

Non-domestic HVAC

Levels 3&4



EXCELLENCE
IN ENERGY
ASSESSMENT

1



EXCELLENCE
IN ENERGY
ASSESSMENT

Contents

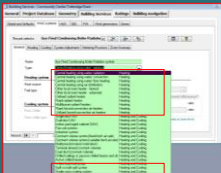
- Level 3 Systems
- No HVAC
- Power Factor
- Extract
- Ventilation
- Hot Water Systems
- Level 4 Systems
- Chillers
- Colour Codes

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Level 3 Systems

Level 3 Systems



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CENTRAL HEATING USING WATER

Radiators or Convectors



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Boilers



Modular atmospheric gas boiler
installation



Forced Draught Gas Boiler

Level 3 up to 95°C

96°C and over classed as MTHW or
HTHW – Therefore Level 4

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ASSESSMENT

Radiators



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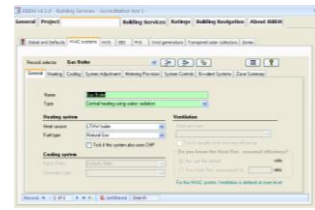
Convectors



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How to Enter In SBEM

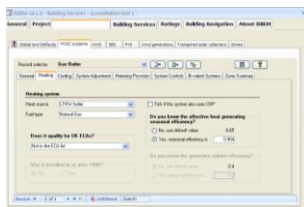


Building Services
↓
HVAC Systems Tab
↓
General Sub Tab
↓
Type in 'Name'
↓
Select 'Type' From
Drop Down List
↓
Select 'Heat Source'
from drop down list
↓
Select 'Fuel type'
from drop down list

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Entry into SBEM



Building Services
↓
HVAC Systems Tab
↓
Heating Sub Tab
↓
**Select 'Yes
seasonal efficiency
is'**
↓
**Type in Box
seasonal efficiency
as a decimal**

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LTHW Boiler Efficiencies

Convention 6.04

Type	Model number	Status
Date and day of last service	307057	Normal
Brand	Model name	Model quality
Manufacturer	Manufacturer	3D D-F

Board ID	47-439-02
Fuse	main fuse
SAT 2000-2012 annual efficiency (%)	89.6
SAT winter seasonal efficiency (%)	89.6
SAT summer seasonal efficiency (%)	89.6
Seasonal hot water efficiency (%)	89.6
SAT 2008 seasonal efficiency (%)	89.6
Efficiency category	SEER1000 based on certified data
Efficiency class	SEER1000
Rated power input	247.5
Rated power output	140
Electrical power when firing	140
Electrical power not firing	140

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LTHW Boiler Efficiencies
Convention 6.04[illegible]

11



No PCDB Data
SAP2005 Table 4b

Substr	Efficiency
Gas boilers (including LFG) in 1998 or later	71
Non-condensing (including condensing with automatic ignition)	71
Condensing (including condensing with automatic ignition)	73
Non-condensing (including condensing) with permanent pilot light	69
Non-condensing (including condensing) with permanent pilot light	67
Boiler losses	97
Gas boilers (including LFG) pre-1998, with fan-assisted heat exchanger	72
Non-condensing (including condensing with automatic ignition)	72
High or ultra-high thermal capacity	73
Costs	78
Condensing (condens)	80
Condensing	83
Gas boilers (including LFG) pre-1998, with balanced or open flue	
WGL condensing	69
Flue vented, pre-1978	67
Flue vented, 1979 to 1987	67
Costs	78
Boiler losses	97
Condensing Primary Heating Units (CPHUs) (include gas and LFG)	
Non-permanent pilot (non-condensing)	70
With automatic ignition (non-condensing)	74
Non-permanent pilot (condensing)	74
With automatic ignition (condensing)	73
Oil boilers	
Standard oil boiler gas (1987)	66
Standard oil boiler gas (1987)	66

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Boiler Identification

Balanced Flue

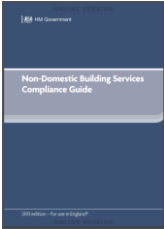


Fanned Flue



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Heating Control Credits



- Different tables for each heating technology
- Table 8 for Gas Boilers
- Maximum 4 Credits

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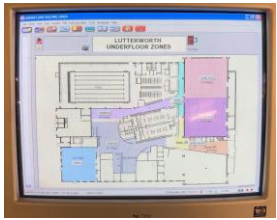
Heating Control Credits
(Gas example)

Table 8 Heating efficiency credits for measures applicable to boiler replacement in existing buildings		
Measure	Heating efficiency potential (%)	Comments
1. Boiler replacement (2.5%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
2. Modulation/condensing (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
3. Outdoor air reset (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
4. Weatherstripping (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
5. Thermostatic radiator valves (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
6. Radiator cleaning (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
7. Radiator painting (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
8. Radiator cover removal (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
9. Radiator relocation (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
10. Radiator replacement (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).

Table 8 Heating efficiency credits for measures applicable to boiler replacement in existing buildings (continued)		
Measure	Heating efficiency potential (%)	Comments
11. Outdoor air reset (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
12. Weatherstripping (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
13. Thermostatic radiator valves (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
14. Radiator cleaning (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
15. Radiator painting (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
16. Radiator cover removal (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
17. Radiator relocation (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).
18. Radiator replacement (2%)	2	Replacement of an existing boiler with a new condensing boiler of the same or greater capacity, with a minimum efficiency of 90% (Gross Efficiency) and a minimum seasonal efficiency of 85% (Gross Efficiency).

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Building Management System (BMS)



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Electric Boilers



Small wall mounted electric boiler



Floor mounted electric boiler

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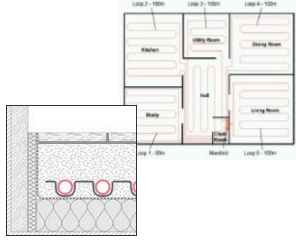


CENTRAL HEATING USING WATER
Floor Heating

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Wet under floor heating systems



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CENTRAL HEATING USING AIR DISTRIBUTION



20



Electric Warm Air Systems (off-peak)



21



Gas (or Oil) fired Warm Air Systems



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System Adjustment

Description:

Type:

Heating system

Heat source:

Heating fuel:

System also uses CHP: ☐

Does it qualify for ECAs:

Was installed on or after 1998: ☐

Effective seasonal efficiency: (HEAT-GEN-SEFF) Override

Heat recovery:

HEAT_REC_SEFF: Override ☐ Tick if variable heat recovery efficiency

System adjustment

Ductwork meets EN1 leakage standard: Override

AHU meets EN1 leakage standard: Override

Ductwork and AHU leakage: ratio

Specific fan power (SFP)(W/m³): Override

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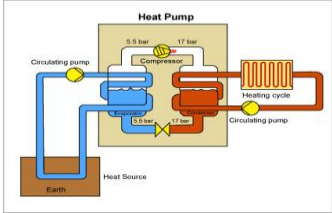


HEAT PUMPS



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Heat Pumps



Air, Ground and Water sourced heat pumps simply move energy from one place to another.

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Air Source Heat Pumps

Air to Water

Flow temperature s up to 65 deg c

Water pipes rather than refrigerant

May be supplying radiators, convectors or under floor heating.

Heat Pump (electric)

26

Ground Source Heat Pumps

Ground to Water

May be supplying radiators, convectors or under floor heating.

Heat Pump (electric)

Ground or water

27

Control Credits (Heat Pump)

Table 18: Heating efficiency credits for measures applicable to heat pump systems in existing buildings		
Measure	Heating efficiency credits (% points)	Comments
< 20% oversizing	2	The amount by which the maximum heat pump output exceeds the system heat output at design conditions, expressed as a percentage of that system heat output.
Optimized stop	2	A control system which stops plant operation at the earliest possible time such that internal conditions will not deteriorate beyond preset limits by the end of the occupancy period.
Full zone control	2	Allows each zone to operate independently in terms of start/stop time. Only appropriate where operational conditions change in different zones.
Monitoring and targeting	2	Means of identifying changes in operation or onset of faults.

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Variable Speed Pumps



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Variable Speed Pumps

If Variable Speed Pumps are present the assessor must choose from 3 options on the dropdown list.

- With differential sensor across pump
- With differential sensor in the system
- With multiple pressure sensors in the system

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LOCAL ROOM HEATERS



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elmhurst energy EXCELLENCE IN ENERGY ASSESSMENT Other local room heater - Unfanned



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elmhurst energy EXCELLENCE IN ENERGY ASSESSMENT Other local room heater – Unfanned
Electric Storage Heaters



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elmhurst energy EXCELLENCE IN ENERGY ASSESSMENT Other local room heater - Unfanned
Electric under floor heating systems



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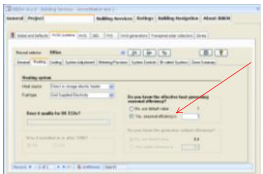
elmhurst energy EXCELLENCE IN ENERGY ASSESSMENT Electric Fan Heaters



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elmhurst energy EXCELLENCE IN ENERGY ASSESSMENT Electric Room Heaters

Note the default efficiency in iSBEM is 0.7 (assumes gas fuel)
Convention 6.03 states that all types of Electric Room heaters have an efficiency of 100% (1) Du



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FORCED CONVECTION AIR HEATERS
Flued and Unflued



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Free Standing



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High Level



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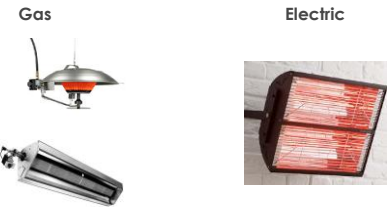
RADIANT HEATERS



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Un-flued Radiant Heaters



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Radiant Tube Heaters
Flued and Un-flued



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Multi-Burner Radiant Heaters



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COOLING

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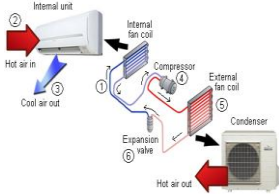


Single Room Cooling Systems



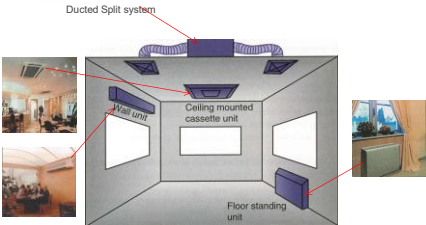
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Split Systems



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Split Systems
Indoor Unit Options



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Multi-split

- Single external unit serving several zones
- Multiple internal units
- Similar in appearance to single split
- Larger capacity units
- Trace pipes
- Multiple pipe manifold (more pipes)
- Classify as "Split or multi-split system" in ISBEM



Three pairs of pipes would indicate three indoor terminal units, perhaps in different zones

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Ducted split

- Single external unit serving a 'fan coil' unit
- Ducted to room diffusers
- Still include as "Split, Multi-split" or VRF



Refrigerant pipework (not water)

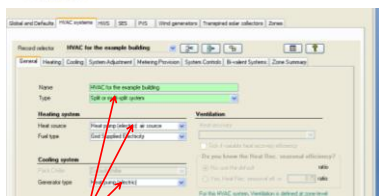
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Variable Refrigerant Flow Systems (VRF/VRV)



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Entering into SBEM



Select: Split or Multi-split, Heat Pump air source, Heat pump electric

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Calculating Efficiency

STARTING CURRENT		5	A
CAPACITY	COOL	28.0	kW
		31.5	kW
INPUT	(OUTDOOR UNIT ONLY) COOL	124 - 124	kW
		9.2 - 9.2	kW
CURRENT	(OUTDOOR UNIT ONLY) COOL	21.0 - 20.0	A
		15.7 - 14.3	A
REFRIGERANT: R-22		11	kg

$$\text{EER} = \frac{\text{Output capacity}}{(\text{cooling}) \text{Input}} = \frac{28\text{kW}}{12.4\text{kW}} = \mathbf{2.26}$$

$$\text{COP (heating)} = \frac{\text{Output capacity}}{\text{Input}} = \frac{31.5\text{kW}}{9.2\text{kW}} = \mathbf{3.42}$$

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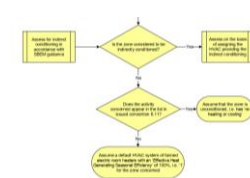
NO HVAC



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No Heating or Cooling

Convention 6.11/6.13/10.06

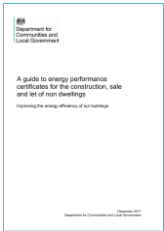


- Indirect conditioning (6.13)
 - **This takes priority over unheated**
 - At least 50% of elements adjacent to conditioned space
- Allowed unheated activities (6.11):
 - Circulation Areas
 - Plant-rooms
 - Store rooms and Warehouse Storage
 - Industrial process area
 - Car park
 - B1 Workshops
 - Toilet (only if there are no other zones in the building that have an expectation of conditioning)

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Unconditioned Buildings

- No HVAC – building is exempt from EPC
- Voluntary EPC is acceptable if required
- Addition of new part (designed or altered to be used separately) can also be triggered by HWS
- Shell and Core new builds – follow L2A

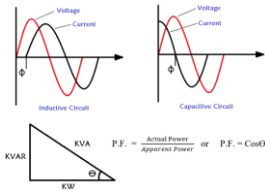


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Power Factor

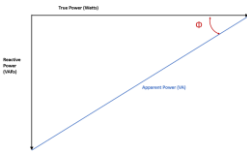
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Electric Power Factor



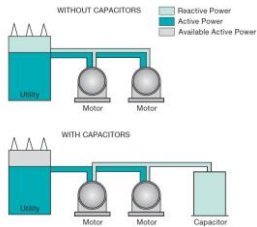
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Electric Power Factor



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Power Factor Correction



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Power Factor Metering
Convention 5.01



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Mechanical Ventilation



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Mechanical Ventilation

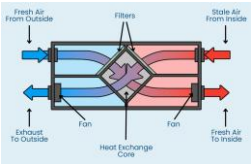


- Zone-based Ventilation
- MVHR
- Central Heating with Air Distribution
- Air conditioning with Air Distribution

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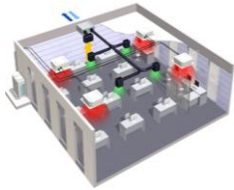
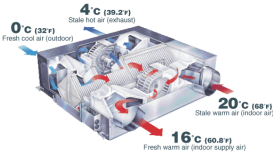
MVHR



69



MVHR



70



Plate Heat Exchanger



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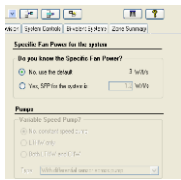


MVHR Evidence



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SFP on Ventilation Systems



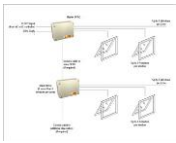
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High Pressure Drop



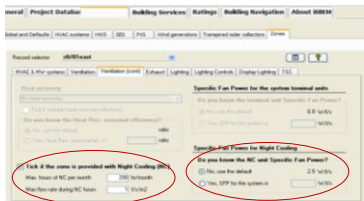
80

Night Ventilation (L4)



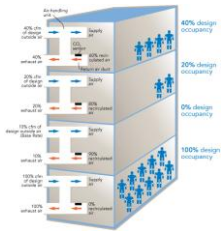
81

Night Ventilation (L4)



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Demand Controlled Ventilation (L4)



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Ventilation with Enhanced Thermal Coupling to Structure (L5)



Night time ventilation strategy

Night time ventilation strategy with enhanced thermal coupling

Area exposed for cooling = length x width (top and bottom surfaces)

Area exposed for cooling = length x width (top and bottom surfaces) PLUS circumference of oval voids x length x no of ovals

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Domestic Hot Water



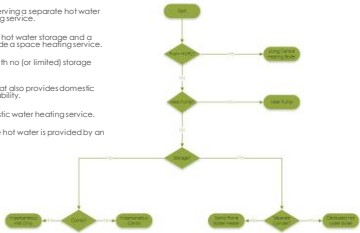
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Hot Water Systems

- » **Dedicated hot water boiler:** A heat generator serving a separate hot water storage unit. It does not provide a space heating service.
- » **Stand-alone water heater:** A unit that combines hot water storage and a heat generator in a single unit. It does not provide a space heating service.
- » **Instantaneous hot water only:** A water heater with no (or limited) storage capability.
- » **Instantaneous combi:** A space heating boiler that also provides domestic water heater with very small or no storage capability.
- » **Heat pump:** A heat pump providing only domestic water heating service.
- » **Same as HVAC System:** Choose this option if the hot water is provided by an existing HVAC system.



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Storage Losses

Convention 6.06

- » In SBEM Storage Losses for DHW Storage vessels must be entered in MJ/month.

$\text{kWh/day} \times 109.5 = \text{MJ/month}$



- » Where storage losses are not available first try to measure the insulation
 - » $\leq 10\text{l}$ 10mm
 - » $\leq 50\text{l}$ 25mm
 - » $>50\text{l}$ 50mm
- » For unvented units use factory fitted insulation:

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Level 4 Systems



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System Definition

SBEM Description – Constant volume system (fixed fresh air rate)

An all-air system in which the volume of supply air is fixed.

Assumed to also provide heating, possibly also with separate perimeter heating system.

If provided with local reheat capability use the "Terminal reheat (constant volume)" system.

This category includes packaged rooftop units.

- » Simple description
 - » What does it look like?
 - » How does it work?
- » How to enter in SBEM
 - » What assumptions does SBEM make?
 - » What options does it have?
- » What evidence do I need?

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Evidence

Central	Distribution	Zone
» Boilers	» Water Pipes	» Vents
» Heat Pumps	» Gas Pipes	» Terminal Units
» Chillers	» Ductwork	» Fan-coils
» Air Handling	» Cables	
» Drives		

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CONSTANT VOLUME SYSTEMS

Fixed air flow, variable air temperature



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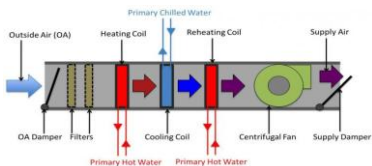
Air Handling Unit



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Air Handling Unit



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Constant Volume (CAV)

SBEM Description – Constant volume system (fixed fresh air rate)

An all-air system in which the volume of supply air is fixed.

Assumed to also provide heating, possibly also with separate perimeter heating system.

If provided with local reheat capability use the "Terminal reheat (constant volume)" system.

This category includes packaged rooftop units.

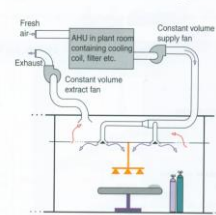
- The Simplest System
- Air is heated or cooled in the AHU, then fed through ducts to the zones
- Typically found on smaller installations
- Default option if system unknown

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Constant Volume (CAV)

Simple constant volume air-conditioning system



Some of the supply and return ductwork for a CAV system providing the ventilation to a building cooled by chilled beams. The small diameter round ductwork shown is typical of this type of CAV system and can be found in the ceiling voids of many buildings with partially controlled air-conditioning systems.

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Constant Volume (CAV)



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CAV Evidence

- Central
- Distribution
- Zone
- Boiler
 - Chiller
 - Air Handling
 - Plant may be in a packaged unit

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CAV - Variable

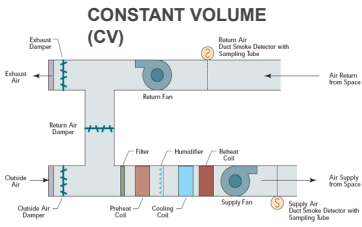
SBEM Description -Constant volume system (variable fresh air rate)
Constant volume system in which the proportion of fresh air can be varied to limit chiller operation ("free cooling economiser").

- CAV with Recirculation

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CAV - Variable



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CAV (Variable) Evidence

- Central
- Distribution
- Zone
- Boiler
 - Chiller
 - Air Handling
 - Evidence of recirculation
 - Plant may be in a packaged unit

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OBSOLETE

Multi Zone (Hot Deck / Cold Deck)

SBEM Description – Multi-zone (hot deck/cold deck)
A central air handling unit has separate hot and cold decks.
Mixing takes place at the Air handling unit and air is supplied to each zone through a single duct per zone.
Assumed to also provide heating, possibly also with separate perimeter heating system.

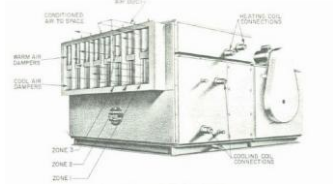
- "Double deck" AHU produces hot air and cold air simultaneously.
- Air is then mixed and ducted to each zone separately.

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OBSOLETE

Multi Zone (Hot Deck/Cold Dec)



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Hot Deck/Cold Deck Evidence

- | Central | Distribution | Zone |
|---------------------------|------------------------------|-------|
| Boiler | Lots of Ductwork | Vents |
| Chiller | Separate ducts for each zone | |
| Complex Air Handling Unit | | |

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Terminal Reheat

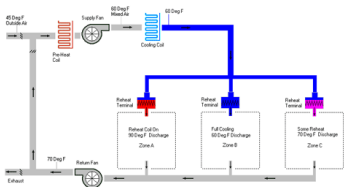
SBEM Description – Terminal reheat (constant volume) :
Cooled air is supplied centrally and reheated locally to the desired supply temperature for each zone.
Assumed to also provide heating, possibly also with separate perimeter heating system.

- Simply a CAV with electric reheat in “terminal units” in the zone

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Terminal Reheat



105



Terminal Reheat



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Terminal Reheat Evidence

- | Central | Distribution | Zone |
|--------------|-------------------------|-------------------------|
| Boiler | Ductwork | Terminal Units - Reheat |
| Chiller | Electrical supply - MCB | Thermostat |
| Air Handling | | |

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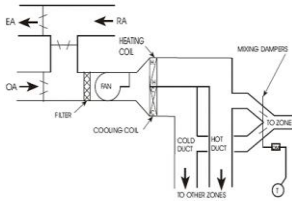
Dual Duct

SBEM Description – Dual duct (constant volume)
Hot and cold air are distributed separately - commonly at high pressure - and locally mixed to provide the desired supply temperature for each zone.
Assumed to also provide heating, possibly also with separate perimeter heating system.

- CAV with separate hot and cold supply ducts
- Terminal mixing units provide correct temperature in zone

108

Dual Duct



109

Dual Duct



110

Dual Duct Evidence

- | Central | Distribution | Zone |
|--------------|--------------------------------|-------------------------|
| Boiler | Separate Hot and Cold Ductwork | Terminal Units - Mixing |
| Chiller | | Thermostat |
| Air Handling | | |

111



VARIABLE VOLUME SYSTEMS
Variable air flow, fixed air temperature

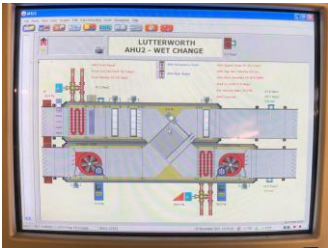
112

Variable Speed Drive



113

Evidence in BMS



114

Single Duct VAV

SBEM Description – Single-duct VAV
An all-air system in which the volume of supply air is modulated to match the cooling demand.

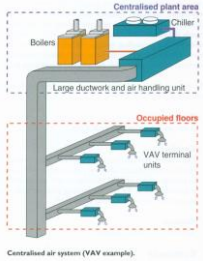
May have reheat capability.

Assumed to also provide heating, possibly also with separate perimeter heating system

- AHU can vary fan speed using inverter.
- Terminal units control volume of air entering each zone.

115

Single Duct VAV



116

Single Duct VAV

Name: HVAC for the example building
Type: Single duct VAV
Heating system: Heat source: Gas boiler
Cooling system: Coolant type: Air cooled chiller
Ventilation: Heat recovery: Pipe heat exchanger (Pre-generator)
Do you know the Heat Rec. seasonal efficiency? No, use the default 0.05 ratio

Gas boiler supplying heat to the system
Single duct VAV
Air (or water) cooled chiller providing cooling
May have heat recovery

117

Single Duct VAV



118

Single Duct VAV Evidence

- | Central | Distribution | Zone |
|------------------|--------------|-------------------------------------|
| • Boiler | • Ductwork | • Terminal Units - VAV |
| • Chiller | | • Thermostat |
| • Air Handling | | • Possibly humidistat or CO2 sensor |
| • VSD / Inverter | | |

119

Dual Duct VAV

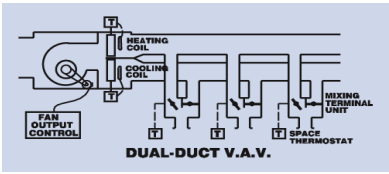
SBEM Description - Dual-duct VAV
A VAV system with separate supply of hot and cold air.

Assumed to also provide heating, possibly also with separate perimeter heating system

- VAV with separate hot and cold supply ducts
- VAV mixing units provide correct air volume and temperature in zone

120

Dual-duct VAV



121

Dual Duct VAV Evidence

- | Central | Distribution | Zone |
|----------------|--------------------------------|-----------------------------------|
| Boiler | Separate Hot and Cold Ductwork | Terminal Units - VAV |
| Chiller | | Thermostat |
| Air Handling | | Possibly humidistat or CO2 sensor |
| VSD / Inverter | | |

122



Indoor Packaged Cabinet

SBEM Description - Indoor packaged cabinet (VAV)

Local cooling/heating unit. May supply air directly into room, into under floor void, or into ceiling void.

May have terminal units with variable local recirculation rate.

May have electrical trim heater.

Volume of air handled is sufficient to handle all the cooling load.

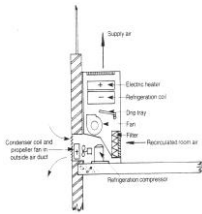
Assumed to also provide heating, possibly also with separate perimeter heating system.

- “VAV in a box”
- Similar to Single Room Cooling, but provides ventilation.

123



Indoor Packaged Cabinet



124

Indoor Packaged Cabinet Evidence

- | Central | Distribution | Zone |
|---------|----------------|----------|
| None | Local Ductwork | IPC Unit |



CHILLED WATER DISTRIBUTION SYSTEMS

125

126

(CHW) Fan Coil Systems

SBEM Description – Fan coil systems

Local fanned terminal units in ceiling, on wall or on floor, with a central chilled water supply.

Systems may be 2-pipe, 3-pipe or 4-pipe, changeover or non changeover - no distinction is made here.

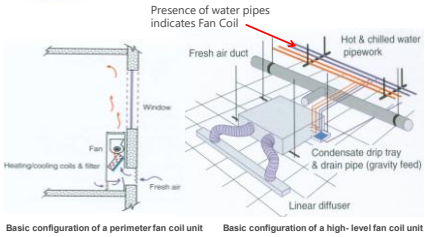
Assumed to also provide heating.

Zonal ventilation is no longer available for fan coil units. Ventilation for this HVAC type is defined at HVAC level.

- Air and Water Distribution
- Air is conditioned centrally
- Temperature is set by the local fan-coil unit
- Beware confusion with split systems

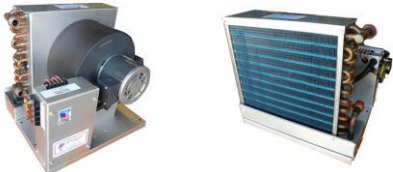
127

Fan Coil Systems



128

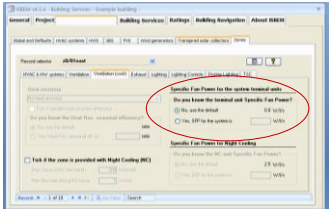
Fan Coil Systems



Typical single-evaporator chilled water fan coils

129

SFP on Terminal Units



130

Fan Coil Evidence

Central

- Boiler
- Chiller
- Air Handling

Distribution

- Ductwork
- Hot and Cold Water Pipes

Zone

- Fan-Coil Unit
- Thermostat
- Possibly humidistat or CO2 sensor

131

OBSELETE

Induction System

SBEM Description – Induction system

Air is supplied from a central unit, commonly at high pressure. This induces a secondary airflow within the terminal unit to achieve an acceptable delivery temperature.

Final heating or cooling is provided by heat exchangers within the terminal.

Systems may be 2-pipe, 3-pipe or 4-pipe, changeover or non changeover - no distinction is made here.

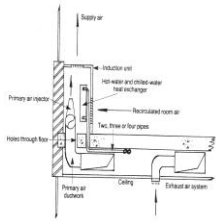
Assumed to also provide heating.

- High pressure air "induces" flow through the unit
- No fan
- Heated and cooled with coils

132

OBSOLETE

Induction System



133

Induction Evidence

- | Central | Distribution | Zone |
|----------------------------|--------------------------|----------------|
| Boiler | Small Ductwork | Induction Unit |
| Chiller | Hot and Cold Water Pipes | |
| High Pressure Air Handling | | |

134

Chilled Ceilings
Passive Chilled Beams

SBEM Description - Chilled ceilings or passive chilled beams and displacement ventilation

The combination of a chilled ceiling (or passive chilled beam) system with a separate low-level, low volume supply of cooled ventilation air.

Heating assumed to be by separate LTHW system.

The default assumption is that there is displacement ventilation

- Chilled ceiling
- Cold beams on ceiling

135

Chilled Ceilings



136

Passive Chilled Beams



137

Chilled Ceiling/Beam Evidence

- | Central | Distribution | Zone |
|------------------------------|------------------|--|
| Chiller | Cold Water Pipes | Perforated ceiling tiles with heavy duty frame |
| Usually Air Handling | Ductwork | Beams and/or pipes |
| Usually separate LTHW system | Hot water pipes | |

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Active Chilled Beams

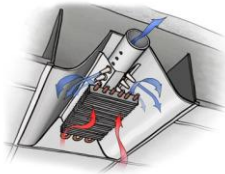
SBEM Description – Active chilled beams
Chilled beams which include the provision of cooled air from a central source, typically operating as an induction system.
May include local fans.
Heating assumed to be by separate LTHW system.

- Combination of chilled beam technology with induction.

139



Active Chilled Beams



140



Active Chilled Beam Evidence

Central

- Chiller
- High pressure AHU

Distribution

- Cold Water Pipes
- High Pressure Ductwork

Zone

- Beams with ductwork

141

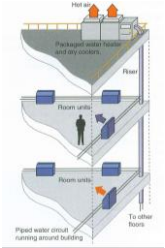
Water Loop Heat Pump

SBEM Description - Water loop heat pump
Local heat pumps are served by a common water circuit to or from which they can reject or extract heat.
Central cooling and heating plant provides the net heat or cooling input to this circuit.
Assumed to also provide heating.

- Temperature controlled water loop around building
- Local water source heat pumps draw heat or cold to zones

142

Water Loop Heat Pump



Room based Heat Pumps (Versatemp system)

143

Water Loop Heat Pump Evidence

Central

- Boiler
- Chiller
- or-
- Air to water heat pumps

Distribution

- Single water loop

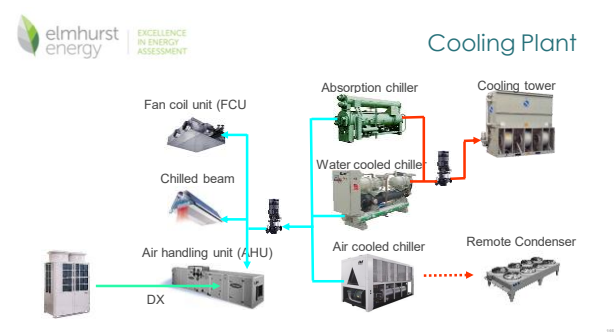
Zone

- Water to air heat pumps

144



145



146



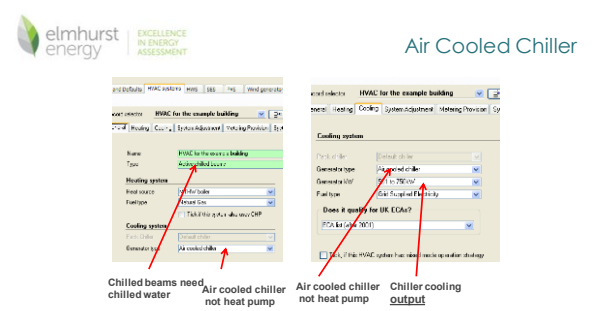
147



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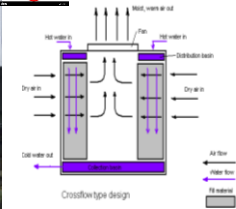


149



150

RARE Water Cooled Chillers
(indicated by Cooling Towers)



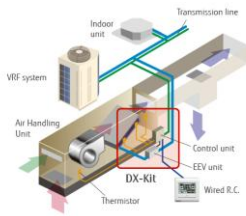
151

Remote Condenser Chiller



152

Heat Pump
(Direct Exchange – DX)



153

Pipework Colour Coding

Pipe Location	Block 10 Corridor	Corridor Levels 10	Block 10 Corridor
Water			
Hot Water			
Cold Water			
Steam			
Condensate			
Refrigerant			
Gas			
Oil			
Acid			
Alkaline			
Other			
Refrigerant Services			
Refrigerant Gas			
Refrigerant Oil			
Refrigerant Acid			
Refrigerant Alkaline			
Refrigerant Other			
Other			
Other			
Other			



154

Ductwork Colour Coding



155