CO-Engineering

Shaping the future of Engineering

Hygienic Building Design

Nestlé Good Hygienic Engineering

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CO-Engineering/Factory Projects

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The Nestlé Sustainable Building Model

Key Principles:

- Safety
- Strategy
- Building design
- Building technology
- Materials
- Building cost
- Image

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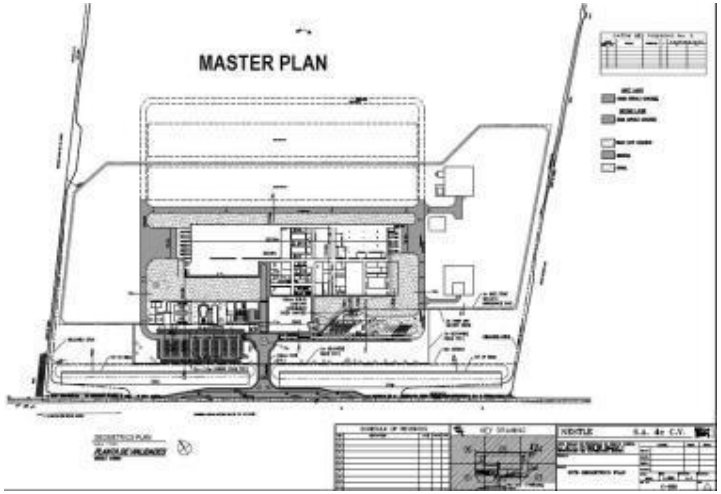
Design and concept of buildings

The objective of the design and concept phase of any food factory project is to:

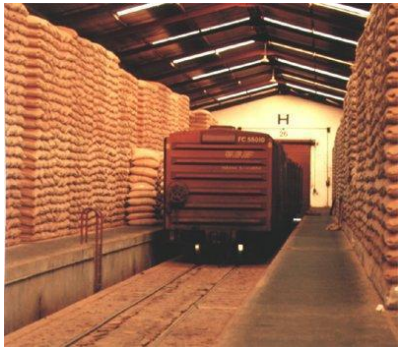
- establish the minimum criteria necessary to protect Nestlé products from contamination
- keep the plan practical and functional
- ensure local requirements are considered



Building types:

Building types are clearly related to their functions (eg.):

- Process
- Stores and warehouses
- Laboratories
- Canteens etc.



Hygiene consideration: construction

- climatic conditions
- soil conditions
- seismic tendencies
- architecture
- maintenance and cleaning
- local problems
- local construction practices and available material
- construction time
- costs

Hygiene consideration:

- processes to be housed
- building codes
- general safety of personnel
- wall and floor joints

Hygiene consideration

Building materials role:

- products, processes and required levels of hygiene
- cleaning procedures
- durability/maintenance of barriers
- ease of maintenance
- pest prevention.

Hygiene consideration example:

Climatic conditions

Hygiene consideration:

Wall and floor joints

Refer to:
GI 206.3 - Guideline for Floor Finishes

The main recommendation

The main recommendation is to keep the building simple.

Points of attention:

- cross contamination
- self-draining ledges
- no bird nests outside of building
- rounded corners
- hollow bodies
- opening to the exterior
- safety exits
- expansion joints

Keep the building simple

- all ledges must be self-draining.
- external ledges must not allow nesting.

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Boundary fences and walls

Main purpose is to be the first barrier to protect from:

- Carriers of contaminants
- Unauthorized personnel entry

Boundary fences and walls types

fine mesh (<5cm x 5cm) fence

solid wall - concrete block or brick

combination of the two - mesh on the top of a brick wall

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Building structure

The structure, which is the load-bearing part of the building, includes:

- foundations
- columns
- walls
- floors
- slabs and beams
- roofs.

Basic types

There are two basic types of building elements:

- vertical bearing elements
- horizontal bearing elements

These elements can be made of:

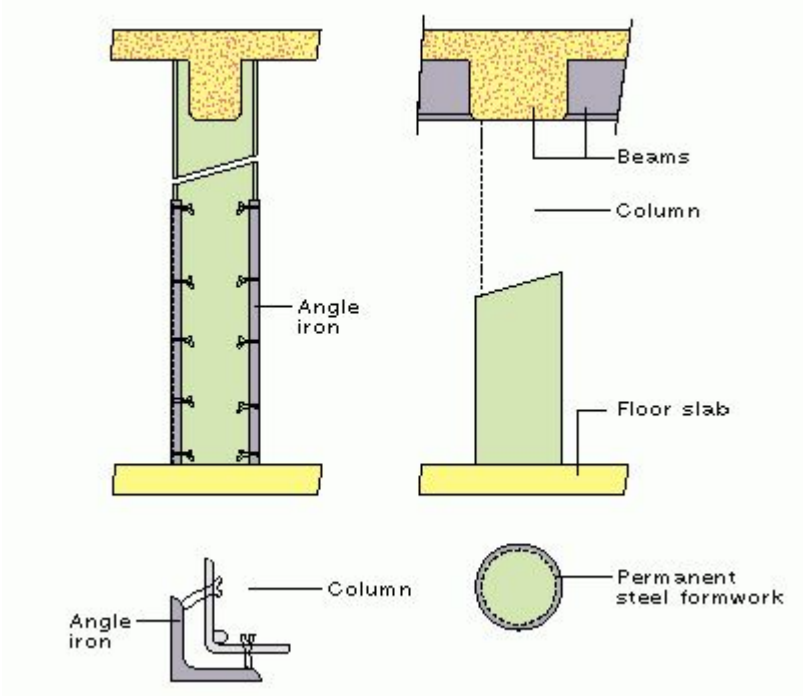
- concrete
- steel
- mixed structure of reinforced concrete/steel.

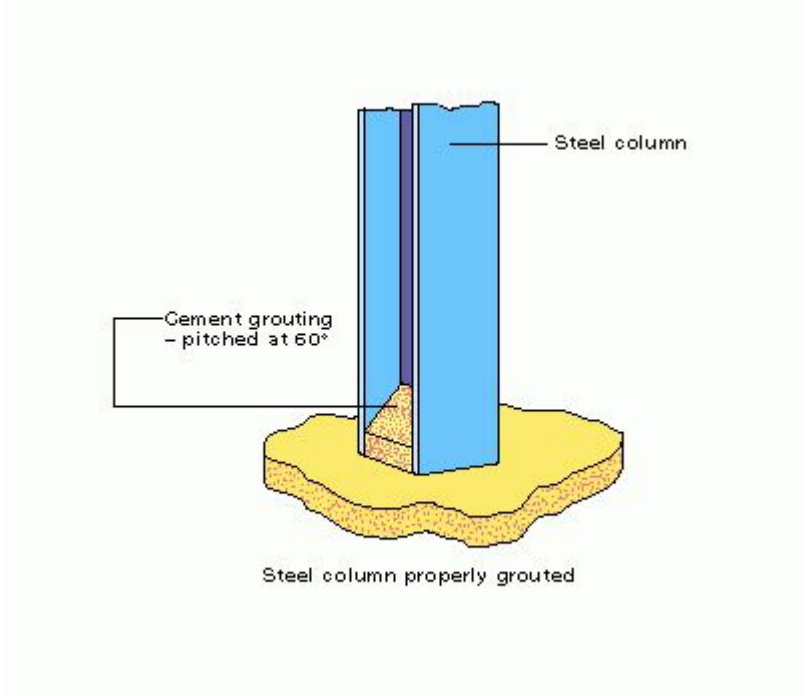
Vertical elements hygiene considerations

Columns and masonry walls should be:

- of steel or reinforced concrete
- in sufficient numbers
- flush with the interior side of adjacent walls
- not of open steel structures with H or I type profiles
- connected to masonry walls
- easy to clean

Vertical elements hygiene considerations





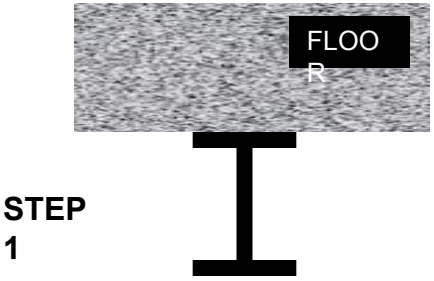
Horizontal elements hygiene considerations

Floor slabs - ground floor - suspended and made of re-enforced concrete:

Critical points to be noted:

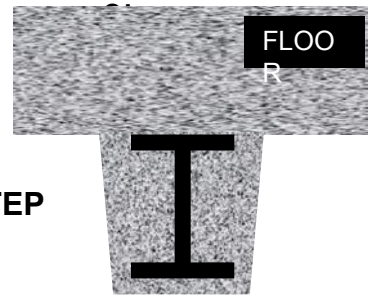
- **joint cracks**
- **hygienic voids**
- **expansion joints**
- **expansion joints**
- **metallic joints**

Horizontal elements hygiene considerations



STEP 1

alternativ



STEP 2

cast in concrete

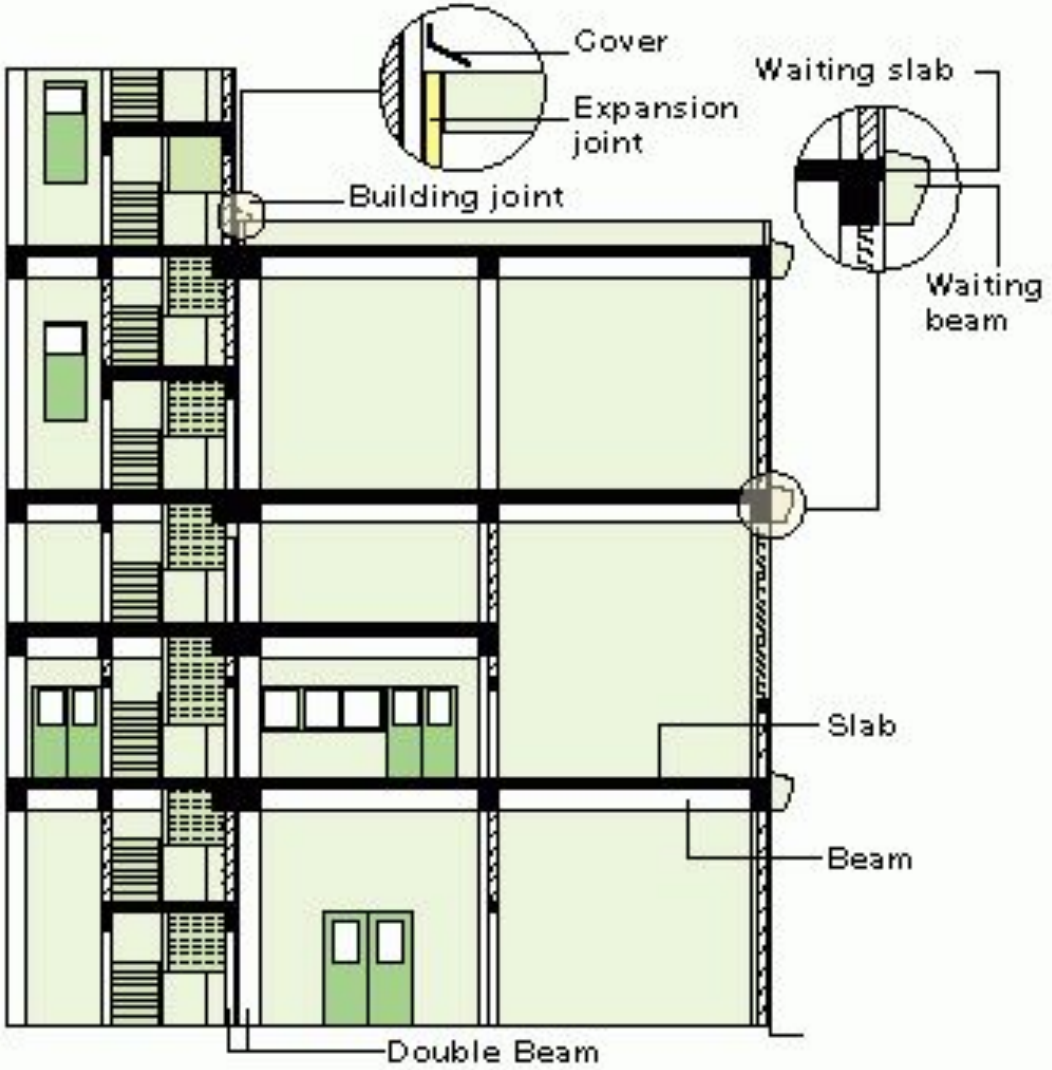
IDEALLY BEAMS DIRECTLY MADE OF CONCRETE

Recommendations

Some important points of consideration:

- Avoid open steel structure in high hygiene zones
- Easiness of cleaning
- Barrier against contaminants
- Surface finishes are critical
- Corrosion
- Expansion joints

Recommendations on building structure



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Visitors gallery

A visitors gallery is designed to:

- observe the operations
- special clothing avoidance
- protect hygienic quality of products
- ensure the safety of visitors

Basic types of visitors gallery

Visitors gallery hygiene considerations

Visitors gallery must:

- permit observation
- provide a barrier

Important hygienic features:

- observation windows of plastic or safety glass
- no passage over exposed lines
- access to gallery only from low hygiene areas
- if possible - a passage-way gallery outside the main process area wall.

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Loading and unloading docks

Loading and unloading docks are points where:

- lorries (trucks)
- containers
- trains (rail cars)
- other transports

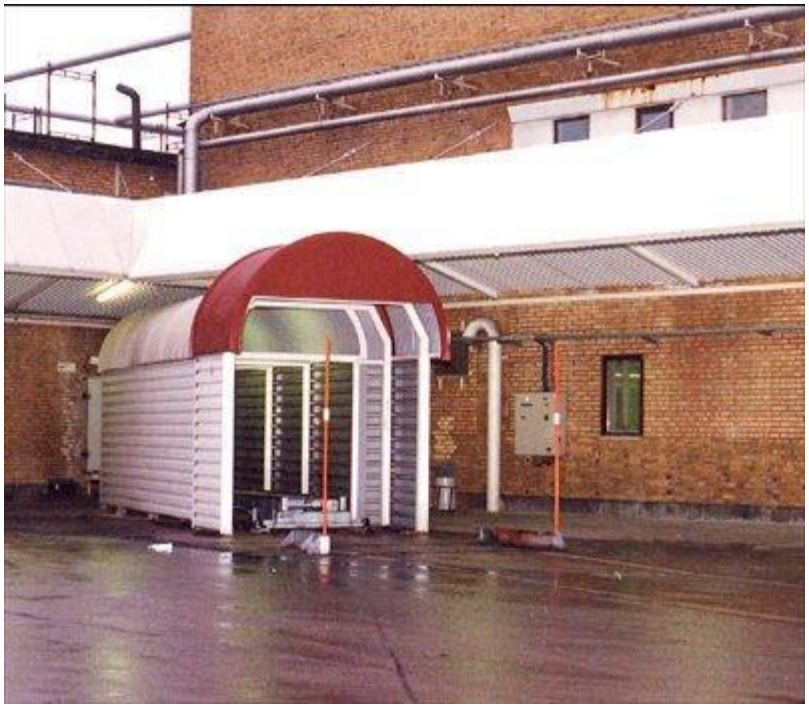
either - off-load:

- raw materials (solid or liquid)
- packaging
- other incoming goods for the factory

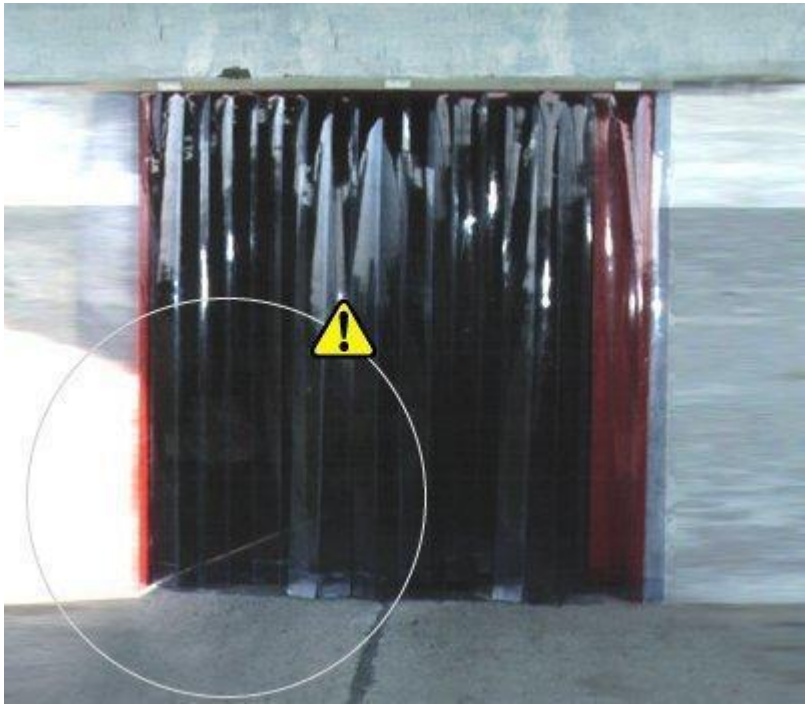
or load products for distribution

Hygiene considerations all types

- Loading/Unloading must not affect the hygienic quality on product



Hygiene considerations road transport



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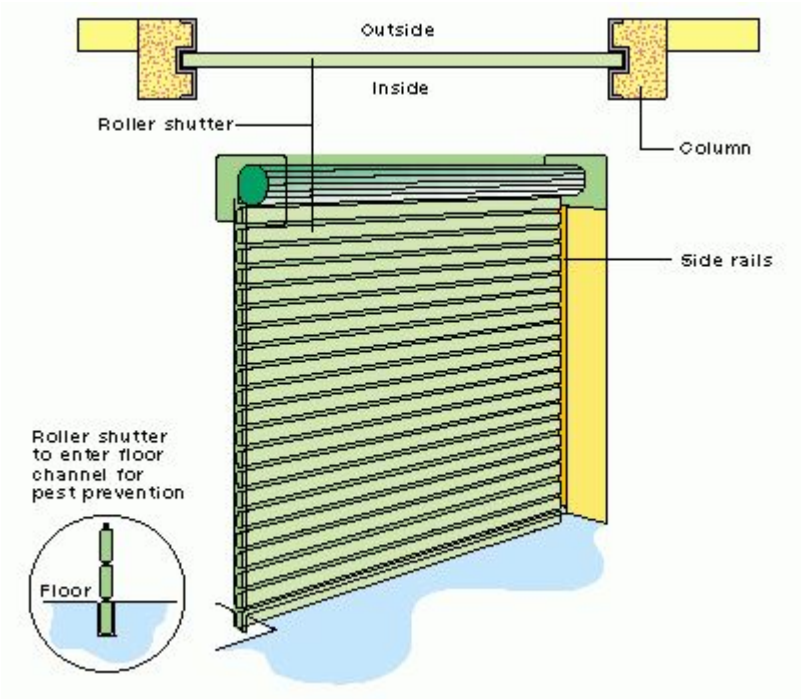
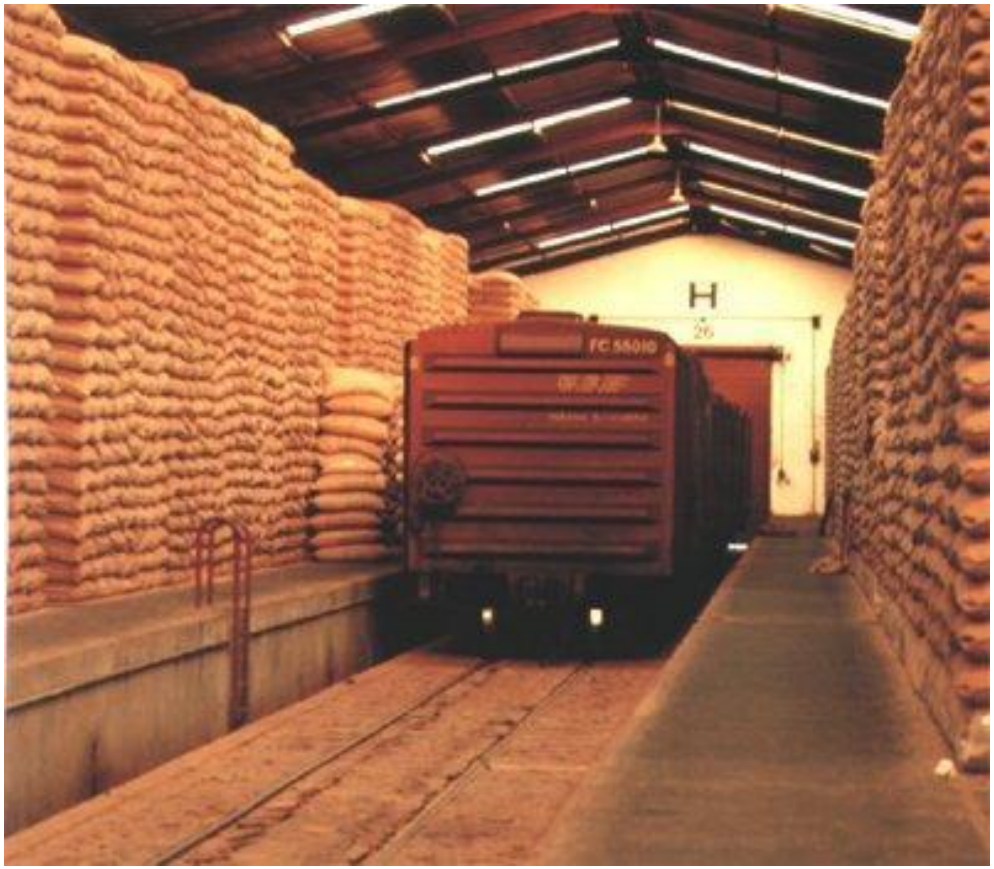


Hygiene considerations trains/rail cars



Loading and unloading docks

Points of consideration:

- Types of products handled
- Protect product and prevent pest entry
- Rapid closing door
- Lighting and cleaning
- Contaminated raw materials

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Milk reception areas

are designated area in any factory processing liquid milk producing:

- milk powder
- canned milk
- ice-cream
- chocolate or chocolate base
- refrigerated desserts
- etc.

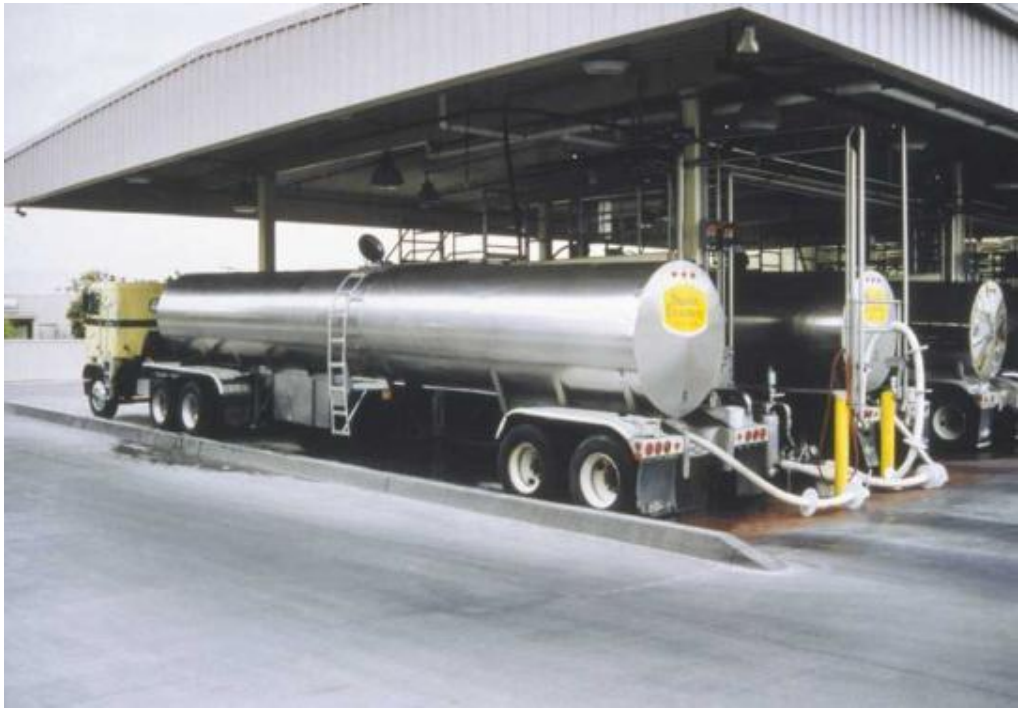
Milk reception areas

- receive either tankers or milk churns or a combination of the two
- either be an integral part of the factory linked to process buildings
- or be separated from main factory grounds for reasons of minimising entry of contamination into the factory environment and only being connected to the latter by pipes.

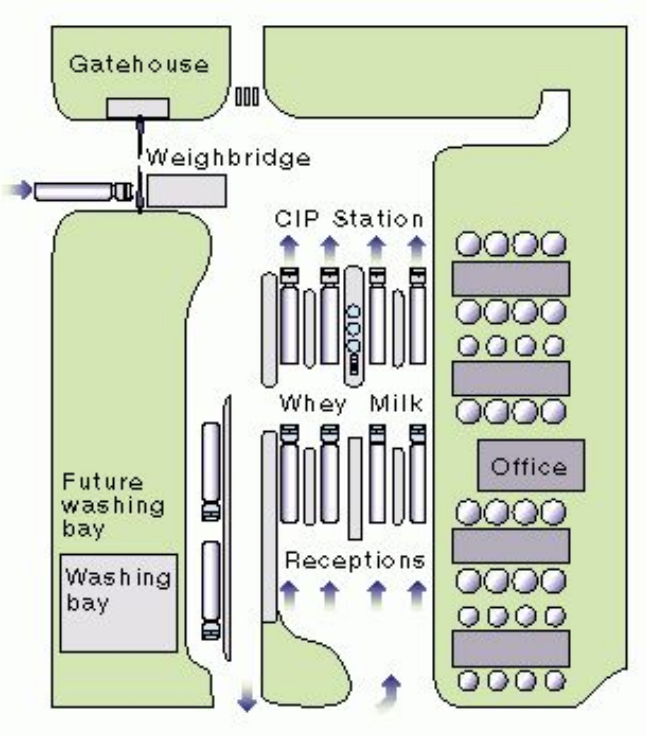
Milk reception areas

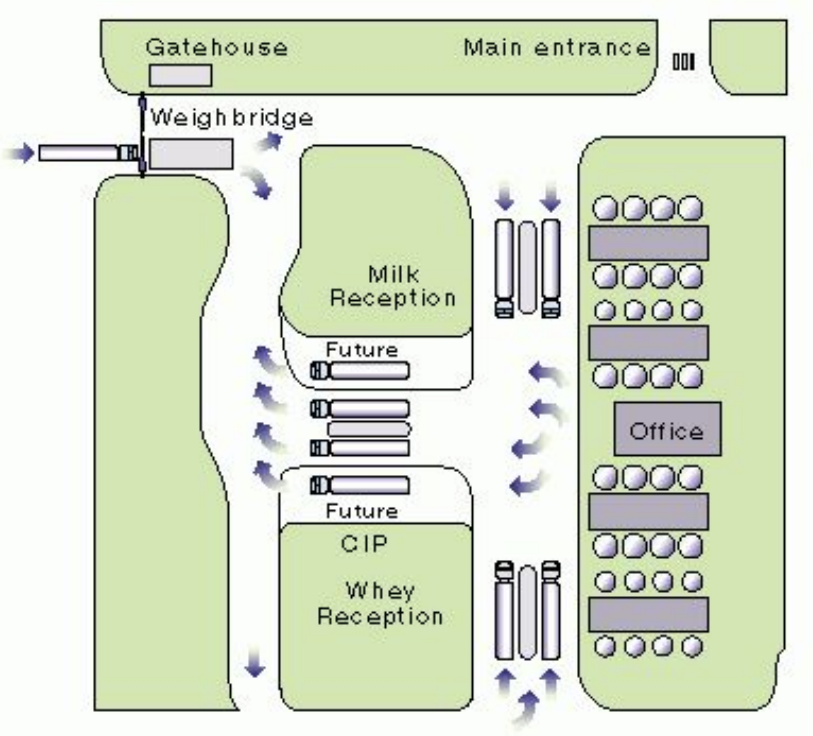
Milk reception areas

Milk reception areas



Milk reception areas hygiene considerations





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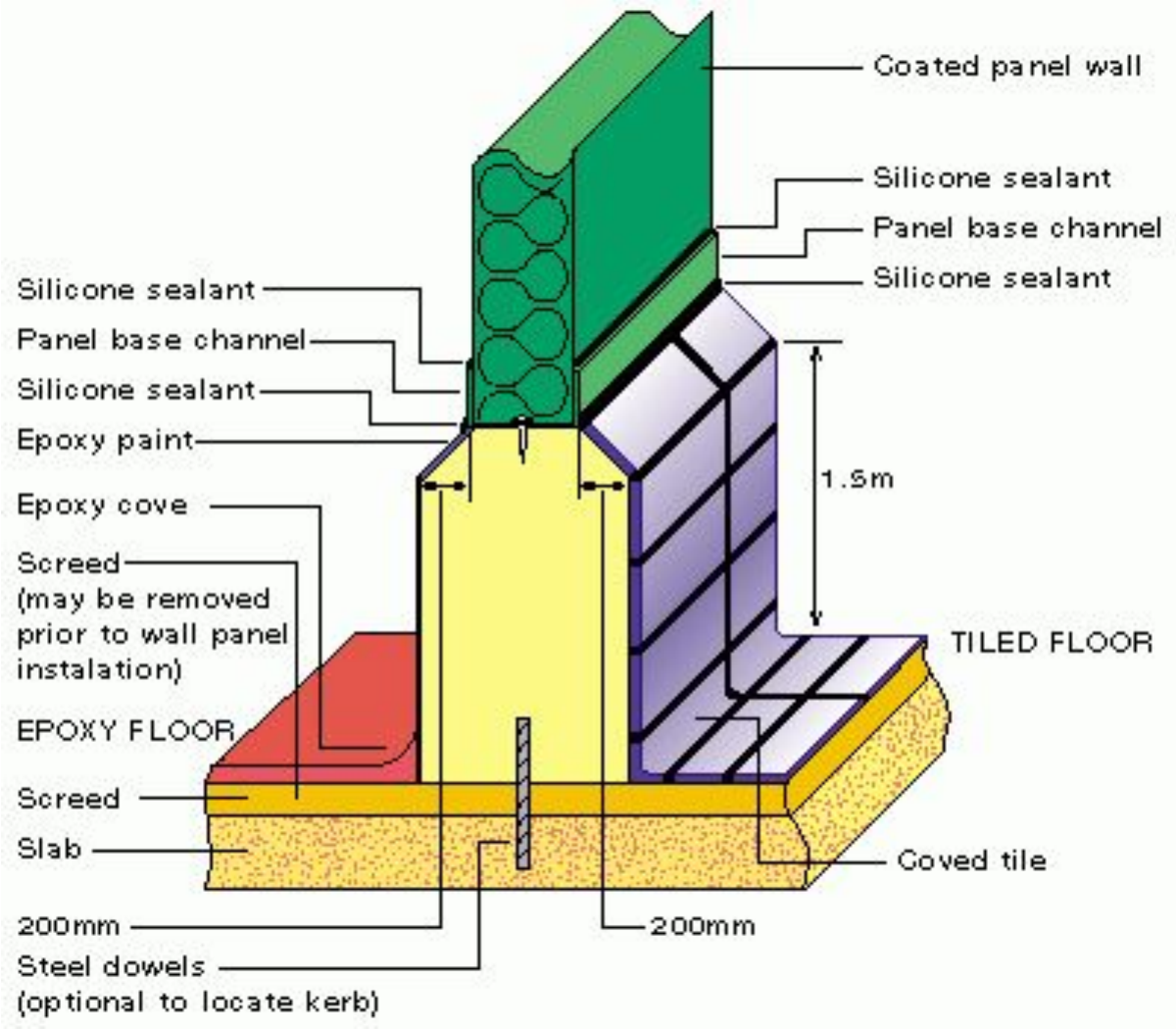
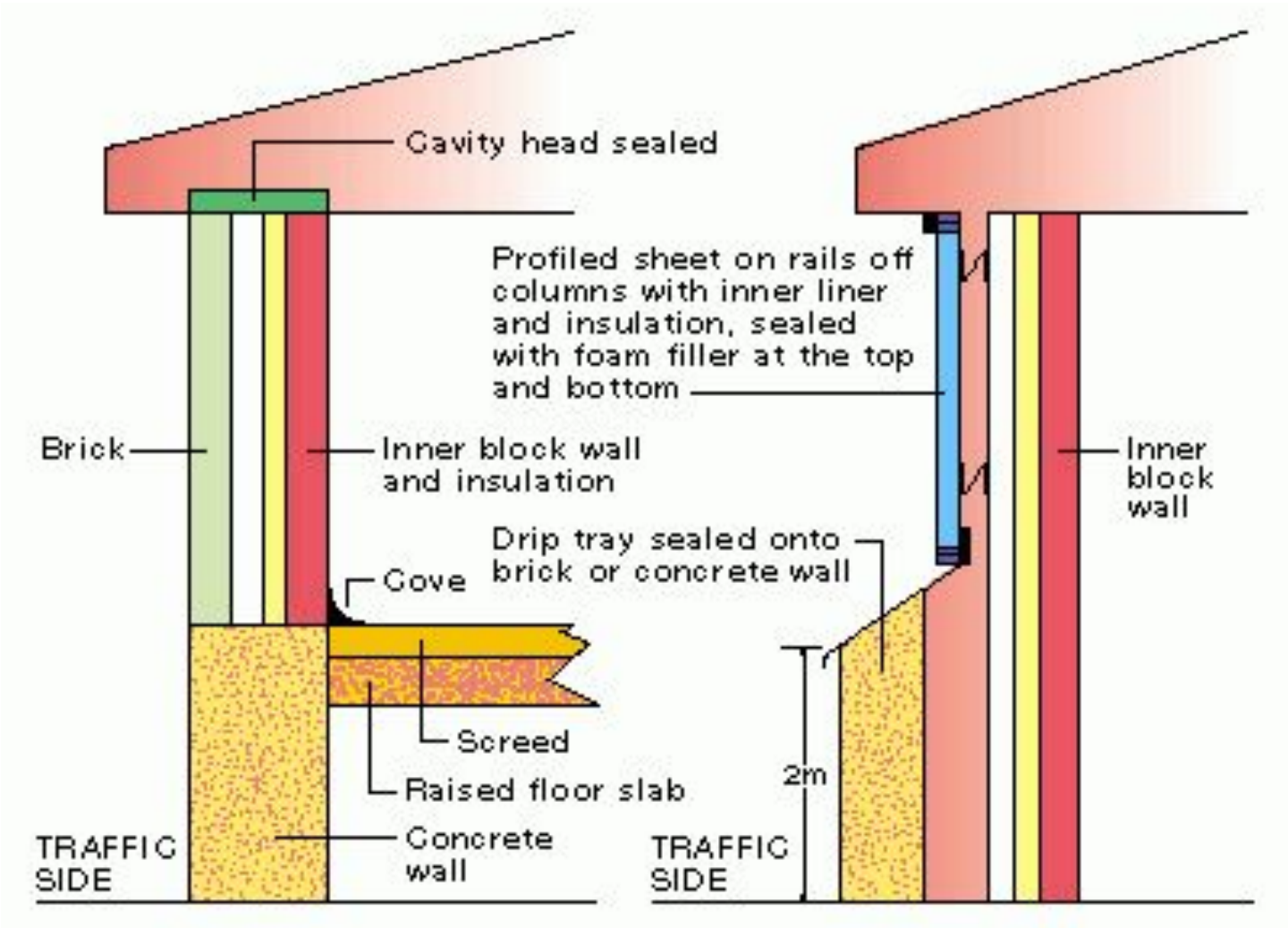
Types of external and internal walls

- **traditional construction**
- **pre-fabricated (sandwich)**
  - made of corrugated or flat facing sheets
  - with core material (PUR, EPS insulation)
  - with surface finish (paint, hard PVC, epoxy).
- **combined structure**

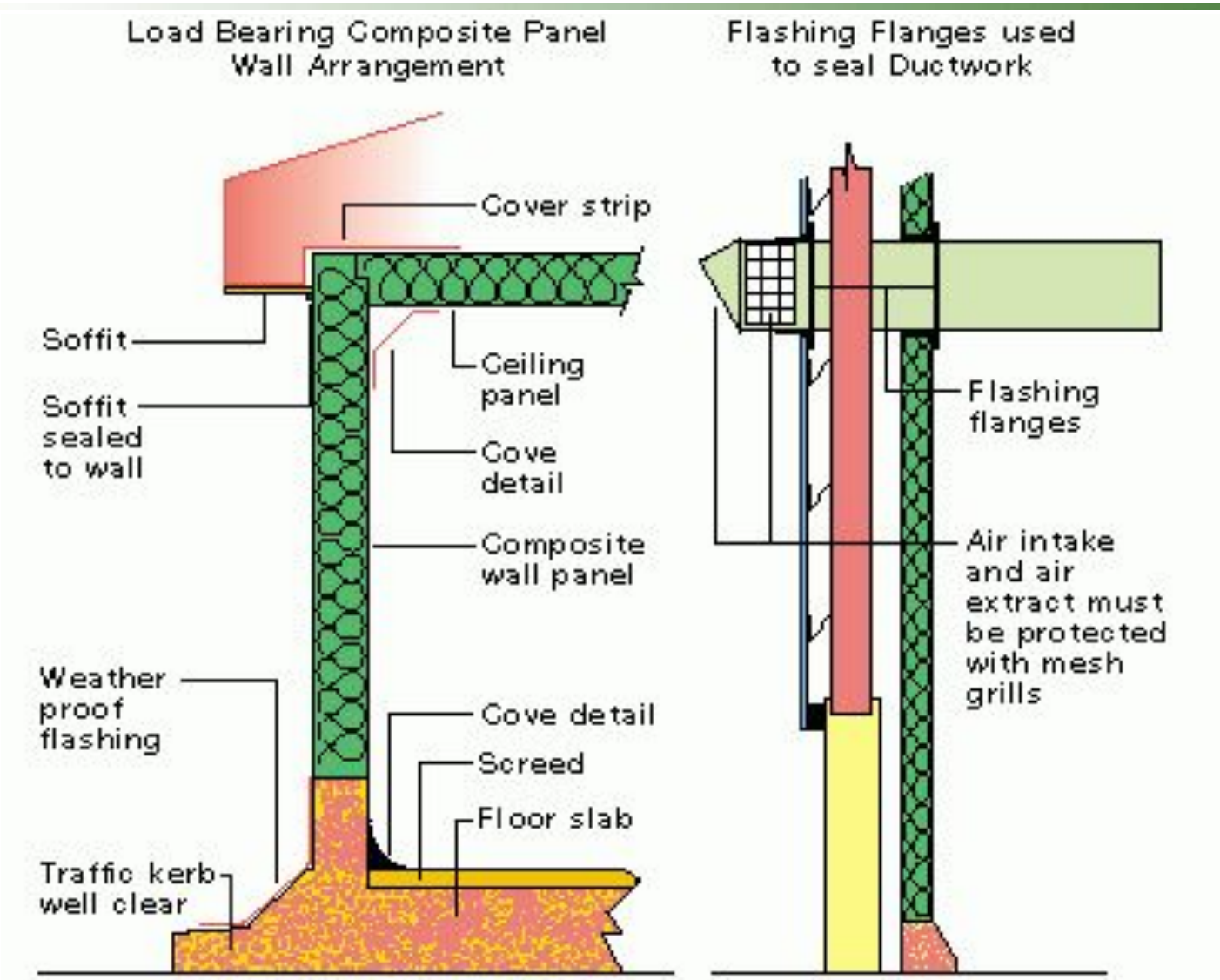
Walls hygiene considerations



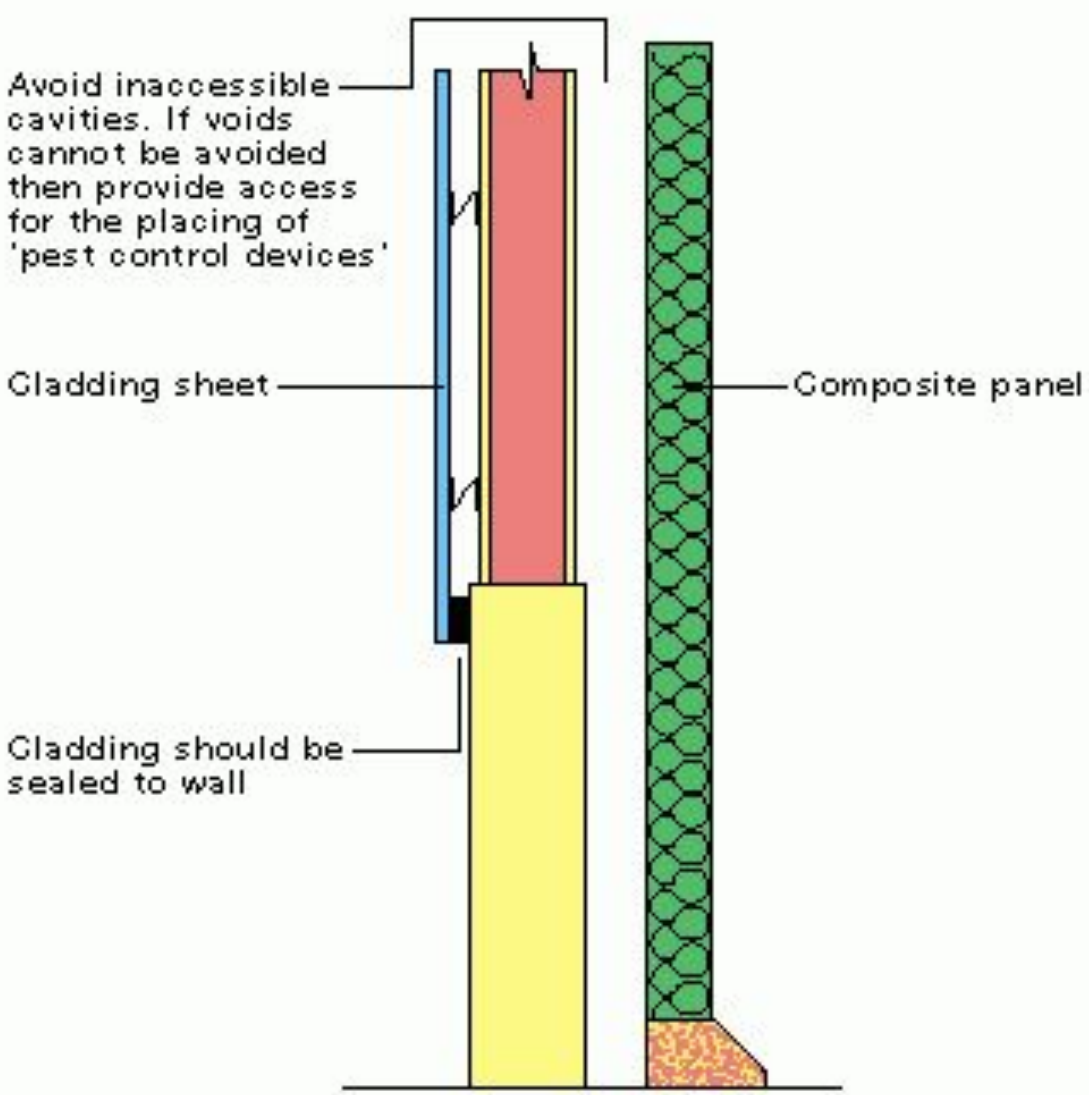
Walls hygiene considerations



Walls hygiene considerations



Walls hygiene considerations



Walls – typical faults

Feature	Traditional	Feature
Normal joints	Normally not a problem, except connections to different material – then care to avoid residue collecting joints	Between elements joints need maintenance to avoid residue collecting points
Surface cracks	Normally not a problem but depends on initial workmanship. Maintenance important to avoid entry points	Not common
Robustness	All depends on workmanship. Poor workmanship leads to hygiene problems such as cracks, residue collecting points	Supplier should ensure quality of finish with exception of joints. These are made on site and care is necessary
Surface finish	Absence of problems depends on workmanship	Must be made by supplier of units – never try to paint panels after wall construction
Expansion joints	Initial execution critical	

Recommendations for wall hygiene

Choice between a traditional and a pre-fabricated wall depends on:

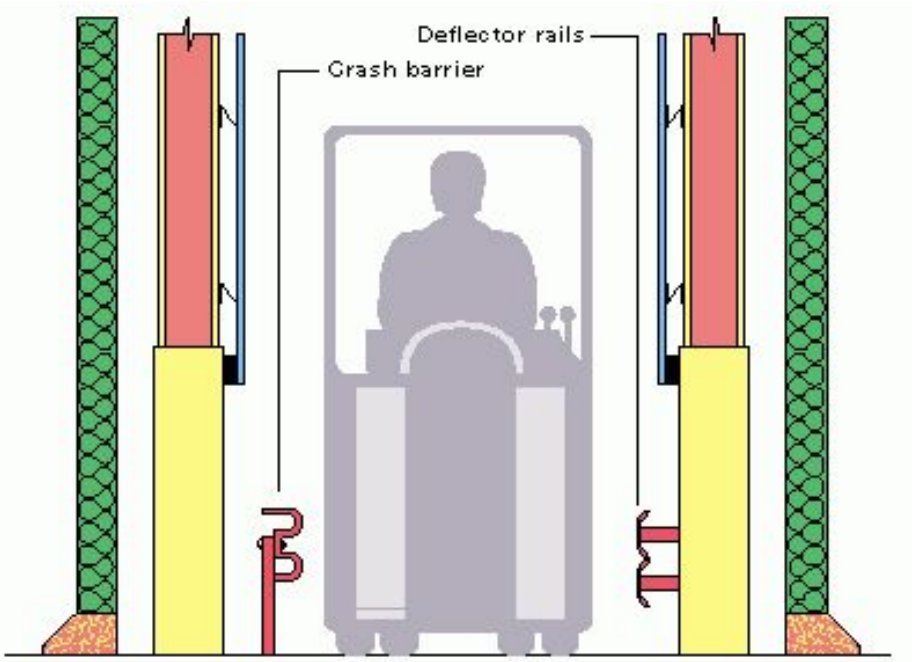
- product
- local possibilities
- costs.

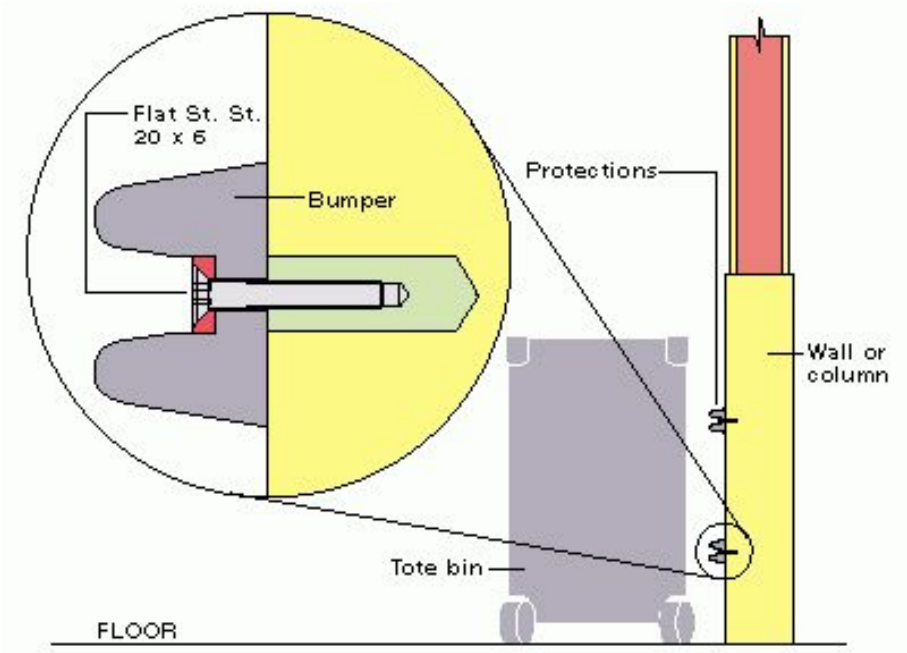
Whatever the choice there are hygienic features recommended for both traditional and pre-fabricated wall types.

Details of wall finishes can be chosen according to several details of processing:

- whether the area is to be dry or wet cleaned
- whether the area is high/medium/low hygiene.

Recommendations for wall hygiene





Recommendations for wall hygiene

Feature	Recommendations
Use of gypsum material	Not acceptable for process areas (absorbs humidity).
Openings	Openings to over-pressured high hygiene areas should be closed. If not closed then pest prevention has to be emphasized.
Wall positioning	Flush with column, beams, avoid recesses where dust, product can accumulate.
Mortar rendering	Smooth preferred to rough, wire mesh reinforcement to bridge different material connections.
Paint finishes	Wet rooms: epoxy paints to 2.5m high abrasive resistance, sound, crack-free substrate. Dry rooms: acrylic paints.
Ceramic tiles finish	To be avoided in process areas although they have higher chemical resistance, but risks of problems at joints and hollow bodies behind the tiles are critical. Break easily, repair difficult – more expensive. In certain low hygiene rooms with corrosion problems, tiles may be a solution.

Preventative measures for wall hygiene

Feature	Recommendations
Use of gypsum material	Not acceptable for process areas (absorbent).
Openings	Should be framed and tightened with cover sheets. For hygiene rooms, over-pressurisation should be employed. Steel sleeves for single pipe passage.
Shock protection	Install bumpers, steel rails.
Paint finishes	Panels to be finished by the supplier.
Facings	Steel min. 0.5mm thick, hard PVC-coating in wet areas
Joints	Weakest part of pre-fabricated walls. Choice of material should be decided by a group of experts.

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Roof types

Two basic types of roof structures:

Pitched

Flat

Roofs

Best hygienic roofing material:

PVC or flexible polyester.

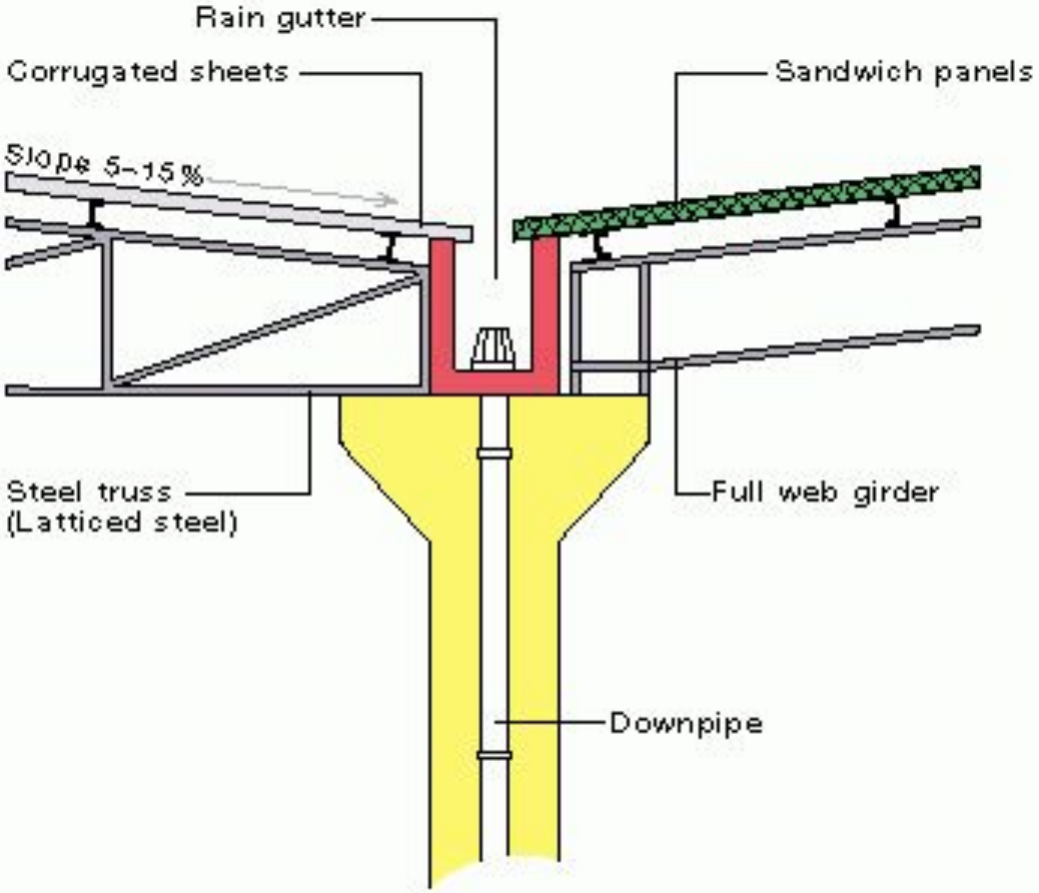
- Easy to clean
- Does not collect dirt
- Does not allow build-up of organic deposits

Roofs hygiene considerations

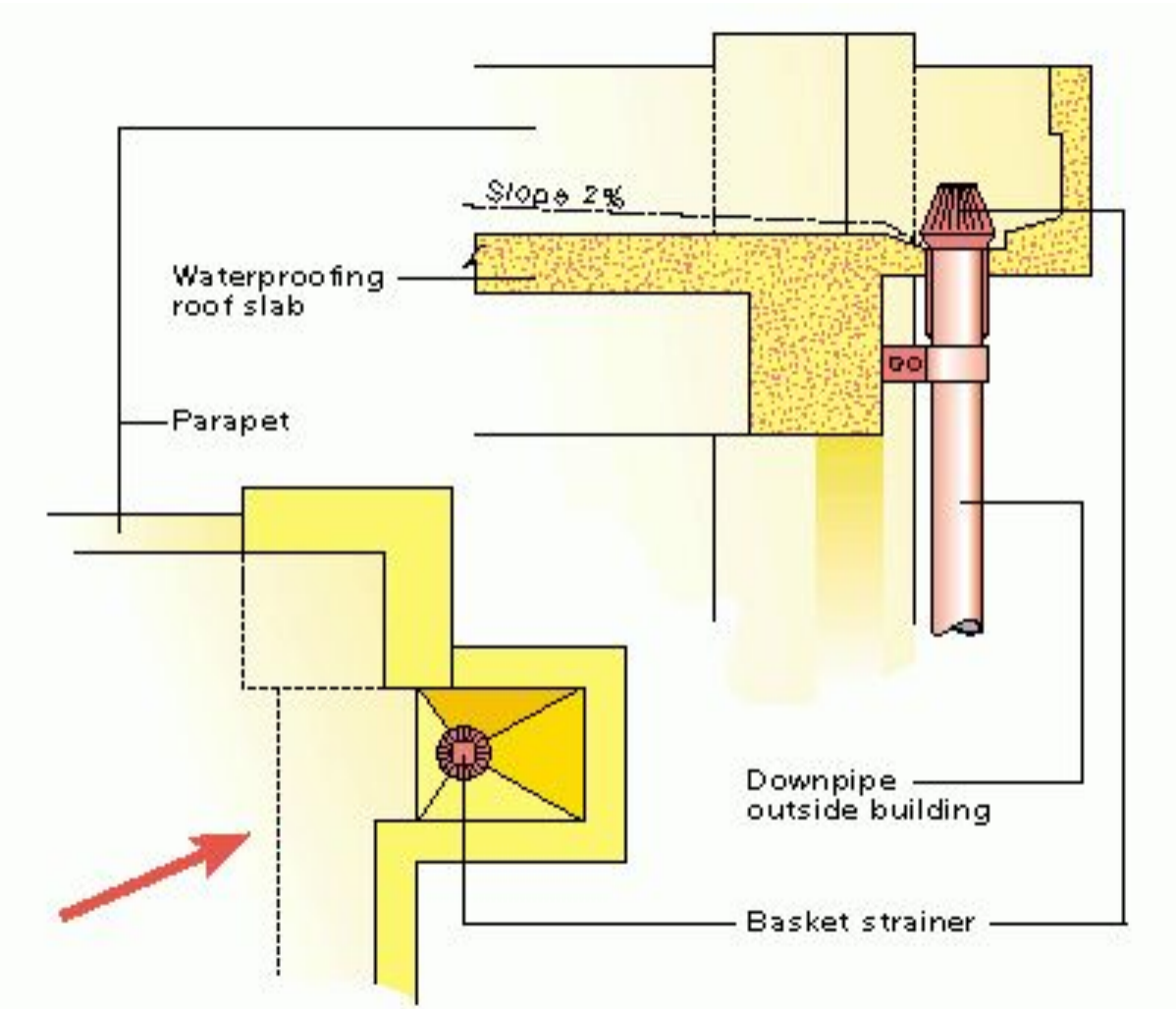
Important hygiene aspects for roofs:

- barrier against infiltrations
- ease of drainage
- good construction and protection at expansion joints or building connections - to prevent infiltrations.

Roofs hygiene considerations



Roofs hygiene considerations

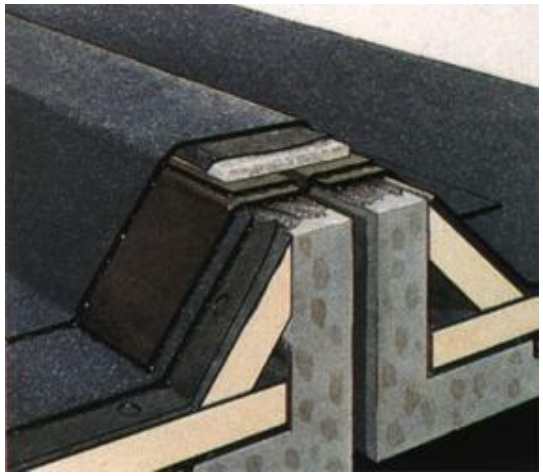


Roofs hygiene considerations

Roofs hygiene considerations

Good construction and protection at expansion joints or building connections - to prevent infiltrations.

Note: Joint must be covered at roof level.



Roofs hygiene considerations

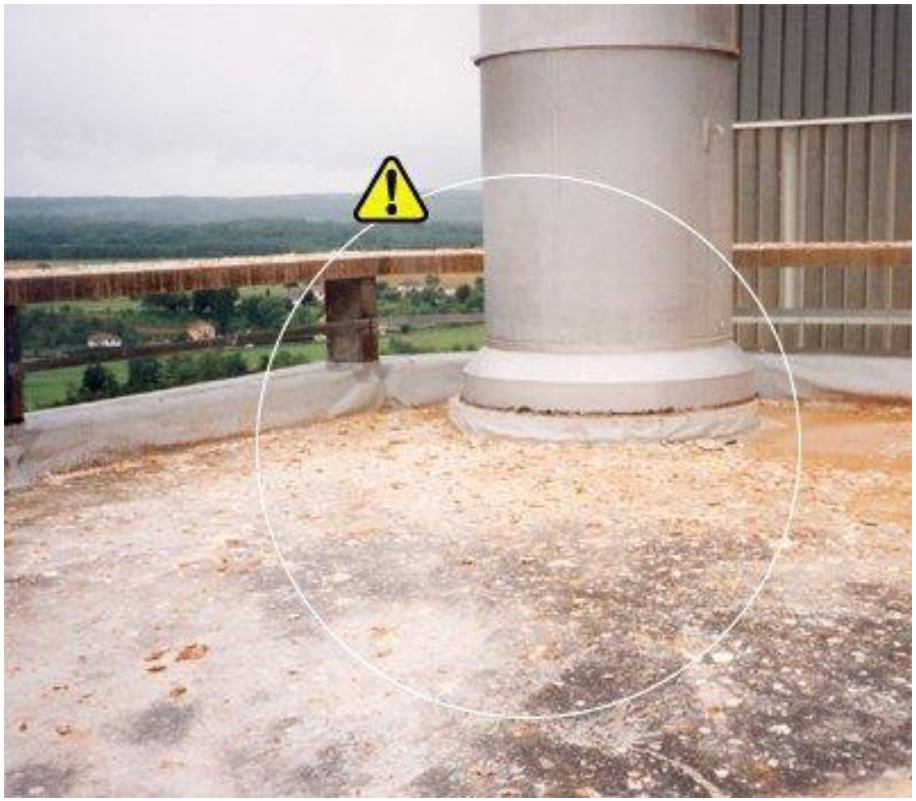
Roofs hygiene considerations

Roofs hygiene considerations

Particular attention must also be paid to condensation created by vents. Water and product residues at such points can attack roof covering. Regular cleaning helps.

Maintenance of roof covering is essential to ensure it remains waterproof.

Roofs hygiene considerations



Recommendations

The roof is a critical part of the building and as it collects debris and contamination from various sources, it should:

- be waterproof
- be self-draining
- not provide harborage for pests
- be easily cleanable
- be accessible for maintenance - without risk for interior
- high/medium hygiene areas

Roof key points

- Water leakage
- Regular inspection and maintenance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