INSPECTION AND SAMPLING

Inspection

- An **inspection** is an organized examination or formal evaluation practices.

Inspections (food storage management)

- An **inspection** is an organized examination or formal evaluation practice.
- It involves a detailed examination of all or part of the consignment of stored commodities including…….
  - the methods of handling and transport,
  - the storage building,
  - the standards of storekeeping and
  - pest control.
- Examination of the commodities themselves may or may not include the taking and analysis of samples.

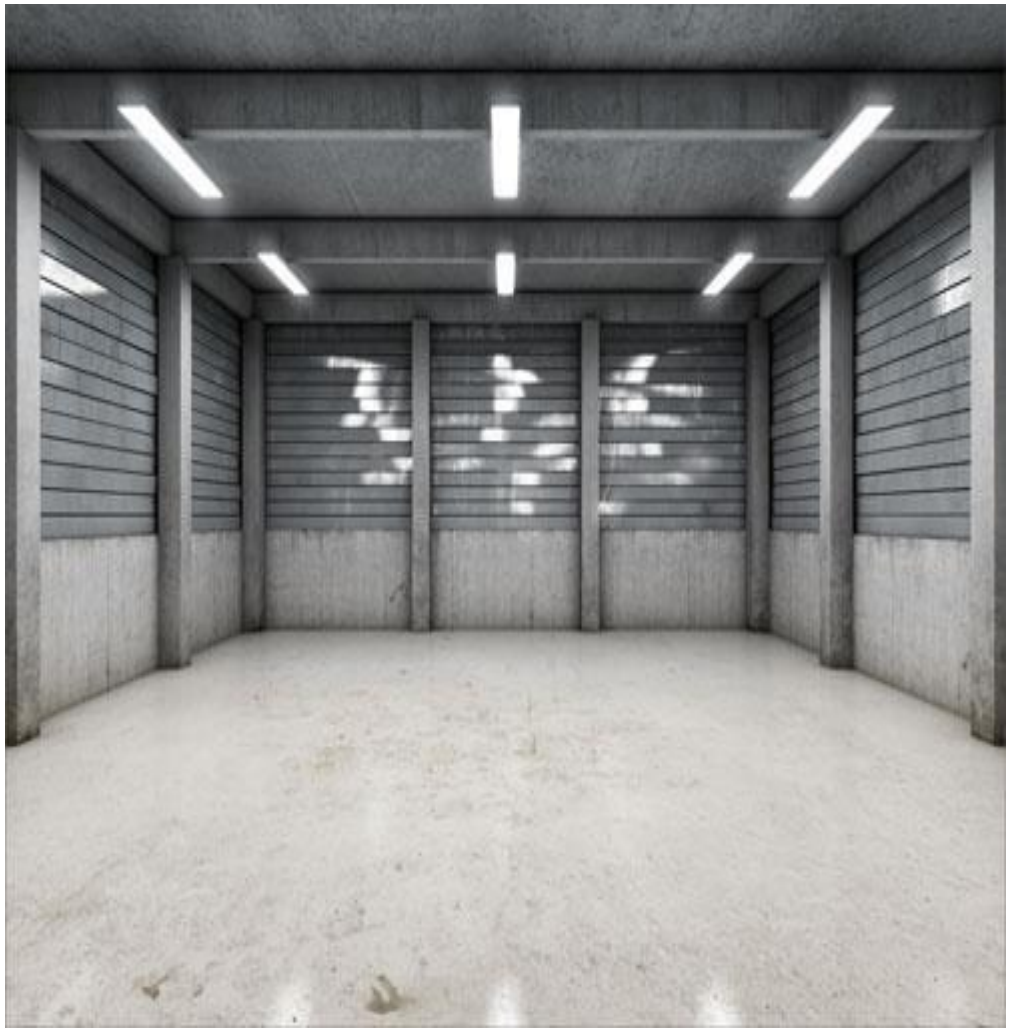
Which things should you inspect when visiting on a food grain storage system?

Objective of Inspection

The overall objective of inspection are……

- to provide information as a basis for management action and future planning
- to ensure that deterioration and loss of stored commodities are kept to a minimum.

Inspection of Storage Buildings

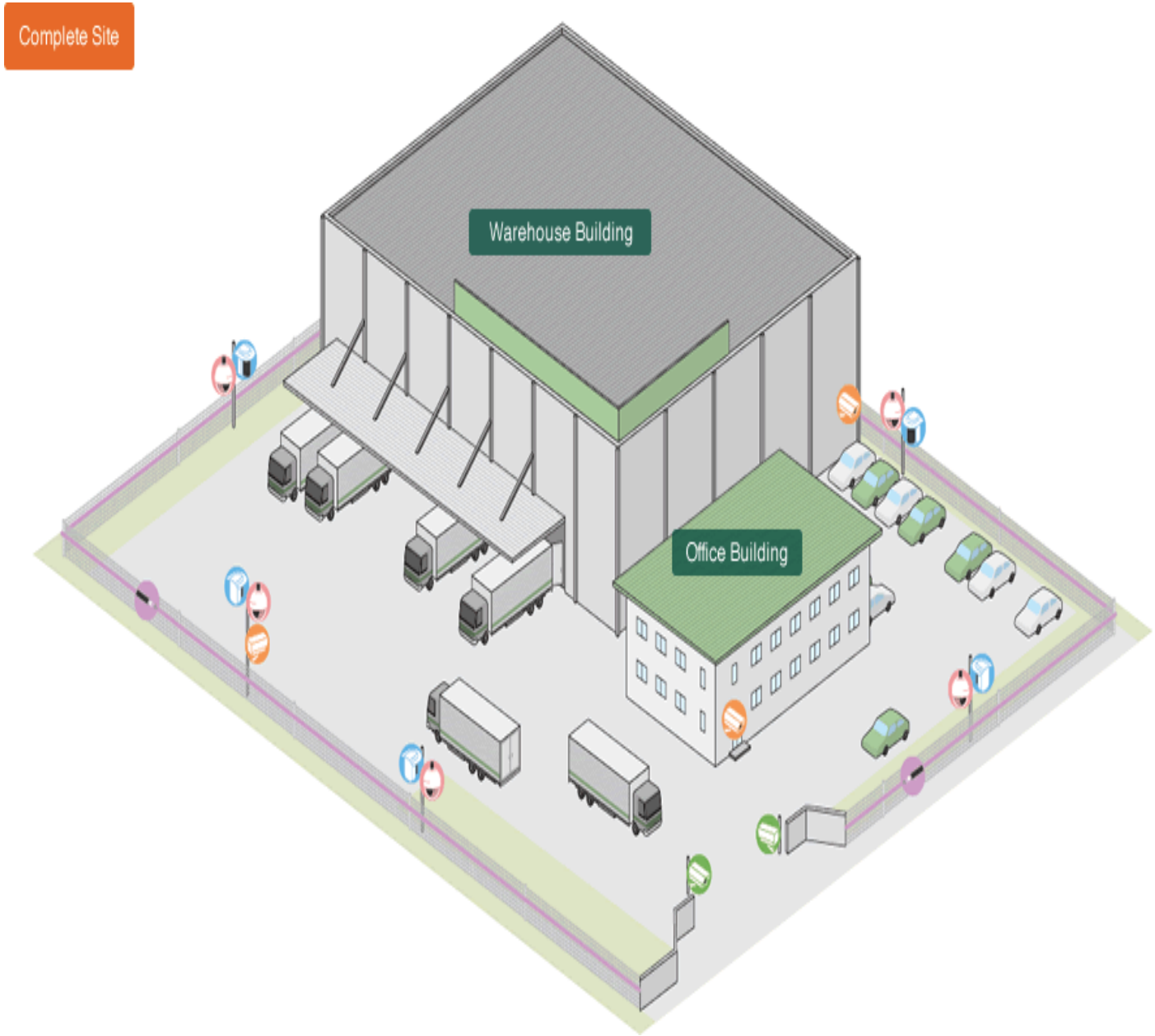


Inspection of Storage Buildings

- The quality of food commodities can be adversely affected, either directly or indirectly, by the design, condition or location of any building in which it is stored.
- Security of stocks from theft or other forms of loss, and the health and safety of persons in or near the building, may also be affected.
- It is important that buildings are regularly inspected to ensure standards are maintained.

Warehouse

- **Warehouse site**
- **Warehouse structure – external**
- **Warehouse structure – internal**



Warehouse site?

- Site generally clean and tidy;
- Suitable arrangements provided for disposal/destruction of rubbish.
- Roads and hard standings in good repair.
- Vegetation under control.
- Areas adjacent to warehouse clear of vegetation, refuse, equipment and machinery.
- No evidence of rodent activity, e.g. burrows, droppings, tracks.
- Drainage and flood water disposal satisfactory.

Warehouse structure – external

- Walls structurally sound.
- Roof in good repair.
- Windows and ventilators in good repair and screened to prevent access by birds and rodents.
- Doors sound, well fitting and secure.
- Rodent barriers, if provided, in good condition.
- Rainwater guttering and drainpipes secure, functioning and screened against rodents.
- Eaves and guttering free of birds' nesting material.
- Service duct entries (water, electricity, telephone) screened against birds and rodents.

Warehouse structure – internal

- Walls structurally sound, clean and smooth as possible.
- Roof in good repair.
- Windows and ventilators in good repair and screened to prevent access by birds and rodents.
- Doors sound, well fitting and secure.
- Rodent barriers, if provided, in good condition.
- Internal drainage pipes functional and in good repair.
- Ledges on beams and walls clear of debris.
- Concrete floors smooth and crack-free; holes and gaps in wooded floors repaired or filled; earth floors well compacted to prevent rodents burrowing.
- Gaps at wall/floor angle filled to prevent rodent access.
- Lighting adequate and functioning.

Inspection of transport

If any form of transport is a potential source of-

- infestation,
- contamination,
- spoilage or loss,

so inspection is necessary if exposure of food commodities to such hazards is to be minimized.

Inspection of commodities in store

When inspection should carryout……...?

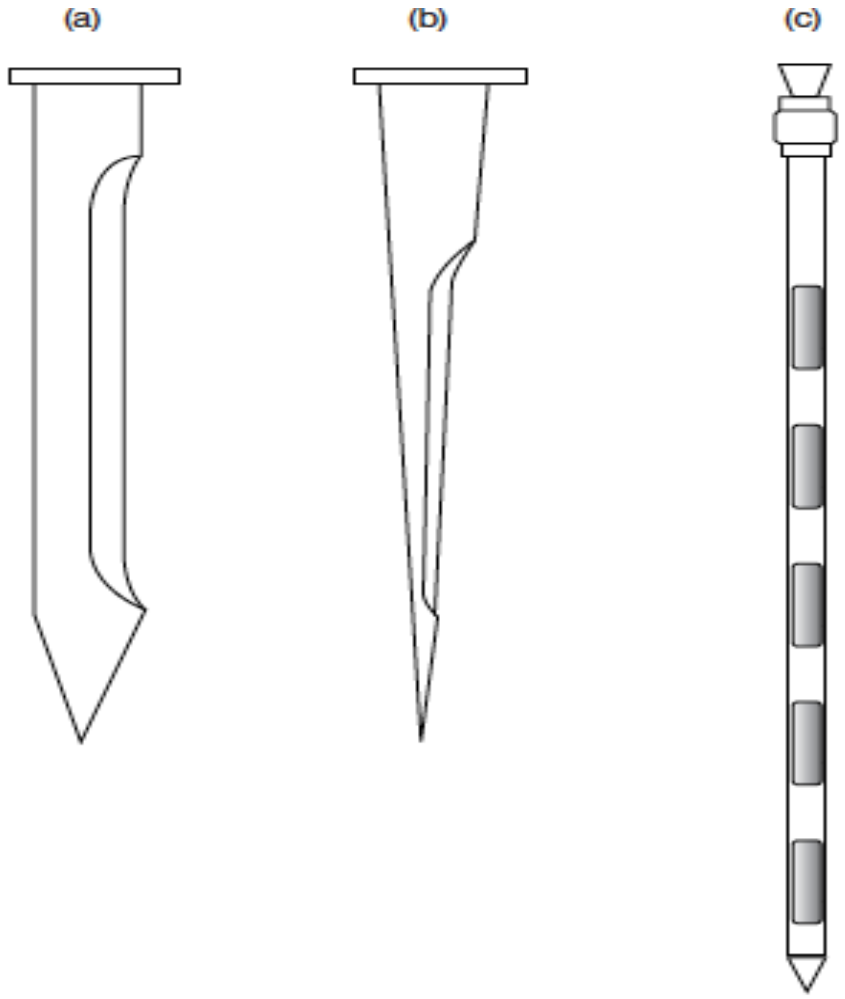
- Inspection of commodities should begin as soon as they arrive at the warehouse.
- Look for signs of damage to containers or packaging.
- Look for evidence of insect or rodent damage or activity.
- Look for signs of fungal discoloration or caking.
- Pour out some oil, and smell or taste it for off-flavors and rancidity.
- Smell or taste dried powders for off-flavors, rancidity or putridity.
- Open canned food to see if it is rancid or putrid.

Equipment required for sampling

The basic equipment required for sampling…….

- A notebook,
- Torch,
- Knife
- Sampling spear
- Sample bags,
- Labels,
- Sieves and
- A hand lens are also useful.

Sampling spear



Sampling spears (not to scale): (a) cylindrical, (b) tapered, (c) compartmented

Effective inspection

- Effective inspection depends on access to all parts of the store.
- For stacked commodities there is a need for sufficient space around the stack to examine the sides and the top surface.
- The best time to inspect a commodity is when it is being moved into or out of the warehouse, silo, ship or truck, because all parts of each lot can be examined.
- However, routine inspections of commodities in store are needed to detect any early signs of deterioration.


FDA


FDA

Recording Insect Infestation

- A form of shorthand notation is needed to record the results of inspections, and the following categories may be useful:

clear or none	(C)	no insects found in the course of a prolonged search
few or light	(F)	small numbers of insects occurring irregularly
medium	(M)	insects obvious, occurring regularly (sometimes in small aggregations)
heavy	(H)	insects immediately obvious – large numbers crawling over the outside of the stack
very heavy	(VH)	insects so numerous and active that a rustling sound can be heard inside the stack; a carpet of insects or cast skins is often present on the floor round the base or on top of the stack.

Responsible Authorities

Sampling is usually done because a problem has been identified with the commodity.

Given the nature of food aid, there may be several parties interested in the consignment, its condition and end use such as:

- Food aid agency staff,
- Stakeholders can include government ministries (agriculture and health),
- Shipping agents,
- Testing laboratories,
- Insurers,
- Cargo superintendents and
- Port authorities.

Organizing A Sampling Exercise

- Stacks must be properly identified or labeled to ensure the results of analysis of samples collected can be matched to the grain from which they were drawn.
- Sampling should be undertaken according to an agreed and acceptable sampling plan.
- Representative samples should be drawn from each stack.
- The number and size of the samples must be determined by the type of analysis to be undertaken – samples for mycotoxin analysis will be much larger than those for routine quality assessment; for example, for cereals at least 10 kg is needed for mycotoxins, whereas 1–2 kg is sufficient for insects.
- Samples must be properly identified and clearly labeled with details of the cargo, warehouse and stack number, the date of sampling, the name of the sampler and the analysis required.

Sample Size

- Different sampling protocols are needed for different commodities, and for different problems, to ensure the sample taken is representative of the lot.
- Thus submitted samples for free-flowing and finely divided commodities (cereal grains, pulses and blended foods) should be not less than 1 kg.
- For commodities that are not free- flowing (such as dried fish), the submitted sample should be not less than one item (such as one piece of fish) if each item weighs more than 1 kg.

Sample Size

- It is important to note that, while the principles of representative sampling can be used to establish a basic sampling scheme for a wide range of commodities, there are occasions when more specialized schemes are needed,
- For example, when samples are required for mycotoxin analysis or when canned goods are to be sampled.
- On such occasions there may be a requirement to increase both the number and size of the primary and/or submitted samples.
- Thus submitted or final lot samples for cereals and blended foods should be 10 kg if mycotoxin, fungal or bacterial analysis is required, with 1–2 kg being sufficient for insects, moisture content and general quality parameters.

Non-representative Sampling

- Best practice requires that samples should usually be representative of the whole lot, but there may be occasions when non-representative sampling is relevant.
- For example, a store roof may leak, so information on spoilage of the commodities directly under the leak may be sufficient, without needing to sample the rest of the lot.
- Likewise, food in containers may deteriorate if the container is damaged, so sampling could be confined to the affected container, there being no reason to take samples from the commodities in undamaged containers.

Sampling Stored Commodities

- Most food aid commodities are stored in bags.
- The number of bags to be sampled depends on…..
  - the type of commodity;
  - its amount; the amount that can be sampled (can the stack be broken down so that internal bags can be reached?);
  - the age of the stack (if newly built, bags on the faces can be assumed to be in the same condition as those inside, but if the stack is old the condition of external and internal bags may be very different).
  - the nature of the problem
    - In general terms, fewer samples are required if insects and fungi are the major problems,
    - but more samples should be taken if mycotoxin contamination is suspected (Table 9.1).

There are no hard-and-fast rules for sampling methods that cover all commodities under all conditions. The data in Table 9.1 should be used as guidelines only.

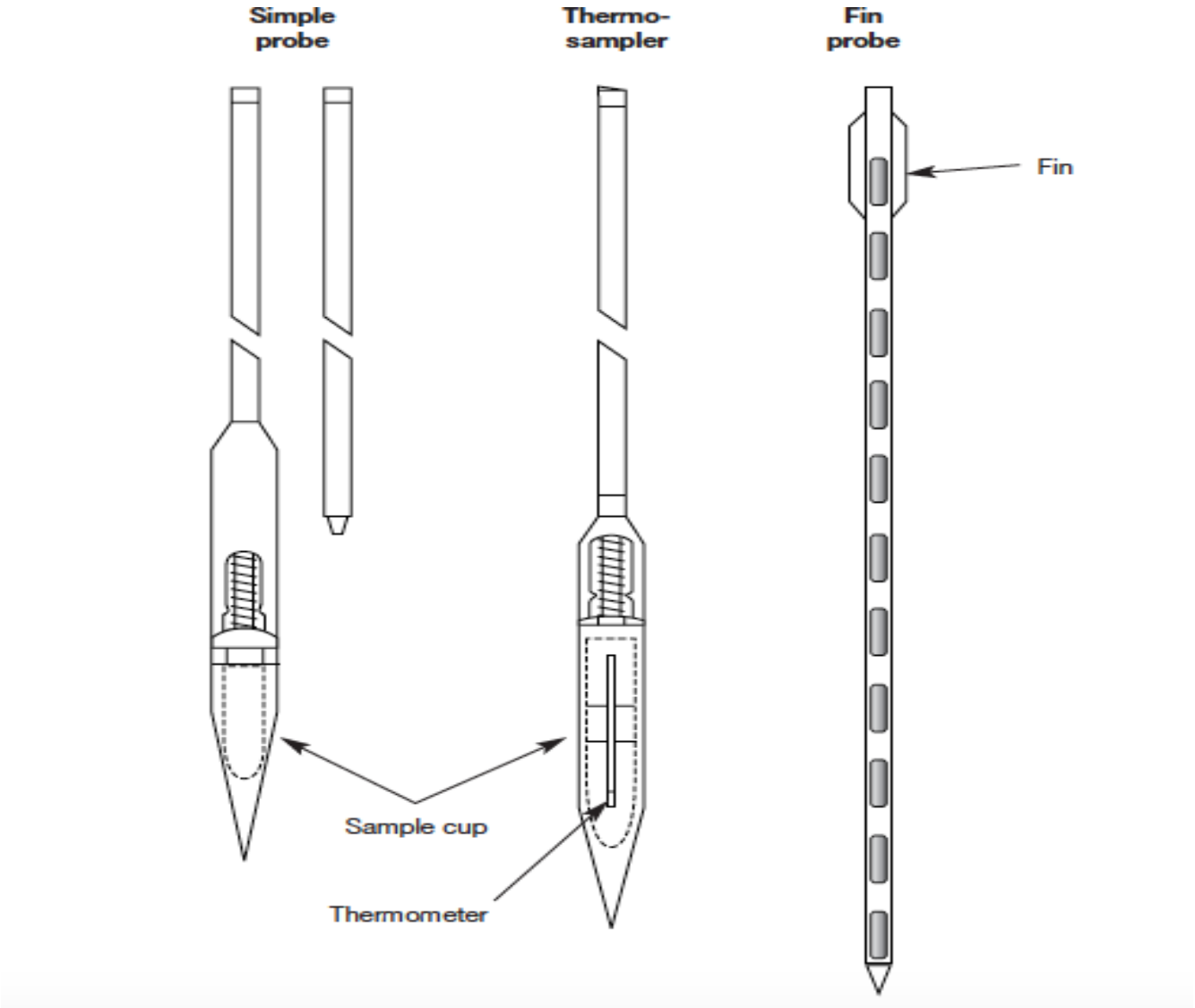
Mycotoxin

Table 9.1 Minimum number of bags (primary units) to be sampled for different problems

Total number of bags	Number of bags to be sampled		
	Insects and moisture content	Fungi and bacteria	Mycotoxins
4–20		4	Every unit
Up to 10	Every unit		
11–100	10		
21–60		6	Every unit
61–100		9	Every unit
>100	Square root		
101–400	Square root	16	100
>400	Square root	20	100
1000	32 (square root)	100	100
10 000	100 (square root)	1001	1001
20 000	142 (square root)	200 (i.e. 2 x 100)*	200 (i.e. 2 x 100)*
30 000	174 (square root)	300 (i.e. 3 x 100)*	300 (i.e. 3 x 100)*
50 000	224 (square root)	500 (i.e. 5 x 100)*	500 (i.e. 5 x 100)*
100 000	317 (square root)	1000 (i.e. 10 x 100)*	1000 (i.e. 10 x 100)*

*When large stacks (>1000 tonnes) are to be sampled, divide the stacks into lots of about 500 tonnes (= 10 000 x 50 kg bags) and take 100 samples from every lot.

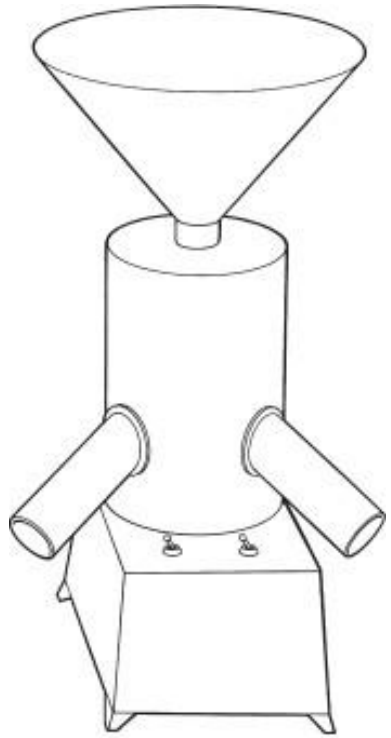
Sampling Equipment



Sampling Equipment

Riffle divider

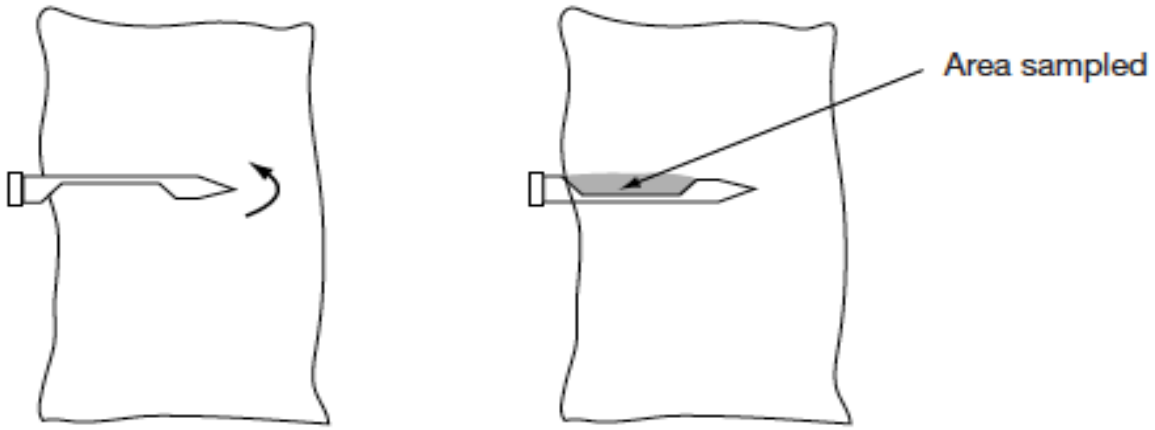
Boerner divider



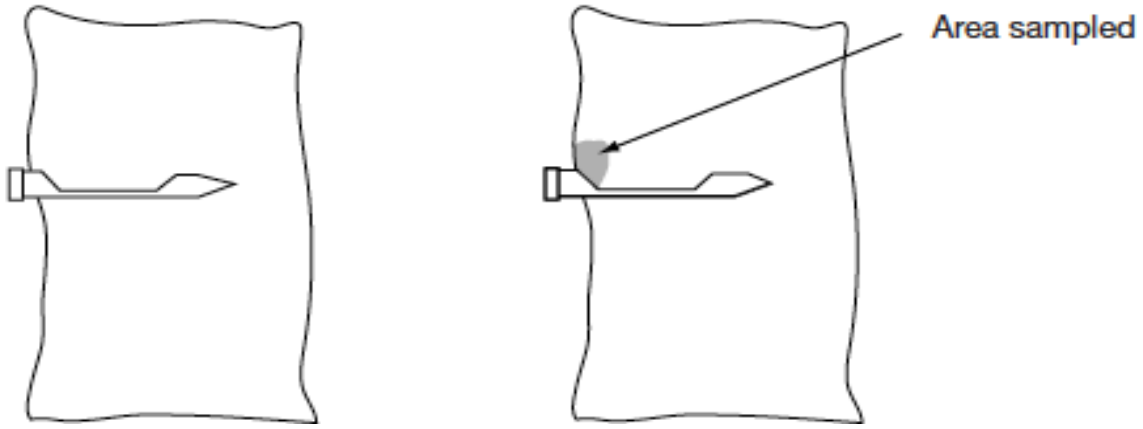
Motorized divider

Sampling Method

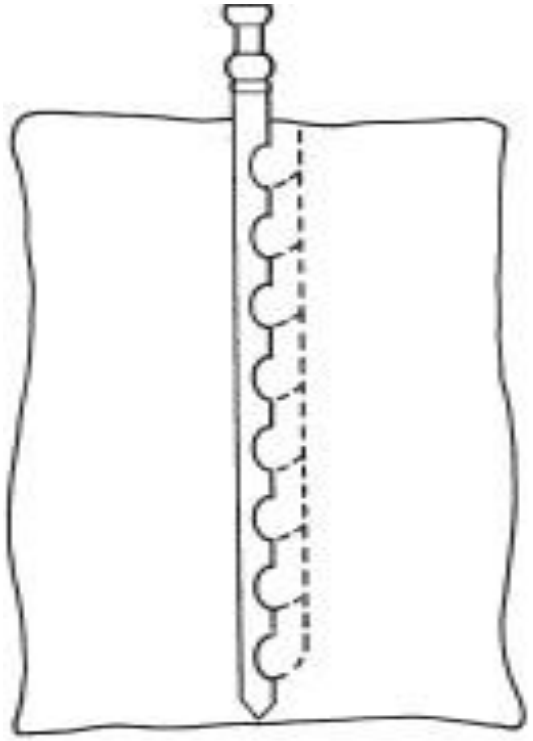
Correct method of spear sampling



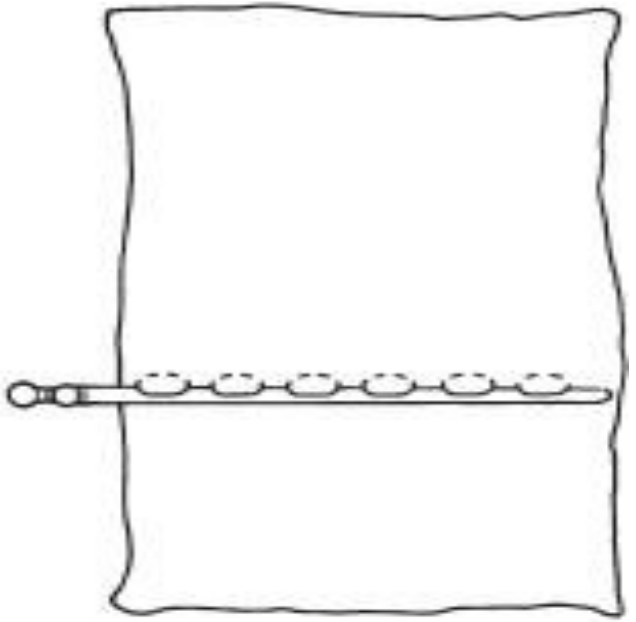
Incorrect method of spear sampling



Sampling Method



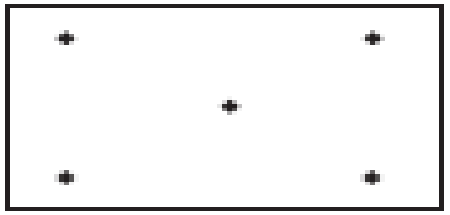
Vertical insertion



Horizontal insertion

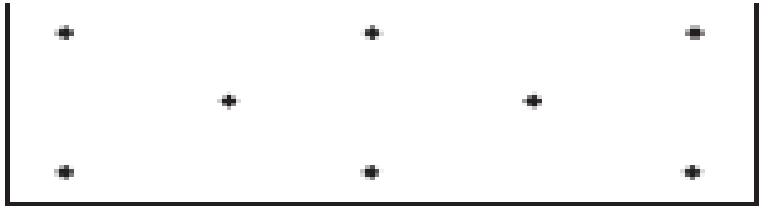
Sampling Method

(a)



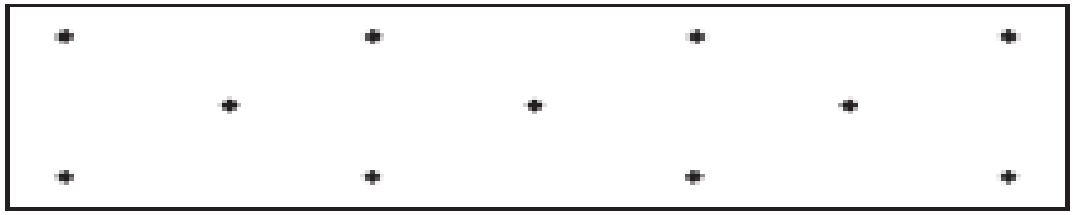
Trucks and bulks up to 15 tonnes

(b)



Trucks and bulks up to 15–30 tonnes

(c)



Trucks and bulks up to 30–50 tonnes

Question

Sampling Method