

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**
- ❑ Heating, Ventilation and Air Conditioning
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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
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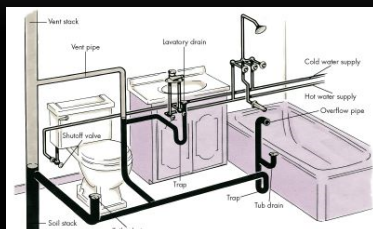
POTENTIAL CONTAMINATION

- 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
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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
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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
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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

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

CHECKLIST

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- ❑ Heating, Ventilation and Air Conditioning
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- ❑ **Electrical supply**
- ❑ **Compressed air and suction system**

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**

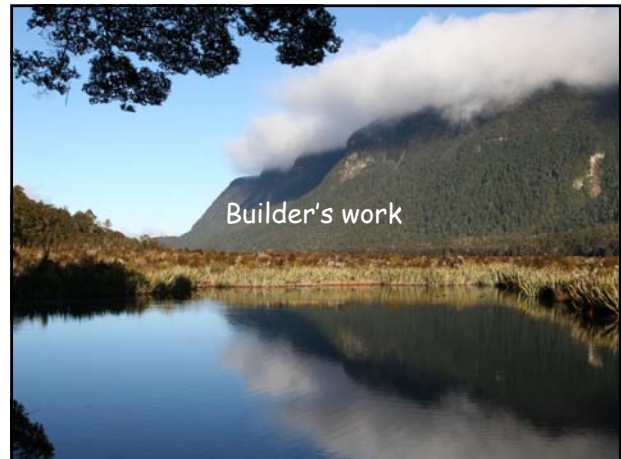
VACUUM SYSTEMS

- **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

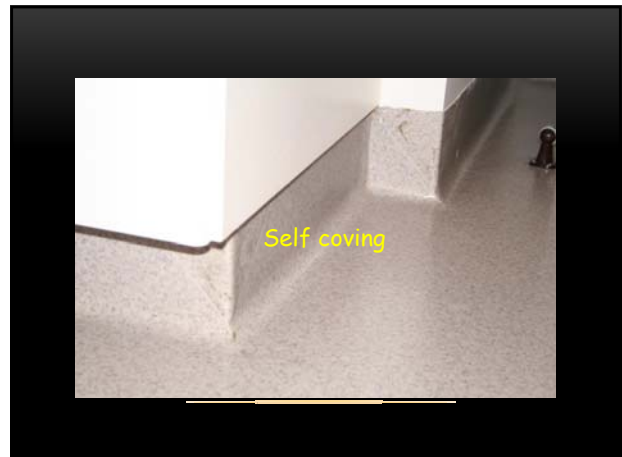
CHECKLIST

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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**





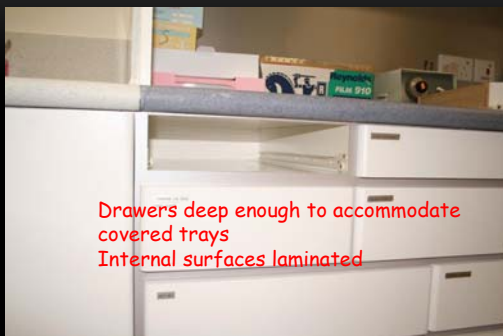
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CABINET

- 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



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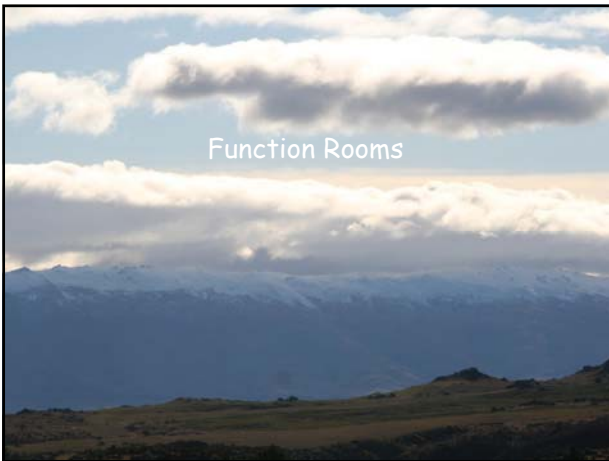
DOORS

- 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



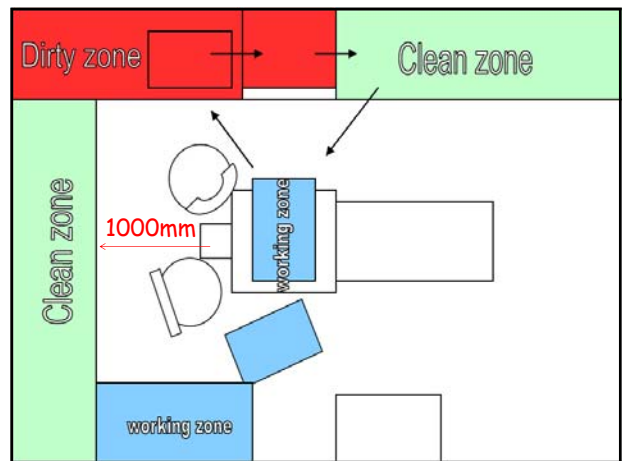


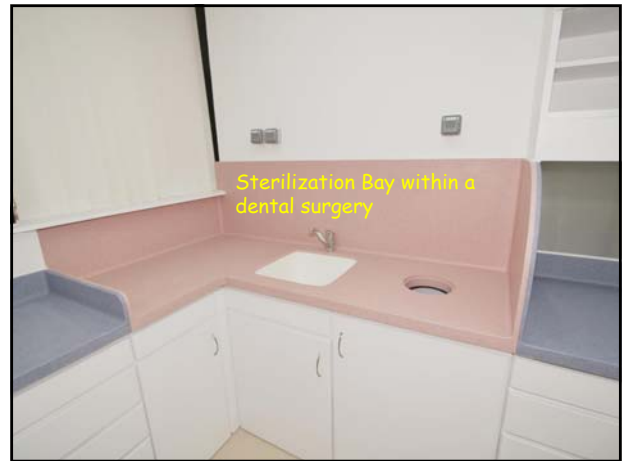
FUNCTION ROOMS

- 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

