GD08 Residential Systems

UNIVERSITY OF LEICESTER

Document Control

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Design Guidance

1. Residential developments, whether private dwellings or student accommodation shall be designed to all relevant and applicable standards. There is, however, an acknowledgement by the University Estates team that consideration may be given to utilising alternative products and methods of installation that are more suited to the construction nature and usage profile of a residential development. Such systems are outlined within this guide as appropriate.
2. The utility infrastructure serving any multi-residential development shall be designed such that commercial monitoring of the energy performance is possible and may be utilised to promote building usage targets amongst the building occupants. Cluster apartments shall be separately metered to ensure targets are manageable and may be influenced by the collective group of occupants to better manage the residential 'unit' performance. Where multi-residential facilities are provided with studio apartments, these shall be grouped as 'cores' or 'wings' so that data may be analysed and utilised for the purpose of energy betterment. For all metering systems applicable to residential properties, refer to GD05 – Utility Management.
3. It is imperative that the early design development fully considers the building fire strategy insofar as the requirements of early warning detection and extinguishant systems are considered at the appropriate stage whereby, design mitigation measures may preclude the use of such automatic extinguishant systems and detection is designed to promote simplicity in terms of maintenance and operation as part of the escape strategy.
4. The Fire alarm Cause & Effect is an essential document that will be required to be developed by the designer as part of the fire risk assessment for sleeping accommodation in line with all system principle proposals. The C&E document shall be presented and agreed with the University Fire Officer during concept design stage.
5. Where multiple floors, cores or blocks are provided with networked Fire alarm systems, each area or zone that is intended to operate independently shall be provided with a networked Fire alarm repeater panel. The Cause & Effect matrix shall be agreed in principle during design stage and finalised during commissioning with the local building control and University Fire Officer. Detailed appraisal of the fire strategy solution shall be expected as part of the automatic detection systems to ensure the evacuation strategy is fully considered and nuisance alarms are negated as far as reasonably practical. This includes the risk assessment of a stay put strategy, removal of manual call points and the provision of sprinkler systems within sleeping accommodation, to better manage the risk to life whilst providing a practical solution to the evacuation of a residential development.
6. USB socket outlets should consider being wired on a separate circuit to the general power to facilitate ease of future insulation resistance testing where electronic devices may be adversely affected. This should be considered throughout the residential developments where only few USB sockets are being provided.
7. USB socket outlets shall be capable of delivering 2A at 5V from both ports simultaneously and shall not share the output current between ports. Where a shared output current is provided, this shall be a minimum of 3A between the two ports. Where USB ports are provided, these shall be capable of dynamic or intelligent power delivery to ensure safety of supply to the connected devices.
8. Heating installations shall follow the requirements of MS01. These standards are particularly relevant to large scale student residences where centralised heating systems are used. However, there are instances where there are small scale University residences which only require small domestic boilers. In these instances, standard system or combination boilers may be proposed.
9. The default pipework material for all heating installations in residential buildings is steel pipework, unless it is agreed early in the design stage that soldered copper pipework can be used. There may be in instances where an

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existing heating system is being refurbished or it isn't practical to install steel pipework. In these instances, copper pipework proposals may be presented to the University for approval. For systems less than 30kW soldered copper pipework may be utilised.

10. The Domestic Water installation shall generally follow the requirements MS04.
11. Circulated hot water systems shall be implemented wherever possible. Hot Water System dead legs shall be eliminated as part of the design; however, it is observed in some instances where combi boilers are used that secondary returns cannot be implemented. In these instances, the hot water system shall be designed to ensure 55°C water temperature is achieved at the furthest outlet within 60 seconds. This only applies to domestic systems less than 30kW.
12. Where the domestic cold-water storage requirements are low i.e. below 1000 litres and storage provisions are via single cold-water storage tank, a delayed action type ball valve should be used. These shall be Keraflo Aylesbury type valves which are fully height adjustable.
13. Where Electric Heating is proposed to be used the following will be adhered to...
    - The panels shall be robust design fully suitable for the locations that they are being installed.
    - Wall mounted design complete with manufacturer supplied wall brackets. Fixings to incorporate wall bracket allowing the heater to hinge forward for decorating or cleaning with hinge incorporating locking facility for safety.
    - Complete with built in overload protection.
    - Complete with automatic resetting overheat protection to prevent the surface and internals from overheating.
    - Provided with warning symbol advising that the heaters are not to be covered
    - Class 2 double insulated and splash proof IP24.
    - Integral silent electronic thermostat for local temperature control.
    - Integral thermostatic control for set point adjustment.
    - User temperature adjustment with tamperproof upper and lower temperature limits.
    - Installed and tested fully in accordance with the manufacturers recommendations.
14. Ventilation systems shall be designed and installed in line with the requirements of MS05 where standard commercial ventilation installations are required in student residencies i.e. residential communal areas such as reception areas, large common rooms etc.
15. Where mechanical ventilation is provided to small residences / residential properties this shall be designed to meet the requirements of Building regulations Part F and CIBSE.
16. The use of heat recovery systems for all residences is the preferred method of ventilation where economically viable. Decentralised Local Extract Systems are the least favoured. Decentralised extract systems shall only be considered if ductwork routes cannot be accommodated or if it isn't economically viable to install a ducted system. The use DMEV systems shall be agreed with the University Estates at concept design stage.
17. Where ventilation is provided via natural or mixed mode provisions, the occupied space comfort temperature should comply with the criteria set out in CIBSE TM59 for all student residences / sleeping accommodation. This guidance benchmarks internal dry resultant temperatures against maximum adaptive temperatures created in the CIBSE 'design summer year' weather data
18. Mechanical extraction must be provided to kitchens, cloak rooms, utility rooms, service cupboards containing washing machines, bathrooms en-suites and toilets
19. Where whole house ventilation type units are being used, supply air shall be distributed into Bedrooms and living spaces if these are present.
20. Ductwork velocities shall not exceed 4m/s when the whole house systems are operating in non-boost mode.
21. The maximum pressure drops on ductwork shall be limited to 1 pascal per metre run on supply and extract systems.
22. Plastic ductwork installations may be used in small residential applications in all other cases the ductwork shall be installed in galvanised steel.

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Design Components

Item	Manufacturer	Comments
LV Distribution	Schneider Isobar P Hager	All LV distribution shall be installed in accordance with ES01 with particular reference made to the following section where appropriate to residential systems only. LV Switchgear for all residential developments shall incorporate Arc Fault Detection Devices (AFDD) as standard. The most appropriate measure deemed applicable in terms of cost and practicality shall be installed until such time that the industry standard facilitates the use of combined RCBO/AFDD devices. Single module devices are preferred with separate proprietary enclosures provided to house AFDD and surge devices. Due to the performance limitations of an AFDD within a ring final circuit, power circuits shall be provided to utilising 32A 4.0mm or 20A 2.5mm radial circuits throughout final dwellings. Power outlet quantities shall be restricted to 8No. and 5No. respectively. Alternatively, a detailed assessment of earth leakage limitations shall be considered to determine the maximum permitted outlet points per circuit.
Cabling	Pirelli	BS6242 LSZH cabling may be utilised for all wiring within individual dwellings. Where multi residential properties are designed and constructed, a detailed assessment shall be made in respect of wiring the systems within dwellings using BS6491 LSZH singles and conduit as a mixture of cabling passing through the landlord areas will require dual containment systems and may be cost prohibitive. BS6242 LSZH cabling may not be used in surface installation methods. For all surface installations, traditional BS6491 LSZH cabling in conduit shall be used in line with ES02 It is imperative however that landlords' systems are wired in BS6491 LSZH singles in fully enclosed containment systems. Containment shall be fully accessible in landlord areas to facilitate future maintenance and adaptation. Where existing properties are part refurbished, cabling types shall match that of the existing installation, avoiding junction boxes by rewiring circuits to accommodate.

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Design Components

Item	Manufacturer	Comments
Containment & Supports (final flexible wiring)	Fischer Fixings	Where cabling within residential properties utilises twin and earth or domestic style wiring methods, cable containment shall fully consider the IET wiring regulations in relation to premature collapse of cable retaining structures/ containment. Where it is deemed that cabling above plasterboard ceilings is effectively fire rated, more simple means of cable containment may be utilised over traditional metal cable basket such as the following products.  **Cable Clasp KB**  **Cable Harness SHA** Proprietary cable fixing methods must be used for all cabling systems, site applied methods such as tie-wraps and all band must not be used For all cable looms installed within landlord areas and for those greater than 6 cables, traditional bracketry and basket containment methods shall be utilised throughout.
Containment & Supports (Landlords Primary & Secondary distribution)	Simplex Davis Swifts	Conventional containment and wiring methodology shall be provided throughout the landlord's areas to suit the preferred wiring methods. Where internal landlord areas are present, cabling containment shall be provided to suit single core cables in a trunking and conduit solution. Refer to ES02 for conventional cable containment arrangements.

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Design Components

Item	Manufacturer	Comments
Small Domestic Hot Water Calorifiers Vented and Unvented in small residences i.e. houses	Worcester Bosch Heatrae Sadia OSO Water Heaters	• Compliant with Commission Regulation EU No. 811/2013 and certified as energy rating of B or better (i.e. A, A+, A++ or A+++). • The overall support casing shall be manufactured from copper or stainless steel and shall be suitable to accept the installation of a proprietary removable insulation jacket that shall insulate all hot surfaces. • All components shall be WRAS approved. • Incorporate a secondary hot water return connection. Connecting the secondary hot water return into the cold feed will not accepted. • Provision for backup electric immersion heaters • Destratification pumps must be used on any calorifier exceeding storage of 150 litres. • Complete with pressure relief safety valve and combined temperature and pressure relief safety valve. (Applies to unvented systems) • Complete with automatic anti-vacuum valve, drain valve and automatic air vent valve – all valves shall be per 'General Installation Standards' section of this specification. • Temperature and pressure gauges. • Fully compliant with requirements of Pressure Safety Regulation and Pressure Equipment Regulations especially for provision of inspection access for the annual 'written scheme of examination'. • Fully thermally insulated and shall be fully compliant with the non-domestic building services compliance guide. • Where the calorifier is located in an occupied area (including cupboard / riser surrounded by occupied areas) the calorifier shall additionally be insulated with an increased thickness insulation jacket to minimise heat loss contribution to avoid summertime overheating.

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Design Components

Item	Manufacturer	Comments
Heating Installation System / Combi Boilers (Decentralised) within small residences i.e. houses (<30kW)	Worcester Bosch Vaillant Baxi Weissman	Boilers installation shall be fully compliant with BS5978 and BS6798. All boilers to have a seasonal efficiency of domestic boiler in UK (SEDBUK) to be Band A. Nox rating to be less than 40mg/kWhr if BREEAM is applicable this shall be less than 24mg/kWhr. All boilers shall come complete with a system filter and condensate neutraliser. Routing of condensate pipework externally shall be avoided where this isn't possible pipework shall be trace heated or other measure implemented such as a 'CondenseSure 'system offered by Worcester Bosch. Heating Controls shall be provided with a tamper-proof 7-day heating and hot water controller. A wall mounted thermostat shall be utilised for providing temperature control within the accommodation. Boiler flue systems shall be supplied by the manufacturer and shall be installed in accordance with their guidance and current building regulations. Discharge positions shall be fully in accordance of approved document J.

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Design Components

Item	Manufacturer	Comments
Ventilation		Ventilation installations shall generally follow the requirements MS05. Typical Domestic Ventilation Rates listed below (refer to the latest version of Part F for further details): **Continuous Ventilation Rates when using MVHR Units** **Bathrooms / Ensuite** Boost Extract Ventilation 8 l/s **Bedrooms** Mechanical Supply Ventilation balanced with extract rates **Kitchens** Boost Extract Ventilation 13 l/s **Living / Dining Rooms** Mechanical Supply Ventilation balanced with extract rates **Utility Cupboards** Boost Extract Ventilation 8 l/s **Communal Circulation** Mechanical Supply Ventilation not required unless overheating model advises of an overheating risk. **Intermittent Extract Ventilation Rate Rates** **Bathrooms / Ensuite** Extract Ventilation 15 l/s **Bedrooms** N/A when using extract only systems **Kitchens** Extract Ventilation 30 l/s adjacent to to hob, or 60 l/s elsewhere **Living / Dining Rooms** N/A when using extract only systems **Utility Cupboards** Extract Ventilation 30 l/s **Communal Circulation** Mechanical Supply Ventilation not required unless overheating model advises of an overheating risk. Note: Table 5.1b of Part F1 shall be referred to ensure whole dwelling ventilation rates are complied with. Minimum extract ventilation rates for all rooms shall be in accordance with Building Regulations Part F Purge Ventilation to be provided to all dwelling habitable rooms and shall comply with Part F1 guidance.

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Ductwork in small residences i.e. Houses	Nuaire Vent Axia Polypipe Domus	Where MVHR systems are used Ductwork shall be flat ductwork: • For example, these systems shall either be 200mm x 60mm or 220 x 90mm. Larger aspect ratios will not be considered. • Sharp 90° bends in ductwork shall be avoided. • All ductwork shall be designed and installed in line with manufactures recommendations and the domestic ventilation compliance guide • Ductwork passing the fire compartment line shall be avoided. Where this unavoidable ductwork shall have fire or fire and smoke dampers as appropriate • Cold ducts and exhaust shall be insulated using a minimum of 35mm diffusion resistant insulation with a thermal conductivity of 0.033 W/mK or below.
Mechanical Heat Recovery Units (MVHR) in Small Residences	Nuaire Vent Axia	• Unit Shall be sized to comply with Part F and Part L requirements • Fully insulated to provide good thermal and acoustic characteristics. • Multi Plate Counter Flow High Efficiency heat exchanger block with a thermal efficiency in excess of 75% • Automatic Summer Bypass Mode • G4 filtration minimum on the intake of the unit and return air to the unit • Motors suitable to operate at 40°C ambient air • Utilise Low energy, high efficiency EC fan/motor assemblies. • Each ventilation unit shall vary its speed and therefore the ventilation rate, as it receives signals from the switched live signal from light / remote switches or any ancillary sensors. When signals are received, the fan shall alter its speed to adjustable, normal and boost rates. • Units shall have a PCB capable of the following 1. independent control of background and boost supply and extract flow rates. 2. Fan failure indication. 3. S/L terminal for boost remote switch 4. Heat Exchanger Frost Protection • 5 year Warranty required The use of MVHR units are the preferred method of ventilating Residences these shall always be considered as the first option for ventilating any residences.

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Centralised Whole House Extract System (CMEV)	Nuaire Vent Axia	Central Extract Ventilation systems shall provide extract ventilation to all sanitary, kitchen and utility areas within dwellings the units shall be: • Typically located within utility cupboards for access • Designed to have maximum SFP of 0.07 W (m3/h) dependant on SAP assessments • Provided with integral humidistat and boost within kitchen areas • Provided with integral back draught dampers. • Provided with High Efficiency centrifugal fans
Decentralised Local Extract Systems (DMEV)	Nuaire Vent Axia	Fans Shall be: • CE Certified and Marked • Supplied with DC motors to minims energy consumption • Supplied with backdraught damper / shutters • Provided with at least two speed operation. Low Speed for normal operating mode during occupied hours. When occupancy / demand is detected in the space boost mode shall be operated. • Provided with local control and fan status LED monitoring
General Power (minimum requirements for power provisions)	MK (Logic Plus)	**Living area** – 5No. TSSO incl. 2No. with USB charging points plus a multimedia wall plate for TV/AV incl. 2No TSSO **Kitchen** – 4No. General TSSO (+ all fixed equipment req.) **Bedroom** – 3No. TSSO incl. 1No. with USB charging points **Circulation** – 1No. SSSO every 5m **Stores** – 1No. TSSO
Lighting (dwellings)	Enlite (Aurora)	**Living area** – E Series LED fixed downlight with IP bezel **Kitchen** – E Series LED fixed downlight with IP bezel **Bedroom** – E Series LED fixed downlight with IP bezel plus LED desk lamp for task based lighting **Circulation** – E Series LED fixed downlight with IP bezel **Bathroom** – E Series LED fixed downlight with IP bezel **Stores** – Utilite LED Bulkhead Note: Where no ceiling voids are present, surface mounted Utilite LED bulkheads shall be used throughout. All landlord areas shall be provided with lighting to suit the requirements of ES04

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Item	Manufacturer	Comments
Lighting Control	MK (Logic Plus) Ex-Or (Honeywell)	**Living area** – Manually switched lighting controls with automatic absence detection via mains wired localised PIR **Kitchen** – Manually switched lighting controls **Bedroom** – Manually switched lighting controls **Circulation** – Automatic PIR presence-controlled lighting **Bathroom** – Automatic PIR presence-controlled lighting **Stores** – Automatic PIR presence-controlled lighting Note: Where PIR presence detection is provided in areas of ambient daylight, it is expected that all lighting will be dimmable and reduced in level to maximise energy efficiency. Zigbee or other RF technology for switching may be considered where Kinetic technology is utilised, however battery systems shall not be used in lieu of hard-wired lighting controls.
Emergency Lighting	Thorlux Scanlight P4 Fastel Aurora?	All Emergency lighting shall be provided in accordance with Guide ES05. This shall be adhered to for all emergency lighting provisions throughout both Landlord and dwelling areas in conjunction with the fire strategy. Risk assessments shall be made in respect of EM lighting within individual apartments or dwellings to determine the most appropriate locations of all fittings. It is imperative that the placement of such luminaires, particularly in sensitive areas such as DDA bedrooms do not impact on the use of such room due to the bright charging indicator LED's within an area of sleeping accommodation.
Fire Alarm	Gent Vigilon Compact	All landlord areas shall be provided with an automatic Fire detection system that is fully interfaced across all landlord areas, in particular where cores/ blocks are provided to suit the need of the multi-residential development. Landlords systems shall be designed to an L1 classification and shall adhere to all other requirements as outlined within ES06 Domestic classification detection prescribed by BS5839:6 shall only be permitted for use within domestic properties by prior agreement with University estates. It is the intention that this type of system will be used for very small individual properties only and as such, all systems shall be designed to BS5839:1 by default, unless agreed otherwise. Where LD classification systems are implemented, these shall be a minimum of a grade D system providing mains powered devices with integral battery backup and networked controls interlink.

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