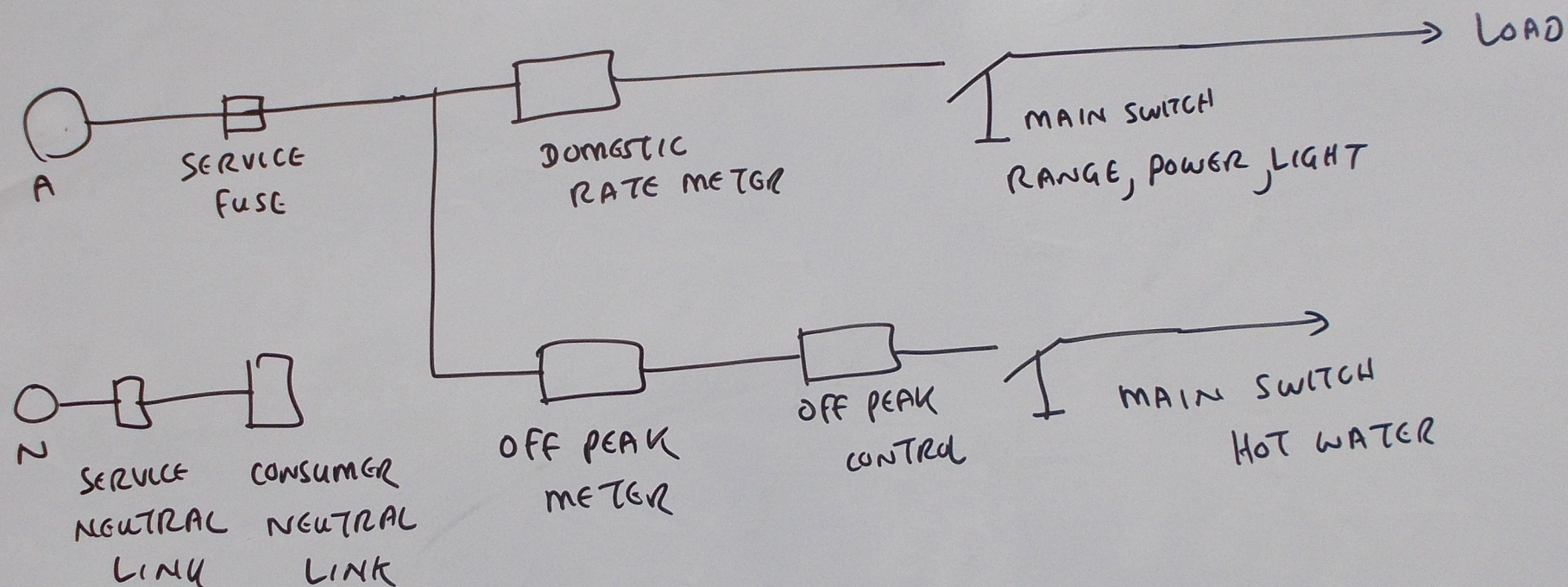


CONNECTION OF LOAD - RELAYS AND TIME CLOCK

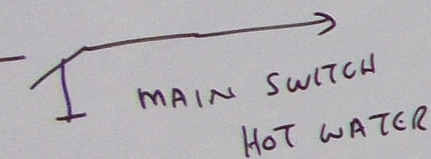
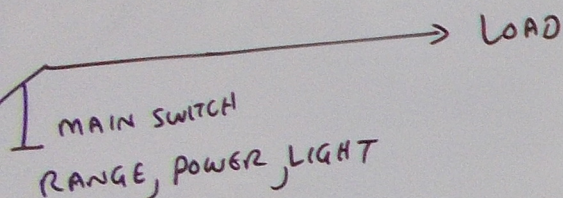
SINGLE ELEMENT HOT WATER UNIT

LOAD CONTROL DEVICES ARE WIRED ON THE MAIN SWITCH BOARD AFTER KWH METER THAT IS INSTALLED TO MEASURE THE ENERGY USAGE OF THE CONTROLLED LOAD. THE LOAD MUST NOT EXCEED 25 A



Clock

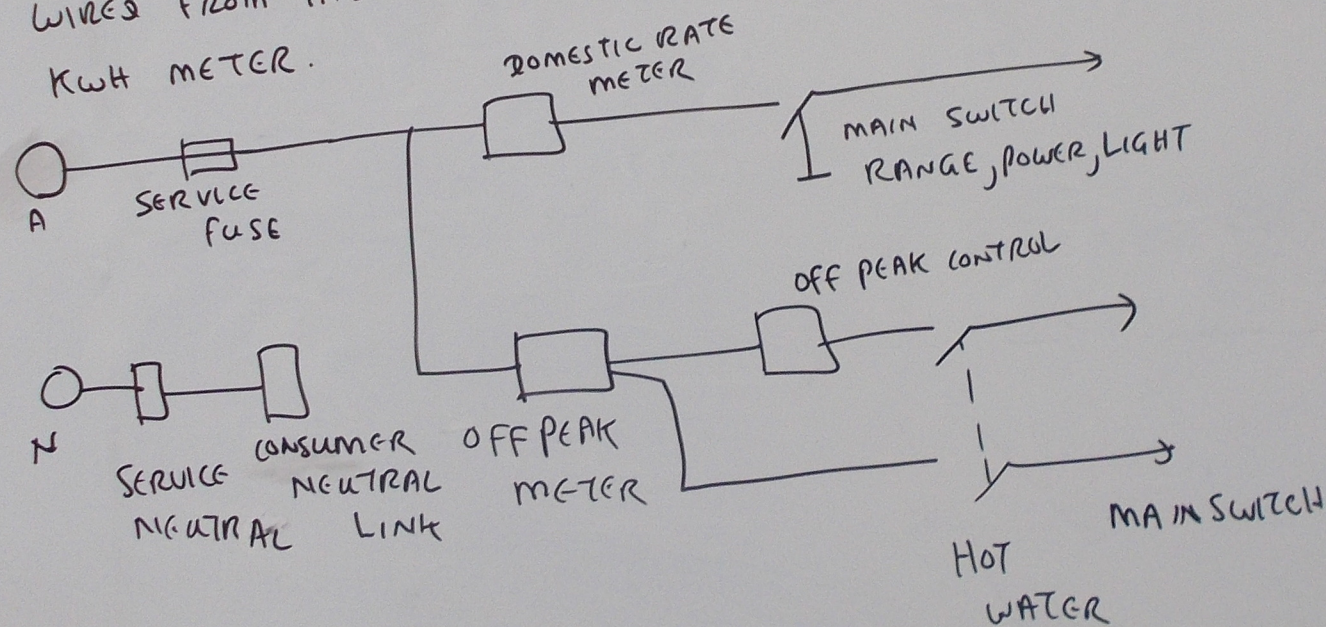
MAIN SWITCH BOARD AFTER KWH METER
ENERGY USAGE OF THE CONTROLLED LOAD.



DUAL ELEMENT HOT WATER UNIT

COMMONLY REFERRED TO AS A TWIN ELEMENT, THESE HOT WATER UNITS REQUIRE THE MAIN HEATING ELEMENT WHICH IS THE BOTTOM ELEMENT, TO BE CONNECTED TO LOAD CONTROL DEVICE. THE TOP ELEMENT, REFERRED TO AS THE AUXILIARY (BOOSTER) ELEMENT IS STILL CONNECTED TO LOAD TARIFF, BUT IS NOT CONTROLLED BY CONTROL DEVICE.

THIS ELEMENT HAS CONTINUOUS SUPPLY TO IT AND IS WIRED FROM THE LOAD SIDE OF THE CONTROL DEVICE KWH METER.



LINE DIAGRAM FOR BASIC EQUIPMENT ARRANGEMENT FOR DUAL ELEMENT

CONNECTION OF LOAD ELECTRONIC METER

ELECTRONIC METER

- PROGRAMMABLE
- VAST ARRAYS OF FEATURES
- METERING CONFIGURATION

SINGLE METER

EXERCISE

ON THE DIAGRAM BELOW, DR REQUIRED TO CONNECT A S OFF PEAK TARIFFS.

THE SINGLE PHASE TARI MAIN SWITCH FOR I CIRCUIT AND OFF SUPPLY TWO POLTS TWIN ELEMENT H

CONNECTION OF LOAD ELECTRONIC METERING

ELECTRONIC METER

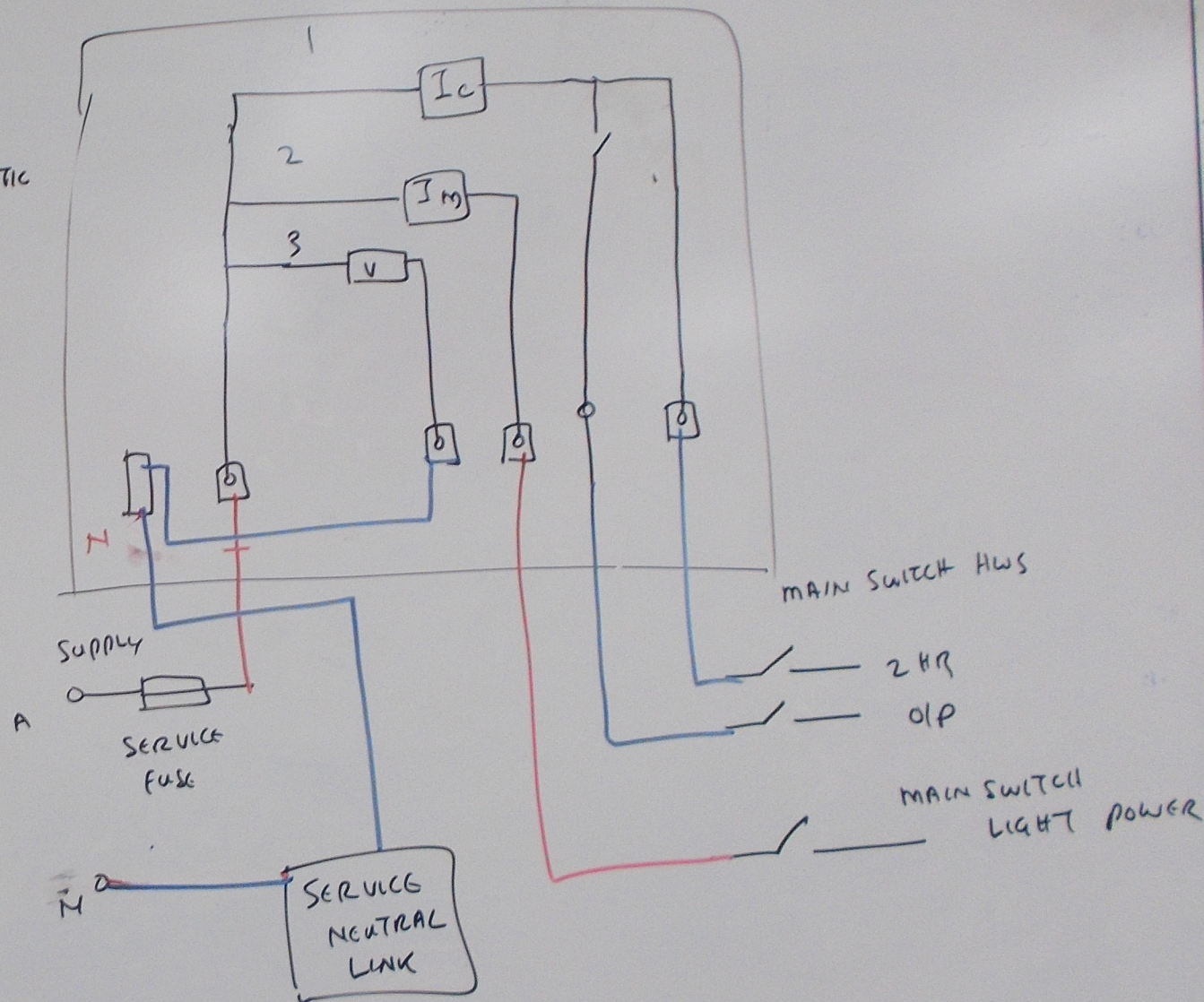
- PROGRAMMABLE
 - VAST ARRAYS OF FEATURES
 - METERING CONFIGURATION
- STANDARD DOMESTIC
CONTROLLED LOAD
METERING

SINGLE METER

EXERCISE

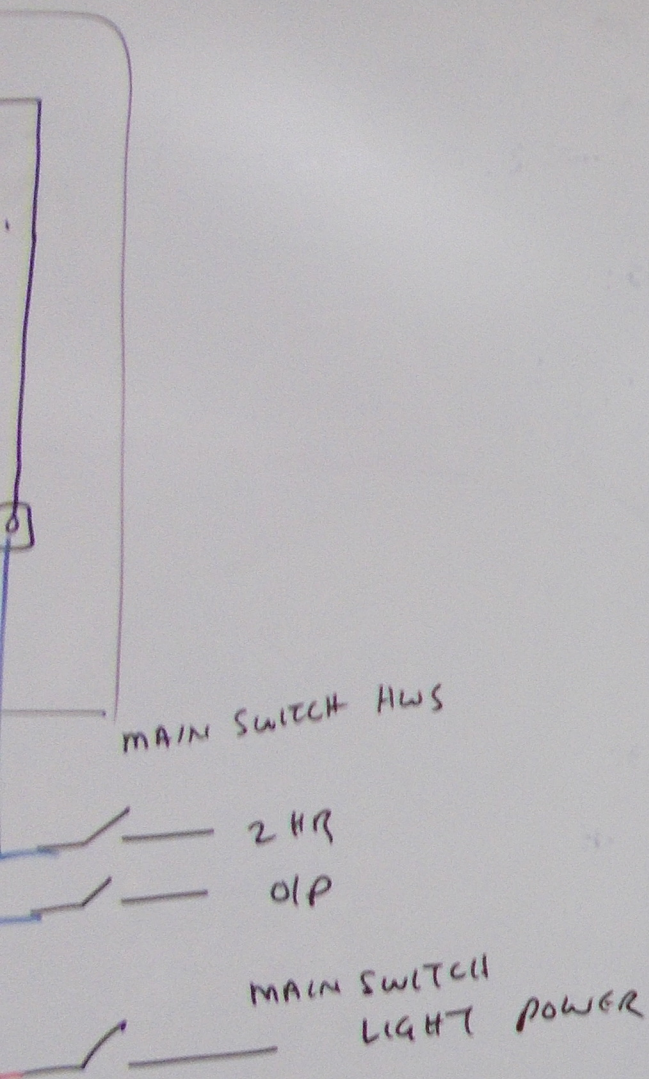
ON THE DIAGRAM BELOW, DRAW THE CONNECTION REQUIRED TO CONNECT A SINGLE PHASE AND OFF PEAK TARIFFS.

THE SINGLE PHASE TARIFF WILL SUPPLY THE MAIN SWITCH FOR LIGHT AND POWER CIRCUIT AND OFF PEAK TARIFF WILL SUPPLY TWO POLES MAIN SWITCH FOR TWIN ELEMENT HOT WATER UNIT.



I_m - STANDARD METERING (100 A RATED)

I_c - CURRENT THROUGH THE CONTROLLED CONTACT (100 A RATED)
UNSWITCHED
25A RATED FOR CONTACT RELAY CONTACT



100 A RATED)
 CONTROLLED CONTACT (100 A
 RATED
 UN SWITCHED
 A RATES FOR CONTACT
 RELAY CONTACT

HOT WATER TARIFFS

SUPPLY AUTHORITY DISTRIBUTE ELECTRICAL ENERGY TO
 HOT WATER SYSTEM AND OTHER SUITABLE HEATING LOADS
 AT NUMEROUS BASIC RATES.

- CONTINUOUS ENERGY IS AVAILABLE 24 HR/DAY
- CONTROLLED CONTINUOUS, RESTRICTED HOUR (OR) EXTENDED OFF PEAK
 SUPPLY IS AVAILABLE FOR 20 HOURS/DAY (NOT AVAILABLE
 AT MORNING AND EVENING PEAKS)
- OFF PEAK RATE - 8 → 10 HR/DAY (BETWEEN 11 PM AND
 7 AM)
- TIME OF USE (TOU) WHERE ENERGY IS CHARGED AT VARYING
 RATES DEPENDENT UPON THE TIME OF DAY IT IS USED.
 ENERGY USED AT PEAK TIMES OF THE DAY ARE CHARGED AT
 HIGHER RATES COMPARED TO ENERGY USED AT LOW DEMAND TIMES OF
 THE DAY.

CHECK LIST REGARDING W

- THE WATER STORAGE
 ON A CERTAIN TARIFF
- WHAT ARE THE SUPPLY
 REGARDING ELEMENT
- ARE THERE ANY RESTRICTED
 SIMULTANEOUS OPERATIONS
 UNITS SUCH AS OTHER
 ELEMENTS?
- WHAT SPECIFIC OPERATIONS
 REQUIRED?

COMMON DOMESTIC

A COMMON DOMESTIC
 SUPPLY IS A 4
 RECOVERY RATE
 40°C TEMPERATURE
 CONTINUOUS
 BUT USUAL
 FINAL SUB

ENERGY TO

HEATING LOADS

24 HR/DAY

OUR (OR) EXTENDED OFF PEAK

RS/DAY (NOT AVAILABLE
AT MORNING AND
EVENING PEAKS)

(BETWEEN 11 PM AND
7 AM)

DAY IS CHARGED AT VARYING
OF DAY IT IS USED.

THE DAY ARE CHARGED AT
USED AT LOW DEMAND TIMES OF

CHECK LIST REGARDING WATER HEATING TARIFFS

- THE WATER STORAGE CAPACITY FOR CONNECTION ON A CERTAIN TARIFFS
- WHAT ARE THE SUPPLY AUTHORITY'S REGULATION REGARDING ELEMENT CURRENT/POWER RATING.
- ARE THERE ANY RESTRICTIONS REGARDING NON SIMULTANEOUS OPERATION OF MULTIPLE ELEMENT UNITS SUCH AS OFF PEAK AND BOOSTER ELEMENTS?
- WHAT SPECIFIC OPERATION ARRANGEMENTS ARE REQUIRED?

COMMON DOMESTIC STORAGE UNIT FOR CONTINUOUS TARIFFS
A COMMON DOMESTIC STORAGE UNIT FOR CONTINUOUS TARIFFS SUPPLY IS A 4.8 KW, 80 LITRE HEATING HAVING A RECOVERY RATE OF OVER 70 LITRES PER HOUR FOR 40°C TEMPERATURE RISE

CONTINUOUS RATE REQUIRES NO SPECIAL TARIFFS
BUT USUAL POWER RATINGS ARE SUCH THAT A SEPARATE FINAL SUBCIRCUIT IS NECESSARY.

STORAGE SYSTEM FOR OFF PEAK

- IT NEEDS TO MEET THE
- IT'S STORAGE CAPACITY
- SOME SUPPLY AUTHORITY
SUPPLY SOLAR HOT WATER
AT OFF PEAK RATE

CONTROLLED LOAD STORAGE
FITTED WITH BOOSTER

① DUAL TARIFFS HEATING
LOWER ELEMENT (MAIN)
TOP ELEMENT (BOOSTER)

TO REDUCE THE DUAL
ARRANGEMENT
TWO ELEMENTS
SUPPLY SIMULTANEOUSLY
THIS IS USUALLY
THERMOSTATICALLY

STORAGE SYSTEM FOR OFF PEAK RATE

- IT NEEDS TO MEET THE LOCAL REQUIREMENT
- IT'S STORAGE CAPACITY IS ADEQUATE
- SOME SUPPLY AUTHORITIES WILL NOT SUPPLY SOLAR HOT WATER SYSTEM AT OFF PEAK RATE.

CONTROLLED LOAD STORAGE WATER HEATER FITTED WITH BOOSTER ELEMENT

① DUAL TARIFFS HEATER

LOWER ELEMENT (MAIN ELEMENT) — OFF PEAK RATE
OFF PEAK METERING

TOP ELEMENT (BOOSTER ELEMENT) — NORMAL RATE
CONTROLLED BY
CONSUMER MAIN
SWITCH

TO REDUCE THE DEMAND, AN INTERLOCK
ARRANGEMENT MAY BE REQUIRED BETWEEN
TWO ELEMENTS TO PREVENT THEM BEING ON
SUPPLY SIMULTANEOUSLY

THIS IS USUALLY INCORPORATED INTO
THERMOSTAT OF STORAGE HEATER UNIT.

② DUAL ELEMENT 24 HR OFF PEAK RATE SYSTEM

- REQUIRE INTER LOCK
- MINIMUM CAPACITY OF STORAGE TANK
IN RELATION TO SIZE OF HOUSEHOLD.

TOP THERMOSTAT

- TURN ON TO HEAT THE TOP THIRD OF THE
TANK IF COLD WATER LEVEL RISE TO THAT
POINT
- BOTH ELEMENTS ARE FED THROUGH OFF
PEAK METER
- ONLY BOTTOM ELEMENT IS CONTROLLED
BY OFF PEAK CONTROL RELAY
- TWO ACTIVITIES AND A NEUTRAL MUST
BE RUN TO THE UNIT FROM THE SWITCHBOARD
- THE NEUTRAL IS COMMONLY SWITCHED TO THE
TOP (OR) BOTTOM ELEMENT BY TOP THERMOSTAT
TO PREVENT SIMULTANEOUS OPERATION OF
BOTH ELEMENTS.

① Give two locations where hot water unit isolating switches may be installed

② How is the temperature from a 3 ϕ instantaneous heater controlled?

③ What safety devices are fitted to non vented storage electric water heaters?

④ How do these safety devices work to prevent the tank from exploding?

⑤ If one of safety devices in Q3 fails what temporary measures may be used to get the heater operating?

⑥ Under what conditions is storage water heater peak storage water

⑦ Compare the peak 3 ϕ simultaneous and off peak the need for

⑧ What is the heater in peak it supplies, spread the

⑨ What temperature recommend heaters in

THE HOT WATER UNIT
BE INSTALLED

FROM A 3 ϕ
BE CONTROLLED?

TTES TO NON
ATER HEATERS?

S WORK TO
EXPLODING?

IN Q3 FAILS
ES MAY BE USED
RATING?

⑥ UNDER WHAT CONDITIONS, MAY A CONTINUOUS SUPPLY TYPE STORAGE WATER HEATER BE RECONNECTED AS A OFF PEAK STORAGE WATER HEATER?

⑦ COMPARE THE KILOWATT RATING FOR A TYPICAL 3 ϕ SIMULTANEOUS WATER HEATER TO THAT FOR AN OFF PEAK STORAGE HEATER AND EXPLAIN THE NEED FOR ANY DIFFERENCE?

⑧ WHAT IS THE BEST LOCATION FOR A WATER HEATER IN RELATION TO THE HOT WATER OUTLET IT SUPPLIES, ESPECIALLY IF THE OUTLETS ARE SPREAD THROUGH THE INSTALLATION?

⑨ WHAT TEMPERATURE SETTING RANGE IS RECOMMENDED FOR THERMOSTAT IN STORAGE HEATERS IN DOMESTIC INSTALLATIONS?

⑩ NAME TWO SYSTEMS OF MORE EFFICIENT THAN STORAGE WATER HEATER

⑪ WHAT DISADVANTAGES IN Q10 HAVE?

ANSWER

① (a) ADDITIONAL TO AN IN HEATER STRUCTURE (AND)

(b) INSTALLED ADJACENT AS 3000 : 20

② CONTROLLED & SIMPLE FLOW S THE ELEMENTS IF FLOW RA

AT CONDITIONS, MAY A CONTINUOUS SUPPLY TYPE WATER HEATER BE RECONNECTED AS A OFF AGE WATER HEATER?

THE KILOWATT RATING FOR A TYPICAL CONTINUOUS WATER HEATER TO THAT FOR A STORAGE HEATER AND EXPLAIN FOR ANY DIFFERENCE

THE BEST LOCATION FOR A WATER HEATER IN RELATION TO THE HOT WATER OUTLET, ESPECIALLY IF THE OUTLETS ARE THROUGH THE INSTALLATION?

TEMPERATURE SETTING RANGE IS REQUIRED FOR THERMOSTAT IN STORAGE HEATER IN DOMESTIC INSTALLATIONS?

TEST - WIRD SUR

10 NAME TWO SYSTEMS OF WATER HEATING WHICH ARE MORE EFFICIENT THAN THE CONVENTIONAL ELECTRIC STORAGE WATER HEATER

11 WHAT DISADVANTAGES DO THE SYSTEM YOU NAME IN Q 10 HAVE?

ANSWER

1 (a) ADDITIONAL TO ANY AUTOMATIC SWITCH INCORPORATED IN HEATER STRUCTURE (AND)

(b) INSTALLED ADJACENT TO BUT NOT ON WATER HEATER
AS 3000:2016 4.8.2.3

2 CONTROLLED BY WATER FLOW (FLOW SWITCH CONTROL)

SIMPLE FLOW SWITCH CONTROL SWITCHES OFF

THE ELEMENTS TO PREVENT WATER OVER HEATING IF FLOW RATE IS REDUCED TOO MUCH.

3 TEMPERATURE AND PRESSURE

4 A SAFETY DEVICE IS NORMALLY FITTED TO PREVENT WATER IF TEMPERATURE

5 THE PROBLEM IS

6 PROVIDED ACCESS

7 AN INSTANTANEOUS HIGH POWER IN RUNNING AT

8 BY LOCATING REDUCED HEATER TO

9 LEGIONELLA ABOUT 7 AT 6 AT 4

HEATING WHICH ARE
CONVENTIONAL ELECTRIC

THE SYSTEM YOU NAME

ATOMIC SWITCH INCORPORATED

NOT ON WATER HEATER

8.2.3

LOW (FLOW SWITCH
CONTROL)

SWITCHES OFF

WATER OVER HEATING

→ TOO MUCH.

③ TEMPERATURE AND PRESSURE RELIEF (T & P (OR) TPR) VALVE

④ A SAFETY DEVICE CALLED TEMPERATURE AND PRESSURE RELIEF (T & P (OR) TPR) IS NORMALLY FITTED ON THE TOP OF THE WATER HEATER TO DUMP WATER IF TEMPERATURE (OR) PRESSURE BECOMES TOO HIGH.

⑤ THE PROBLEM CAN BE FIXED BY A PLUMBER

⑥ PROVIDER ACCEPTED MODEL CAN BE USED.

⑦ AN INSTANTANEOUS ELECTRIC WATER HEATER TYPICALLY REQUIRES HIGH POWER INPUTS PARTICULARLY IF MORE THAN ONE UNIT IS RUNNING AT ONCE.

⑧ BY LOCATING THE HEATER CLOSE TO POINT OF USE, IT WILL REDUCE THE AMOUNT OF TIME TO TRAVEL FROM THE WATER HEATER TO OUTLET.

⑨ LEGIONELLA

ABOUT 70°C → DIE INSTANTLY,

AT 60°C → 90% DIE IN 2 MINUTE

AT 50°C → 40% DIE IN 80 → 124 MINUTE

48 → 80°C → CAN SURVIVE, BUT NOT MULTIPLY

32°C → 42°C → IDEAL GROWTH

DISH WASHER 50°C → 60°C

MAXIMUM TEMPERATURE

49°C (OR) 120°F

⑩ (a) AIR SOURCED HEAT

(b) TANKLESS WATER

⑪ THE MAIN DISADVANTAGE OF AIR SOURCE HEAT IS BELOW

— LOWER HEAT SUPPLY AND GAS BOILERS WOULD BE NEEDED

— THEY PERFORM

HEATING (OR)

WORK MORE

WITH LARGE

(TRP (OR) TPR)

to pump

REQUIRES
UNIT IS

IT will
WATER

$32^{\circ}\text{C} \rightarrow 42^{\circ}\text{C} \rightarrow$ IDEAL GROWTH RATE

DISH WASHER $50^{\circ}\text{C} \rightarrow 60^{\circ}\text{C}$

MAXIMUM TEMPERATURE

49°C (OR) 120°F

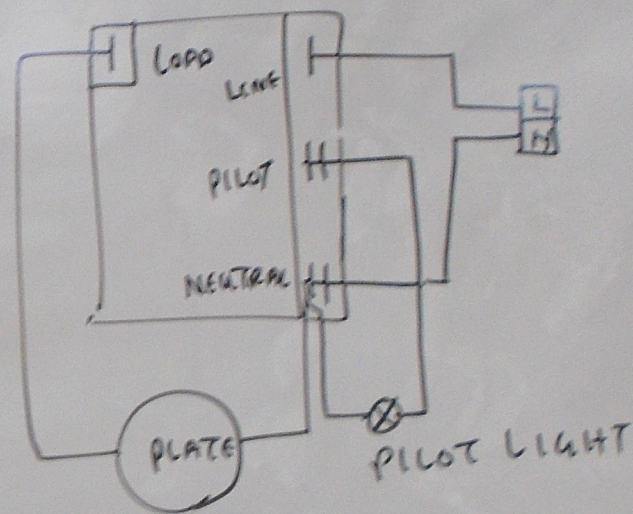
- (10) (a) AIR SOURCED HEAT PUMP
(b) TANKLESS WATER HEATER

(11) THE MAIN DISADVANTAGE ASSOCIATE WITH
AIR SOURCE HEAT PUMPS ARE LISTED
BELOW

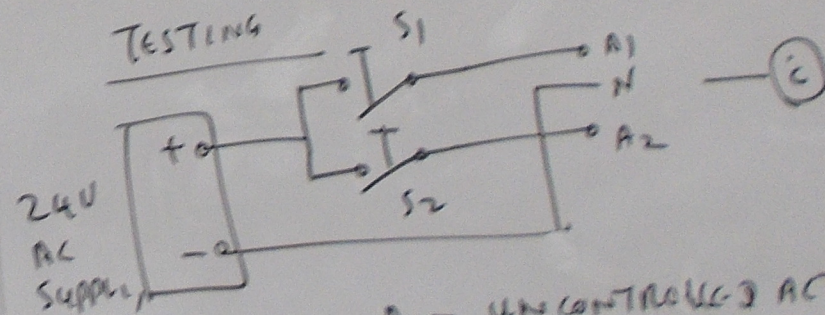
- LOWER HEAT SUPPLY COMPARED TO OIL
AND GAS BOILERS, SO LARGER RADIATORS
WOULD BE NEEDED.
- THEY PERFORM BETTER WITH UNDERFLOOR
HEATING (OR) WARM AIR HEATING AND
WORK MORE EFFICIENTLY WHEN COUPLED
WITH LARGER RADIATOR.

SIMMER STAT WIRING DIAGRAM

SUNVIC SIMMER STAT



TESTING



A₁ - UNCONTROLLED ACTIVE
A₂ - CONTROLLED ACTIVE

PROCEDURE

- APPLY A SMALL OIL
ON THE END OF
MOUNT IT INTO
THERMOSTAT SIDE
- ADJUST THE THERMOSTAT
BOTTOM THERMOSTAT
- TURN ON THE THERMOSTAT
- NOTE WHEN THE THERMOSTAT
INITIALS
- TURN OFF THE THERMOSTAT
THAT IS THE THERMOSTAT
OPERATING CYCLE
TEMPERATURE

PROCEDURE

- APPLY A SMALL QUANTITY OF HEAT SINK COMPOUND ON THE END OF DIGITAL THERMOMETER PROBE AND MOUNT IT INTO THE LUG PROTRUDING FROM THE THERMOSTAT SIDE OF THE PANEL
- ADJUST THE TOP THERMOSTAT TO 65°C AND BOTTOM THERMOSTAT TO 75°C
- TURN ON THE SUPPLY
- NOTE WHICH LAMP IS ON
INITIAL HEATING ELEMENT = TOP (OR) BOTTOM
- TURN OFF THE SWITCH CONTROLLING THE ELEMENT THAT IS NOT ON. THIS IS TO ALLOW THE OPERATING ELEMENT AND THERMOSTAT TO CYCLE ON AND OFF SO THAT THE TEMPERATURE RANGE OF THE OPERATING THERMOSTAT CAN BE MONITORED.

- MONITOR THE TEMPERATURE OF HEAT SINK. MEASURE WITH THERMOMETER AT WHICH THERMOSTAT TURN ON AND TURN OFF

CYCLE	Temperature $^{\circ}\text{C}$		DIFFERENCE $^{\circ}\text{C}$
	Turn off	Turn on	
1			
2			
3			
4			
5			
AVERAGE			

