leading causes of fatalities in the construction industry (falls, struck by, caught in or between, electrocution)
- Instructions that all contractors be equipped personal protective equipment with first aid kit, ground fault circuit interrupter, and fire extinguisher
- Occupational Safety and Health Administration Job Safety- “It’s the Law” poster
- Emergency contact information posting
- Map and route to the nearest hospital and occupational clinic
- “Safety First” posting



5.5 Barricade tape

5.1.1 Yellow and black barricade tape (caution tape)

Yellow and black barricade tape serves as a caution to indicate to employees that a potential hazard exists.

This barricade tape is used for, but not limited to, the following:

- ✓ Excavation less than 4 feet in depth
- ✓ Identification of trip hazards, and low hanging objects
- ✓ Material storage on the site

5.1.2 Red barricade tape (danger tape)

Red barricade tape indicates DANGER and that a potentially serious hazard may be present. No Centennial employee, subcontractor employee or any other person may enter without first obtaining permission from the erector of the tape.

This barricade tape is used for, but is not limited to, the following:

- ✓ Overhead work
- ✓ Live electrical components
- ✓ Scaffold under construction
- ✓ Around swing radius of equipment with a rotating superstructure
- ✓ Slip/trip/fall hazard

5.6 Accident prevention signs

Please use the chart below to determine the appropriate signal word:

If Worst Credible Severity of Harm is Death or Serious Injury.		Probability of Accident if hazardous Situation is not Avoided	
		WILL	COULD
Probability of Death or Serious Injury if Accident occurs	WILL		
	COULD		

If Worst Credible Severity of Harm is Moderate or Minor Injury.		If Worst Credible Severity of Harm is Property Damage.	
For all Probabilities: 		Preferred → 	Alternate → 
		For all Probabilities:	
		Alternate → 	

5.7 Caution signs

Caution signs shall be used only to warn against potential hazards or to caution against unsafe practices. Caution signs shall have yellow as the predominating color with a black upper panel and borders and yellow lettering of "caution" on the black panel. The lower yellow panel shall be used for additional sign wording. Black lettering shall be used for additional wording.



5.8 Danger signs

Danger signs shall be used only where an immediate hazard exists. Danger signs shall have red as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording.

5.9 Safety instruction signs

Safety instruction signs, when used, shall be white with green upper panel with white letters to convey the principal message. Any additional wording on the sign shall be black letters on the white background.



5.10 Accident prevention tags

Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc. They shall not be used in place of, or as a substitute for, accident prevention signs.

- Accident prevention tags contain a signal word and a major message. The signal
 - word shall be legible at a minimum distance of five feet
- Accident prevention tags shall not to be used as a substitute for accident prevention signs
- Accident prevention tags shall be affixed as close as safely possible to the respective hazards by a positive means, such as string, wire, or adhesive, that prevents loss or unintentional removal
- Accident prevention tags shall be promptly removed when a hazard no longer exists.
- The tag is removed by the person who installed the tag or their designee
- Examples include, but are not limited to:



CAUTION

SIGNED BY: _____
DATE: _____

CAUTION

DO NOT REMOVE THIS TAG!

REMARKS: _____

SEE OTHER SIDE

40 (3, 125 x 6, 25) Front

DANGER

DO NOT OPERATE

NAME: _____
DATE: _____

Back

DANGER

DO NOT REMOVE THIS TAG!

REMARKS: _____

SEE OTHER SIDE



Self-Check – 5	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write down and discuss all the accident prevention signs.
2. Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard. Explain?
3. What is the objective of placing warning signs at workplace?
4. Write down why barricade tape is used for.
5. What are accident prevention tags?



Information Sheet 6 - Monitoring application and ensure effectiveness operation

5.1 Introduction

Monitoring is an on-going process usually directed by management to ensure processes are working as intended. Monitoring is an effective detective control within a process. Follow-up relates to ensuring that improvement opportunities and problems identified through auditing and monitoring efforts have been addressed by the organization, typically through the efforts directed by management. Follow-up is an effective mechanism to establish management accountability for compliance and internal control. While compliance and internal audit are responsible for following up to ensure remedial actions have been taken.

5.2 Roles and Responsibilities of Corporate Compliance and Internal Audit

The focus group of Health Care Compliance Association (HCCA) and Association of Healthcare Internal Auditors (AHIA) members continues to explore opportunities to better define and explain auditing and monitoring, clarify the roles of compliance and internal audit functions as they address issues within their healthcare organizations, and develop guidance and reference materials on key aspects of health care auditing and monitoring processes. The Seven Component Framework developed by the AHIA/HCCA focus group for compliance auditing and monitoring is comprised of the following activities:

- Perform a risk assessment and determine the level of risk
- Understand laws and regulations
- Obtain and/or establish policies for specific issues and areas
- Educate on the policies and procedures and communicate awareness
- Monitor compliance with laws, regulations, and policies
- Audit the highest risk areas
- Re-educate staff on regulations and issues identified in the audit

There is no attempt to address the merits of having separate or combined corporate compliance and internal audit functions. Whether the functions are separate or



combined, the roles and responsibilities remain essentially the same for each function, though each approach provides reciprocal advantages and disadvantages to an organization, which can best be summarized as follows:

- With separate compliance and internal audit functions, collaboration is more challenging but functional independence is assured.
- In combined compliance and internal audit shops, collaboration is assured but functional independence is more challenging.

The Focus Group categorized the different roles and responsibilities for comparative purposes. This categorization and comparison is summarized in a matrix as Exhibit A to this article. Twenty-two comparative categories were identified: requirement, purpose, reporting, internal authority, span of responsibility, professional standards, high level focus, primary focus from a risk standpoint, activity focus, relationship to management, training responsibility, auditing, monitoring, expertise, impact on internal audit plan, impact on compliance plan, risk assessment, follow-up, investigation, hotline, information systems, and internal controls. This of course highlights the complexity of attempting to discern the roles and responsibilities, though once addressed it's actually quite easier than it seems.

5.3 Similar Roles and Responsibilities

Corporate compliance and internal audit functions are best served by being independent of the operations they assess. To achieve independence, proper governance, lines of reporting and authority, organizational placement and organizational access are key to the success of both functions.

Risk assessment is a key component of both functions. Risk assessment involves the application of a methodical process for identifying key risks that face the organization. Both corporate compliance and internal audit address corporate level risk, governance and control. As defined by the Committee of Sponsoring Organizations (COSO) of the Tread way commission, internal control is broadly defined as a process, effected by an entity's board of directors, management and other personnel, designed to provide



reasonable assurance regarding the achievement of objectives in the following categories:

- Effectiveness and efficiency of operations.
- Reliability of financial reporting.
- Compliance with applicable laws and regulations.

5.4 Unique Roles and Responsibilities

Exhibit A identifies in detail by category the uniqueness of each function. The following discussion summarizes the unique roles of each function deemed most notable by the Focus Group.

5.4.1 Corporate compliance

Corporate compliance documents follow-up regarding resolution of hotline calls and reported compliance issues. Follow-up reporting to the board is not specifically mandated and is therefore at the compliance officer's discretion.

5.4.2 Internal audit

Internal audit is required to ensure follow-up of recommendations made in internal audit reports to determine if management has responded accordingly. Formal tracking and reporting to the board is also required.

✓ Compliance program

A formal documented compliance program is recommended by the Office of the Inspector General. Some organizations are also required to have such programs by corporate integrity agreements reached with the government due to prior significant compliance failures. Compliance and internal audit work in tandem to ensure the compliance programs are functioning and effective.

Corporate compliance creates and executes the organization's corporate compliance program relative to its role. Management and all members of the organization are responsible for ensuring that compliance with laws, rules and regulations occurs. Internal audit provides advice and consultation relative to the compliance program. Internal Audit is responsible for auditing compliance program implementation and evaluating program effectiveness



✓ Compliance Risks

Compliance risk is the driving need for a corporate compliance program: organizations must ensure that they are taking reasonable measures to comply with applicable laws, rules and regulations, as well as their own policies. Corporate compliance and internal audit have comparable roles relative to addressing compliance risk. However, corporate compliance creates and executes an annual or periodic compliance work plan that ensures compliance risks are being addressed through the use of compliance personnel and management led monitoring activities.

Internal audit addresses compliance risk as part of risk-based audits or in conjunction with corporate compliance coordination and the compliance work plan.

5.5 Conclusion

Corporate compliance and internal audit share similar roles and responsibilities, while also maintaining specific, unique roles and responsibilities. These roles and responsibilities are not structured the same in all organizations and, in some cases, are combined. Regardless of how your organization structures these important governance functions, corporate compliance and internal audit are most effective when they work in a collaborative manner, one that includes joint planning and coordination of risk assessment efforts to review for overlapping areas, coordinated reporting to management and the board on significant issues, and shared involvement in key compliance related committees, task forces and other working groups. Understanding the similarities and differences as summarized in this article should help to ensure such collaboration is deliberate and effective.



Self-Check – 6	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List down the seven Component Framework for compliance auditing and monitoring
2. What is ethics and compliance monitoring?
3. What is monitoring of effectiveness?
4. What is Office of Inspector General compliance?
5. Write down the similar roles and responsibilities of corporate compliance and internal audit functions.

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 4 points

Unsatisfactory - below 4 points



Information Sheet 7 - Applicable regulations and legislations.

7.1 Applicable regulations and legislations.

Guidelines for Developing an Effective National Food Control System contained a Model Food Law that has been used in many developing countries. Unfortunately this model has not always been appropriate because its precepts are not consistent with all legal systems. Many concepts and issues in food law have evolved over time and these were not reflected in the Model Food Law. In addition, strict adherence to the terms of the Model Food Law meant that many countries left out provisions, concepts and standards that their individual circumstances, administrative structures and legal frameworks required.

In this document, a set of guiding principles have been prepared. These principles describe a general approach to the drafting of food legislation, and as such they should be applicable to different legal systems. There is no substitute, however, for an in-depth analysis of the legal framework and the institutional set-up that directly or indirectly govern food production, import, export, distribution, handling and sale in a particular country. Only in that way can the particular and unique national needs be met.

In addition to legislation, governments need updated and internationally accepted food standards. In recent years, many highly prescriptive standards have been replaced by horizontal standards that address the broad issues involved in achieving food safety and quality objectives. While horizontal standards are a viable approach to delivering food safety goals, they require a food chain that is highly controlled and supplied with good data on food safety risks and risk management strategies and as such may not be feasible for many developing countries.

7.2 Form and Content of Food Regulations

As noted, the topics that may be addressed by regulations made by the executive authority under the basic law may be very broad. Generally, they fall into four categories:



- **Regulations Affecting Food Products in Genera**

Usually the purpose of this category of regulations is to establish general rules regulating the contents, handling, packaging and labelling of food products. These kinds of regulations are of particular importance in countries which do not include in the basic law rules governing the manufacture, processing and sale of food but leave it to the Minister to introduce detailed regulations. But whether or not general principles are laid down in the basic law, in one way or another a government authority must be entrusted with their implementation at the technical level.

- **Regulations Affecting Specific Food Products**

In many countries the provisions peculiar to each food may constitute specific and distinct regulations (for example novel foods, baby foods, special dietetic foods). The practice has developed in some other countries, however, of grouping such provisions, under different headings, into a comprehensive set of regulations governing food. Here, the legislative traditions may vary appreciably from one country to another.

- **Regulations for Organizational or Coordinating Purposes**

Although the main body of regulations putting into effect the food law will fall into the above two categories, there are a great number of internal regulations or 'house' rules that are of no direct concern to the public but which are required for the efficient operation of the administrative units created or empowered under the law. For example, regulations may address the functioning of the Food Control Agency, if any; the issuance, suspension and revocation of licenses of various kinds; the conduct of the inspection and analysis services; and so forth.

- **Schedules**

Many countries include detailed schedules among the subsidiary legislation to the basic food law. These will contain, for example, lists of inspection and sampling/analysis fees;



models for application forms or certificates used under the law; and other detailed matters.



Self-Check – 6	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is regulation and legislation?
2. Write the forms of food legislation?



Information Sheet 8 - Returning and disposing empty fumigant containers

8.1 Introduction

This prime fact is adapted from the Spray Sense series. Read the label The New South Wales (NSW) Pesticides Act, 1999 requires all pesticide users to follow the label recommendations for disposal methods. The label is a legal document, so it is important that you read it and understand the disposal requirements before getting rid of containers. This section outlines several techniques to help you dispose of pesticide containers safely and legally. The Resource Conservation and Recovery Act (RCRA) is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste.

8.2 Rinse empty containers

In most Australian states, containers that have not been properly rinsed are classified as hazardous waste. Discarded, un rinsed and improperly rinsed empty containers are a health risk to the people who handle them, and they can contaminate the environment. They are a potential danger to public health, domesticated animals, plants, soil, wildlife and the environment.

8.1.1 Rinsing methods

When you are rinsing a pesticide container make sure you wear the correct personal protective equipment as recommended on the label. The chemical remaining in the container is a concentrate, the most hazardous form of the chemical. There are a number of different techniques for rinsing pesticide containers including:

- ✓ Piercing nozzle

This manual method uses a specially-designed nozzle to pierce the container and force the remaining product out into the spray tank. Use clean water at 200 – 300kPa (30 – 45psi). The rinsate is returned to the spray tank. Definition - Rinsate is a mixture of pesticides diluted by water, solvents, oils, commercial rinsing agents or any other substances. It is produced from cleaning pesticides application equipment or pesticides containers. Source EPA

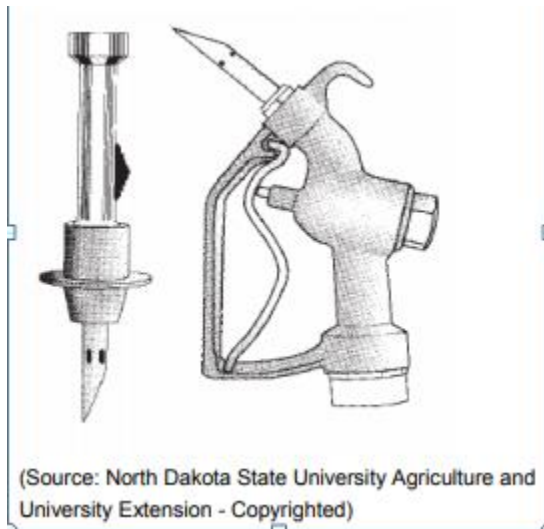
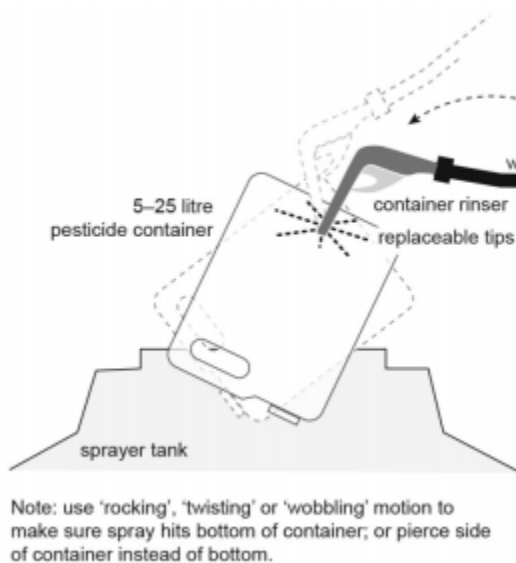


Fig. 1 Typical piercing nozzles



(Source: North Dakota State University Agriculture and University Extension - Copyrighted)

probe that is used to spray water into the container, the rinsate is then caught in the hopper and transferred into the spray tank. Hopper unit: are available from several spray equipment manufacturers.

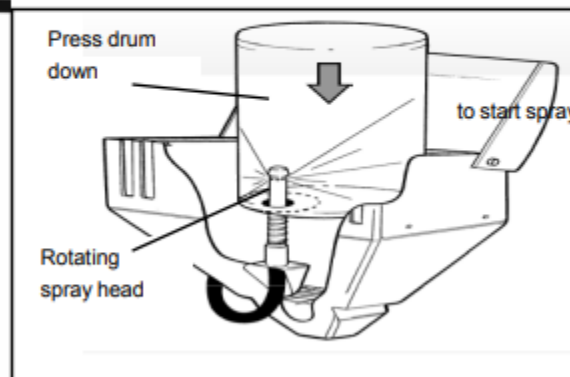
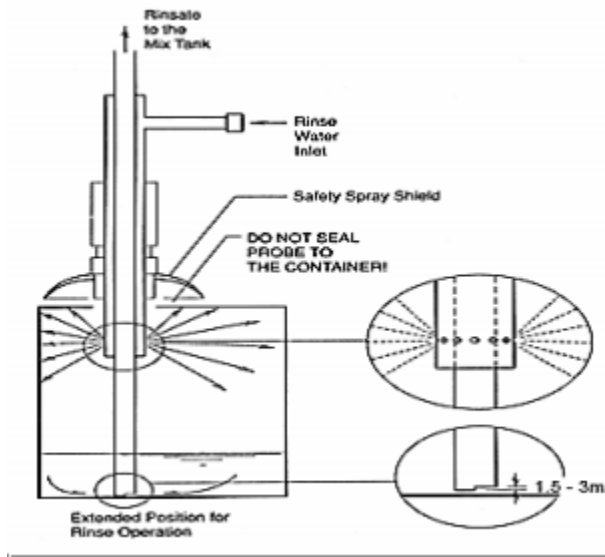


Image kindly supplied by **SILVAN**

Fig. 2 Rinser

✓ Suction - Rinse Probe transfer systems

This system initially uses a probe to suck the contents of the container into the spray tank. Next the high pressure nozzles are turned on while the probe sucks the rinsate into the mixing tank. Rinse for 3 to 5 minutes;



This is a particularly good option for larger containers that are too heavy to lift above the spray tank, for example 200 litre drums.

✓ Induction hoppers

An induction hopper is attached to the sprayer or can be purchased as separate unit. They consist of a hopper adjustable to a convenient height for easy tipping of pesticide containers. When the container is empty they have either a nozzle or

LIQUID FERTILIZER TRAILER



6000 litre tank, hydro drive centrifugal pump, raven flow control system, 2-wheel and 4-wheel steering, small turning radius of 5 mtr and more!

LIQUID KIT



6000 litre tank, hydro drive centrifugal pump, raven flow control system, 2-wheel and 4-wheel steering, small turning radius of 5 mtr and more!

CUSTOM SOLUTIONS



The Katanning workshop staff can handle any custom work, from sheet metal work, agricultural plumbing, spraying solutions, tank repair, pump repair, metal lathe, and more. All work is quoted beforehand.

HANDLER 1 & 2



The Handler I at 59 litres is a granny pot with Banjo fittings. The Handler II at 190 litres is a larger unit. Both Handlers include the Handler knife system, agitation, frame, cone bottom tank, and

HANDLER 3



The Handler III, at 265 litres, includes the knife system, Roto flush tank rinse nozzle, agitator, venturi manifold, 2" or 3" Banjo fittings, 6.5hp Honda engine with optional drum probes and micromatic coupler.

HANDLER 4



The Handler IV, at 870 litres, includes the knife system, Roto flush tank rinse nozzle, 2 x 2" agitators, 3" Banjo fittings, 6.5hp Honda engine, forklift ready base with optional venturi manifold, drum

HANDLER 1 SEED TREATER



At 59 litres, these are pumping systems that are an on-the-go seed treating system. The unit is driven by an electric motor. By adjusting the pressure valve next to the gauge, you can adjust the rate and coverage of the product.

HANDLER 3 SEED TREATER



Similar to the Handler I seed treater, this unit is larger and comes with a hydro pump. It is also driven by a 6.5hp Honda motor, rate and coverage of product is adjusted by the pressure valve next to the gauge.

ZAG AUGER CHUTE



This unit is meant to be used as an auger chute, so your auger does not get contaminated. The ZAG features an internal ladder style system that spreads the grain to provide optimal coverage as it falls past the spray nozzles. The unit includes spray tips and anti-static magnet.

✓ Rinsing attachments

Attachments that can be used to rinse plastic and paper bags are available with some of the induction hopper units.



For containers that are too large to shake: Empty remaining contents into the application equipment or a mix tank, fill the container $\frac{1}{4}$ full with clean water, replace and tighten bungs, tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds, tip container over and repeat so the clean water gets into all corners. Drain container for 30 seconds after the flow has stopped. Repeat 3 times.

Ensure thread and bungs are thoroughly clean. Larger drums are usually recycled so their bungs should be reinserted after cleaning and drying. Cleaning a container by triple rinsing involves twice as many steps and takes about four times as long as pressure rinsing. However it does not need any special equipment.

Comparison of triple and pressure rinsing

Features	Pressure Rinsing	Triple Rinsing
Number of Steps	8	17
Time Spent per Container	1 - 2 min	4 - 9 min
Special Equipment Needed	Rinse Nozzle/high pressure water	None

Source: Guidelines on Management Options for Empty Pesticide Containers
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS MAY
2008

8.3 Other packaging material

Paper, cardboard, plastic or other packaging material that has come in contact with a pesticide should be stored safely until disposal. Paper or cardboard packaging should be well shaken, punctured or shredded and plastic bags should be rinsed once to remove any pesticide residue prior to either storage or disposal. The cleaning methodology to be used depends on the physical and chemical characteristics of the pesticide. In all cases instructions for cleaning the container will be included in the product label and product safety data sheets.



8.4 Oil and solvent based products

For pesticides that are formulated in a solvent or oil and are not water soluble or dispersible, the rinsing process has to use a solvent as the rinsing medium. Solvent rinsates may not be suitable for adding to the tank mix product for application, in which case they have to be treated as pesticide waste and be disposed of in an environmentally sound manner. It is important to note that an inappropriately selected cleaning methodology will be at best ineffective and at worst dangerous. For example some pesticide formulations are water reactive and, if the containers were triple rinsed, there could be a violent reaction.

8.5 How to dispose of empty containers

Puncture metal containers, unless they are marked as returnable or recyclable, to assist the draining process, containers should be punctured from the inside. For example, drive a crowbar or spike through the container opening and puncture its base, then let the container dry completely (this may take a couple of days) and store in a dry place before disposal. Remove cleaned lids and store separately to reduce the chance of the container being reused. drumMUSTER is a national collection and recycling scheme that provides a solution to the problem of disposing of used non-returnable chemical containers.

8.6 Intermediate bulk containers

These are bulk pesticide containers that hold between 450 and 3000 Litres/Kilograms of material. The Environment Protective Authority (EPA) requires that they be recycled. There are a number of different companies that recycle them and all have different rules about cleaning. As a general rule they should be triple rinsed or pressure washed and dried before returning to supplier or recycler.

8.7 Burning restrictions

Do not burn empty (even properly rinsed) plastic or paper containers or packaging material on farm as toxic fumes will be given off. Pesticide labels clearly state that



burning of empty containers is illegal. Such action could result in your prosecution by the regulatory powers of the EPA, which administers The Pesticide Act.

8.8 Burial of containers

Burying rinsed pesticide containers at the place of use is not a good idea. It potentially uses up scarce land and can be a danger to animals. Plastic containers are highly stable and do not biodegrade. If buried, they will remain intact indefinitely. Burying containers is not permanent because the void space inside them and their low density cause them to rise gradually to the surface of the soil.



Self-Check – 8	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Why is my container empty?
2. How should you dispose of empty chemical containers?
3. What are RCRA and NSW empty container?
4. What is empty container compressed gas?
5. Discuss on rinsing methods?

Note: Satisfactory rating - 3 points

Unsatisfactory - below 3 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet 9- Preparation of baits following legislation and manufacturer's instructions

9.1 Introduction

Bait is food or other lure placed on a hook or in a trap and used in the taking of fish, birds, or other animals as prey. Worm and fresh food used for this purpose. In the such situation, read the label before using (see back panel for additional precautionary statements) keep out of reach of children only to be used by certified pest control operators, farmers and persons authorized in government-approved pest control programs.

9.2 Precautions

Keep out of reach of children, pets and livestock. May be harmful or fatal if swallowed or absorbed through the skin. Do not open premeasured place packs. Chemical-resistant gloves must be worn when disposing of dead rodents, unconsumed bait and empty containers. Avoid contact with eyes, skin or clothing. Wash hands before eating, drinking, and chewing gum, using tobacco or using the toilet. Wash skin thoroughly with soap and water after handling. Wash contaminated clothing, separately from other laundry, with soap and water before reuse. Keep away from feed and foodstuffs.

9.3 First aid

If in eyes, hold eye open and rinse slowly and gently with water for 15–20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control centre or doctor for treatment advice. If on skin or clothing, take off contaminated clothing. Rinse skin immediately with plenty of water for 15–20 minutes. Call a poison control centre or doctor for treatment advice. If swallowed, call a poison control centre or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control centre or doctor. Do not give anything by mouth to an unconscious person. For all cases of human ingestion, immediately notify a physician or Poison Control Centre. If a pet or livestock poisoning is suspected, immediately contact a veterinarian. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.



9.4 Toxicological information

Vitamin K1 in the form of intramuscular or subcutaneous injections, or by oral ingestion are suggested remedial treatments for anticoagulant poisoning. The severity of the case measured by establishing prolonged prothrombin times (P.T.) will determine appropriate therapy. Monitoring P.T. will indicate the necessity of repeated treatments.

9.5 Environmental hazards

This product is toxic to fish and wildlife. Keep out of lakes, streams or ponds. Directions for use:

9.1.1 Use bait to control the nor way rat (*rattus norvegicus*), roof rat (*rattus rattus*), and house mouse (*mus musculus*) indoors and outdoors within 15 metres of buildings (dwellings, farm buildings, food service establishments (non-food areas), granary bins (empty), processing plants (feed, food, in non-food areas) and storage areas (non-food)). Rodenticide bait can be placed in tamper-resistant bait stations along the fence line of properties, outside of the 15-metre limit but within 100 metres of buildings, if the station is securely fastened (e.g. nailed down) to the fence or the ground.

9.1.2 For areas not directly related to food processing: use only in non-food or non-feed areas where feed, food, packaging and handling equipment are never opened or exposed.

9.1.3 For areas where feed or food is processed, served or stored: in meat and food processing plants (processing areas) use only when plant is not in operation. Remove or cover all food, packaging material and utensils before placing bait in baiting stations. Remove all baits and dead rodents before re-use of the plant (processing areas include storage and service). Users should remove clothing immediately if pesticide gets inside. Then wash skin thoroughly and put on clean clothing.



9.1.4 Use limitations: bait must be placed either in tamper-resistant bait stations or in locations not accessible to children, pets, livestock or non-target wildlife. Do not place bait in areas where there is a possibility of contaminating food or surfaces that come in direct contact with food.

Bait stations (tier 3) used for the placement of rodenticide bait indoors, in locations not accessible to pets or livestock must have the following characteristics:

- be constructed of high-strength material (e.g., metal or injection molded plastic) and resistant to destruction by children:
- have an entrance designed so that children cannot reach the bait;
- have internal structure which prevents bait from being shaken loose;
- have an access panel that fastens securely and locks (e.g., metal screw or padlock); and
- Bear the product name, active ingredient, guarantee, registration number, “warning poison”, and the skull and crossbones symbol.

Bait stations (tier 2) used for the placement of rodenticide bait indoors, in locations accessible to pets or livestock must have the following characteristics, in addition to those outlined above for tier 3 bait stations:

- ✓ Resistant to destruction by non-target animals; and have an entrance designed so that non-target animals cannot reach bait. Bait applied outdoors and above-ground **MUST** be placed in bait stations.

Bait stations (tier 1) used outdoors, above-ground, in locations accessible to children, pets and non-target wildlife must have the following characteristics, in addition to those outlined above for tier 2 and 3 bait stations:

- ✓ be resistant to destruction or weakening by elements of typical non-catastrophic weather (such as, snow, rain, extremes of temperature and humidity, direct sunshine, etc.).



Self-Check – 9	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List down bait precautions?
2. What are the first aid recommended for eye affected by bait?
3. What is empty container compressed gas?

Note: Satisfactory rating - 3 points Unsatisfactory - below 3 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet 10 - Placing baits in site as per manufacturer's instructions

10.1 Placing baits in site as per manufacturer's instructions

Determine areas where rats and/or mice will most likely find and consume the bait. Generally, these areas are along walls, by gnawed openings, in or beside burrows, in corners and concealed places, between floors and walls, or in locations where rodents or their signs have been observed. Remove as much food as possible.

- Application directions: Rats: place 2 to 10 place packs per placement at intervals of 4.5 to 9 meters. Maintain an uninterrupted supply of fresh bait for at least 10 days or until signs of rat activity cease.
- House mice: Place 1 Place Pack at intervals of 2.5 to 3.5 metres per placement. Larger placements (up to 2 Place Packs) may be needed at points of very high mouse activity. Maintain an uninterrupted supply of fresh bait for 15 days or until signs of mouse activity cease.
- Rats and mice: replace contaminated or spoiled bait immediately. To prevent re-infestation, eliminate food, water, and harborage as much as possible. If re-infestation does occur, repeat treatment. Where a continuous source of infestation is present, establish permanent bait stations and replenish bait as needed.
- Disposal: Do not reuse empty container. Dispose of unused or spoiled bait in accordance with local requirements. Follow provincial instructions for any required cleaning of the container prior to its disposal. Make the empty container unsuitable for further use. Dispose of the container in accordance with provincial requirements. For more information on the disposal of unused, unwanted product and cleanup of spills, contact the provincial regulatory agency or the Manufacturer.
- Rodent disposal: Dispose of dead rodents in garbage or by burying.
- Storage: Store in cool, dry place away from other chemicals and food or feed. Store product not in use, in original container, in a secure location inaccessible to children and non-target animals

- **Notice to user**

This pest control product is to be used only in accordance with the directions on the label. It is an offence under the Pest Control Products Act to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.



Fig,1 Rat and Mouse Bait called Quintox



Fig. 2 Bait station



Self-Check – 10	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List directions help to use bait.
2. What is the definition of bait?
3. Why we need to use bait?

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 3 points

Unsatisfactory - below 3 points



LAP TEST 2	Performance Test
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Name..... ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

Task	Test
2	Perform wearing of types of personal protective equipment
5	Perform the component framework for compliance auditing and monitoring•



Reference materials

1. Said, P. P., and Pradhan, R. C. 2014. "Grain Storage Practices: A Review." *J. Grain Process. Stor.* 1 (1): 1-5.
2. Mishra, A., Prabuthas, P., and Mishra, H. N. 2012. "Grain Storage: Methods and Measurements." *Quality Assurance and Safety of Crops and Foods* 4 (3): 136-58.
3. Navarro, S., and Navarro, H. 2016. "Emerging Global Technological Challenges in the Reduction of Postharvest Grain Losses." In *Proceedings of the 15th International Cereal and Bread Congress*, 39.
4. Fidan, U., and Satuk, S. 2011. "Designing of Silo Automation Control System with Fuzzy Logic Controller." *AKU J. Sci.* 11: 1-14. (in Turkish)
5. Erbaş, M. 2016. "Cold-Centered Silo Design." *Miller Magazine*. Accessed August 5, 2016. <http://www.millermagazine.com/80/index.html/>.
6. Navarro, H., and Navarro, S. 2016. "Organic Treatments of Stored Cereals and Grains." In *Proceedings of the 15th International Cereal and Bread Congress*, 6.
7. Mishra, A., Prabuthas, P., and Mishra, H. N. 2012. "Grain Storage: Methods and Measurements." *Quality Assurance and Safety of Crops and Foods* 4 (3): 136-58.
8. Mrema, G. C., Gumbe, L. O., Chepete, H. J., and Agullo, J.O. 2011. "Grain Crop Drying, Handling and Storage." In *Rural Structures in the Tropics: Design and Development*. Rome, Italy: FAO, 363-411.
9. <file:///H:/Cereal%20Storage%20Techniques-A%20Review%20.pdf>
10. <file:///C:/Users/pc/Downloads/ApplyingPesticidesCorrectly.pdf>
11. <http://www.pcs.agriculture.gov.ie/media/pesticides/content/sud/professional/End%20User%20storage%20requirements%202014.pdf>
12. <http://www.pcs.agriculture.gov.ie/media/pesticides/content/sud/professional/End%20User%20storage%20requirements%202014.pdf>
13. FAO/FAOLEXE, 2012. *European Communities (Sustainable Use of Pesticides) Regulations. Regulation/Legislation, S.I. No. 155 of 2012.*



14.13 Philip Burrill (DAF Qld), Greg Daglish (DAF Qld) and Manoj Nayak (DAF Qld),
4370. Grain storage – updates for fumigation in large silos and grain protectants



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