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Setting up of a Analytical laboratory

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INTRODUCTION

In order to have an effective Quality control programme, we need a well equipped quality control laboratory where we have to analyze the various materials, such as *raw materials, semi-finished, finished, stored products etc. for various chemical and bacteriological parameters*, so as to see that they meet the legal and quality standards.

Therefore, Quality control laboratory should be regarded as one of the key features of any dairy plant. While designing a dairy plant, a due consideration should be given for the location and design of a quality control laboratory.



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Types of dairy laboratories(BIS)

1) Category A

For dairies which handle 1 lakh liters or more of milk per day.

2) Category B

For dairies which handle 25,000 litres or more of milk per day, but less than 1 lakh litres.

3) Category C

For dairies which handle 10,000 liters of milk or more per day, but less than 25,000 liters.

4) Category D

For dairies which handle 5,000 liters of milk or more per day, but less than 10,000 liters.

5) Category E

For dairies which handle less than 5,000 liters per day.



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- For the first three A,B, C categories more or less similar facilities are required. The facilities are as follows:
 - *Bacteriological room, sterilization and Media room, balance room, wash-up room, gas chamber, fume chamber (Fume hood or fume cupboard), Fine instrument room,*
- *Separate rooms for quality control officer and laboratory staff, working benches etc*

For last two D,E categories;

- Bacteriological room, Sterilization & Media room, fine instrument room are not generally required.
- These labs look like labs only for collection centers.



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Location of QC lab in a dairy

It should not be at a remote (far-off) place from the dairy operations because procurement of samples or conveying of results should not take unnecessary amount of time.

At the same time, it should not be very close to the dairy operations where there can be lot of noise, vibrations, steam etc. In other words, it should be free from noise and vibration.

It should preferably be away from boiler houses.

It should be easily accessible for all the major activities of the dairy.



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Layout/design of the laboratory

- Laboratory should have adequate number of rooms/chambers and benches of suitable dimensions.
- While setting up a laboratory, the possible expansion of the dairy should be kept in view.
- Every laboratory should be provided with a minimum of 2 exits.
- For each category (A, B, C, D, E) of lab, BIS has given two alternate layout plans.



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General requirements for a QC lab

- ☀ Walls
- ☀ Windows
- ☀ Lighting : Northern or east - northern exposure is preferred for a satisfactory natural day light, particularly for color matching
- ☀ minimum average intensity of 400 to 450 lumen/m² at working level
- ☀ Direct sun light should be avoided particularly for sensitive instruments (e.g. Chemical balance)
- ☀ A roof light is helpful.
- ☀ Flooring



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- ☀ Store room: 2 store rooms
 - (a) One for acids, alkalies and ammonia
 - (b) Second for fine chemicals, glasswares, apparatus and equipments

- ☀ *Benches*

Bench top should be made of material resistant to acid and alkali (For example, acid and alkali proof tiles or sunmica may be used).

A. Above bench fittings

Shelves should be provided above the bench to keep various solutions, chemicals, reagent bottles, glassware etc.

B. Under Bench fittings

- ☀ The drawers and cupboard with shelf accommodation should be provided. The under bench unit could be of fixed or removable type and inter changeable



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☀ *Cupboards*

Protect the apparatus

Give neat and clean appearance. wall cupboards are preferred without occupying the floor space.

☀ *Sinks*

Glazed earthenware or vitreous ware or stainless steel. Preferable dimensions of sinks 75 x 45 x 25 cm

Service bench or laboratory bench or working bench should be fitted beneath

☀ *Fume cupboard/ fume hood/fume chamber*

There should be a fume cupboard provided with an efficient means of removing objectionable fumes, gases, vapors etc for carrying out operations which cause fumes etc.

☀ Fume chambers should have the provision for gas, water, waste outlet and electricity.



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- ☀ *Water supply*
- ☀ *Distilled water plant*
- ☀ *Gas*
- ☀ *Electric supply*
- ☀ *Service lines (of water, gas & electric power)*
- ☀ *Drainage Underground drainage system should be there.*
- ☀ *Fire-extinguishers*
- ☀ *Ventilation*
- ☀ *Air-Conditioners*
- ☀ *Chemicals, glassware & Consumable Stores*
- ☀ *Equipments*



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Integrated Pest Management

- Integrated Pest Management which is environment friendly broad ecological approach for managing pest problems.
- It encompasses pest control techniques, such as cultural, mechanical and biological with minimum dependence on chemical pesticides



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Integrated Pest Control

- The care full consideration of all available pest control techniques and sub sequent integration of appropriate measure that discourage the development of pest populations and reduce or minimize risks to human health and environment
- Emphasis is on control, not eradication



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IPM Inspection zones

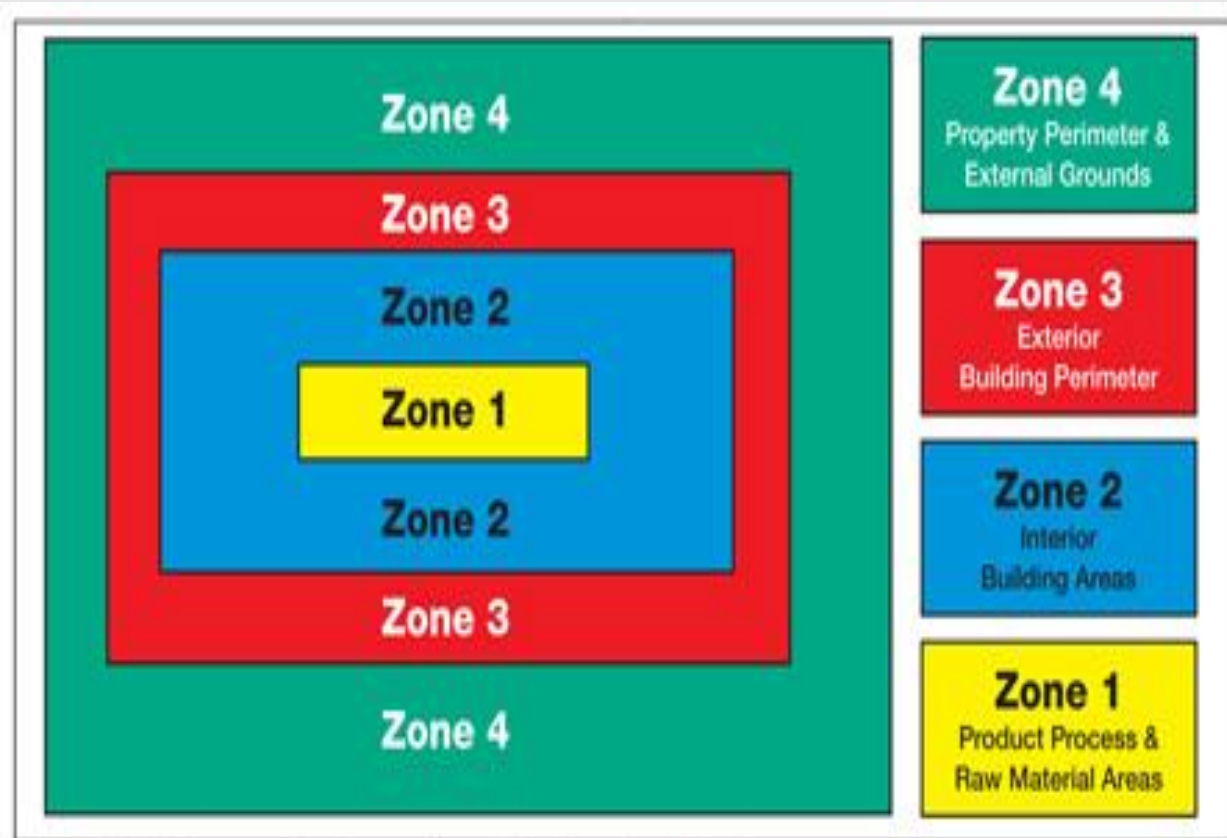


Figure 2: IPM Inspection Zones for a Manufacturing Facility



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Pest prevention



Figure 1: Pest Prevention: Controlling Food, Water and Shelter



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Pests require an available food or water source to thrive.

It is critical that food and water sources are controlled or eliminated where possible.

Unnecessary water sources, such as standing water and puddles, should be prevented by maintaining proper drainage and sloping of facility grounds.

Controlling Shelter

Controlling and eliminating pest shelter sites is an effective way of reducing pest pressure on the facility by removing nearby harbourage sites and eliminating breeding grounds.



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Rodent Pest Management for building capacity, creating awareness and conducting rodent control campaigns to reduce product loss and cost break up for each component under Rodent Pest Management

Strategy for fly control in dairies



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Equipments in QCL

- Mojonnier apparatus, water baths
Mojonnier flask and flask stand
- Hot air oven, Hot plates
- Analytical balances, Desiccators
- Colorimeter/Spectrophotometer
- Nitrogen digestion/distillation apparatus
- Glass distillation apparatus
- Refrigerator, BOD incubator
- Microscope, Autoclaves
- Milkotester/Milko scan



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- Gerber fat testing centrifuge
- Automatic measure for Gerber acid and iso- amyl alcohol
- pH meter,
- Viscometer
- Pro-milk, Infra-red Moisture tester
- General purpose centrifuge
- Solubility index apparatus
- Butyro-refractometer with circulating water bath
- Polarimeter



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Special requirements

✓ *Fat Test*

A white tiled platform of suitable dimension would be found to be useful for conducting fat test.

✓ *Wash-up Room*

In wash up rooms, it is desirable to have 3 sink units with draining board and draining rack.

✓ *Balance Room*

The balance room should be so located in laboratories that it is least affected by vibrations.

✓ *Doors*

The doors of the laboratory should be self closing



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✓ *Bacteriological Room*

The bacteriological room should be dust-free and air- conditioned.

✓ *Drains*

made of an acid-proof material.

the volume of discharge

suitable traps at suitable places to prevent blockage of drains.

✓ All the rooms meant for analytical work in the laboratory should be fly-proof and rodent proof.



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THANK YOU