Hygienic Design of Food Manufacturing Premises

Dr. John Holah
Technical Director
IFTS Hygienic Design Conference 25th February 2016
Guideline No. 44

- Largest Working Group
- Largest Document
- Suggested established best practice
- Novel solutions
- Published late 2014 – currently final review due to EHEDG restructuring
Hygienic food factory design provides:-

• Defence against external factory hazards
• Defence against internal factory hazards - no harbourage sites and ease of cleaning
• Internal flows of people, product, packaging, air and wastes to prevent cross-contamination
• Security against deliberate contamination
• The maintenance of hygienic conditions via structure rigidity - appropriate foundations, steelwork, floor slabs
• The Maintenance of hygienic conditions via material durability
• Compliance with customer/GFSI best practice
New concepts

- Hazard management - segregation, zoning and external/internal barriers
- Personnel entrances and hygiene sequences
- Cleaning and disinfection rooms
- Walls and floor interfaces
- Drains and flooring integration
- Structural rigidity/flexibility
- Services - electrical, compressed air
Hazard management – external hazards

• People (petty crime, journalist, fraud, bioterrorists)
• Pests – rodents, insects, birds, reptiles
• Microorganisms – farm operations, animal activities, refuse/waste disposal, sewage works
• Industrial activities - Chemicals/odours, particulates
• Water – pests, rain, flood,
• Ground movement – effect on foundations and structures
Zoning and barriers

- Site barrier (1)
- Non-food production areas
- Factory barrier (2)
- Basic hygiene area
  - Soiled raw materials, packed ingredients/finished products
- Medium hygiene area
  - Ingredient preparation
  - General processing
- High hygiene barrier (3)
- High hygiene area
  - Microbiologically decontaminated products, design risk assessed
Prevent entry of pathogens

- Site
- Soil/dust/water
- Air
- Air
- Air
- Raw materials
- Packaging
- People
- Product
- Air
- Air
- Services
- Supplies
- Packaging
- Outer packaging
- Drains
- Basic hygiene
- Medium hygiene
- High hygiene
- Non Food Production area
- Laboratory
- Toilets

- Prevent entry of pathogens
- Basic hygiene
- Air
- Product
- People
- Medium hygiene
- Raw materials
Category of food product:- Degree of protection required

- Degree of preservation/susceptibility to microbial growth
- Shelf-life and storage conditions
- Consumer type
- Size of company/market - strength of brand name
  - (Barrier 1) - Raw produce in the field
  - Barrier 2 - Processed foods/GMP in the factory
  - Barrier 3 – Ready-to-eat products – ready meals, fresh-cut produce, infant formula, chocolate, cereals, peanuts?
    - BRC High care, High risk Ambient high care
  - Aseptic – true aseptic, ultra-clean, some RTE products
Barrier 1: Site Barrier

- Environment
  - wind direction, surface run-off
  - Landscaping
Factory barrier

Hygienic receiving

Load Bearing Composite Panel Wall Arrangement
Pests: Preventing entry principle
Pests - control them externally!

- Sealed surface entry points in the external factory structure
- Covered waste collection units and frequent removal
- 4mm door gaps
- Limit surface water

Hygienic trees and shrubbery!
Roofs: water leakage and Salmonella

- Ventilation devices that discharge food particles onto the roof should be avoided (they can attract birds, infestation - Salmonella)
- Roofs shall be pitched to the external walls, self draining and roof drains should be external to the building wherever possible.
- All openings to the roof should be curbed and flashed to a height of 0.3m (12 inches) or more (snow levels?)
Site Security

- Perimeter fence/security guards/CCTV/no dogs
- No raw materials/finished products outside barrier 2
- Silos, water tanks locked off (super chlorination?)
- Bulk loading equipment - factory pumps/pipework should be used
- Parking areas not close to factory entrance
- Lighting at night
- National guidance e.g. *Defending food and drink PAS 96:2008* British Standards
Barrier 2: Internal Hazards

- Microorganisms
- Allergens (milk, gluten, peanuts, strawberries)
- Foreign bodies: glass, plastic, metal, wood, water
- Religion (Halal, Kosher)
- Personal choice (vegetarian, organic, GMO)
- Legal (meat speciation), DNA
- Bioterrorism
- Fraud
Internal hazards/brand protection

- Allergens (milk, gluten, peanuts, strawberries)
- Religion (Halal, Kosher)
- Personal choice (vegetarian, organic, GMO)
- Legal (meat speciation), DNA
- Separate factories – not likely
- Separate areas (goods in, transport, utensils, cleaning equipment, clothing etc.)
- Separate times (verified cleaning, labelling, rework?)
Horizontal segregation across zones
Internal hazards/brand protection

- Foreign bodies
- Pests

- Glass/plastic – covered lighting, breakage policies
- Glass – no windows – what about the cows?
- Wood policy – limit of pallet movement
- Maintenance policy
- Metal/foreign body – metal/x-ray detection
- Pest control
Microorganisms

5 point pathogen control plan

- Prevent entry
- Restrict harbourage and growth
- Kill or remove
- Reduce cross-contamination vectors

Internal hazards/brand protection
Amenities
Tray wash
Wet DRY

Microbial growth requirements
• Temperature
• Nutrients
• Oxygen
• Water

Water supply
Drain

Internal hazards/brand protection
Foundations to prevent structural movement but above all else, consideration of the sub-floor and its movement.
Good drain design
Drain/floor interfaces

Need to integrate drain and flooring contactors
Doors

To be effective barriers
• Tight fitting (no gaps)
• Threshold
• Solid or closed cell foam
• Self closing (man doors)
• Actuator closing (truck doors)

Horizontal rather than vertical roller shutter doors
Electrical installations

• Minimum wire ways and cable routing
• No conduits.
• Cables clips should be avoided.
• Control boxes sealed, not over product, sited to facilitate cleaning and bottom cable entry
Bioterrorism/fraud

- Key processes:
  - mixing/even distribution
  - Mixers, bulk storage, grinders
- Collective responsibility

**Diagram:**
- Store
- Prep
- Chill
Barrier 3: High hygiene

- Product (pasteurisation or decontamination)
- Utensils etc.
- Packaging
- People
- Air
- Solid and liquid waste

- Risk assess required barriers
Boxes within boxes

Easy to manage?

• Manufacturing flexibility
• Infection control
Wall-to-floor Junctions?

- Low risk
- Medium risk
- High risk
Personnel - High hygiene entry sequence

- Remove outer/low risk clothing
- Put on hair net
- Remove footwear
- Step over barrier - Wash hands - psychology
- Put on high risk boots
- Step over barrier - Wash hands
- Put on factory clothing
- Alcohol rub on entry
Packaging and airlocks

• Double bagged
• Who owns it – high or low
• Who cleans it – high or low
• Can we effectively over pressure it

High
Low
Air movements between high and low hygiene

Positive pressure is required, typically 2-5 Pascals /air velocity > 3m/s

Natural

Induced

Forced

Intake

Extract

Low risk  High risk

Low risk  High risk

Low risk  High risk
Design for cleaning and decontamination
Any Questions?

www.holchem.co.uk