KURSUS PENGENALAN KEPADA PERKHIDMATAN MEKANIKAL DALAM BANGUNAN

HOT WATER DESIGN

AN INTRODUCTION TO

HOT WATER DESIGN

YATIM SELAMAT BIN LATIB
JURUTERA MEKANIKAL

CLASSIFICATION OF HOT WATER

1. DIRECT SYSTEM
2. INDIRECT SYSTEM
3. CLOSED SYSTEM
4. OPEN SYSTEM

DESIGN OF HOT WATER SYSTEM

1. Determination of demand, quantity and temperature.
2. Design, type, capacity and output of hot water calorifier.
3. Design, type and size of boiler.
4. Design, arrangement of boiler, calorifier, automatic control and pipe scheme.
5. Detemination of primary and secondary mains.

DESIGN STANDARDS

***The relevant standards are*:**

1. **BS 3456**
2. **BS 2871 Part 1**
3. **BS 61**
4. **BS 10**
5. **BS 659**
6. **BS 2815**
7. **BS 1952 and 1953**
8. **BS 21, BS 855, BS 2790**

APPLICATIONS

1. PROCESS HEATING.
2. STERILIZATION.
3. HOT WATER GENERATION.
4. LAUNDRY.
5. COOKING, ETC.

HOT WATER DEMAND PER FIXTURE

1. APARTMENT HOUSE, PRIVATE RESIDENCE.
2. HOSPITAL, SCHOOL, UNIVERSITY.
3. CLUB, GYMNASIUM.
4. HOTEL, OFFICE BUILDING.
5. INDUSTRIAL PLANT, ETC.

DEMAND RATES

1. PRIVATE WASH HAND BASINS @ 10 lit/hr.
2. CLINICAL WASH HAND BASINS @ 15 lit/hr.
3. PUBLIC WASH HAND BASINS @ 15 lit/hr.
4. BABY BATH @ 30 lit/hr.
5. SLOP/LAB SINK @ 50 lit/hr.
6. ADULT BATH @ 60 lit/hr.
7. SHOWER @ 70 lit/hr.
8. PANTRY @ 80 lit/hr.

DEMAND RATES

1. BATH TUBS.
2. DISH WASHERS.
3. KITCHEN SINKS.
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5. HYDROTHERAPEUTIC SHOWERS.
6. HUBBARD BATHS.
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SYSTEM EQUIPMENTS

1. BOILER
2. CALORIFIER
3. PUMP
4. PIPING RETICULATION
5. VALVES AND ACCESSORIES

BOILER CATAGORIES

1. ELECTRIC BOILER.
2. WATER TUBE.
3. FIRE TUBE.
4. WATER TUBE AND FIRE TUBE.
5. SECTIONAL
6. ROUND
7. SCOTCH

BOILER CATAGORIES

1. ***WATER TUBE*** *– Gases circulated around the tubes where water passes through. i.e water always inside the tube(Load over 25,000 lb/hr, 15 – 7500 BHP)*

2. ***FIRE TUBE*** *– Water circulated around the tubes where Gases passes through. i.e Gases always inside the tube(Load 25,000 lb/hr, 10 – 1000 BHP)*

BOILER EFFICIENCY

1. ***BOILER PERFORMANCE*** *– Ratio of the heat absorbed by the water and steam in the boiler to the heat in the fuel fire.*

2. ***TYPE OF FUEL USED*** *–*
   a) Coal (Efficiency 50%-65%)
   b) Oil & Gas (70%-80%)
   c) Electric (90%-99%)

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INSTANTANEOUS DOMESTIC HOT WATER STORAGE

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1. Low pressure, storage type, electrically heated.
2. Design for wall mounting.
3. Tested to withstand pressure 150 psi.
4. Automatic Thermostat control preset at 60C.
5. Heating Element and Thermostat must comply BS 3456.
6. Inner water container shall construced Stainless Steel, Copper or Nickel Copper Alloy.

INSTANTANEOUS DOMESTIC HOT WATER STORAGE

1. Corrosion protected by cathodic i.e sacrificial magnesium anode.

2. External casing shall mild steel treated againt corrosion.

3. Finished in deluxe acrylic white or enammel white.

SELECTION AND SIZING

1. The type of facility served.
2. Required water volume and load peaks.
3. Type and number of fixtures served.
4. Required water temperature.
5. Fuel/energy source for heating the water.

*Deg F = (1.8 x C) + 32

*Deg C = $\frac{F - 32}{1.8}$

*212F=100C

MAIN FEATURES

1. ***Foam Insulation*** – **Rigid polyurethane foam for improved economy and fuel saving.**

1. ***Tank*** – **The tank surface coated with exclusive porcelain and fuse to the solid steel at 870C.**

2. **Tank designed and tested withstand 2000 kpa hydrostatic test pressure.**

3. ***High Efficiency Heating Elements –*** **Ceramic insulated low density SS sheated incology immersion type heating.**

4. ***Isolated Tank Design*** – **Reduces heat loss and consequently saves on electricity cost.**

5. ***Hot Water Outlet*** – **Draw water from top of storage tank where temperature is highest.**

MAIN FEATURES

1. ***Anode Rod*** – **Equalizes aggressive water action, to match local water chemical reaction.**

1. ***Cold Water Inlet*** – **Replaces water at tank bottom to prevent mixing with already heated water.**

2. ***Automatic Temperature Control –*** **Automatically keeps the water temperature at a desired level and instantly shuts off the power at preset temperature.**

3. ***Over Temperature Protector*** – **Automatically and safely cuts off the power in the unlikely event the desired preset temperature is exceeded.**

HEALTH/SAFETY CONCERNS

1. Distribution temperature may be higher than 120F(49C) because of the concern over Legionella pneumophia (Legionnaires Disease).

2. This bacterium cause serious illness, can grow in domestic hot water storage at temperature 115F(46C) or less.

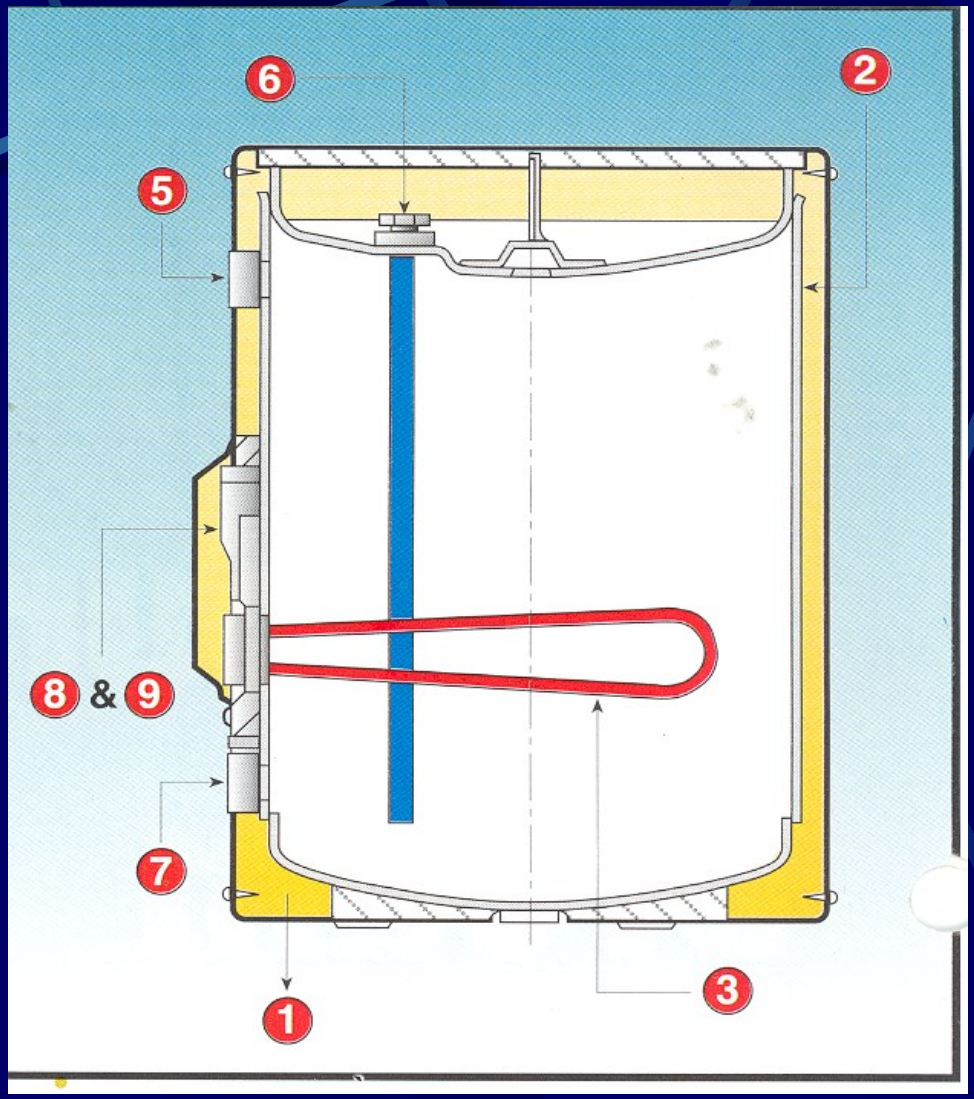
3. A water temperature of 140F(60C) is recommended to reduce potential of growth of this bacterium.

4. However, higher temp. increases possibility of scalding. This is particular concern for small children, the elderly and infirm, patients in health care facilities and occupants of nursing homes.

HORIZONTAL/VERTICAL TYPES

FLOOR MOUNTED

TANK DESIGN DETAILS



TYPICAL BOILER

DESCRIPTION

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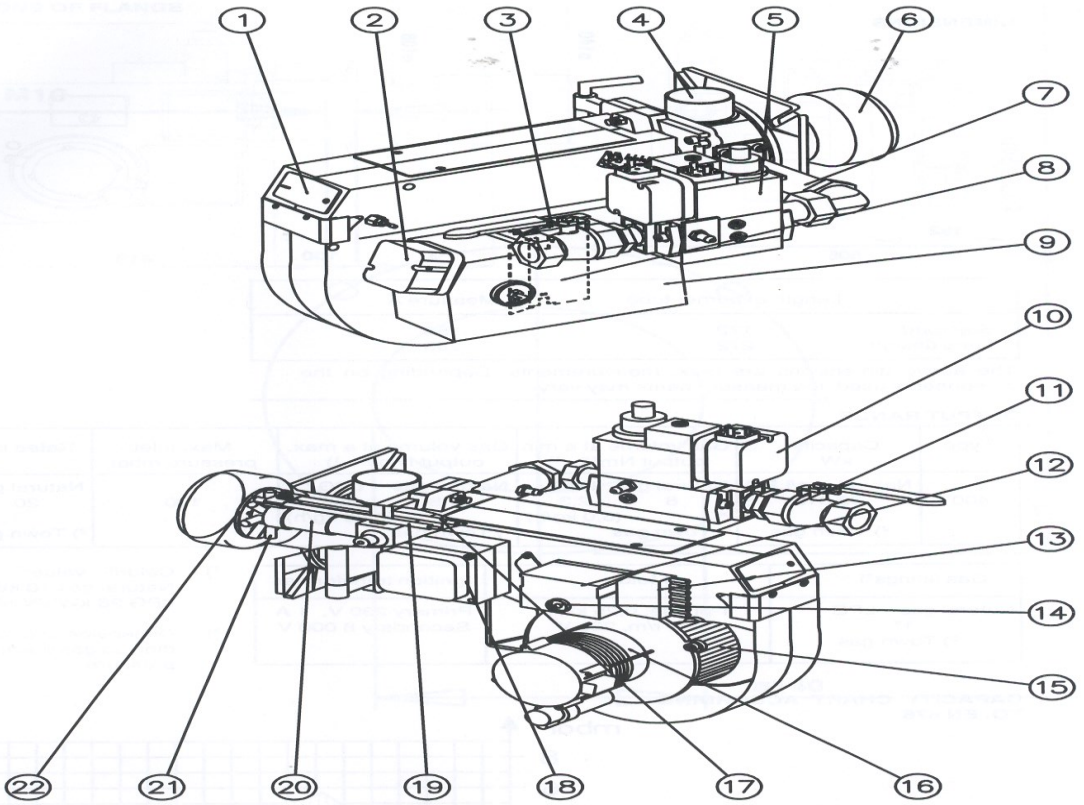

COMPONENTS

1. Cover, inspection glass
2. Air pressure switch
3. Air adjustment
4. Inner assembly adjustment (not town gas)
5. Multibloc
6. Flame cone
7. Connecting pipe
8. Air damper
9. Air intake
10. Gas pressure switch
11. Ball valve
12. Control box
13. Electrical connection
14. Reset button
15. Fan wheel
16. Motor
17. Ignition electrode
18. Transformer
19. Ionization electrode
20. Inner assembly
21. Nozzle
22. Brake plate

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Akhir Kata...

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