

## INFECTION CONTROL DESIGN AND PRACTICES IN DH DENTAL CLINICS

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## DENTAL CLINIC DESIGN MAJOR CONSIDERATIONS

- Operational work flow
- Occupational safety and Health
- **Infection control**
- Ergonomics
- Barrier Free Access
- Comfort
- Professional image
- Esthetic

- Infection control should be considered in the **design stage** of a dental clinic
- Rectification work may be very difficult after operation of a dental clinic

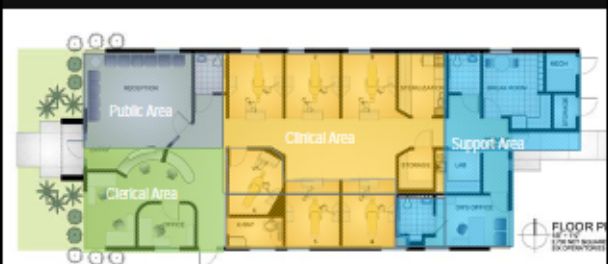
## BASIC PRINCIPLES

- **Zoning** clean and dirty zones, clinical area and support area
- **Flows** from clean to dirty
- **Simple** to decrease contact surfaces
- **Seamless** to avoid un-cleansable area
- **Smooth** to allow easy disinfection
- **Durable material** able to withstand repeated disinfection

## ZONING

- **Clinical area**-dental surgeries, sterilization room, x-ray room, recovery room...
- **Supportive area**-reception office, waiting area, server room, plant room, pantry, toilets...
- **Use color** for easy compliance, e.g. red for dirty and green for clean

## LAYOUT CONSIDERATION





- Building Services**
- ❑ Heating, Ventilation and Air Conditioning
  - ❑ Fire services
  - ❑ Water supply and drainage
  - ❑ Electrical supply
  - ❑ Compressed air and suction system
- Builder's work**
- ❑ Ceilings
  - ❑ Walls
  - ❑ Floor
  - ❑ Cabinets
  - ❑ Doors
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- CHECKLIST**
- Building Services**
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- HUMIDITY, VENTILATION AND AIR CONDITIONING**
- Goal**
- Temperature: **22°C** for clinical area(25.5°C for general offices)
  - Relative Humidity: **50-60%**
  - Air Change per Hour (ACH): **2-6**
  - Air flow: **from clean to dirty** area
  - Air Pressure: +ve for clean room, -ve pressure for dirty room e.g toilet
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- ACH AND AIR FLOW**
- 1 ACH will reduce the concentration of a given contaminant within a room by 67% in 1 hour, whereas a ventilation rate of 6 ACH will reduce the contaminant concentration by more than 99% in the same period
  - American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommends **6 ACH for dental department in hospital**
  - The overall air movement of a dental clinic should flow from waiting area to the sterilization area and finally the toilets
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## CHECKLIST

### Building Services

- Heating, Ventilation and Air Conditioning
- Fire services
- **Water supply and drainage**
- Electrical supply
- Compressed air and suction system

## WATER SUPPLY

- CDC recommends <500 CFU/ml (colony forming units of heterotrophic bacteria per milliliter of water)
- The quality of the water supplied by Water Supplies Department (WSD) conforms to the Guidelines for Drink-water Quality recommended by WHO

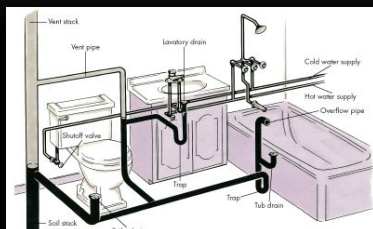
## POTENTIAL CONTAMINATION

- Back-flow can occur
- Water is drawn from an appliance into the pipework supplying it
- Any contamination present in the appliance could find its way into water used for drinking or food production, with serious consequences for health

## PUT INTO PRACTICE

- **Potable water** supply for domestic use
- **Break tank (non-potable water)** for clinical water supply for medical use, include dental unit, instrument sinks, autoclaves and film processor etc...
- Consult plumbing system designer

## DRAINAGE



## DRAINAGE

- **Standard gravity drainage system** should be provided in general
- **Sump Pump system**, with drain pipes running in the ceiling void for waste water in dental surgeries should be avoided to prevent undesirable consequences during the break down of the system



**CHECKLIST**

**Building Services**

- ❑ Heating, Ventilation and Air Conditioning
- ❑ Fire services
- ❑ Water supply and drainage
- ❑ **Electrical supply**
- ❑ Compressed air and suction system

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**ELECTRICAL SUPPLY**

- **Emergency power supply** may needed for normal functioning of autoclave
- **3 phase power** supply for plant room and instant electric water heaters
- Dental clinics need 3 times electrical power supply

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**CHECKLIST**

**Building Services**

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**COMPRESSED AIR AND VACUUM SYSTEMS**

**Quality requirement**

- Health technical Memorandum (HTM 2022 supplement 1 )DH, UK
- "The compressor should be fitted with an **air-intake filter** and a **post compression filtration and dry system**, to ensures that the air is clean and dry, minimizing the risk of contamination of the system by micro-organism..."
- **Industrial compressor should not be used**

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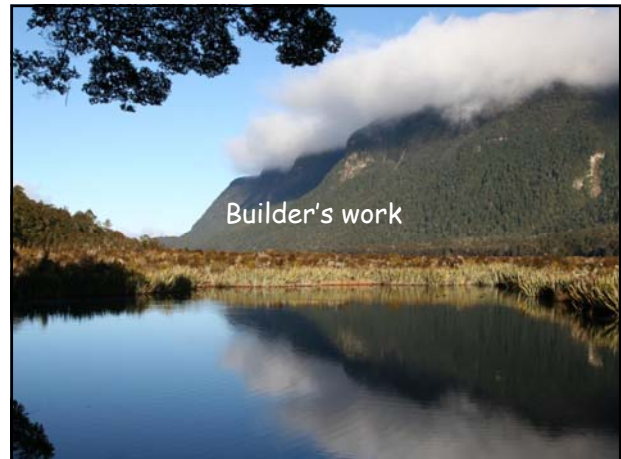
## VACUUM SYSTEMS

- **Dry system**- waste water drain away by a separator before the air enters the vacuum pump; the pipes remain dry
  - **Wet system**- waste water and air enter the vacuum pump, where they are separated; the pipes are wet
  - **Semi dry system**- similar to dry system, but the vacuum pump and separator are combined; the pipes are wet before enter the pump
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- In dry systems, the vacuum line is relatively dry and clean compared with wet system, which helps minimize bacterial contamination of the vacuum line
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## VACUUM EXHAUST FILTRATION

- The **exhaust** from the vacuum system should be sited **outside**, away from air intakes, opening windows etc( preferably above roof level) and be clearly labeled
  - A **bacterial filter** (HEPA filter) should be inserted in the system, preferably between pipework and vacuum pumps
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## CHECKLIST

### Builder's Work

- Ceilings
  - Walls
  - Floor
  - Cabinets
  - Doors
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## CEILING

- **Aluminum** false ceiling with acoustic features to reduce the growth of fungus
  - Arrange the "air return" near the entrance to avoid dropping of dust over the clean area
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## WALLS

- Cleansable, smooth and anti-fungal
- Non VOC emulsion paint, vinyl sheet, compact board, or ceramic tiles
- Avoid too much texture

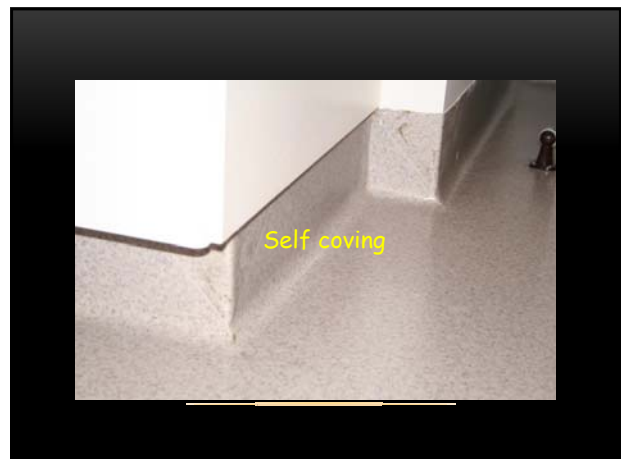
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## FLOOR COVERINGS

- Vinyl flooring sheet with self-coving skirting( No need for separate skirting)
- Wax free and high coefficient of resistance
- All joins sealed
- **Avoid carpet and wooden flooring**





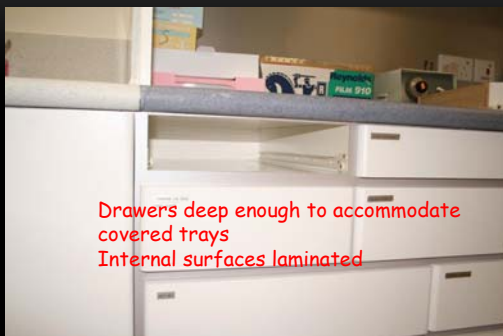
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## CABINET

- Design to facilitate routine disinfection
- Simple, smooth and seamless
- Able to withstand Alcohol and bleaching solution
- Avoid open shelf
- Solid surface countertop and laminated wood (include all the inside surfaces)
- Drawers should be deep enough to enhance flexibility and placement of covered trays



## PROPRIETARY PRODUCTS



## HAND WASHING BASIN

- At least 1 in a dental surgery, not to share with instrument cleaning sink
- Medical grade hand free tap and dispenser preferred
- No overflow protection and plug needed

## HAND WASHING BASIN



## CHECKLIST

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## DOORS

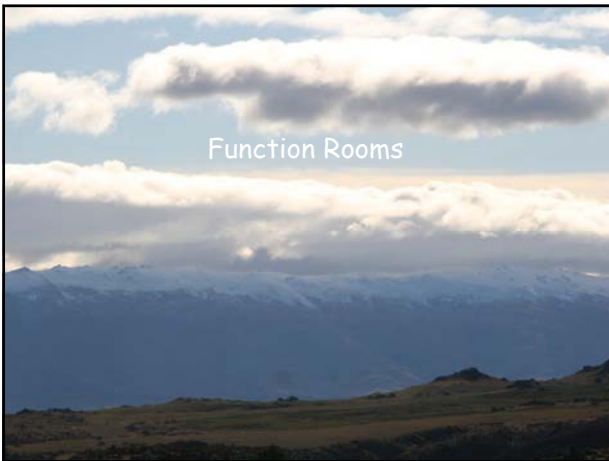
- Door knobs can serve as a fomite to indirectly transmit infectious organism
- Need regular disinfection



- Consider automatic doors with hand free sensor or foot control





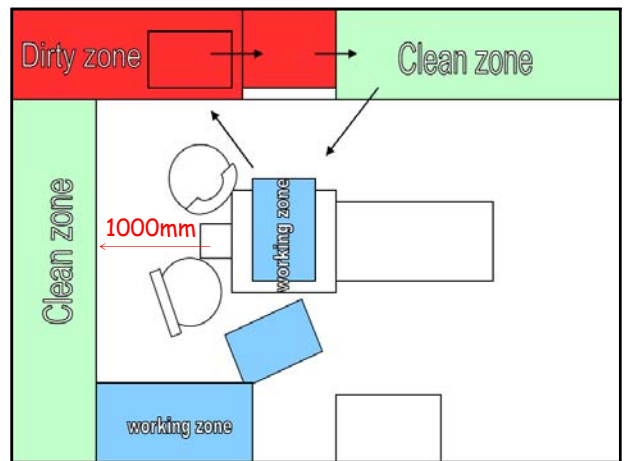


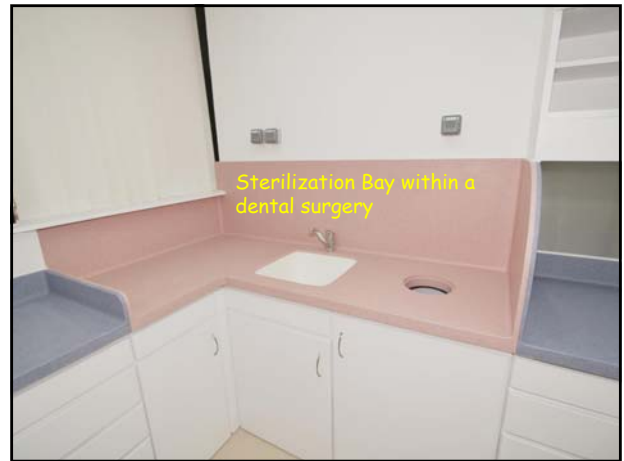
### FUNCTION ROOMS

- Dental surgery
- Central sterilization room (instrument reprocessing area)
- X-ray room and film processing area
- Laboratory

### DENTAL SURGERY

- Optimize size for ergonomics, OSH, and infection control
- Simplified cabinets to minimized contacts
- Zoning should be clearly delineated
- **1 meter space** from the patient's mouth to the bench top to avoid splatter contamination





### STERILIZATION ROOM

- CDC "...should process all instruments in a designated central processing area to more easily control quality and ensure safety. The central processing area should be divided into sections for
  - 1) receiving, cleaning, and decontamination;
  - 2) preparation and packing;
  - 3) sterilization; and
  - 4) storage

