THE UNIVERSITY of EDINBURGH
Estates Department



Estates Design Guidelines No. 3

Mechanical Design Guidelines

Important Comment on Estates Design Guidelines, Assets & Standards

These Estates Design Guidelines, Assets and Standards and the associated suite of documents have been produced in order to furnish external design consultants and contractors with guidance on required University standards for inclusion within their proposed project design.

These guidelines are to be used as supplementary information during project design stage, and as such, detail the minimum standards expected from the University Estates Department.

Please note, these guidelines do not absolve the project design team including, sub-consultants and sub-contractors of their legal and contractual obligations under, design liability, statutory regulations and health and safety legislation.

EDG No. 3 Mechanical Engineering Services - Approval Procedure	
Estates Design Guidelines No. 3 Mechanical Engineering Services Check and Approval - Head of Building Services	Name: Sheila Scott Date: 30/07/2026
Estates Design Guidelines No. 3 Mechanical Engineering Services Approval (Major Policy Changes Only) - Director of Estates Operations	Name: Date:
Estates Design Guidelines No. 3 Mechanical Engineering Services Approval (Major Policy Changes Only) - Estates Leadership Team	Name: Date:

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1.0 Introduction

1.0 Introduction

The UoE Design Guidelines (as a whole), have been developed for employees of the UoE, Design Teams, Architects, Engineers, Project Managers, external consultants and contractors. This documentation has been developed to enable Design Teams and Contractors to have a broad understanding of the principles that the University of Edinburgh will require to be adopted for any future developments.

The guide is primarily designed to be used in conjunction with Royal Institute of British Architects (RIBA) stages. The actual extent and scope of the design guide to be incorporated for any future development will be based upon the specific project requirements.

The UoE Design Guidelines aim to discuss strategic matters and does not provide an exhaustive treatment of statutory or best practice design and compliance requirements; its primary purpose is to establish a starting point for design briefs, support the consultation process and outline existing assets and standards. It is the responsibility of the Design Team readers/duty holders to ensure subsequent designs are complete, compliant and able to meet the final approved brief when measured in use.

Reference should be made to the relevant UoE Design Guidelines throughout the Design drawings and documents and Designers should confirm that the appointed Contractors are made aware of the Guidelines to ensure that installations conform to these requirements.

1.1 Important Notice – Essential Prior Reading

It is essential for readers of this document to first refer to the Guide Number 1, entitled Estates Design Guidelines (Assets & Standards) Introduction and Application, which serves to provide the principles and overview with vital information and context that apply to all projects.

1.2 Purpose of the University of Edinburgh Estates Design Guidelines (Assets and Standards)

The purpose of the UoE Estates Design Guidelines is to act as a briefing document to give designers an overview of the minimum design requirements, constraints and challenges presented by the University of Edinburgh's particular needs. It applies to all new-build, refurbishment, minor works and change of use projects, including property leased by the University, controlling quality in the production of designs, specifications and the subsequent performance of buildings, developed to a

consistently high standard and ensuring continuity throughout the University Estate.

The University of Edinburgh encourages innovation; however, all project Design Teams should ensure that their proposed projects have end user considerations and ease of maintenance at its core.

The use of the UoE Estates Design Guidelines will not take the place of, or remove, any of the professional responsibility from Design Teams and Contractors to fully comply with the requirements within this document. Given the complex, diverse and growing estate, not all eventualities can be fully defined within this document.

Should any projects deviate from these guidelines, a technical submittal outlining the deviation, reason why and impact to the University maintenance strategy should be prepared and forwarded to the nominated University project representative for liaison with the Building Services Group (BSG).

A review of this deviation shall be carried out by the UoE BSG; a final decision on the deviation shall be communicated to the appropriate design/construction team.

1.3 Interpretation of UoE Estates Design Guidelines, Assets and Standards

The UoE Estates Design Guidelines, Assets and Standards are required to be issued with all project contractual documentation in order to inform project design and construction teams of expected standards to ensure quality continuity across its Estate.

1.4 Glossary of Terms:

Enforced Requirements

The use of the word(s) ‘shall’, ‘are required’, ‘is required’ ‘must’ or ‘will’ denotes a requirement that is non- negotiable and shall be used as the basis for designs, technical submissions and/or activities. If such a statement conflicts with a statutory obligation, then a technical submittal shall be issued to the University project representative for liaison with the UoE BSG for their final decision regarding compliance with the documentation.

Requirements Needing Confirmation

The use of the word ‘may’ denotes a negotiable requirement or indication of a solution, where innovation and further calculation, design and discussion may be required to arrive at an optimised solution.

Quality

The UoE Estates Design Guidelines aim to arrive at the University of Edinburgh's highest design aspirations and standards. It may be that, at the University of Edinburgh's sole discretion, solutions are value managed and then value engineered during subsequent design iterations. Design Teams and Contractors are encouraged to consider where value management and subsequent value engineering may result in an improved financial performance should funding constraints occur. All mechanical and electrical value management and value engineering exercises carried out shall be forwarded to the UoE BSG for review.

Assets and standards

The Design Guidelines endeavours to set out Assets and Standards that will maximise the benefits realisation for the UoE to achieve its strategic objectives and maximise value for money. This will involve coordinated and optimised planning in conjunction with Procurement, robust asset selection with particular reference to existing legacy assets and standards on the University Estate, for reasons of utilisation and continuity of maintenance, replacement of parts, renewal and ultimate disposal

Currency of Third-Party Documents

Where superseded standards and regulatory documents are referred to in the text, the reader shall apply current revisions and amendments to their project. Should there be any ambiguity, the BSG should be contacted for clarity.

Proof

Where the word 'proof' is used, e.g., 'proof is required', a written report or installation certificate must be produced for approval depending on context.

1.5 Review Design Data Process (RDD)

All proposed designs shall be submitted to the Project Manager, respective Estates Teams and Building Services Group for review and comments, the response will be categorised as follows:

A. Design Team to acknowledge comments and continue to develop the design to the next stage.
B. Design Team to acknowledge comments and update the design in accordance with comments and resubmit for consideration before proceeding to the next stage.

C. Design Team to acknowledge comments and completely review and update the design in accordance to the agreed design principles and resubmit for consideration before proceeding to the next stage.

In addition to the above, the UoE may request specific technical submission to support the RDD and may include the request setting out with proof, e.g., calculations, drawings, etc.

The purpose of the RDD is to ensure designs meet the strategic requirements of the UoE and do not compromise the future operations and maintenance provision. The obligations owed by external architects, consultants and contractors to UoE and their liabilities to UoE is not in any way diminished or otherwise reduced by the RDD.

1.6 The Obligations Owed

By external Design Teams, consultants and contractors to University of Edinburgh and their liabilities to University of Edinburgh is not in any way diminished or otherwise reduced by the approval process. University of Edinburgh is not taking over the roles and duties of the external Design Teams, consultants and contractors who will remain legally responsible for the design and/or works carried out by them or on behalf of their staff, agents, sub- consultants and/or sub-contractors.

1.7 Version Control and Updates

The Estates Design Guidelines are to be reviewed and updated by the Mechanical Engineering Services Working Group each calendar year.

The UoE Estates respective Project Management (PM) teams will send e-mail notifications to the Directory of current Design Teams and Contractors appointed, following any update or change.

Any updates to the Design Guidelines, which cause significant change to a project design, should be raised and discussed with the respective Project Management Team and application of the Change Control Process will be required.

Any new items or amended content shall be highlighted in yellow to enable identification of changes from previous versions.

1.8 Purpose of UoE Design Guideline Number 3

The purpose of this document is to set out the guidelines and standards that apply to University of Edinburgh (hereby referred to as UoE) Estate and its design requirement for Mechanical Engineering Services as set out by the Building Services Engineer (Mechanical.) This document will apply to newly constructed buildings and

existing buildings scheduled to be refurbished. In some cases, this standard exceeds the Building Regulation requirements, as it represents good practice in the Higher Education sector.

The Building (Scotland) Regulations set out to ensure that new buildings and works achieve the objectives of the Building (Scotland) Act 2003 in terms of health, safety, welfare, convenience, conservation of fuel, power and sustainable development and the purpose of this guide will be to provide a standard policy specifying the standard that is required by the UoE.

This guidelines document is for designers, engineers, specifiers, installers and commissioning and maintenance engineers of Mechanical Engineering Services from the design stage to when the building is in use. The design team will be required to align the requirements of the Scottish Buildings Standards Technical Handbook / Building (Scotland) Regulations, fire safety legislation, CDM Regulations, CIBSE Guides with those of the University.

The guidelines provide an indication of non-prescriptive preferred solutions and appropriate standards. The content is not a statement of requirements or intended to replace existing British or European technical standards or national guidance; reference to these will still be necessary.

If due to the nature of the project, certain aspects of Mechanical Engineering Services are not covered in these guidelines and standards, the relevant codes of practices, British Standards and building regulations are to be applied and followed. For any general and specific queries, advice is to be obtained from the Building Services Engineer (Mechanical.) In the event those documents referred to within this document, which have been superseded, then most recent versions are to be referred to.

Any other doubts, concerns or points of clarification on Mechanical Engineering Services, please contact the Building Services Engineer (Mechanical.)

This document applies to all buildings managed or owned by the UoE. Any tenanted buildings must not have building works, adaptions or change any building or part of a building which will affect the Mechanical Engineering Services or any other building without first receiving permission from Building Services Engineer (Mechanical) and the Landlord of the property or nominated agent and written in the respective lease.

This document indicates the University's generic Mechanical Engineering Services Client requirements. Consultants must also refer to specific project requirements identified by the University's Project Manager and they must fully integrate any new Mechanical Engineering Services with the University's existing legacy systems.

Consultants and contractors must obtain approval in writing for any variation from these requirements.

Before incorporating these client requirements in, e.g., tender documentation, etc, please always check with the undersigned that you have current issue of both these client requirements and the field equipment list.

Please always approach the University engineers directly to discuss any point of clarification or possible improvement and to obtain further copies of the client requirements.

Building Services Engineer (Mechanical)
Estates Operations
Estates Department
Edinburgh
EH1 1NP
General enquires: 0131 650 9157

1.9 Legislation and Best Practice Standards for Reference

Any design must, as a matter of statute, be compliant with the Health and Safety at Work Act 1974, any relevant legislation and associated Approved Codes of Practice (ACOP's.)

Examples of secondary legislation include; the Provision and Use of Work Equipment Regulations 1998 (PUWER), the Workplace (Health, Safety and Welfare) Regulations 1992, the Electrical Safety at Work Regulations 1989, the Control of Major Accident Hazards Regulations 1999, the Confined Spaces Regulations 1997 and the Gas Safety (Installation and Use) Regulations 1998.

Your attention is drawn in particular to the legal duties placed on designers by the Construction (Design and Management) Regulations 2015.

Suitable and sufficient safe access for maintenance and repair must always be provided.

The University will comply with all relevant legislation and regulations relating to the design and structure of the building. Academic, administrative buildings and all residential property are subject to the requirements of the current Technical Standards (Scotland) Regulations/Building Regulations and CIBSE Guides:

Guide A	Environmental Design
Guide B1	Heating
Guide B2	Ventilation and ductwork
Guide B3	Air conditioning and refrigeration
Guide B4	Noise and vibration control for building services systems

Guide C	Reference Data
Guide D	Transportation systems in buildings
Guide E	Fire Safety engineering
Guide F	Energy Efficiency
Guide G	Public health engineering
Guide H	Building control systems
Guide K	Electricity in Buildings
Guide L	Sustainability
Guide M	Maintenance Engineering and Management

These standards allow detailed professional knowledge and judgement to be applied in order to develop a final design solution, which will satisfy projects that are more complicated.

The list of legislations, regulations and guides above is not exhaustive. The Design Team shall prepare and submit project related list as part of RIBA Stage 3 design submission.

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2.0 Mechanical Engineering Services Design Criteria

2.0 Mechanical Engineering Services Design Criteria

2.1 General

The design criteria outlined in the following sub-sections should be considered the minimum acceptable standards and reference shall made to the UoE Sustainability Guidelines, which may impose more stringent requirements.

2.2 External Conditions

External conditions shall align with CIBSE Guide A – Environmental Design.

Where plant and equipment are required to operate continuously or for the purpose of AHU frost coil sizing or pipework frost protection the design winter temperature should be taken as -10°C.

Where heat rejection plant and equipment are expected to operate continuously serving critical infrastructure or building operation, it should be capable of operating when the external temperature is 32°C and 50% saturated providing full design capacity.

The design of the mechanical services for new buildings and refurbishment projects should take into consideration increased wind speeds attributed to climate change, both in terms of system performance and also whether plant or services on roofs or exposed areas are adequately protected against high winds.

To account for the proximity of the Forth Estuary to much of the UoE Estate, designers should ensure that externally mounted plant and equipment is suitable for installation in a salt-laden atmosphere, and that services are provided with protective coatings and durable finishes to provide weather resistance and corrosion protection to suit such environments.

2.3 Internal Comfort Conditions

Internal comfort conditions shall align with CIBSE Guide A – Environmental Design.

The following internal conditions shall be considered for each internal space:

- Fresh air rates
- Air change rate
- Thermal comfort
- Sumer design temperature
- Winter design temperature

- Humidity level
- Filtration
- Internal noise level

For laboratory areas please refer to University of Edinburgh Laboratory Ventilation Policy.

2.4 Thermal Comfort

Thermal comfort is to be assessed for winter and summer based on **CIBSE TM52**: The Limits of Thermal Comfort: Overheating in European Buildings. Unless otherwise agreed, environment types are as follows:

- New building and major refurbishments: **Type II**
- Existing buildings: **Type III**
- Residential **Type I**
- For Residential buildings, an overheating assessment should be carried out as per the requirements of the Scottish Building Standards.

2.5 Noise Criterion

Several alternative guides to acceptable ambient noise have been published in recent years. These have been referred to in CIBSE Guide A. The designers are encouraged to review these guides as part of the design process:

- BB93 – for teaching environment
- BCO Guide to Specification – for office environment
- DOH Technical Design Manual – for laboratories

Plantrooms shall be designed to meet CIBSE Guide A: Environmental Design – recommended comfort criteria for factories/light work environment.

2.6 Plant and Equipment Performance Criteria

All plant and equipment selections shall comply with the minimum efficiency backstops outlined in the current version of the Non-domestic Building Services Standards Compliance Guide for Scotland in addition to criteria set out in this document.

Break-out noise from externally mounted plant or dedicated plant rooms affecting University teaching facilities only and shall **not** exceed a background sound level of 58 dB A, (NR 50) at 3 metres from the plant and equipment or plant room.

Noise generation from building services systems shall not exceed the maximum daytime and night time noise pollution limits required by the Local Authority. Should there be no limits issued by the Local Authority, then designers should align their

design to the World Health Organisation document – Guidelines for Community Noise. Stand-by generators and emergency equipment may be exempt subject to agreement from the Local Authority. All necessary approvals shall be in place prior to installation.

All plant items shall be evaluated to ensure that noise and vibration during operation does not have any adverse impact on the building users or any processes being undertaken within the building.

All mechanical plant shall have minimum of 2 years manufacturer's warranty, unless specified otherwise within this guide.

Access to all main plantrooms shall be via ASSA ABLOY 1-2 key. Energy Centres shall be via ASSA ABLOY ECD key. Access to all secondary plant distributed throughout the building and located at low level shall also be protected via 1-2 key or special key agreed with the estates department (i.e.: local risers, plate heat exchangers unit, heat interface units, commissioning valves).

2.7 System Resilience

The design consultants shall provide resilience strategy for the proposed mechanical services in the building. The strategy should be developed during early stage of the design (i.e.: RIBA Stage 2). The following key considerations should be included:

- Facility type (learning and teaching, research, accommodation, data centre);
- Functional requirements;
- Resilience level of site infrastructure;
- Description of proposed HVAC and Plumbing systems;
- Systems and components configuration (N, N+1,2N);
- In refurbishment projects of existing buildings, the resilience of the existing heating systems should be assessed. This should involve a review of the performance of the heating systems in cold weather, in consultation with the UoE BSG. This should be carried out at an early stage and recommendations from the review should be used to inform the project cost plan.
- Where ventilation systems incorporate heat recovery, heating coils for supply air heating should be sized to account for the heat recovery being unavailable/in fault. LTHW systems which serve AHUs which have heat recovery should be capable of operating at full load in winter without reliance on the heat recovery in the AHUs.

2.8 Building Operating Heating and Cooling Temperatures

To futureproof buildings for low temperature heat networks, buildings shall be designed to perform year-round with district heating flow temperatures lower than the existing. This should be discussed at an early stage with the UoE Development Engineer and Energy Team during the Consultation process.

A key factor in the drive towards net zero are system operating temperatures. Lower heating and higher cooling operating temperatures facilitate the connection of renewable energy sources such as heat pumps or low temperature district energy systems.

Pumping energy and the capital cost of the system could also be lower if flow rates are reduced by increasing the difference between flow and return temperatures. Lower operating temperatures and lower return temperatures can be achieved through appropriate building services design, i.e., by using larger heat emitters and selecting suitable approaches to controls. This may lead to higher costs for the building services but improves energy efficiency, reduces carbon emissions and the payback period. Therefore, there is a requirement for the Designer to optimise operating temperatures.

The Designer shall undertake an assessment of possible operating temperatures and submit to the UoE Development Engineer for review and comment. The assessment shall consider the operation over the year, not just at times of peak demand, reducing the flow rates at part load using variable volume control principles and limiting bypass flows is important in order to limit pumping energy and achieve lower return temperatures.

For new buildings, the building orientation and the design of the building fabric should be optimised to minimise heat losses in winter and heat gains in summer and subsequently reduce the demand for mechanical heating and cooling systems.

Natural ventilation should be utilised where possible.

2.9 Building Energy Management Systems

Controls and BEMS proposals for any project should be reviewed with the UoE Controls team. Refer to Estates Design Guideline 4 (BEMS) for all BEMS and controls related design guidance. This includes power and wiring requirements.

It is the responsibility of designers and contractors to ensure that they have fully familiarised themselves with the requirements of EDGL4 and have incorporated these requirements within their design before these are presented for review with the University. Below are some key items for which allowance should be made in the design:

- For all new build projects, Schneider Eco-Structure or Trend systems shall be designed, installed and commissioned by the incumbent controls specialist contractors with proven knowledge of the University Estates Design Guidelines and the requirements of the UoE Controls team.
- For refurbishment projects, works to existing Schneider or Trend systems shall be designed, installed and commissioned by the

incumbent controls specialist contractors with proven knowledge of the University Estates Design Guidelines and the requirements of the UoE Controls team.

- All power supplies for mechanical equipment shall derive from a separate distribution board mounted adjacent to the BEMS control panel. The provision of the distribution board, including protective devices, SPD and the wiring of outgoing ways shall be incorporated within the controls package. The electrical contractor shall be responsible for terminating the submain cable into the distribution board main isolator. The controls contractor and electrical contractor must coordinate their responsibilities/work to ensure correct glanding kits are supplied and check correct protective device and cable ratings are selected for these supplies.
- The controls contractor shall be responsible for all outgoing supplies from the BEMS power distribution board. The appropriate NICEIC certification must be provided for the BEMS power installation.
- All power supplies derived from the mechanical control panel DB shall be provided with a local isolator to isolate all power supplies & controls circuits at the plant/equipment served.
- All HVAC plant shall be connected directly into the BEMS and be completely controlled via the BEMS. Packaged controls are not permitted.
- All control valves and actuators controlled by the BEMS shall be supplied by the controls specialist.
- Ensure that any works to existing controls allow for complete removal of any redundant elements. Legacy issues identified with existing controls should also be identified early in the project.
- Prior to controls demonstrations at handover on any project, the pre-demonstration controls handover checklist should be completed and returned to the UoE Controls team. This can be found within EDGL4.

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3.0 Heating and Cooling Generation

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3.1 District Heating Systems

The UoE has a number of district heating networks across the estate providing Low Temperature Hot Water (LTHW) for use as heating and for domestic hot water generation.

Buildings that are located in vicinity of any of the University's district heating networks shall be supplied by the district heating network. No local, de-centralised heat generation equipment shall be provided unless specifically agreed with the UoE Development Engineer.

The following areas are served with LTHW from a district heating main:

- Kings Buildings – whole campus
- George Square – area around George Square including Quartermile, Buccleuch Place accommodation, Teviot Row, Potterrow and the Medical Buildings
- Pollock Halls Residences – area served by north boiler house
- Pleasance Energy Centre – includes Holyrood Campus, Pleasance, High School Yards, Old College, 13-15 South College Street, Lister and Infirmary Street
- Easter Bush – Centre Building, Equine, Greenwood and the Roslin Institute Buildings.

A network operated by the UoE Building Services Group will provide LTHW to all buildings connected to a district heating system. At design conditions, this network currently operates at the following conditions:

- Flow/return temperatures - 75°C flow and 55°C return (leaving the energy centre). This temperature may be reduced at the entry point of the buildings due to distribution losses of the system;
- Maximum operating pressure – all pipework, valves and components shall be capable to withstand PN16 pressure
- For existing buildings with direct connections, the pressure differential at the connection point to the DH system – 100kPa
- For new systems which incorporate a Heat Station, the pressure differential at the connection point to the DH system –60kPa
- The systems are variable flow and operate continuously throughout the year.

The district heating design and alteration shall comply with industry good practice such as described in CIBSE/ADE Heat Networks Code of Practice in the UK and the Associated Design Guide.

New buildings shall connect to the district heating via plate heat exchangers unless agreed with the UoE Development Services Engineer. PHEs shall be located within designated heat stations either within or adjacent to the building. In the case of existing buildings with direct connections to the district heating which are to undergo significant alterations to the heating installation, the provision of a plate heat exchanger shall be reviewed in consultation with the BSG.

No aluminium materials or components should be used or present within district heating or cooling networks or buildings with a direct connection.

All proposed connections should be agreed with the UoE Development Engineer / BSG.

3.2 De-centralised Heat Generation

Only buildings that are not located in vicinity of any of the University's district heating networks shall be provided with their own independent heat generation plant.

The selection of the heat generation plant shall be evaluated by the designer and options reported to the UoE Development Services Engineer. Consultation with the UoE Development Engineers and Energy Team is required. Depending on resilience level required, the building may be equipped with dual fuel energy sources or temporary boiler connections.

3.2.1 Heat Pumps

Heat pump systems shall comply with industry best practice such as described in CIBSE AM17 Heat pump installations for large non-domestic buildings

Heat pump installations shall be designed with adequate provision to maintain suitable heat output in the event of a failure of a single item. This will generally require a minimum of two heat pumps rated at 60% of design load or multiple cascading units (N+1 configuration) unless there is alternative suitable back-up.

External heat pump compounds shall be dimensioned to accommodate at least three different heat pump manufacturers including their airflow/maintenance requirements.

Where it is proposed that heat pumps be located on roofs, a structural load analysis should be carried out. Bird deterrent measures should be considered in consultation with UoE Estates.

In order to minimise starts at low load conditions and provide volume for defrost cycles, the system shall include a thermal store or a buffer vessel. Sizing should be in

line with recommendations from the relevant industry standards including those listed below.

Larger thermal stores/buffer vessels may be required e.g., as part of a strategy to reduce installed capacity of heat pumps, or as recommended by the manufacturer.

The integration of thermal stores/buffer vessels form a key part of the LTHW system control and hydraulic design. Designers shall refer to relevant CIBSE AM17 sections in determining the optimum thermal store/buffer vessel arrangement.

All heat pumps shall comply with BS EN 14511

Selection of refrigeration systems shall consider the restrictions imposed by the F-Gas Regulations. A low Global Warming Potential is required with no future phase out or phase down plan. The selection must be submitted prior to the end of the design phase for approval by the UoE Development Engineer.

Natural non-synthetic refrigerants are preferred.

Selection of appropriate refrigerants should take into consideration the requirements of BSEN 378 and relevant industry guidance such as FETA Guidance on Risk Assessments for Compliance with DSEAR.

Refrigerant selection should be agreed at an early stage in the design with the UoE Development Engineer in order to ensure that any additional control and safety measures identified can be accommodated within the design.

Low noise, energy efficient heat pumps with low vibration levels shall be provided.

When selecting heat pumps, refer also to CIBSE AM17 for minimum turndown requirements.

Heat recovery is the most energy efficient way of providing heat to buildings, therefore, the use of simultaneous heating and cooling heat pumps should be maximised.

The design team shall submit the heat pump proposal (including SCoP and annual energy use) for UoE Energy Team evaluation during Stage 3.

All proposed suppliers of Heat Pump equipment to the University of Edinburgh, must operate on an “open protocol” basis with respect to the provision of spares, parts, software and controls to approved third parties as determined by the University of Edinburgh. Refer to EDG NO.4 Section 6.4 for BEMS interfaces and monitoring.

Where ASHPs are proposed, the frost protection strategy should be given careful consideration early in the design and provide a balanced approach between protection and energy efficiency.

This will apply to the LTHW and (where applicable) cooling systems served by the ASHP.

The frost protection strategy should ensure that thermal stores are not unduly depleted when the system is operating in frost protection mode. External heating and cooling circuits should be protected. Internal circuits may not require protection although this should be assessed as part of the overall strategy.

Valve and pump selection should be optimised to offer sufficient turndown when circulating water for frost protection only. A bypass could be considered at the thermal stores to prevent depletion of the store energy whilst the systems are running in frost protection mode. An interlock between any bypass valves and the ASHP may be required to ensure that the system is opened up if the ASHP is activated.

End of line valves and AHU valves should be selected to allow sufficiently low pump turndown for when the system is in frost protection mode. It should be demonstrated that the design captures this aspect. The system should be designed to ensure that circulation for frost protection is limited to those parts of the system where this is required and that LTHW or cooling water is not unduly circulated throughout the building in frost protection mode.

A detailed description of operation for the heat pump(s) should be provided at Stage 4 design for review by the BSG. Any important system limitations (for example minimum return temperatures) should be highlighted at the review. An operational review should also be carried out with UoE. For example, in non-critical buildings where heat pumps are proposed, it is preferred that the heating systems are off at weekends and during holidays (other than for frost protection).

Refer also to EDGL 4 Section 8.3 for frost protection stages and setpoints.

Sufficient space for access and maintenance of heat pumps and clearance for airflow in accordance with manufacturer's instructions shall be considered at design stage and shall be demonstrated at handover.

Heat pumps must be adequately commissioned to ensure that they operate as per the design intent.

3.2.2 Boiler – Gas

New and replacement gas boiler installations must be approved by the UOE Development Engineer.

Gas fired boilers installations shall be designed with adequate provision to maintain suitable heat output in the event of a failure of a single item. This will generally require a minimum of two boilers rated at 66% of design load or multiple cascading boilers (N+1 configuration.)

Where gas boilers are supplied in sections, the manufacturer or their approved installer shall assemble them on site complete with a provision of a protective casing and insulating jacket.
Boilers shall be installed on purpose made plinths, stands, plates or prefabricated rig.
Where gas burners are installed, they shall be provided with an acoustic enclosure.

Flue dilution systems are not permitted without prior approval from the UoE Development Engineer.

Application and operation in service:

- Boiler burners shall have fully modulating control
- Link boiler firing to the system shunt pump(s) to allow override operation to dissipate excessive residual heat
- In boilers > 500kW incorporate oxygen trimming controls as part of the combustion control package
- Anti-dry cycling controls shall also be incorporated in boilers > 200kW.
- All non-condensing boilers to be protected by means of back-end bypass valves;

Boiler installation should be capable of automatically switching itself on after the event of power disruption.

3.2.3 Local Combined Heat and Power

New and replacement CHP installations must be approved by the UOE Development Engineer.
Application and operation in service:

- CHP sized to accommodate a base load throughout the year with 4500 running hours potential, load assessment will be submitted to BSG manager for review upon request
- Plant and equipment to be selected with low discharge of noise to ambient and attenuators fitted as required to mitigate nuisance
- CHP buffer vessel capacity must be suitable and sufficient to prevent cycling and hunting
- The heating system must design for the CHP to enable it to be taken out of commission for maintenance
- The CHP unit needs to be low NOx, less than 250mg/m3 at 5% O2
- The CHP must be connected to a variable flow system with two port control and low return temperatures
- Flue to comply with Clean Air Act, Local Authority Regulations and the current DEFRA Clean Air Strategy
- Modulation control shall be adopted
- Where jacket water coolers/oil/engine exhaust coolers are employed, re-use of the CHP waste heat shall be investigated

- The power supply shall be G59 Embedded Generator Regulations compliant
- Package gas turbine CHP or reciprocating engine within enclosure c/w proprietary controls system
- All flue seals shall be suitable for the maximum flue gas temperature assuming no heat recovery takes place between prime mover and flue outlet.

Note (relating to 3.2.2 / 3.2.3) - Projects involving single plant or combinations of combustion plant units with a net rated thermal input of between 1 and 50 megawatts (MW), regardless of the fuel used should ensure that the installations are in full compliance with the Medium Combustion Plant Directive (MCPD - transposed by The Environmental Authorisations (Scotland) Amendment Regulations SSI 2025/165).

This will include new installations and plant and/or flue replacement or refurbishment in existing installations.

Flue installations shall be provided with safe, accessible and correctly positioned sampling ports of sufficient size for accurate sampling and monitoring, in accordance with the recommendation in the current version of European Standard BS EN 15259 - Air quality Measurement of stationary source emissions.

Monitoring ports should ideally be accessible via fixed platforms with easy access to power.

The location, size and quantity of sampling ports should be agreed in consultation with an emissions monitoring or chimney / flue specialist.

3.2.4 Heat Recovery Systems

Heat recovery should be utilised wherever possible on all University projects. All projects involving chilled water systems should include waste heat recovery, the proposals for which should be reviewed with the UOE Development Engineer at an early stage in the design. This may include proposals to utilise the low-grade heat locally within the building or to contribute to the local district heating network. Consultation with the UoE Energy Team and Development Engineers is required.

3.3 District Cooling

Cooling systems are used by the University to provide chilled water for use in conditioning the internal environment and rejecting heat from process water. In addition, the principle of useful heat to be recovered for re-use when economically practical, serves to underpin the University's Sustainability agenda.

A risk assessment is required for animal areas and/or critical operational areas, e.g., main computer server rooms, where the maintenance of specified temperatures is either legislative or operationally required. Such considerations should include 100% independent back up with auto changeover, remote alarm of high temperature and/or plant changeover to a continuously manned monitoring position and UPS/standby electrical generator.

Internal condensing units shall not be accepted unless prior approval from the Building Services Group.

Buildings that are located in vicinity of any of the University's district cooling networks, shall be supplied by the district cooling network. No local, de-centralised cooling generation equipment shall be provided unless specifically agreed with the UoE Development Engineer.

The following areas are served with CHW from district cooling main:

- Central Area around George Square
- Easter Bush.

A network operated by the UoE Building Services Group will provide cooling to all buildings connected to chilled water distribution. At design condition, this network will operate at the following conditions:

- Flow/return temperatures when outside temperature is above 10deg: 6oC and 120C
- Flow/return temperatures when outside temperature is below 10deg: 14°C and 18°C
- Maximum operating pressure – all pipework, valves and components shall be capable to withstand PN16 pressure
- For existing buildings with direct connections, the pressure differential at the connection point to the DH system – 100kPa
- For new systems which incorporate a Heat Station, the pressure differential at the connection point to the DH system –60kPa
- The systems are variable flow and operate continuously throughout the year.

The district cooling design and alterations shall comply with industry good practice such as described in CIBSE CP 01 – Code of Practice in the UK.

Any proposed connections to the district cooling system must be raised at an early stage to establish the connection viability with the UoE Development Engineer. The following information shall be provided:

- Assessment of building connected load
- Assessment of peak diversified loads for winter and summer operation
- Heating system schematic for the proposed installation

- All new connections to district cooling shall be through a plate heat exchanger arrangement.
- Details of secondary side (building side) temporary chiller connection point and proposed location of the chiller on GA plans
- Details of secondary valve armaments for VT and CT connections in the building.
- New buildings shall connect to the district cooling via plate heat exchangers unless agreed with the UoE Development Services Engineer. PHEs shall be located within designated heat stations either within or adjacent to the building. In the case of existing buildings with direct connections to the district cooling which are to undergo significant alterations to the cooling installation, the provision of a plate heat exchanger shall be reviewed in consultation with the BSG.

No aluminium materials or components should be used or present within district cooling networks or buildings with a direct connection.

All proposed connections should be agreed with the UoE Development Engineer / BSG.

3.4 De-centralised Cooling Generation

Buildings that are not located in vicinity of any of the University's district cooling networks shall be provided with their own independent cooling generation plant.

Heat recovery should be utilised wherever possible on all University projects. All projects involving chilled water systems should include waste heat recovery, the proposals for which should be reviewed with the UOE Development Engineer at an early stage in the design. This may include proposals to utilise the low-grade heat locally within the building or to contribute to the local district heating network. The use of simultaneous heating and cooling heat pumps should be maximised. Consultation with the UoE Energy Team is required.

The selection of the method of providing cooling shall take account of the total cooling demands, the type of cooling required and the availability of fuel/energy sources.

Preference will normally be for chilled water from a modular unit. Central packaged chillers shall generally utilise multiple screw compressors and designers shall require tenderers to identify the COP at design conditions as part of their tender submission. In order to minimise starts at low load conditions, buffer vessels shall be provided. BEMS control should include system enable/disable with monitoring feedback (on/off), fault status, true operational status and temperature set point adjustment as required for the application.

The integration of thermal stores/buffer vessels form a key part of the CHW system control and hydraulic design. Designers shall refer to relevant CIBSE AM17 sections in determining the optimum thermal store/buffer vessel arrangement.

Cooling systems shall operate on a variable flow basis employing variable speed pumps and two port control valves. When selecting stand-alone chiller equipment, take account for this method of pumping and the varying of the flow rate through the chiller's evaporator, acknowledging any minimum flow rates which may be required. Where applicable, the system should be protected with the introduction of glycol to a concentration of 25% of the system volume affording protection to minus 12°C.

The following are the most common types of de-centralised cooling generation equipment owned and operated by the University:

- Air/water cooled chillers
- Dry air coolers
- Direct expansion cooling
- Free cooling

The designers may wish to consider various alternative solutions such as:

- Variable refrigerant flow
- Air/water ground source heat pump
- Adsorption chillers
- Absorption chillers
- Adiabatic heat rejection
- Any other alternative systems

Cooling towers must **not** be used, unless expressly agreed with the UoE Development Engineer.

Natural non-synthetic refrigerants are preferred.

Selection of appropriate refrigerants should take into consideration the requirements of BSEN 378 and relevant industry guidance such as FETA Guidance on Risk Assessments for Compliance with DSEAR.
Refrigerant selection should be agreed at an early stage in the design with the UoE Development Engineer in order to ensure that any additional control and safety measures identified can be accommodated within the design.

3.4.1 Air/Water Cooled Chillers

All chillers shall comply with BS EN 14511. Selection of refrigeration systems shall consider the restrictions imposed by the current F-Gas Regulations. Refer also to Section 3.2.1.

Low noise, energy efficient compressors with low vibration levels shall be provided. A free cooling cycle shall be incorporated into the controls.

3.4.2 Dry Air Coolers

The preferred method of rejecting heat from cooling systems is by means of dry air coolers. Wetted/Adiabatic Dry Air Coolers may also be considered provided there are appropriate water safety systems provided.

3.4.3 Local DX Cooling

Local DX systems shall provide the ability to communicate room temperature, system enable and fault indication to the University BEMS.

Local DX systems shall be employed in locations where no centralised cooling is being provided. Examples of the potential use of local DX systems include; transformer/switch rooms, communications rooms, meeting/conference rooms, specific laboratories, etc. However, lower energy solutions, such as supply and extract air ventilation with local thermostat, are to be considered on the grounds of future maintenance burden. Selection of refrigeration systems shall consider the restrictions imposed by the current F-Gas Regulations. Refer also to Section 3.2.1. Again, consideration of the consequences of equipment failure is essential.

Hardwired fault signal and BEMS temperature sensor to be provided for switch rooms/communication rooms. Hardwired BEMS signals for enable/disable, fault and BEMS temperature sensor to be provided for meeting/conference rooms, laboratories etc. True run signal to be provided if available.

Note that containment and support for cables associated with DX systems should align with requirements set out in the UoE Electrical Services Design Guide (No.6).

3.4.4 Free Cooling

Free cooling should be utilised wherever possible. the following measures shall be provided:

- Fresh air bypass on plate heat exchangers in air handling units
- Air cooled chillers with integral controls allowing free cooling cycle
- Water cooled chillers with by-pass arrangement allowing direct free cooling by heat rejection plant.
- A description of operation for free cooling installations should be provided at Stage 4 design detailing how this is intended to operate. This should be reviewed with the UOE Development Engineer and UOE Controls team.

3.4.5 Central VRF Equipment

The use of a centralised VRF system will only be considered and permitted where there is no connection to the University's district heating or cooling networks. Selection of refrigeration systems shall consider the restrictions imposed by the current F-Gas Regulations. Refer also to Section 3.2.1.

VRF systems shall be considered in buildings with multiple spaces, varying heating and cooling demand and the need for good local control such as meeting rooms where some rooms may be unoccupied whilst others have a very high thermal demand. This system application may be suited to retrofitting older buildings due to their limited space requirements (depending on how ventilation is provided) compared to some other systems. The system compressor shall employ inverter drive technology providing efficient operation on partial and full load.

Systems providing simultaneous heating and cooling, heat recovery shall also be provided.

Refrigeration pipework shall be thermally insulated with class O grade preformed flexible pipe insulation.

In projects where existing VRF or split AC systems are to be retained, an allowance should be made for a health check on the existing systems, including their controls.

3.5 General

Any proposed connections to the district heating or cooling system must be raised at an early stage to establish the connection viability with the UoE Development Engineer. The following information shall be provided:

- Assessment of building connected load
- Assessment of peak diversified loads for winter and summer operation
- Heating system schematic for the proposed installation
- All new connections to district heating shall be through a plate heat exchanger arrangement.
- Details of secondary side (building side) temporary boiler connection point and proposed location of the boiler on GA plans
- Details of secondary valve armaments for VT and CT connections in the building.
- Mapping of proposed pipework routes against high groundwater levels.

If any of the alternative technologies are proposed, the designer shall consult the UoE Development Engineer at the earliest opportunity. Full feasibility study for alternative heat solution shall be provided for information and review during stage 2 of the project.

Consultation with the UOE Energy Team shall also be required.

The study should include, but not be limited to, the following aspects:

- General description of proposed technology
- Load assessment
- Review of site assessment
- Review of applicable legislation
- Description of operation
- Description of proposed controls
- Typical maintenance requirements
- Annual energy savings assessment
- Annual carbon emission assessment
- Simple cost payback analysis for 10 years
- Simple cost payback analysis for building operation 20 - 25 years
- Plantroom drawings/sketches
- System schematics drawings/sketches.

Ventilation and cooling proposals for rooms/spaces containing equipment with a high heat output (e.g., ICT rooms, freezer farms etc.) will be subject to review with the UoE Development Engineers and Energy Team.

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Estates Department

4.0 Heating and Cooling Systems

4.0 Heating and Cooling Systems

4.1 Heat Station

A heat station with plate heat exchangers (duty and assist) is the preferred method of connecting to UoE District Heating and Cooling Systems.

Heat station proposals including schematics should be submitted to the UoE Development Services Engineer for approval. Connections to each PHE should include all necessary PICVs, isolation valves, pressure and temperature gauges, AAVs, safety valves and drain cocks. Test points should also be provided.

The PHEs Heat exchangers shall be arranged Duty-Assist, each sized to deliver 50% (total in aggregate 100%) of the peak diversified connected load.

In existing buildings where space for heat stations may be limited, proposals should be reviewed at an early stage with the UoE Development Engineer.

In buildings with significant domestic hot water loads, a dedicated DHW plate should be considered.

Flushing loops (normally closed) should be provided on the primary and secondary sides of the heat station.

Heat station installations should be designed and installed to make provision for connection of temporary heating or cooling plant in the event of system failure. Both primary and secondary side connections for temporary plant should be considered.

Temperature sensors connected to the BEMS are to be installed on the flow and return on both the primary and secondary connections to individual PHEs, and on the main primary and secondary flow connections to the heat station. Sensors should also be provided on flow and return connections from secondary pumped circuits supplied by the heat station.

Gate valves to be installed on the primary DH flow and return connections to the heat station and on flow and return connections either side of any secondary pumps.

PICVs connected to the BEMS are to be provided on the connections to each PHE for control and shall have valve position monitoring.

Flow meters connected to the BEMS and AMR systems are to be provided on the primary and secondary sides of the heat station PHEs.

Heat meters connected to the BEMS and AMR system are to be provided on the primary and secondary sides of the heat station PHEs and on return connections from all secondary pumped circuits.

DPS connected to BEMS required across DH flow and return to Heat station PHEs. Refer also to UoE BEMS Guide (No. 4).

Strainers required on DH flow to PHEs and on secondary return to PHEs. Pressure gauges required upstream and downstream of strainers.

Temperature and pressure gauges required on primary and secondary side of PHE on main flow and return pipes and are required on flow and return on all secondary pumped circuits.

Provide vacuum degasser and pressurisation unit / expansion for secondary systems where a new heat station with PHEs is proposed. N+1 pumps required. Press unit to include CAT 5 break tank.

Water supply to pressurisation unit to be complete with water meter connected to the AMR system.

Expansion vessel to have anti-gravity loop.

A combined dosing pot and side stream filter shall be provided to achieve 5microns c/w DPS across system to alarm BEMS and panel on alarm.

CT/VT pumps to be provided as required to suit the building requirements and agreed with the UoE Development Services Engineer. Valve arrangement to be designed to avoid poor modulation range. Where mixing is required, passive mixing arrangement is preferred.

Commissioning sets to be provided for all secondary pumped circuits.

Heat stations shall ensure efficient heat transfer under turbulent flow conditions with load turn down to10% of the specified design load or the minimum diversified demand of the connected load, whichever is the lower.

The minimum diversified demand of the connected load shall be determined through an assessment of observed system load or through demand-based calculations.

Heat station components shall be designed for continuous operation at temperatures of; 110°C, or, a minimum of 10% above the maximum working temperatures of the system they are connected, whichever is the greater.

Internal ambient temperature operating range shall be -5 °C to +45 °C.

Heat station design pressure ratings shall be; 16 bar, or, a minimum of 1.5 times the maximum working pressure of the system they are connected to, whichever is the greater.

For applications in unheated environments, where there is a freezing risk a means of mitigating against freezing risk shall be provided. This shall use the available

decarbonised heat source wherever possible. Electrical trace heating shall only be permitted by prior agreement with the UoE Development Engineer.

Target pressure drops across primary and secondary sides of PHEs shall be between 25-30 kPa at full load conditions. Where higher pressure drops are proposed for a particular selection, prior agreement shall be obtained from the UoE Development Engineer.

The Heat Station shall be a single or multiple pre-fabricated skids. Where this is not proposed, the Designer/Contractor shall provide justification for the alternative selection to the UoE Development Engineer.

Substation equipment, including ancillaries shall be arranged to ensure they can be safely maintained throughout their life.

Secondary pump sets shall be selected to give sufficient turn down. Where necessary pump sets shall be equipped with automatic bypass arrangements to protect them outside of normal operating envelopes.

Pressure independent control valves shall be matched to heat exchanger capacities at the specified design temperatures.

When considering approach temperatures, the Designer shall ensure that there is sufficient heat transfer at low loads and low flow rates. Target approach temperatures between the primary and secondary at design condition shall be 3°C or less as per CIBSE CP1. Check that there is sufficient heat transfer at low loads and low flow rates when low velocities may occur within the heat exchanger. Detailed consultation with the heat exchanger supplier is recommended.

Refer also to EDGL 5 (Metering). The Consultant/Contractor must liaise with the UoE Energy team during the early stages of design to agree final requirements and responsibilities.
It is the responsibility of the Contractor to ensure that the metering system is fully operational and demonstrated to the UoE Energy team prior to handover.
The UoE Energy team should be invited to site during the construction stage to review installation locations of gateways and meters and to confirm the commissioning process.

4.2 Heat Recovery Systems

Plate heat exchangers are the preferred option for both air and water systems, for reasons of no moving parts and no cross contamination.

Where these plate heat exchangers units are installed in a building with a BEMS, they shall be supplied as a basic unit without a control panel and the plate heat exchanger operation shall be controlled through the BEMS system.

4.2.1 Plate Heat Exchangers

Brazed plate heat exchangers may be employed where:

- The primary heat input is below 250kW, and
- The Primary and Secondary system is in good condition, is relatively new and does not have current or previous issues with corrosion or poor water quality.

Guidance and approval of the UoE Development Engineer should be sought during the design stage.
Where the above does not apply, PHEs shall be gasket type.
Plate heat exchangers should have AHRI certification.

Gasket type Plate Heat Exchangers

Gasket PHEs shall be:

- CE certified (PED)97/23/EC.
- CE/UK-CE or Water Regulations 4 (UK Regs 4) approved / WRAS approved.
- counter current type

Plate material shall be AISI304 or AISI316 stainless steel.
Gasket material shall be EDPM or Nitrile.
Frames shall be sized to accommodate 20% future expansion

Brazed Plate Heat Exchangers

Brazed PHEs shall be:

- CE certified (PED) 97/23/EC.
- CE/UK-CE or Water Regulations 4 (UK Regs 4) approved / WRAS approved.
- counter current type

Plate material shall be AISI304 or AISI316 stainless steel.
Brazing material shall be copper.
Factory installed 'Cleaning in Place Valves' shall be fitted to assist with flushing.

4.3 Thermal Stores

Thermal stores shall be designed to:

- Optimise techno economic and carbon reduction for the project
- Ensure resilience of energy supply

Thermal stores shall be vertical and have a height to diameter ratio of no less than 2:1, ideally 2.5:1.

Where possible a single thermal store shall be used, to minimise capital cost and heat losses. Multiple small stores shall be avoided where possible due to adverse impacts on stratification.

Where multiple stores are required (for example due to space constraints, transport constraints, planning requirements, structural implications, manufacturing/fabrication processes etc), these shall be interconnected in series to ensure stratification.

Thermal stores shall have 2-pipe connection arrangements in line with the current version of CIBSE CP1.

Inlet and outlet connections shall limit velocities and minimise turbulence in line with the current version of CIBSE CP1.

Thermal stores shall be designed and manufactured in accordance with the current Pressure Equipment Directive and Pressure Equipment Safety Regulations.

Inspection Manways shall be included. These shall typically be with davit door.

Vessel connections shall be flanged branch for flow and return connections, valves and fittings, BSP for gauges and sensors unless otherwise stated in the Contract Documents.

Thermal stores shall be supplied with multiple sensor pockets. Pockets shall be spaced evenly up the useful height of the store.

Pocket and probe depths shall be sufficient to ensure full immersion within the flow.

The thermal store shall be thermally insulated to current BS requirements. This includes the manhole, lifting lugs etc. The insulation for the thermal stores shall consist of 300mm thick, compressed mineral wool or equivalent. Thermal stores shall be clad in a protective Aluzinc or approved equivalent outer coating. Insulation shall be in accordance with BS5422. External surfaces shall be primer painted.

Pressure relief valves shall be installed to protect thermal stores against excessive pressure. Discharge from the valve shall be routed safely to drain at low level. The pressure relief valves shall be positioned such that they are easily and safely accessible for maintenance. There shall be no isolation between the pressure relief valves and the thermal stores.

Automatic air vents and vacuum breakers shall be provided at the top of the thermal stores to allow dissolved air to be expelled and to prevent vacuum conditions within the store. Discharge from the automatic air vent shall be routed safely to the drainage system. There shall be no isolation between the automatic air vents and vacuum breakers and the thermal stores.

Manual isolation valves and a drain cock shall be provided to allow drain down of each thermal store. Drain lines shall be fitted with swan neck connections, routing the valve to an easily accessible location that avoids the need for the Operator to bend down or climb into the area beneath the vessel.

A bypass line shall be provided for maintenance purposes. Where multiple stores are installed, bypassing of individual stores shall be possible.

A pressure indicator shall be provided in each thermal store line.

For cooling applications, where vessels are located externally and/or where there is a risk of freezing, a means of mitigating against freezing risk in ancillary pipework, fittings and connections shall be implemented.

4.4 Distribution

4.4.1 Heating

Where buildings are connected to a district heating system or are served by decentralised systems, a single constant temperature (CT) circuit shall be provided per building and where required a single variable temperature (VT) circuit shall be provided. Where operational temperatures permit, there may not be a requirement for a VT circuit. A lifecycle assessment shall be provided to the UoE Development Engineer for the approval of the omission of a VT circuit.

4.4.2 Cooling

Where buildings are connected to a district cooling system or are served by decentralised systems, a single constant temperature (CT) circuit shall be provided per building and where required an elevated temperature (ET) circuit shall be provided. Where operational temperatures permit, there may not be a requirement for a CT circuit.

Space cooling shall generally be by the application of chilled beam on a (typically) 14°C flow and 17°C return ET circuit. A single circuit shall be provided per building with two sensor-less VSD pumps and 2-port control valves. Where other forms of cooling are used it is essential that control of water flow be by 2-port control valves. The use of low water temperature systems should be avoided, particularly where operation is required during periods of low external temperature. A lifecycle assessment shall be provided to the UoE Development Engineer for the approval of the omission of a CT circuit.

To prevent conflict between the primary and secondary distribution circuits (adverse mixing affecting flow temperature and flow direction), the circuits shall incorporate the staging of the chillers by flow. In this design approach, the primary flow is always equal to or greater than the secondary flow and carry out pump or chiller staging on

the primary side as required to maintain the primary flow greater than the secondary flow.

The provision of cooling to server rooms, IT hubs and freezer equipment rooms, etc, where cooling load would not be proportional to external temperature, design applications should be selected with care. For areas which are operational on a 24/7 basis, the cooling equipment must be selected on the basis of 14°C flow temperatures. Generally, these areas should be provided with air supply to utilise local free cooling.

All design proposals for new and replacement installations must be submitted to the UoE Development Engineer for consideration and approval.

4.4.3 General

Where buildings are connected to a district or are served by decentralised systems, the distribution shall adopt two port valves with variable flow for the control of circuits. A plate heat exchanger shall be interposed between the district and the building energy system.

A two-port system shall be self-balancing and the design should seek to minimise the number of commissioning stations, DRVs and other flow control devices.

All systems shall remain charged with treated water and any drain down time shall be kept to a minimum.

All pump formations shall consist of two single head pumps in a duty/standby auto changeover arrangement. The pumps shall be variable speed drive (VSD) pumps incorporating differential pressure control. Pumps should be selected with a capability of 120% of the design flowrate and pressure.

All main components of the systems shall be equipped with isolation valves. Temperature gauges shall be provided on both sides of heat generating or heat exchanging equipment. Pressure gauges shall be provided on all main system components, i.e., pumps and plate heat exchangers. Test points shall be provided on all terminal devices and terminal units.

Commissioning stations shall be provided on all system branches where the pipework connects to the main riser. Isolation valves shall be provided on all pipework leaving the plantroom as close as possible to the plantroom wall. All pipework shall be routed at least 1m away from electrical distribution zones: switchgear room, electrical risers and DB boards. Where dissimilar metals are used these should be connected via brass connectors or dielectric unions.

All variable flow pipework systems should be provided with devices to control and limit part load pressure variations at key points in the system.

Pressure Independent Control Valve (PICV) or Differential pressure control valves (DPCVs) combined with control valves are commonly used on wet systems. The types of valves should allow for the flowrates to be measured and verified on site or additional devices shall be used.

Pressure independent control valves (PICVs) are preferred however proposals should be reviewed with the UOE Development Engineers.

A vacuum degasser and pressurisation unit shall be provided. Pressurisation units shall be equipped with N+1 pumps arranged with cascade controls.

The pressurisation system should be monitored by the BEMS.

A combined dosing pot and side stream filter shall be provided to achieve 5microns c/w DPS across system to alarm BEMS and panel on alarm.

All expansion joins shall be tied.

No aluminium materials or components should be used or present within and heating or cooling system.

Cold water feed to closed loop water systems shall be suitably protected in line with WRAS CE/UK-CE Water Regulations UK Regulation 4 requirements and metered with BMS connection. Refer to section 8 for further domestic water system requirements.

4.4.4 Pipework and Jointing Systems

The University maintains a vast estate and the integrity of the pipework systems serving the buildings is critical.

A number of pipework and jointing systems may be utilised throughout the estate subject to the building criticality, operational purpose and with approval of the UoE Development Engineer. The system selected shall be capable of delivering the temperature and pressure.

Critical buildings are those which are considered high value from a research, reputational or historical perspective. An example of each are the research facilities at Little France, Main Library in George Square and New College on the Mound.

The following lists to potential materials and technologies applicable to each of the building types.

Note that a single material shall be used for each building. Therefore, a heating strategy which is proposed to have a mixture of steel and copper for the heating system will not be accepted. Where working within existing buildings, the existing pipework system and jointing method shall be adopted.

Critical Buildings

Heating pipework within critical buildings shall be medium grade steel (Blue Band), threaded and screwed up to 50mm with flanged connections where the diameter is greater than 50mm. All Pipework within plantrooms shall be welded.

Non-Critical Buildings

Medium grade steel heating pipework (as above) is also preferred within non-critical buildings. Alternative options which may be considered are:

- Copper; crimped, compression, flanged, brazed or soldered
- Stainless Steel; crimped, compression or flanged.
- Victaulic grooved couplings and fittings.

Note that Victaulic pipework and fittings shall only be permitted on main distribution runs where the pipe size is greater than 80mm diameter. Cross-linked polyethylene (PEX) multi-layer barrier pipe with a metallic crimped jointing system may be considered for small and low value non-critical facilities with the approval of the UoE Development Engineer.

Approval of a system other than Medium Grade Steel for non-critical buildings can be gained through the submission of a Technical Submission during the design stage. The submission should include the proposed system, manufacturer, installation case studies, technical datasheet and manufacturer's warranty information.

Where extended warranties are available, the preferred system shall be installed by an approved Contractor in order to maximise the warranty of the installation. The Designer shall ensure this is included within the Tender documentation.

General

No joints or fittings are permitted within inaccessible locations.

Where steel pipework is to be run below floors or is generally inaccessible, joints to be welded regardless of pipe size.

Carbon steel press-fit systems are **not permitted** in any proposed pipework installations.

Speed-fit or Push-fit system are **not permitted** in any proposed pipework installations.

Contractors must use operatives who are suitably trained and certified for the jointing methods used.

All pipework to be adequately supported. Pipe supports shall be arranged to support each pipe run independently of others and to permit expansion / contraction of

pipework. Support arrangement shall not impede access for maintenance of adjacent services. Supports should incorporate insulation and not be in direct contact with the pipes.

All heating and cooling pipework to be thermally insulated. In the case of low-level heating pipework this will help prevent scalding.

4.4.5 Valving and Ancillary Equipment

Safe isolation of any hydronic system is a key CDM and maintenance requirement. On pipework greater than 50mmθ, it is essential the designer specifies good quality isolation valves from a reputable manufacturer. Furthermore, Gate Valves and NOT butterfly valves shall be provided in strategic locations to be agreed with the UoE Development Engineer at Design stage. Valves should always be in accessible locations.

The minimum performance for valving is defined below:

Butterfly Valves

- Robust, ductile iron valve body for long life service
- Valve body fully lugged to fit PN16 flanges
- Temperature range -10°c to 120°c
- Pressure rating: PN16
- Test pressures: Shell: 24 bar seat: 17.6 bar
- Lever operated epoxy coated ductile iron body.
- Ductile Iron body epoxy coated.
- Fully-lugged.
- Stainless steel disc.
- EPDM liner. To suit flange connections.
- May require to be gear operated depending on application.

Gate Valves

- Cast iron
- Pressure rating: PN16
- Pressure/temperature operating range: -10 to 120°C at 16 bar, 200°C at 12.8 bar
- UK End Connection: flanged.
- Wedge disc, non-rising stem, inside screw, handwheel operated
- To Current Pressure equipment directive.

Rubber Expansion Joints

Rubber Bellows shall incorporate tie rods with inner and outer nuts. Rubber Bellows shall be capable of withstanding the operating and testing, pressure and temperature of the associated system. The minimum performance requirements are as follows:

- Materials: Liner EPDM, hot water resistant, seamless, high abrasion resistance
- Reinforcement: Polymer textile cord, hot water and hydrolysis proof
- Cover: EPDM, ozone proof, heat resistant
- Marking: 2 red bands, ERV DN ., PN ., production date
- Flanges: Swivelling, DIN PN 16, carbon steel, zinc plated
- Operating conditions: Temperature range (depending on medium) -40°C up to +130°C, temporarily up to +150°C. Electrically dissipative.

The handover Asset List shall include a schedule of the Rubber Expansion Joints. Any deviation from these requirements shall be agreed with the UoE Development Engineer.

In designing and installing the system, all necessary expansion/contraction devices and anchors are to be provided as part of the installation.

Expansion Vessels

To be flow through type for potable systems.

Control Valves

All control valves should be selected, supplied and commissioned by the Controls Specialist on the project. The schedule of control valves should be reviewed with the Consultant and with the UOE Controls team prior to procurement.

4.4.6 External Pre-Insulated Buried Pipework

External pipework should comply with CIBSE/ADE Heat Networks Code of Practice CP1 (current version), and all associated documents.

Pipework for district heating and cooling systems should be pre-insulated steel carrier pipe. Pipework proposals should be reviewed with the UoE Development Engineer.

General

Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene. The joint closure system shall allow for an air test to be carried out to prove that the joint is sealed against ground water ingress.

The installation shall be designed and installed to provide a minimum service life of 30 to 50 years, designed to operate with the minimum of maintenance and minimum of heat losses.

In designing and installing the system, all necessary expansion/contraction devices and anchors are to be provided as part of the installation.

At all entry and exit points from buildings, inspection pits, proprietary valve chambers, etc., the pipelines shall extend into the structure by a minimum of 350mm with the water proof pipe casing extending a minimum of 150mm and be complete with a suitable water barrier fixed into the structure or to any water/damp proof membrane.

All pipework shall be protected by a leak detection system to provide the actual status of the pipework and detect any issues at an early stage, to mitigate any unnecessary damage and disruption to supply. Where a new pipework installation is to be connected to an existing installation, the new leak detection system shall be linked to the existing and the overall monitoring system reconfigured accordingly.

The leak detection surveillance system shall be zoned and capable of detecting a leak to within one metre through interrogation of the associated leak detection panel. Leak detection as-built drawings should provide an accurate zone reference baseline for the location of leak.

Separate monitoring systems shall not be installed. The leak detection system to be connected to the BEMs via consultation with the UoE Controls Systems Team.

All proposed suppliers of leak detection equipment to the University of Edinburgh, must operate on an “open protocol” basis with respect to the provision of spares, parts, software and controls to approved third parties as determined by the University of Edinburgh.

Where extended warranties are available, the preferred system shall be installed by an approved Contractor in order to maximise the warranty of the installation. The Designer shall ensure this is included within the Tender documentation.

Pipes should be buried in accordance with the manufacturer’s recommendations and in coordination with any other buried services.

4.5 Water Quality

District networks shall be treated with a synergised nitrite-based corrosion inhibitor to 250 ppm. This is indicative and the exact level must be reviewed with the UoE Building Services Group prior to treatment. Systems containing Aluminium should not be connected to district heating or cooling installations.

Decentralised systems shall be treated with a synergised nitrite-based corrosion inhibitor to 200 ppm. This is indicative and the exact level should be reviewed and agreed between the Contractors Water Treatment specialist and the UoE Building Services Group prior to treatment. Systems should not contain Aluminium.

Where aluminium is present within a heating system, a multi-metal corrosion inhibitor should be used.

The UoE Building Services Group should always be consulted for clarification on water treatment regimes or systems changes.

A water condition monitoring system should be considered for new installations and projects involving significant alterations to existing systems. This should be specified in consultation with the UOE Development Engineer. The system should provide an alarm to the BEMS when pre-set threshold values are not met.

The design should ensure that the installation, testing and commissioning, water treatment and recording of the above and any maintenance carried out during construction is in accordance with HSE guidance.

Where existing systems are altered, the design should ensure that there is allowance for system sampling in consultation with the UoE Building Services Group. The management of water quality issues during construction and maintaining records of system changes and system management should also be reviewed with the UoE Building Services Group.

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5.0 Heating and Cooling Emitters

5.0 Heating and Cooling Emitters

5.1 General

The selection of the type(s) of heat emitters to be employed on a project shall reflect the use of the spaces they are to serve and any other HVAC systems which are proposed. The emitters shall be controlled to avoid any conflict in operation, which will result in the use of excessive energy and discomfort to the users.

All specified emitters shall be capable to withstand operating temperature and pressure of the heating system.

The designers shall propose the system and to allow for proportional balancing of the system. Local isolating valves shall be fitted to allow for individual branch isolation. Each branch shall be fitted with drain cocks. Air admittance valves shall be located at the high and points of the systems.

Access to maintainable parts of the heat emitters, isolation valves, drains, AAVs and other ancillaries shall be considered at early design stage and demonstrated to the University during handover.

All TRV heads shall be Danfoss Aero Ref 015G4690 or Herz equivalent. All TRVs shall be pressure independent type and lockable. The maximum temperature setting shall be 22°C.

5.2 Under-floor Heating

The design and deployment of underfloor heating systems shall only be heating water based and employ a proprietary pump and manifold. Electric underfloor heating systems shall **not** be used.

All underfloor heating systems shall be zoned to suit the use of the space and shall be incorporated into the BEMS.

The system shall not be installed in an area with intermittent occupation or where there are high ventilation rates, heat losses or floor mounted obstacles.

Underfloor heating manifolds shall be located in a secure cupboard or riser adjacent to the zones served by the manifold. All pipelines above the floor shall be insulated.

To avoid hydronic system bypasses, UFH flow temperature control valves shall not divert the flow into the return. Injection type circuits will generally be acceptable whereas 4-port diverting will not.

Provide an overheating mechanical failsafe safety device with set temperature as manufacturer's recommendations and temperature gauges for the under-floor flow and return water.

The Contractor design shall be submitted for review to Designer and UoE Development Engineer.

The suitability of proposed floor surfaces for use with underfloor heating shall be reviewed with the Architect and UFH manufacturer

5.3 Heated Ceiling Panels

Radiant heating panels to be integrated into the ceiling or service raft. The panels shall be suitably insulated on their upside. Flow and return pipework shall be connected to the units by means of flexible, braided stainless steel pipe connectors.

The panels shall be secured to the structural soffit by means of suitable and sufficient suspension system. Suitable access to ancillaries above the ceiling shall be provided.

The whole of the rear of the units are to be covered with minimum of 50mm thick Class "O" foil backed fibreglass insulation.

5.4 Fan Coils

The units shall have tamperproof access panels secured by means of an Allen key.

Integral grilles shall be manufactured from extruded aluminium with an appropriate treated finish.

All fan coil plant items shall be thoroughly evaluated to ensure that noise and vibration during operation does not have any adverse impact on the building users or any processes being undertaken within the building. Where required, adopt acoustic attenuation plenums on the intake and discharge to the unit. Provide a unit or appropriate attenuation to control breakout noise from fan coil casing.

Flexible ductwork connections from the fan coil to grille plenum shall not exceed 1m.

All fan coil units should be provided with condensate drainage connections. Condensate pumps should be avoided where gravity drainage is possible.

Access to filters and maintainable components to be considered at design stage and shall be demonstrated at handover.

5.5 Radiators

All radiators shall be fitted with a restricted range TRV on the flow and a matching lock-shield on the return. TRVs should have horizontal heads and be fitted at the top connection of the radiator.

Radiators shall be fitted to give a minimum clearance of 40 mm from the wall and 150 mm above FFL. Contracts should allow for removal of radiators to permit wall finishes and decoration.

All radiators shall be supplied with manufacturer's brackets, self-bleeding air vents, flow regulating lock shield valves and necessary bushes and plugs.

Where radiators are to be fitted in areas of vulnerable occupancy, they shall be of the Low Surface Temperature (LST) type and all pipework serving such radiators below 2000mm above finished floor level shall be protected to avoid contact. LST radiators shall have a surface temperature not exceeding 43°C.

All radiators shall be finished in powder-coated white RAL 9010, gloss 70 unless otherwise specified.

5.6 Trench Heating

Heating elements shall comprise solid drawn copper tubes expanded into close metallic contact with aluminium plate type fins. The tubes shall be brazed into headers having BSPT female connections. The elements shall be fitted with air vents. Front covers shall be easily removed to facilitate element cleaning and access to control and isolation valves.

Control shall be via a TRV on the flow and matching lock-shield valve on the return. Individual control shall be provided to each room or at every three metres of convector.

The natural convective air path shall be kept clear of any obstructions and the clearances of the air inflow and heated air discharge shall be in accordance with the manufacturer's recommendations.

Zonal thermostatic control shall be provided either directly or remotely to suit the application.

Trench heating floor grilles shall be selected to allow pedestrians and any vehicles (e.g., trolleys) to traverse it and with maintenance access to clear debris.

Casing finishes for wall mounted and skirting heating shall be manufactured from 0.7mm zinc coated steel as a minimum.

5.7 Chilled Beams

Chilled beams can be either active or passive and ceiling or surface mounted unit for heating and cooling. Multi-service beams can be employed. All beams shall be co-ordinated with all other services and finishes components. During design process, modelling of airflows from chilled beam units and proposed furniture layouts is to be undertaken to mitigate draughts to occupants.

Flow and return pipework shall be connected to the units by means of flexible, braided stainless steel pipe connectors.

In addition to the housing of services and controls, the beams shall incorporate acoustic absorption and insulation to assist in the control of noise transmission in the spaces they serve.

5.8 Chilled Ceilings

Chilled ceiling shall only be used where there are limited heat gains to be handled. Flat panel radiant panels are preferred to finned coil batteries set behind a perforated panel. Appropriate insulation shall be provided and environmental controls to ensure that no condensation forms on/in the unit.

5.9 Warm Air Curtains

The building entrances must be protected from uncomfortable draughts. Where warm air curtains are proposed, the design should be based on the following:

- The air curtain should be water based with connection to LTHW system;
- The valve should be 2 port valve rather than 3 port valve;
- Air curtain to be completely controlled via BEMS. Integrated controls are not acceptable.
- Temperature control shall be based on a BEMS temperature sensor located near reception desk.
- The Designer should consider ambient air barriers where appropriate.
- Warm air curtains should be considered where sliding doors are to be installed.

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6.0 Ventilation Systems

6.0 Ventilation Systems

6.1 General

The University employs ventilation systems for numerous applications, including the introduction and distribution of fresh air and heating, air conditioning, process and fume control and control of odours, etc. The use of mixed mode or full ventilation systems shall be considered to eliminate the need for artificial cooling.

The type of system(s) selected shall reflect all the statutory and environmental requirements.

Where applicable, the Specific Fan Power (SFP) shall be no higher than the standards set out in the current Non-Domestic Building Services Compliance Guide for Scotland.

All new ventilation systems shall have heat recovery (unless there is a use-specific reason not to – to be agreed with the UoE Development Services Engineer). Dry heat recovery efficiency shall be a minimum of 80% at duty flowrate at winter design conditions.

All ductwork to be adequately supported. Duct supports shall be arranged to support each run independently of others. Support arrangement shall not impede access for maintenance of adjacent services.

6.2 Ventilation System Components

6.2.1 Air Handling Units

Air handling unit framework shall be constructed using 50mm penta-box section, manufactured from 18 swg (1.2mm) Z2 hot dip galvanised steel. The framework shall have a natural galvanised finish.

All air handling units shall have the following:

- All panels shall be located on closed cell neoprene acoustic gaskets about their perimeter
- Control of all air handling units to be via the BEMS. Control panels shall always be located internally, irrespective of whether the AHU is located internally or externally. All controls equipment to be provided by the Controls Specialist. Refer also to EDGL 4.
- All filters shall be fitted with complimentary differential pressure gauges
- Fan motors shall be wired to local isolators complete with auxiliary contacts. Fan assemblies shall be mounted on vibration isolators. Drive guards shall be fitted to all fan assemblies

- Access shall be provided to each section of plant for inspection and maintenance purposes. Minimum clearances shall be in accordance with the manufacturer's guidance.
- Units shall be constructed to eliminate the transmission of mechanical vibration.
- AHUs shall be provided with heat recovery. Proposed form of heat recovery to be agreed with UoE Development Services Engineer.

In air handling units which have an air flow rate in excess of 1 m^3/sec, all enclosure panels and access doors shall be nominal 45mm deep and double skinned. The outer skin shall be manufactured from 20 swg (0.9mm) B.S.C. colour coat plastisol (plastic coated steel.) The colour selection shall be subject to any planning constraints imposed on the project. The inner panel skin shall be manufactured from 22 swg (0.7mm) Z2 hot dip galvanised steel. The cavity shall be packed with slab rockwool insulation, with a density of 45kg/m^3 (thermal conductivity of 0.035 W/m°C), compressed between the inner and outer skins, to form a panel with excellent thermal and acoustic properties. In addition, these units shall have the following:

- Units shall be fitted with inspection portholes and internal lighting (locally switched adjacent to the exterior of the unit with push back timers
- Suitable permanent lifting points shall be incorporated into the unit base frame or framework.

For ease of handling, larger units shall be transported to site in sections for assembly. All jointing gaskets, sealing materials and hardware shall be provided to allow assembly to be completed.

All units shall be complete with fixed identification, airflow and warning labels.

As a minimum, all AHUs shall be constructed to meet the leakage requirements of DW143 class B.

AHU's shall be mounted within a plant room environment with adequate space for maintenance (external locations only by prior agreement with the UoE Development Engineer.) If AHUs are agreed to be located externally, the associated control panels and fan inverter drives shall always be located internally. All control functions shall be undertaken directly by the BEMS – AHU manufacturer controls will not be acceptable. Each section shall be clearly labelled as to function.

Variable Speed Drives (VSD) should be by stand-alone units, internally located and connected to BEMS and should be fitted to all motors to permit areas requiring ventilation to varying timescales and conditions from a single unit. Where appropriate, the number of AHU's should be minimised (e.g., combined) to minimise plant complexity and cost.

Motorised dampers shall be provided between ambient conditions, heater/cooler batteries and controlled to “close” when the ventilation is idle. Heater and cooler batteries should be fully controlled via the BEMS.

Where external intake grilles are at high level, provision should be made for access to the insect screen from within the plant-room.

Flushing loops shall be installed at all heater and cooler batteries complete with normally closed isolating valves. Connections to heating and cooling batteries to be rigid rather than via rubber bellows, unless specifically required by the AHU manufacturer.

Note that where DX cooling is proposed for AHU cooling, the DX systems should be fully controlled by the BEMS.

Air handling units to be equipped with suitable drainage connection which shall be reviewed with the UoE BSG at design stage. If water traps are used the depth of traps should be confirmed by the manufacturer. Sufficient AHU upstand should be provided to allow for the drainage installation and natural gravity slope towards the nearest floor gully.

Manufacturer’s guidance should be sought in relation to frost protection of AHUs and this should be reviewed with the UoE Development Engineer.

6.2.2 Supply/Extract Fans

Generally, ventilation fans should be centrifugal, of the backward bladed type with a fan total efficiency of not less than 50%. Belt driven fans are not preferred by the university however where used fans shall be equipped with minimum of two fan belts.

Where appropriate, fans shall be controlled by inverter drives to maximise efficiency and plant life. Supply and installation of the inverter shall be part of the BEMS contract. Inverter drives shall be located internally irrespective of whether the fan is located externally.

EC motors can also be considered. Designer to submit proposals for fan drive systems to UoE Development Services Engineer for review.

Access to fans and their maintainable components are to be considered at design stage and shall be demonstrated at handover.

6.2.3 Filters

Supply air shall be filtered as specified in CIBSE Guide “A”. A set of spare filters shall be provided under the contract and should only be fitted under direction of the UoE Development Engineer.

Panel filters – air velocity at the filter face shall not exceed 1.75 m/sec and manufactured to standard sizes.

Bag filters – air velocity at the filter face shall not exceed 2.5 m/sec and manufactured to standard sizes.

Filter condition indication shall be by magnahelic gauge, no BEMS indication is required.

Filters shall be easily replaceable and fitted with dirty filter indicators. Energy efficient filters should be used. Access to filters should be demonstrated at handover.

6.2.4 HEPA Filters

Centralised filter location is preferred to local individual filters.

Filters shall be connected to BMS as well as magnehelic gauges shall be provided. Refer also to EDGL 4.

Filters in the extract ductwork from dusty environment shall be protected by lower grade panel pre-filters.

The use of HEPA filters must be agreed with the UOE Development Engineer.

6.2.5 Humidifiers

Generally, humidification shall be provided by employing mains water supplied, resistive humidifiers providing humidity control of ±3%RH. Humidifiers integrated into air conditioning units, close control units, etc, shall be of this type.

Where high-capacity humidification is required, an adiabatic evaporative type humidifier, as manufactured by Condair (or an equivalent University approved unit), shall be used. Adiabatic humidifiers shall be supplied complete with filters, pumps, staged control and a purpose-made control panel incorporating UV or chemical sterilisation.

Care shall be exercised to ensure maximum recommended face velocities within the humidifier are not exceeded.

Humidifiers should be designed and installed to ensure that they can be maintained in accordance with the manufacturer's recommendations and HSE guidance HSG 274. The systems should be risk assessed to identify a checklist of recommended frequency of inspection associated with any risks from the system.

The proposals for drainage from humidifiers in AHUs and close control AC units shall be reviewed with the UoE Development Engineers.

6.2.6 Volume Control Dampers

Shall be constructed with the following characteristics:

- Spindle control, 12 mm square, 100 mm long for use with actuators
- Robust yet lightweight blade and frame construction
- Casing leakage satisfies classes A-D of DW142
- Opposed aerofoil blade operation
- All operating gear shall be fully enclosed and out of ducted airway
- Blade position indicator.
- Access to VCDs to be considered at design stage and shall be demonstrated at handover.

6.2.7 Air Diffusers

Shall incorporate the following components:

- The internal core style shall be selected to ensure that the diffusion of the supply air does not create draughts
- The grille shall be finished in RAL 9010 unless otherwise agreed
- Each grille shall be equipped with an opposed blade damper for air balancing.

6.3 Central Ventilation

All central ventilation systems shall take cognisance of the areas which they serve:

- Use and occupancy of the space;
- Operating times;
- Internal conditions required to be maintained.

In spaces which have similar operating characteristics, consideration shall be given to employing controlled motorised dampers to isolate unused spaces and allow a reduction in the airflow rates through the air handling system.

Variable Air Volume (VAV) is a type of heating, ventilating, and/or air-conditioning (HVAC) system. VAV systems vary the airflow at a constant temperature. The advantages of VAV systems over constant-volume systems include more precise temperature control, reduced compressor wear, lower energy consumption by system fans, less fan noise and additional passive dehumidification.

VAV systems can be particularly energy efficient as they are able to operate the main supply and extract fans at reduced speeds. This can yield significant energy savings from reduced fan power and a reduction in the costs associated with heating and cooling air.

Variable Air Volume (VAV) systems shall be considered where zones with different requirements by varying the quantity of air (and hence the amount of cooling) supplied to each space.

VAV systems can be utilised to control the amount of fresh air being introduced and removed from spaces through the monitoring and control of spatial co2. In larger applications with numerous zones, local motorised damper control (such as TROX or similar) shall be employed with fan pressure controls to reduce/increase airflow rates. This arrangement requires careful testing and commissioning ideally with furniture arrangements in the building space. VAV control and feedback monitoring shall be hardwire linked directly to the BEMS to allow full environmental control.

For specific guidance on desired HVAC setting in laboratory areas please refer to University of Edinburgh Laboratory Ventilation Policy.

Access to VAV and CAV (constant air volume) devices to be considered at design stage and shall be demonstrated at handover.

6.4 Dirty Extract Units

The location of all dirty extract systems shall take account of any local openable windows or ventilation air intake to prevent re-entrainment of the exhausting air.

Dirty extract discharges shall be designed to dissipate the exhaust air clear of the building. Roof level discharges are the preferred solution.

Duty/standby fan arrangement may be required depending on the installation. Review proposals with UoE Development Engineer at an early stage

6.5 Local and Special Ventilation

The University's activities require varied and extensive application of extract ventilation to provide healthy and safe internal working environments. All system shall comply with the current HSE and COSHH standards. The location of all extraction equipment shall ensure that their discharges prevent air re-entrainment into the building or its ventilation systems. The systems shall be designed to provide the required extract performance for the lowest energy consumption.

A COSHH risk assessment must be undertaken to assess the risks of substances hazardous to health. With some processes, more than one type of hazardous substance (for example chemical and radiation) may need to be assessed and controlled. The risk assessment should follow the hierarchy of control, and identify which, if any, LEV system is most appropriate for the tasks to be undertaken.

LEV systems may be required for any facilities using chemical, biological or radioactive substances, or other substances such as wood dust or welding fumes.

Following installation, a user manual must be supplied by the installation company to the end users to ensure all users are aware of the technical requirement for safe usage, checks and maintenance.

The current version of the University of Edinburgh Code of Practice for the safe management of local exhaust ventilation (LEV) systems should be consulted at design stage.

Designs for LEV systems shall be submitted for review at an early stage by the UoE Authorising Engineer.

6.6 Toilet/Bathroom Ventilation Extract Fans

All ducted toilet extract systems shall be served by an extract ventilation system equipped with duty and standby fans complete with automatic changeover in the event of the failure of the duty fan.

The location of all toilet/bathroom extract systems shall take account of any local openable windows or ventilation air intake to prevent re-entrainment of the exhausting air.

All local extract fans shall be controlled by means of PIR linked to integral over-run timers. The PIR can be linked to the lighting personnel detection system as appropriate. Toilets should be maintained under negative pressure.

The ceiling in mechanically ventilated toilets should be fully accessible.

6.7 Kitchen Ventilation

Kitchen ventilation systems shall comply with the current version of DW172 – The Specification for Kitchen Ventilation Systems from BESA.

The proposals for kitchen ventilation shall be reviewed with the UOE Development Engineer at design stage including proposals for access to fans, filters and ductwork for maintenance and cleaning and all proposed safety interlocks and alarms for the system.

A Kitchen specific demand-based ventilation control system (e.g., Quintex Cheetah) shall be provided to all new or refurbished kitchens. This does not apply to domestic scale kitchens (e.g., in student residential apartments).

6.8 Safety Cabinets

When dealing with chemical and biological agents, a formally recorded COSHH assessment must be carried out in conjunction with the University's end users, to determine what level of biocontainment is required, including any LEV (local exhaust ventilation) issues. Refer also to 6.5.

- The COSHH assessment (COSHH Regulation 7 which requires that exposure to hazardous substances must be controlled or prevented at all times) must also account for the cleaning/fumigation of safety cabinets as well as everyday use.
- All Microbiological Safety Cabinets (MSC) shall be designed and installed in accordance with BS 5726 and BS12469
- All projects requiring containment shall be designed in full compliance with "the management, design and operation of microbiological containment laboratories" – Advisory Committee on Dangerous Pathogens published by HSE
- Designers should consider carefully the intended method of ventilation where MSC's and/or fume cupboards are to be installed. Agreement with the UoE Development Engineer should be obtained before any design work is completed.

To prevent the re-entry of dangerous chemical fumes, exhausts should be sited at least three metres from:

- Windows, doors and other building openings
- Pedestrian walkways
- Nearby buildings
- Nearby flat roofs

6.9 Fume Cupboard Extracts

Please refer to University of Edinburgh Laboratory Ventilation Policy for further details.

All fume cupboard extraction systems shall be installed to run efficiently, safely and with the minimum of noise levels. To achieve these requirements, the extract and ductwork systems shall be designed, installed and commissioned to meet the requirements of H.V.A.C. DW154 (Plastic Ductwork Specification) and B.S.E.N. 14175. In addition, HSE testing requirements for condensing gases and vapours in particular need to be applied for all ducted systems so that the minimum transport velocity required in the HSE guidance are met.

The designers should choose low energy systems over more conventional systems which result in higher energy consumption (i.e: low flow fume cupboards, variable volume fans, lower sash height, wind responsive controls, etc. should be considered and agreed with the end users and UoE Development Engineers during design phase).

Where 24/7 ventilated storage is required, this should be provided on a separate system from the fume cupboards, to allow fume cupboards to be switched off when no activity is taking place. These full room venting systems, although aimed at internal atmospheric control are not strictly Local Exhaust Ventilation (LEV) and as such the full statutory requirements around LEV outlined in HSG258 do not apply.

However, where condensing gases and vapor may be part of the reason for such room venting requirements, ducted systems need to be designed and installed to ensure that condensation in the ductwork is not an issue due to low transport velocity.

Installation of new units should take into account the School/Department Generic Project requirements for fume cupboards and microbiological safety cabinets. All fume cupboards should be clearly marked with a unique identification code or marker. Newly installed units should also display the name of the manufacturer/supplier of the fume cupboard including the model and the year of production. All such systems must come with an operating manual, a commissioning report and an operational logbook. Where they are supplied as a self-contained unit for connecting in to ducted systems or rely on returned air, a UKCA marking is required along with the supply of a formal Declaration of Conformity.

Fume cupboard and associated extract system emergency shutdown procedures to be agreed at an early stage. The proposals should be agreed between the Department, the UoE Fire Safety Unit and the Design team. Where shutdowns are prompted by an emergency stop single action activation, such emergency stop systems need to comply with the colour coding and identification requirements outlined in HSE Guidance supporting The Provision & Use of Work Equipment Regulations (PUWER)

The proposal of fume cupboards design shall be submitted for review to UoE Development Engineer. This shall include a description of operation for the system including how the system interfaces with the BEMS and with any general supply and extract systems serving the rooms containing fume cupboards and those serving adjacent spaces to provide a safe, reliable and energy efficient installation.

Where multiple extract fans are proposed, the fume extract ductwork shall transform externally to a header duct with fresh air bleed dampers prior to connection to the fume extract fans. Fume discharge from the fans shall terminate in accordance with BSEN14175.

Requirements for fire rated ductwork or enclosures should be agreed at an early stage with the Project Fire Engineer and in consultation with a fume cupboard specialist installer. Where such a requirement is identified, this should trigger a formal review of the current DSEAR assessment or prompt one to be done as part of the project.

Designs for LEV systems shall be submitted for review at an early stage by the UoE Authorising Engineer. This shall include fume cupboard extract systems.

Refer also to 6.5.

6.10 Roof-mounted Ventilation Units

The location of the ventilation units shall ensure that safe access for maintenance is provided.

Roof mounted ventilation fans shall be mounted on suitable upstands to prevent rain/snow ingress and provide a kerbing for facilitating the waterproofing of the roof membrane.

Fan selection shall be suitable for mounting on the pitch of the roof.

Bird deterrent measures should be considered to protect plant on the roof. This should be reviewed with the UoE Development Engineer and the Local Estates staff.

Controls for roof mounted plant shall be located in nearby internal plant areas.

6.11 Natural Ventilation

Natural ventilation should be utilised wherever possible and may be an option for many spaces within University buildings. This could simply be provided by openable windows in a single sided or cross ventilation set-up, or as stack ventilation (e.g., by using an atrium). Some areas may use a combination of mechanical and natural ventilation.

Proposals for natural ventilation should be in accordance with the Scottish Building Standards Technical Handbook.

Proposals to utilise natural ventilation should be reviewed with the UOE Development Engineer. In some instances, dynamic simulation modelling may be requested to demonstrate the effectiveness of the proposed natural ventilation system in maintaining occupant comfort.

6.12 Smoke Ventilation

Smoke extract or smoke control systems shall be designed by a suitably experienced Specialist in consultation with the UOE Development Engineer, UOE Fire Safety unit and the projects designated Fire Engineer.

Panel locations should be agreed with the UoE Fire Safety Unit and Technical Compliance teams.

The system shall be designed in accordance with the proposed fire strategy and fire detection cause and effect strategy. Refer also to Design Guidelines 6 and 9.

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7.0 Desired HVAC Installations by Room Function

7.0 Desired HVAC Installations by Room Function

7.1 Lecture Theatres

Heating and ventilation designs for Lecture Theatres shall comply with the following parameters:

- Heating/ventilation system shall be designed to achieve an occupancy temperature of 19°C in the heating season and 24°C during all other times
- 'Cooling' will normally be achieved by mechanical ventilation unless there are very high internal and solar heat gains
- Displacement ventilation system shall be the system of choice in lecture theatres. Each theatre shall have its individual system
- Fresh air supply rates shall be based on CIBSE recommendations. If a displacement system is used then the rate may be higher
- Air handling unit equipment supplying/extracting air from lecture theatres shall incorporate some method of heat recovery. The preferred system of heat recovery is by the use of a plate recuperator c/w face and bypass section or, if suitable, recirculation. Other methods, such as a heat pipe, may also be considered but run around coils should only be used as a last option
- Ventilation plant serving lecture theatres shall be designed to achieve noise rating no higher than NR30
- Occupancy sensors (microwave type) shall be installed within lecture theatres to enable the controls system to 'set-back' to a lower temperature set-point of 16°C when no movement is detected (see Controls Section)
- Consideration should be given to the control of supply/extract fans either by the use of inverter or two speed controls. CO2 sensors normally fitted within the extract ductwork would dictate the fan speed. The system should maintain CO2 levels below 0.08% (800 ppm)

7.2 IT Communications Rooms

DX split air conditioning units complete with temperature monitoring/control and alarm linked to the University's BEMS. Dedicated system typically required, however connection to a cooling system serving other areas may be considered in certain circumstances. This is dependent on the size and type of equipment located within the IT room and level of resilience required, and the type of cooling system which could be used to serve the IT room.

Comms room cooling load testing may be required. This should be agreed with the UoE Development Engineer.

Depending on equipment load and whether the IT room is adjacent to an external wall, a simple supply and extract system controlled by a room or equipment thermostat may be sufficient. Design application to be subject to a resilience risk assessment, in the event of a failure and impact on the business. Submit proposals to the UoE Development Engineer for review.

7.3 Refrigerator/Deep Freeze Rooms

Packaged refrigeration system integrated with the refrigerated store/room complete with temperature monitoring/control and alarm linked to the University's BEMS. Please also refer to the UoE Cold Storage Facility Policy for further details.

Freezer room cooling load testing may be required. This should be agreed with the UoE Development Engineer.

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8.0 Domestic Water Systems

8.0 Domestic Water Systems

8.1 General

All domestic water services shall be designed, installed and commissioned in accordance with the latest UK legislation, standards and industry guidance, including:

- The current Water Supply (Water Fittings) Regulations, enforced by local water authorities.
- WRAS (Water Regulations Advisory Scheme) Guidance including current interpretations and approved fittings.
- CE/UK-CE or Water Regulations UK Regulation 4 / WRAS approved
- The current HSE Approved Code of Practice and Guidance (L8): Legionnaires' Disease. The control of legionella bacteria in water systems.
- BS EN 806. Specifications for installations inside buildings conveying water for human consumption
- BS 8558 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages
- BS8554 – Code of practice for the sampling and monitoring of hot and cold-water services in buildings
- PD855468 – Guide to the flushing and disinfection of services supplying water for domestic use
- HSG 274 Part 2 - Technical Guidance for Hot and Cold-Water Systems
- CIBSE Guide G – Public Health and Plumbing Engineering
- CIBSE TM13 – Minimising the Risk of Legionnaires' Disease
- Local Water Authority Byelaws and specific requirements.

Commissioning and Disinfection

On completion of installation and prior to use domestic water systems shall be thoroughly disinfected in accordance with PD855468.

Following flushing, all strainers shall be cleaned and cleared of debris.

Water sampling and monitoring shall be carried out in accordance with BS8554, where applicable.

Temporary Use During Construction

Where domestic water systems are taken brought into use during construction, the contractor shall be responsible for maintaining water quality on site and shall ensure full compliance with Table 2.1 of HSG 274 Part 2.

Contemporary records of water quality management shall be maintained and included within the Operation and Maintenance (O&M) Manual.

Contractors are required to continue to fulfil their duties under HSG 274 Part 2 throughout the construction period.

Gas and water pipes to be buried in accordance with the requirements of the Local Authority/Utility Provider. Refer also to relevant industry guidance, e.g., NJUG.

8.2 Cold Water Systems

8.2.1 Mains Water Supply and Distribution

Any external mains water distribution shall be run underground in MDPE pipework, unless alternative materials are required to address ground contamination risks.

The MDPE pipework shall transition to copper mains water pipework at each building entry point to ensure compliance with WRAS-approved materials and fittings.

The main point of isolation to each building shall be agreed with the UoE Development Engineer at design stage and shall be highlighted to the UoE BSG at handover demonstrations.

Site mains water supply meters shall be installed in accordance with Metering Design Guidelines (No. 5) and integrated with the UoE BEMS and AMR systems for monitoring and control.
Refer also to EDGL 5 (Metering). The Consultant/Contractor must liaise with the UoE Energy team during the early stages of design to agree final requirements and responsibilities.
It is the responsibility of the Contractor to ensure that the metering system is fully operational and demonstrated to the UoE Energy team prior to handover.
The UoE Energy team should be invited to site during the construction stage to review installation locations of gateways and meters and to confirm the commissioning process.

As built schematic drawings should be displayed in the area where water enters the building or is stored. Drawings should clearly note all critical system valves

New water mains connections and/or additional connections to existing water mains should be carried out in consultation with Scottish Water and the UoE Energy and Utilities team to ensure that there is capacity for the new connections.

Note that Scottish Water requires a Pre-Development Enquiry (PDE) as the first step in any new or modified connection. This ensures that they can assess the network capacity and the impact on the existing infrastructure (including any need for reinforcement or diversion) and the technical feasibility of the proposal.

Water demand calculations may be requested for review with the UoE Water Management team.

Regulatory Compliance

All cold water service systems shall comply with the HSE Approved Code of Practice and Guidance (L8), and the accompanying HSG 274 Part 2 technical guidance.

Cold water systems shall be designed to maintain water temperatures below 20°C with appropriate insulation and layout to prevent thermal gain.

Water sampling and monitoring shall follow BS 8554 where applicable, to ensure microbiological safety and compliance with Legionella control protocols.

Identification and Backflow Protection

Any cold-water pipework serving laboratory or process systems shall be clearly labelled and readily distinguishable from the wholesome water supply.

Where pipework branches serve non-potable systems (e.g., heating or cooling pressurisation units), each branch shall be fitted with an in-line spring-loaded single check valve, installed as close as practicable to the point of connection, in accordance with the current Water Supply (Water Fittings) Regulations.

Thermal Protection

To mitigate thermal gain, cold water pipework shall be provided with suitable insulation and adequate separation from heat sources such as heating and hot water pipework.

Pipework routing shall be coordinated to avoid proximity to high-temperature services, and insulation materials shall meet the performance standards outlined in CIBSE Guide G and BS 5422.

8.2.2 Cold Water Storage

If cold water storage is required in the building, the following standards shall apply to ensure compliance with the current Water Supply (Water Fittings) Regulations, WRAS guidance and HSE ACOP L8:

General Requirements

Cold water shall be stored in potable quality storage tanks located internally within a dedicated tank room or plantroom shared with no heat generating equipment where possible.

Water storage should be minimised wherever possible, and it should hold no more than one normal day’s typical water demand. The stored water calculations should

be provided to the UoE Development Engineer / UoE Water Manager for review and approval.

Tank components and fittings shall meet with CE/UK-CE or Water Regulations UK Regulation 4 / WRAS approved.

The construction of the tanks shall be GRP sections with flange bracing (externally flanged unless agreed with UoE)

Tank Design and Features (including Installation and Access requirements and Usage restrictions)

Tanks shall be fully insulated and be dual-compartment type with lockable covers and have screened vents and overflows to prevent ingress of insects and debris.

Further, tanks shall provide the following:

- Overflow and warning pipes shall be installed to discharge externally in a visible location to ensure prompt detection of overflow events. Discharge should be into or as close as possible to external waste water drains.
- Storage tanks shall have self-draining profiles to facilitate cleaning and maintenance.
- Storage tanks plantrooms shall allow for sufficient maintenance around the tanks. Minimum 1m around the tank;
- Storage tanks fitted within plant rooms with a heat source or externally within direct sunlight to be double insulated to prevent heating of the stored water.
- Sufficient space above the tank shall be allowed, minimum 0.75m;
- Stainless steel fixings shall be utilised for all cold water storage tank installations
- Storage tanks shall have inlets and outlets on opposing sides to promote circulation and reduce stagnation.
- If tanks maintenance requires work at height the safe access and working environment should be provided; Fixed, hooped access ladders shall be provided for all cold water storage tanks to facilitate maintenance. Guard railing should also be provided.
- Water storage tanks shall be fitted with a side access panel to facilitate egress in the case of an emergency;
- Float valve shall be adjustable to allow for operational flexibility.
- Mains water pipework connections shall be designed to ensure equal length / pressure to each section;
- The tanks shall be installed on upstand walls or steel beam supports allowing for inspection below the tank base and sufficient space for maintenance (minimum 0.45m).
- Sectional tanks to be externally flanged. Internal flanging of tanks requires the approval of the Development Engineer.

- The tanks should be provided with high and low level alarms and a tank water temperature sensor which should provide an alarm to the BEMS.
- The tanks should be dedicated for the purpose of cold water storage only. Combined water storage and sprinkler tanks are not acceptable.

8.2.3 Pressure Booster Sets

General Requirements

All units employed on potable water to meet with CE/UK-CE or Water Regulations UK Regulation 4 / WRAS approved and be in accordance with the current Water Supply (Fittings) Regulations and Schedule 2 Paragraphs 2-4 of the Water Fittings Regulations.

Booster sets shall not be connected directly to the mains supply. A break tank with a Type AB air gap shall be provided upstream of the booster set to comply with backflow prevention requirements.

System Configuration

Units shall incorporate integrated pressure transmitters for real-time monitoring, a dedicated control panel and a variable frequency drive controller for energy efficient operation.

Pumps to operate on cascade control logic. One pump shall be variable speed controlled and the remainder shall operate at fixed speed activated as demand increases. all components mounted on a frame for easy installation, maintenance and for vibration isolation

Units shall be equipped with N+1 pumps arranged with cascade controls. One additional pump beyond the required duty to ensure resilience.

Hydraulic Accumulator Vessels

Units shall also be provided with N+1 hydraulic accumulator vessels to ensure pressure stability and system resilience.

Each vessel to be individually isolatable with lockable isolating valves, sized appropriately for the system duty/pressure range and installed with drain valves and pressure gauges for maintenance and monitoring.

Additional Requirements

Units shall include:

- Automatic duty rotation to balance wear across all pumps
- Manual override capability for emergency operation
- Isolation valves on suction and discharge lines for maintenance

- Flexible connections to reduce transmission of vibration to pipework
- Drain valves and pressure gauges on each pump outlet
- Booster sets shall be installed in ventilated plantrooms with adequate access for maintenance, typically 1m clearance around the unit.
- A common fault signal should be provided to the BMS. In buildings where there is no BEMS allow for connections to be made in the future.

8.2.4 Rainwater/Greywater Harvesting Tank

Rainwater and Greywater harvesting systems are generally not required on new University buildings. Proposals for rainwater/greywater harvesting should be agreed with the UOE Development Engineer and Water Manager at an early stage in the design.

8.2.5 Drinking Points

Proposals for drinking water points should be reviewed with the UoE Development Services Engineer and Water Manager at an early stage in the design.

All new and refurbished University of Edinburgh facilities shall comply with the University's Water Policy, which is available on the UoE Estates website.

The University of Edinburgh is committed to providing a safe, wholesome, sustainable and accessible supply of drinking water for all students, staff and visitors. Drinking water shall be provided through clearly identified drinking water points located across the University estate and supplied from wholesome water systems that are maintained in accordance with legislative requirements and the University's Water Safety Management arrangements. Drinking water points should be conveniently located, accessible, and incorporated into the design of all new buildings and major refurbishment projects.

The University promotes the use of designated drinking water points and discourages the consumption of water from outlets located within laboratories, workshops, sanitary facilities, plant rooms, construction areas, or any outlet not specifically identified for drinking purposes. Free-standing bottled water coolers should be avoided wherever a wholesome mains-fed supply is available, and plumbed-in water coolers will only be permitted in exceptional circumstances subject to Estates approval and compliance with relevant British Standards and water regulations.

The Water Policy also supports the University's sustainability objectives by encouraging the use of reusable drinking bottles, reducing reliance on bottled water, and promoting free access to drinking water throughout the estate. Through these measures, the University seeks to safeguard drinking water quality, support health and wellbeing, and ensure compliance with regulatory and best practice requirements.

8.3 Hot Water Systems

All hot water service systems shall comply current Scottish Building Standards as well as current design guidance including:

- The requirements of the current HSE Approved Code of Practice and Guidance (L8): Legionnaires' Disease. The control of Legionella bacteria in water systems
- HSG274 Part 2.
- BS EN 12828
- BS 8554
- Current Water Supply (Water Fittings) Regulations, including WRAS approved components.

Hot water shall be stored and distributed in a manner that prevents stagnation, maintains safe temperatures, and ensures compliance with Legionella control protocols. Storage temperatures shall be maintained at ≥60°C, and distribution systems shall deliver water at ≥50°C within one minute at outlets.

8.3.1 Hot Water Storage

General Arrangement

Hot water storage shall be provided by 2no. copper HWS unvented storage vessels with plate heat exchangers located in the plant rooms, each capable of providing 66% of the demand. Stainless steel may also be considered in consultation with the UoE Development Engineer and Water Manager.

Any commercial kitchen and laundry shall be provided with separate dual storage buffer vessels for their dedicated hot water services. The level of storage shall be agreed with the UoE Development Services Engineer and Water Manager.

Refer also to the Scottish Government New Build Heat Standard.

Heating and Backup

The hot water storage vessels shall generally be heated by LTHW via plate heat exchangers (designed to perform with reduced district heating temperatures in future which should be reviewed with the Development Engineer and UoE Energy Team).

Electric immersion heaters shall be provided to provide back-up DHWS heating and pasteurisation cycles for when district heating flow temperatures are reduced in the future. Electric immersions shall be controlled from the BEMS. A local override feature for the immersion should be provided which should be reviewed with the

UoE Controls team. A BEMS pasteurisation cycle shall be programmed to activate when LTHW flow temperature drops. In installations where there is no BEMS present, there should be provision made for future BEMS connection. Refer also to EDGL 4.

The design should allow for a suitable recovery period for the hot water storage based on the building type and use. Typically, the recovery period is within 4 hours, but faster recovery may be required in certain cases. Proposals should be agreed at design stage with the UoE Development Engineer.

All hot water Storage vessels shall be equipped with the following:

- Suitable inspection hatch (access manhole typical size 600diameter).) Hatch cover to be insulated. If unable to fit an inspection hatch, allow for means of access via bore scope for inspection.
- Pressure Temperature Relief Valve
- Anti-Vacuum Valve
- Temperature Sensor 1/3rd from the top of the cylinder and on secondary return.
- Drain cock at low level
- Pressure gauge
- Temperature gauge
- Electric immersion with integral high limit thermostat. High limit thermostat to be monitored via the BEMS.
- Pump and flow regulator on PHE secondary side.
- IV, strainer, NRV, expansion vessel and expansion relief valve on cold feed.

8.3.2 Distribution

All hot water circuits shall be designed and installed in accordance with:

- HSE Approved Code of Practice L8 – Legionnaires' Disease: The Control of Legionella Bacteria in Water Systems
- HSG 274 Part 2 – Hot and Cold-Water Systems
- Current Water Supply (Water Fittings) Regulations
- Building Regulations Part G – Sanitation, Hot Water Safety and Water Efficiency
- BS EN 806 and BS EN 8558 – Design and maintenance of domestic hot water systems

General Distribution Requirements and Temperature Control:

- Monobloc single lever taps (TMV Type 1 and TMV Type 2) are the preferred solution for the UoE on the grounds of future maintenance and cost
- Circuits shall be fitted with a secondary return to maintain circulation and temperature control. If a hot water return system is deemed unnecessary for a specific installation, this must be reviewed and approved by the University

of Edinburgh Development Engineer or the University of Edinburgh Water Manager prior to proceeding.

- Secondary returns shall be connected within 1m of each final outlet or 500 mm of any thermostatic mixing valve (TMV.) For back-to-back installations, best practice is to install the TMV at 500 mm and the return within 500 mm of the mixer.
- A standby dry secondary return pump shall be provided for all installations, wall-mounted with capped ends for future commissioning.
- Where TMV's are used, these shall generally be installed within 500mm of each final outlet
- Domestic hot water storage temperature shall be 60°C. Consideration should be given to maintaining storage temperatures where ASHPs are used as the heat source and/or energy saving time schedules are proposed.
- Domestic hot water return temperature shall be a minimum of 50°C, prior to the connection to the hot water generation.
- Flexible hoses should be avoided except when they are required for vibration or movement.
- Heat loss from hot water pipework should be mitigated by providing suitable insulation and adequate separation from sources of cooling such as chilled water, ventilation ports or cold water pipework.
- Hot pipework should always be run above cold pipework.
- TMVs, scalding protection and user groups, temperature set to 41°C – 43°C.

The UoE has undertaken a generic risk assessment of scald in accordance with HSE guideline HSG274 Part 2.

Thermostatic Mixing Valves (TMVs) shall be installed **only where required** by risk assessment, in accordance with TMV2 and TMV3 certification schemes:

- Every bath shall be fitted with a Type 2 TMV (Mixer) or Type 5 TMV (concealed feeding bath pillar tap).
- Every wash hand basin within an accessible toilet shall be fitted with Type 2 TMV (Mixer) or Type 5 TMV (concealed feeding pillar tap).
- Every wash hand basin which is within accessible accommodation rooms, including summer let accommodation rooms, shall be fitted with a Type 2 TMV
- **NOTE:** There is no requirement for valves noted above to have additional automated shut off valves beyond thermostatic control.
- Every shower shall be fitted with a Type 3 TMV.
- Every wash hand basin within a nursery should have a Type 2 TMV, with additional automated shut-off to NSF-TMV3 set to 38-40°C.
- Every wash hand basin within healthcare premises and in areas of public accessibility should have a Type 2 TMV, with additional automated shut-off to NSF-TMV3 set to 40-42°C.

- All other areas from those noted above, including Staff rooms, general office washrooms, utility sinks and back-of-house areas etc, would not require a TMV.
- Where TMVs are installed, they shall be located within 500 mm of the final outlet and be easily accessible for maintenance and testing. TMVs must be WRAS-approved, tested regularly, and maintained in accordance with manufacturer guidance and HTM 04-01 for healthcare environments.
- The domestic hot water distribution proposals should be reviewed with the UoE Water Manager.
- All hot water pipework to be thermally insulated. In the case of low level pipework this will help prevent scalding.

8.3.3 Heat Interface Units

Localised instantaneous HIU's will be considered when it is more economical to install than a centralised system. However, the below parameters MUST be met.

Regulatory Compliance

- HIUs shall be designed and installed in accordance with:
- CIBSE CP1 (current version) – Heat Networks: Code of Practice for the UK
- Current Water Supply (Water Fittings) Regulations, including WRAS-approved components
- HSE Approved Code of Practice L8 and HSG 274 Part 2 for Legionella control
- BS EN 12828 – Design of water-based heating systems in buildings

Design Parameters

- Mains fed cold water systems only. (No stored Water tanks)
- Applicable to outlets with high usage where instantaneous generation is justified by demand.
- DHW Recirculation not to be used with HIUs.
- Pipe work to be sized so as all DHW Outlets are supplied with a minimum hot water temperature of 50°C within 45 seconds
- Use would be limited to core spaces of buildings which have a low number hot water outlets such as Individual flats, office buildings and general teaching spaces serving i.e kitchens, tea points and WCs.

Performance and Safety

- HIUs shall be capable of delivering consistent hot water temperatures without reliance on stored hot water.
- Systems shall include anti-scald protection where required by risk assessment, and comply with TMV2/TMV3 guidance for applicable outlets.
- All HIUs shall be BESA-tested or equivalent, and selected based on diversity factors and peak demand calculations.

8.3.4 Local Hot Water Heaters

Local hot water heaters (single or multi-point outlets) shall be employed where it is not economic to install a centralised storage or non-storage system.

For low usage applications, instantaneous units can be used to eliminate the need for storage and save energy. This may apply to small installations such as some University accommodation or remote service points in any building type, as well as isolated WCs, tea points or staff kitchenettes

Local water heaters fitted with internal scald protection devices (TMV type 5 units) must be clearly marked as having the device fitted. Units >15ltr in size must be equipped with self-monitoring and low use pasteurisation.

All units shall:

- Comply with the Water Supply (Water Fittings) Regulations 1999 (Scottish Byelaws 2014) via WRAS-approved products or equivalent compliance, using the current WRAS Product Approval process
- Comply with Building Regulations Part G for hot water safety
- Deliver water at ≥50°C within 1 minute of activation
- Be installed with appropriate scalding protection where required by risk assessment

Water boilers or Zip Taps are to be avoided where possible (refer also to UoE Inclusive Design Guidelines). This applies also to local water coolers. Note that Zip Taps and similar instantaneous water heaters/boilers/coolers are not maintained by Estates/Maintenance Services and are the responsibility of the Department/College in which they are situated. The installation of this type of product should be agreed with the UoE Development Engineer prior to installation.

8.3.5 Taps

Single lever mono bloc mixer taps, complete with the installers certificate of compliance and a 5-year warranty and guarantee period, shall be utilised as standard across all facilities. Please note for reasons of ongoing maintenance and cost, automatic sensor taps have not been a preferred solution, however, it is acknowledged that they do have applications within inclusive design.

Their use should be agreed on a case-by-case basis with the UoE Development Engineer however it is anticipated that they may be used within accessible toilets and washrooms and in healthcare or nursery environments.

Refer also to the UoE Inclusive Design Guidelines in relation to the height of water outlets at lowered and adjustable height benches.

All taps shall be:

- Compliant with the Water Supply (Water Fittings) Regulations 1999 (Scottish Byelaws 2014) via WRAS-approved products or equivalent compliance, using the current WRAS Product Approval process
- Installed with backflow protection suitable for Fluid Category 2
- Supplied with water from systems compliant with HSE L8 and BS EN 806

8.4 Water Hygiene

Prior to taking into use, the water system in the building shall be pressure tested, flushed and disinfected by water specialist. These activities shall be undertaken in line with the guidance set out in BS 8554 and procedures undertaken in line with PD 855468, British Standards including BS EN 806-4 and BS7592 and BSRIA standards including BG 29 (current version). Closed water systems will be in accordance with BS8552 and current BSRIA BG Guidance.

A full record of all testing, flushing, and disinfection activities shall be submitted to the client and included in the Operation & Maintenance (O&M) manual.

Legionella Risk Control

The disinfection procedures presented for cold water storage tanks, domestic hot water vessels and water systems shall be designed to minimise the risk to students, staff and others of exposure to Legionella spp, in accordance with:

- The current HSE Approved Code of Practice L8 – Legionnaires' Disease: The Control of Legionella Bacteria in Water Systems
- HSG 274 Part 2 – Technical Guidance for Hot and Cold-Water Systems

It will be the responsibility of the contractor/ installer to produce a suitable sampling plan in accordance with the guidance issued in BS8554 for water quality and BS 7592 for Legionella Species pluralis (spp.).

In all instances of draining and purging, water should be drained in such a way as to avoid the creation of an aerosol. This also applies for the safe purging of stagnant water, e.g., from unused outlets.

Temperature sensors for L8 monitoring via the BEMS should be provided in the following locations (Note where no BEMS present, allow for future connection)

- Hot Water Cylinders (2/3 of the way up);
- DHW Flow;
- DHW return;
- Mains incoming
- Cold Water Storage Tank each section
- Cold Water Storage – Flow

8.5 Backflow and Back Siphonage Prevention

Regulatory Compliance

All water systems shall be designed in accordance with:

- Current Water Supply (Water Fittings) Regulations, including Schedule 2 requirements for backflow prevention
- WRAS Guidance on Fluid Categories and backflow protection. Note that Under the current Water Supply (Water Fittings) Regulations 1999 and WRAS guidance, fluid categories 1–5 define contamination risk, and backflow protection must match the category — with Category 5 requiring a physical air gap
- Water Regs UK RPZ Installation Method (AIM) for Reduced Pressure Zone valves
- BS EN 1717 – Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow

Design Coordination

Early engagement between the Designer, Client's Representative and the Estates Department is required to understand the anticipated building/system operation and water system usage. This will allow the Designer to determine the Fluid Category of each water system and make suitable allowance for the prevention of Backflow and Back Siphonage.

RPZ Valve Strategy

- Reduced Pressure Zone (RPZ) valves shall be avoided where possible by designing out the need for Fluid Category 4 connections.
- Where RPZ valves are required:
- Their installation must be notified to the local water undertaker
- They must be installed and tested in accordance with the Water Industry RPZ AIM
- Testing shall be carried out at least annually by a competent RPZ tester, and records submitted to the water authority

Laboratory and High-Risk Applications

- Laboratory sinks often present a Fluid Category 5 risk due to user-installed hose connections that compromise the air gap.
- In such cases, a dedicated Fluid Category 5 water system shall be provided, incorporating:
- Type AB air gaps or specialist backflow prevention devices
- Clearly labelled outlets and restricted access to prevent misuse

- This requirement shall be identified and resolved early in the design process, with input from laboratory users and Estate's compliance teams.

8.6 Water supplies for Fire Fighting Installations

Contractor designed fire suppression systems (e.g., fire sprinklers, watermist systems etc.) shall be reviewed with the UOE Development Engineer, UOE Fire Safety unit and the projects designated Fire Engineer.

Dedicated water supplies and water storage for these systems shall be provided with suitable backflow prevention.

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9.0 Drainage Systems

9.0 Drainage Systems

9.1 Above Ground Foul Drainage

Above ground foul drainage shall be run from stub-stack pop-ups at ground floor slab level to all waste connections. Drainage pipework shall be a modified one-pipe system. Primary vents shall terminate externally at high level through walls, or if unavoidable, at roof level complete with suitable guard/cowl and flashing.

Floor gullies shall be provided in plant rooms where wet services are installed.

Sufficient rodding access points and access panels should be considered at design stage and demonstrated at handover.

9.2 System Standards

The above ground surface water, soil, waste and vent systems installation shall fully comply with the following:

- BS EN 12056: Part 2 and Part 3
- Current Scottish Technical Building Standards
- CIBSE Guide and CIPHE Design Guide

Note that BSEN12056 does not account for increasingly higher rainfall intensity which is predicted for future decades. Designers shall include a climate change allowance to the design rainfall intensity. Best practice at the time of design should be used. Enhanced specification and sizing of rainwater drainage systems should be considered.

Fire collars shall be fitted to all pipework penetrating floors and walls designated as fire barriers to maintain the integrity of the barrier.

The Local Authority Building Inspector shall inspect the entire above ground drainage system prior to handover.

9.3 Plant Room Drainage

Plant rooms shall be provided with adequate drainage provision to service the following:

- Condensate drains
- Tanks and system overflows and safety valve discharges
- General system drain down
- Plant room cleaning

Separate drain points shall be provided to service individual or collective overflows and safety valve discharges complete with suitably sized tundish/trough to control spillages.

All plant room areas which contain cold water storage tanks, hot water calorifiers or buffer vessels/thermal energy, stores shall have such equipment located within a water sealed bund complete with dedicated floor gully/channel.

All condensate drains shall be piped to discharge directly into a floor gully/channel and be so arranged as not to impede the flow of any discharge.

Each plant room containing water-based services shall be provided with a hose, 30m minimum length, looped onto a storage spoil to allow controlled drain down of each service.

9.4 Plant Area Flood Protection

A flood risk assessment, complete with control measures, shall be undertaken at the design stage by the design team to review the risk of flooding of important areas and services of the building, from sources such as water tanks, cylinders, humidifiers, pipework, drainage or external rainwater ingress, heat pump defrost water (list is not exhaustive.) This should be reviewed with the UoE BSG and the UoE Project Manager.

To control the spread of water following any seepage, discharge, leak or similar incident, the following prevention measures shall be implemented:

- All items of plant, including electrical panels, shall be located on a plinth (typically 150mm high)
- All risers shall be equipped with a water resisting upside bunding kerb (typically 100mm high)
- Plant rooms contained water shall be provided with a bunding kerbs set to allow a full sweep of the access doors (typically 100mm high)
- All cold water storage, hot water calorifiers and heating and cooling plate heat exchangers shall be located in bunded areas, be provided with leak detection tape covering any potential discharge within the bund and have both a local audio/visual alarm and a link to signal an alarm condition through the BEMS. The leak detection should be single point (at drain).
- No water services or drainage shall be installed in electrical sub-stations, switch rooms or data centres.
- Avoid locating plant or essential services within basements or areas which may be susceptible to groundwater ingress or flooding. Wet services should be located in separate plant areas and risers from electrical services.
- Projects involving works to existing buildings where plant/essential services are located within basements or others areas with a flood risk should allow for a review of whether sufficient protection is currently allowed for.
- Enhanced specification and sizing of drainage systems serving plant areas should be considered.

Please see No. 10 – Building Fabric Guidelines.

9.5 Sump Pumps

In all applications, arrangements shall be made to lift and lower the pump(s) without requiring to descend into the sump pit.

All sump pump motors shall have IP 68 protection with Class F insulation and be rated for continuous operation.

Sump pumps shall incorporate automatic float switches to initiate and stop operation. The sump pump installation shall be connected to BMS and security systems providing both high level alarm and plant fault alarm.

9.6 Effluent Storage Tanks

Effluent tanks shall be designed and manufactured in accordance with BS 4994/BS EN976.

Every building with a drainage system discharging to a private wastewater treatment plant or septic tank should be provided with a label to alert the occupiers to such an arrangement. The label should describe the recommended maintenance necessary for the system (Note the PPM's) and should include the following:

'The drainage system from this property discharges to a wastewater treatment plant (or septic tank, as appropriate). The owner is legally responsible for routine maintenance and to ensure that the system complies with any discharge consent issued by SEPA and that it does not present a health hazard or a nuisance'.

The label should be located adjacent to the gas or electricity consumer unit or the water stopcock.

9.7 Chemical, Toxic and Industrial Liquid Waste Drainage

Obtain from the end users, the nature and classification and associated hazards of all liquid waste expected to be used within the facility. No hazardous chemical, toxic or industrial waste shall be disposed of through a building's drainage system.

Note that wastes are classified as 'hazardous' in accordance with:

- The Waste (Scotland) Regulations
- The Water Environment (Controlled Activities) (Scotland) Regulations
- (WAT-RM-04) Regulation of Indirect Sewage Discharges to Ground Water (use of septic tanks)
- SEPA Guidance on using The European Waste Catalogue (EWC) 'List of Wastes'

Certain activities may also require authorisation from SEPA via Scottish Water. The level of authorisation required is dependent on the effect that the activity will have on the water and local environment.

9.8 Pumped Drainage Systems

All proposed pumped drainage systems shall be agreed with the UOE Development Engineer at design stage. The use of small Saniflo type units is to be avoided where possible, although where options are restricted this will be reviewed on a case-by-case basis.

9.9 Fire Suppression System Drainage

Contractor designed Fire sprinkler or water mist systems will have drainage points in various locations throughout the system. Systems charged with air may require partial drain down as part of testing procedures or false activation. The locations and procedures for such drain down processes should be demonstrated clearly at handover.

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10.0 Steam and Condensate Systems

10.0 Steam and Condensate Systems

10.1 General

The University uses steam for various processes including autoclaves and for cleaning.

Where applicable steam generators must comply with the Guidance on the Safe Operation of Boilers (BG01) latest edition, compiled by the Combustion Engineering Association (CEA), the Safety Assessment Federation (SAFed) and the Health and Safety Executive (HSE.).

Steam systems shall be designed and installed to comply with the current Pressure Systems Safety Regulations (PSSR), including provision for a Written Scheme of Examination, and the current Pressure Equipment (Safety) Regulations (PESR), including UKCA/CE conformity of new pressure equipment and assemblies.

In order to ensure the energy efficient use of steam, the provision of a complimentary condensate recovery system shall be made.

The Designer shall investigate the opportunity for local direct electric steam generation and submit a document assessing the benefits and risks to the UoE Development Engineer for consideration.

10.2 Steam Generators

Steam generation plant shall be arranged to provide N+1 generator resilience.

Each generator shall have a minimum thermal efficiency of 93%.

The package equipment shall incorporate complimentary ancillary equipment including:

- Water softener and dosing equipment, with boiler water treatment in accordance with BG04 – Industrial Boiler Water Treatment (Edition 4)
- Stainless steel insulated feed water tank
- Feed water tank steam injection heating system
- Water monitor facility
- Blow-down arrangements, including blow-down vessel and cooling water facility, designed in accordance with BG03 – Blowdown Systems; Guidance for Industrial Steam Boilers
- Steam separator and trap set
- Pre-pressure pump system
- Integrated control panel unit

- Remote emergency stopping at points of egress and, where applicable, linked to the fire alarm system.

Steam generators, controls and limiters shall be designed in accordance with BG01 Section 7 (Design and Installation).

Boiler water treatment shall comply with BG04, including defined monitoring, alarm and sampling points.

Boiler blowdown systems and blowdown vessels shall comply with BG03; no new blowdown pits shall be provided on new installations, and discharge temperatures shall not exceed 43 °C to drain, subject to trade effluent consent.

All new steam boilers, blowdown vessels and associated pressure equipment or assemblies shall conform to the current Pressure Equipment (Safety) Regulations and carry a UKCA or CE mark with an associated technical file and Declaration of Conformity.

Critical safety functions shall be fail-safe and shall require manual reset following a trip, as per BG01 safe-operation principles. Remote emergency stopping at points of egress shall comply with the Provision and Use of Work Equipment Regulations (PUWER), as referenced in BG01.

All proposed suppliers of steam generation equipment to the University of Edinburgh, must operate on an “open protocol” basis with respect to the provision of spares, parts, software and controls to approved third parties as determined by the University of Edinburgh.

10.3 Distribution

Steam distribution pipework shall take the shortest route to the service points.

The pipelines shall incorporate strategically located pockets/condensate collection points at low points, at the ends of mains and before vertical risers. Each pocket shall be fitted with a trap to discharge the condensate, to minimise the build-up of condensate within the steam pipework.

Steam mains shall be installed with a small but continuous fall (typically not less than 1:100) in the direction of flow to promote condensate drainage and reduce water hammer risk.

- All steam traps shall be accessible for inspection and cleaning
- Automatic air vents for steam systems shall be fitted above the condensate level so that only air or steam/air mixtures can reach them. The best location for them is at the end of the steam mains
- The discharge from an air vent must be piped to a safe place.

- Metallic steam and condensate pipework shall be designed and tested in accordance with BS EN 13480 – Metallic industrial piping, or an equivalent recognised piping code.

10.4 Outlets

All outlets shall be taken from the top of the distribution pipework via a drop-leg.

All outlet branches shall be provided with isolation valves, strainer, sight glass and thermostatic steam trap, with the trap set located at the bottom of the drop-leg to ensure removal of condensate ahead of the control/regulating valves.

Outlets shall be fitted with control/regulating valves with low noise and anti-cavitation characteristics.

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11.0 Gaseous Systems

11.0 Gaseous Systems

The University employs various gaseous systems as noted below.

11.1 Natural Gas

All gas installations must comply with all relevant regulations, standards and procedures, in force and current at the time of work.

The following non-domestic industry standards must be adhered to:

- IGEM/ UP/2 Latest Edition – Installation of pipework in industrial and commercial premises;
- IGEM/UP/10 Latest Edition – Installation of flued gas appliances in industrial and commercial premises;
- IGEM/UP/11 Latest Edition – Educational establishments;
- IGEM/UP/16 Latest Edition – Design for natural gas installations in industrial and commercial premises with respect to DSEAR.

System schematics and all required labelling must be provided in a permanent and durable format. The gas installation pipework schematic must be displayed in a readily accessible position as near as practicable to primary gas meter and/or gas emergency control valve (ECV), adjacent to the additional emergency control valve (AECV) at the building entry point and within any plantroom.

All gas installation pipework must be easily identified as containing gas using approved methods such as painting and/or banding as specified in BS 1710: Specification for identification of pipelines and services.

Where the primary gas meter is installed externally from the building an approved additional emergency control valve (AECV) must be installed internally as near as practical to the point of entry into the building. The AECV must be easily identified, accessible and easy to operate with the key, lever or hand wheel securely attached to the operating spindle. For lever operated valves, the lever must have a 90o action falling to the “off” position, the method of operation must be displayed on or adjacent to the valve. Hand wheel operated valves must have suitable position indication clearly showing when the valve is open or closed. The ECV/AECV must be located in a secure area to mitigate unauthorized tampering.

The location of the ECV/AECV to each building shall be agreed with the UoE Development Engineer at design stage and shall be highlighted to the UoE BSG at handover demonstrations.

A main safety shut-off valve (SSOV) shall be installed as near as practicable downstream of the AECV, or in the case of an internal primary meter installation, meter outlet valve (MOV). The SSOV shall have provision for manual opening or be

fitted with a suitably sized lockable bypass. It must be interlinked to the building fire detection system and be provided with local electrical isolation (fire alarm test activation should not close the SSOV). An additional isolation valve should be installed downstream of the SSOV to enable the safe isolation and replacement of the valve.

Additional manual isolation valves shall be fitted on every lateral, downstream of the connection to any riser, on any branch pipework and as near as practical to the point of entry to any self-contained area in which gas is being used, for example plantrooms, catering installations, laboratories, etc.

A safety shut-off valve (SSOV) shall be installed downstream of the manual isolation valve as near as practicable to the point of entry to each plantroom or kitchen. These valves shall have provision for manual opening or be fitted with a suitably sized lockable bypass. The SSOV(s) shall be operated by local emergency stop buttons, ventilation/exhaust/flue interlock systems and local fire detection on a “two knock” arrangement. Appropriate shielded emergency shut off button shall be located at all emergency exit point(s).

In addition to the local fire detection system, gas supplies to all plantrooms located within occupied buildings shall be provided with Carbon Monoxide and flammable gas detectors interlinked to the SSOV through a suitable control panel.

Gas supplies to all laboratories, commercial/teaching kitchens and teaching areas shall be provided with a gas soundness-proving unit interlinked to the SSOV and, where reasonably practicable, the manual means of isolation should be in a prominent accessible position adjacent to the emergency egress point within each area.

Where it is not reasonably practicable to install a manual isolation at the emergency egress point, an appropriate shielded emergency shut off button shall be located at all emergency exit point(s). These gas proving units should not supply more than one area. An additional easily assessable isolation valve shall be installed on the main gas supply at the end of each laboratory bench or gas supply to individual fume cupboards.

Refer also to the UoE Inclusive Design Guidelines in relation to the height of gas outlets at lowered and adjustable height benches.

All proposed new or upgraded external, below ground gas supplies shall be installed in Medium Density Polyethylene (MDPE) minimum PE80 pipe to each building, jointed using approved methods such as electrofusion and butt fusion welding. MDPE pipework and fittings shall be of a standard BS EN 1555, GIS/PL2 and GIS/PL3 and must have a wall thickness and grade of material suitable for the duty and pressure. Where carbon steel is to be used for bespoke building service exit/entry purposes it must be converted from/to the MDPE below ground no greater than 1m from the building entry/exit point. Where practicable, all building entry points shall

be above ground level. MDPE shall not be visible above ground level or located within buildings.

The main point of isolation to each building shall be agreed with the UoE Development Engineer at design stage and shall be highlighted to the UoE BSG at handover demonstrations.

Pipework, fittings and components in a location where they may be subject to corrosion shall be suitably protected using approved methods and materials (Petroleum impregnated tapes such as Denso must have an additional heavy-duty PVC over wrap). Paint coatings must be of a type having corrosion resistant properties.

Gas pipework, fittings and components must be of a type and manufacture fit for the intended purpose. Materials used must have physical properties suitable for the supplied maximum operating pressure and installation environment.

Copper tube shall be to BS EN 1057 grade R250 or 290 and must not be used in any public areas unless suitably protected against damage. Compression joints must be accessible and should be kept to a minimum and restricted to a diameter up to 54 mm. Soft solder joints must only be used up to a maximum operating pressure of 75 mbar. Pressed joints may be used following approval up to a maximum nominal bore of 108 mm and maximum operating pressure of 5 bar. Copper tube located in concealed locations must be joint free or jointed by using brazed fittings.

Carbon steel and stainless-steel pipework of nominal bore greater than 50 mm shall be welded. With approval by the manufacturer and UoE, stainless steel may be jointed using press jointing up to a nominal bore of 108 mm and maximum operating pressure of 5 bar. Pipework shall have a wall thickness suitable for the duty and jointing method selected.

Screwed fittings for carbon and stainless-steel pipe shall be best quality of branded or beaded pattern to BS 143, BS 1256, BS EN 10241 and BS EN 10242. All external threads shall be tapered as specified in BS EN 10226-1. Internal threads may be parallel up to and including 500 mbar, above this pressure they shall be tapered.

Jointing compounds and tapes shall meet the requirements of BS EN 751 and be applied in accordance with manufacturer's instructions.

Pipe flange joints shall be kept to a minimum and shall comply with BS 10, BS 1560, BS EN 1092 (BS: 4504) and to the table suitable for the maximum operating pressure of the system. All flanges shall be jointed using bolts of a suitable length such as it protrudes beyond the nut when tightened. 3mm washers are to be used at both bolt head and nut. Flange gaskets used within buildings shall not be of an elastomeric material. Flange gaskets shall not have any jointing compound applied or be re-used.

All pipework passing through any wall, ceiling, floor or other solid structure must be suitably sleeved. The pipe sleeve shall be PVC to BS 3505 class E, PE, copper or steel

appropriately sealed to the building fabric. Sleeves installed through internal structures must be of a fire-resistant material, compatible with the pipework being installed. One end of the annular space between the pipe and sleeve must be sealed using a suitable flexible fire-resistant mastic type material. When installed the pipework and sleeve must not impair the structural stability or fire resistance of any part of the building. In all accounts the sleeve should protrude from the finished surface of the structure, in the case of commercial kitchens the protrusion must be at least 25 mm.

Pipework must be adequately supported along its length using clips of sufficient size, strength, quality and fire resistance (Plastic or nylon clips should not be used). The pipe clips must be securely affixed to those parts of the building structure capable of supporting the weight of the installed pipework without creating unacceptable stresses on the structure.

Strength testing, tightness testing and purging shall be in accordance with the appropriate industry standards IGE/UP/1, IGE/UP/1A or IGEM/UP/1B and documented in an agreed approved format.

An appropriate number of suitably sized pressure test and purge points must be installed to ensure safe strength testing, tightness testing and purging of the gas installation pipework. Pressure test and purge points should incorporate a suitable manual isolation valve and be connected using separate individual connections to the installation pipework, they must not be combined. Pressure test points should be installed at the inlet and outlet of all ancillary controls such as SSOV's, regulators, filters, etc for the purpose of condition testing and monitoring.

All gas installations and pipework shall be provided with adequate ventilation in accordance with the relevant standards and regulations.

All pipework shall be installed ensuring adequate ventilation is provided, pipework shall not be routed through any unventilated ducts or voids. Ventilation must be located such that it allows sufficient air movement around all pipework joints to dilute any minor leakage ensuring an explosive atmosphere will not arise. Ventilation must meet the requirements of the current relevant regulations and standards. Where gas installation pipework is installed in the vicinity of electrical switch gear, control panels, consumer units, electrical equipment, etc. or other sources of ignition a DSEAR risk assessment must be conducted to ensure suitability and safety of the installation. Gas detection systems must not be used as an alternative to correct ventilation, but may be used to supplement the gas safety following a risk assessment.

Proposals to provide new natural gas connections or to modify existing natural gas installations should be reviewed with the UOE Development Engineer and Gas Authorising Engineer.

New gas connections and/or additional connections to existing gas services should be carried out in consultation with the Gas Transporter and the UoE Energy and Utilities team to ensure that there is capacity for the new connections.

Refer also to EDGL 5 (Metering). The Consultant/Contractor must liaise with the UoE Energy team during the early stages of design to agree final requirements and responsibilities.

It is the responsibility of the Contractor to ensure that the metering system is fully operational and demonstrated to the UoE Energy team prior to handover.

The UoE Energy team should be invited to site during the construction stage to review installation locations of gateways and meters and to confirm the commissioning process.

Gas and water pipes to be buried in accordance with the requirements of the Local Authority/Utility Provider. Refer also to relevant industry guidance, e.g., NJUG.

11.2 Medical Gas

Medical gases shall be designed and installed by a suitably experienced and qualified Specialist in consultation with the end users. There are several aspects of gas flow to consider when designing the pipeline distribution system:

- The test flow that is required at each terminal unit for test purposes (this flow is essentially to establish that the terminal unit functions correctly and that there are no obstructions)
- The typical flow required at each terminal (this is the maximum flow likely to be required at any time in clinical use)
- The likely numbers of terminal units in use at any time
- The flow required in each sub-branch of the distribution
- The total flow to the lab/department
- The flow in the main branches/risers, that is, the summation of all diversified flows
- The flow required at the plant, that is, the sum of all diversified flows to all like departments and labs, plus individual or dissimilar departments.
- Safe storage of gas cylinders and safety features / alarms associated with Laboratory/Medical gases also to be considered. This shall include any equipment or services shutdown interfaces required and the activation of any required emergency extract systems.

11.3 Liquid Nitrogen Installations

11.3.1 Introduction

The use of liquid nitrogen (LN2) occurs in research activity throughout the University. The number of bulk storage installations should be kept to a minimum and should be installed and maintained to a consistent standard following the guidance below.

Generally, University LN2 installations should comply with the latest issue of BCGA Code of Practice (British Compressed Gases Association.)

A liquid nitrogen system shall be designed by a suitably experienced and qualified engineer, the design must include a risk assessment as required by both the current Management of Health and Safety at Work Regulations and the current Control of Substances Hazardous to Health Regulations (COSHH.)

11.3.2 Location

The internal part of the LN2 installation (the LN2 Room) comprises the delivery pipe and valves, cryogenic storage and flask filling facility. An external wall is generally required to permit the high ventilation rates and basements should be avoided. Access must be restricted to authorised personnel only.

The length of the delivery pipe is critical. The location of the internal facility and the bulk storage should be such as to minimise the total length of the delivery pipe. This should be kept below 15m as a maximum length to avoid excessive LN2 waste.

11.3.3 Bulk Storage

Location should comply with current BCGA Codes of Practice. A vacuum insulated bulk storage tank should be installed within a purpose-built compound; this part of the installation is generally leased from the cryogenic gases supplier who will take responsibility for the design, supply and maintenance.

11.3.4 Delivery Pipe

The delivery pipe shall be manufactured from high grade stainless steel and be of the super insulated vacuum line type. All isolation and point of LN2 supply valves shall be suitable for cryogenic service. Supply and installation shall be by specialist contractor.

The delivery pipe shall incorporate an electro-pneumatically operated emergency shut off valve adjacent to the bulk storage tank.

11.3.5 Room Layout

An oxygen depletion monitor shall be provided with sensors mounted 1200 mm above finished floor level. The control unit should incorporate an oxygen % display and be located outside the LN2 Room.

All electrical circuits should be within galvanised conduit. Socket outlets shall be IP65 and 1200 above finished floor level.

A PIR presence detector, emergency "panic" buttons and audio/visual alarm shall be installed.

- Liquid nitrogen shall only be stored in secure plant areas/cages
- All liquid nitrogen storage vessels shall be insulated, vacuum-jacketed pressure vessels, be complete with safety relief valves and rupture discs to protect the cylinders from pressure build-up
- All pipework, vessels, equipment and ancillaries shall be insulated
- Due to the large expansion ratio of liquid to gas, adequate ventilation shall be provided in areas using liquid nitrogen. A minimum of ten air changes per hour is to be considered in these areas. The level of ventilation required should be advised by the Specialist Gases Designer.
- The provision of an oxygen depletion/displacement system is to be made on areas such as laboratories, use multiple inert gases such as argon, nitrogen and helium as carrier gases and also in cryogenics
- Inert gases such as argon and helium, as well as nitrogen, are not toxic but they do not support human breathing and reduce levels of oxygen in the air. They are odourless, colourless and tasteless making them undetectable
- An increase in the concentration of any other gases that are not oxygen, can lead to a situation where individuals are at risk of asphyxiation which can cause serious injury or even death
- This removal of oxygen gas in the air we breathe makes having an oxygen depletion sensor not just useful, but essential to maintaining life.

11.3.6 Room Ventilation

Very high levels of ventilation are required to cope with spills of LN2. Experience has shown that ductwork should be avoided and multiple axial plate fans fitted at low level and directly on an external wall provide a cost-effective solution. High level supply air grilles should be provided. Where cross flow ventilation is not possible, a false ceiling can be used as a supply plenum.

Ventilation should be designed by a suitably experienced and qualified Specialist in accordance with BCGA guidance and in consultation with the end users. The Specialist should confirm the levels of ventilation to be used for the project.

The proposals should be reviewed with the UOE Development Engineer.

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12.0 Fuel Oil Systems

12.0 Fuel Oil Systems

The fuel storage and supply system shall have sufficient fuel capacity to operate for an agreed period on winter load. This shall be site dependant and should be reviewed with the UoE Development Engineer.

- The fuel oil store shall comply with the current Water Environment (Controlled Activities) (Scotland) Regulations
- All equipment and assemblies which fall within the scope of the current Pressure Equipment Directive (PED) and the current Pressure Equipment Regulations, shall be tested by the manufacturers and be certified as compliant with the above.
- The steel oil storage tanks shall be manufactured in accordance with BS 799-5. The oil storage tanks shall be installed in accordance with BS 799-5, BS 5410-2 and CIBSE Guide B. The tank(s) shall be Type J, rectangular tanks with a design head equivalent to a head of water not exceeding 0.5m above the top of the tank
- The fuel oil pumps shall be electrically driven positive displacement screw type for use with BS 2869: Part 2 Class D oils suitable for the viscosity and temperature of the grade of oil to be pumped. In addition, the provision of a manual pump is to be made. An integral pressure relief valve shall be fitted to positive displacement pumps. Anti-vibration mountings and flexible connections shall be provided as required
- A fire valve assembly shall be installed to shut off fuel supply to boilers in an emergency. The valve shall comply with BS 799-5
- A leak detection system between the oil fill point and the delivery of fuel oil to the boilers shall be provided. The leak detection shall comply with BS EN 13160. Any leak detection sensor system shall be linked to an integral alarm system, which shall activate an automatic shut-off system.

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13.0 Trace Heating

13.0 Trace Heating

Trace heating shall be used to maintain or raise the temperature of pipes and vessels applicable for internal and external frost protection and low temperature maintenance on heating lines, oil and chemical lines, sprinkler system mains and supply pipework. Including any exposed pipework or associated fitting either permanently or intermittently filled with water shall be trace heated, including vent and drain pipes.

All trace heating shall comply with BS EN 62395

Electrical heat tracing systems shall be provided with earth leakage protection (ground fault or RCD) devices for personnel and equipment protection.

Self-regulating tape shall be used, which must be suitable for any pipe material (copper, threaded pipes, stainless steel pipes, plastic pipes and composite metal pipes without restriction) and aluminium adhesive tape is required for use with plastic pipes.

Trace heating installations should be connected to the BEMS.

The use of trace heating shall be reviewed with the UoE Development Services Engineer.

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14.0 Insulation

14.0 Insulation

All building services insulation shall be specified and installed in accordance with BS 5422.
For heating and hot water systems, the pipework and ancillaries shall be insulated to thicknesses in accordance with NES Y50 ECA Enhanced values.

All vessels (calorifiers, buffer vessels, thermal stores) shall be provided with insulation with the following minimum R-values:
Internal vessel ≥ 2.2 W/mK
External vessel ≥ 3.6 W/mK

Vessel inspection hatches shall have removeable insulation.

All insulation materials and finishes shall be inherently proofed against rotting, mould and fungal growth, attack by vermin, non-hygroscopic and, in all respects, suitable for continuous use throughout the range of operating temperatures and the environmental conditions indicated and in compliance with BS 5422 and 5970, as applicable. Insulation materials that contain or are manufactured using CFC or HCFC shall not be used.

All thermal insulating materials installed within buildings shall meet the requirements as set out in the current Scottish Technical Building Standards and shall achieve a smoke generation rating of less than 5% when tested to BS 5111. These ratings shall be obtained on un-faced insulating material.

Combustible facing materials shall not be more than 0.8mm thick and shall achieve a Class 1 Surface Spread of Flame when tested in accordance with BS 476.

All thermal insulation materials and finishes must be free from substances, which in the event of fire would generate appreciable quantities of smoke, noxious and toxic fumes.

Stone wool products are the preferred form of thermal insulation.

Phenolic products will not be accepted.

All ductwork and pipework shall be fitted with thermal insulation with pre-formed stucco aluminium casings, “hammerclad” type, within each plant room area up to 2m in height.

All external pipework and ductwork services shall be weather protected with a PIB insulation covering Polyisobutylene (PIB) to give exposed insulation and ductwork a tough weather and water-resistant sheet finish. The seams, overlaps and endlaps shall be solvent welded. The PIB sheet shall comply with BS 467.

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15.0 Testing and Commissioning

15.0 Testing and Commissioning

The Services Contractor shall apply following procedures to the installation:

- CIBSE Commissioning Codes Series
- BESA DW/144 – Specification for Sheet Metal Ductwork, Low, Medium & High Pressure/Velocity Air Systems
- BESA DW/145 - Guide to Good Practice for the Installation of Fire and Smoke Dampers
- BESA TR/6 - Guide to Good Practice - Site Pressure Testing of Pipework
- BESA TR/19 - Guide to Good Practice - Internal Cleanliness of Ventilation Systems
- BG29 Pre-commission Cleaning of Pipework Systems
- Local Authority Building Standards Scotland

On completion of tests all systems shall be:

- Set to work;
- Fully regulated;
- Demonstrated to Design Team / UoE Development Engineer;
- Demonstrated to Estates Operation (Refer to Estates Design Guideline 19 for handover procedure).

The Contractor shall employ specialist Commissioning Engineers, with all necessary manpower and equipment, continuously on site during the commissioning works period and until completion of the commissioning. The commissioning specialist shall be responsible for preparation of integrated testing and commissioning programme. The programme shall allow for demonstration of all the systems.
Commissioning procedure will not be completed until witnessed by the Engineer and is accepted in writing. Seven days' notice of intention to commission any system shall be given.
The installation will only be deemed to have been successfully completed following a period of 7 days continuous, fully automatic operation (without malfunction, breakdown, out of tolerance performance). Note that some systems may require a far longer period and this should be reviewed during the preparation of the commissioning programme.

Some commissioning checks may need to occur during maximum heating/ cooling condition. If the project is completed in summer, peak heating loads will be difficult to simulate. It may be necessary to defer some tests outside weather conditions to achieve useful results.

All commissioning activities should be well planned with a commissioning programme detailing all activities produced early in the Construction phase.

Refer also to EDGL 4 and EDGL 19 for BEMS Pre-Handover checklist.

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16.0 Identification of Plant and Equipment

16.0 Identification of Plant & Equipment

16.1 General

For each services installed, upgraded or altered during works, the contractor shall provide full hydraulic schematics (glass frame, minimum size of A1.) The schematic drawings shall have reference for each main plant of equipment and associated valves, fire dampers along with corresponding schedules. Refer to UOE Design Guides 18 and 19 for Asset tagging and Asset list requirements at handover.

16.2 Plant

Identify all items of plant and equipment by permanently fixed identification labels as well as manufacturers' name plates.

Manufacture the labels from "Traffolyte" or similar material and print the name of the plant item, in 6mm high black infilled engraved lettering, on the upward facing side of the labels.

Ensure that all items of plant and equipment are provided with a securely fixed manufacturers' name plate, giving the reference number, size and model number, etc, of the plant as well as the following information as applicable:

- Speed in RPM, horse power, full load running, starting currents and voltage in the case of electrical plant
- Any other details necessary to allow the item of plant to be readily identified for the purposes of future replacement and spare parts.

16.3 Services Distribution

Identify all insulated and uninsulated pipework with P.V.C adhesive tape or similar, suitable for use with temperatures up to 125°C.

Ensure that all identification tapes give the following information:

- Colour coding, where applicable, in accordance with the recommendations of BS: 1710
- Colour coding and pipework marking should also consider the needs of the ACoP L8 as noted by the ACoP L5 COSHH regs 12, as these maybe applicable to areas including livestock, farming or laboratory testing and processed waters.
- Name of service, whether flow or return, and an arrow indicating the direction of flow, all clearly legible against the background colour and with lettering not less than 6mm high
- Apply 300mm wide colour bands to each pipe at intervals of 15 metres maximum.

Place the identification tapes at all pipework junctions, at both sides of valves and items of plant at floor, ceiling and wall penetrations and at not less than 5m intervals on all straight pipe runs.

Identify all valves and cocks by permanently fixed labels, manufactured from 'Traffolyte' or similar material and engraved with markings and/or lettering in accordance with an agreed system of valve reference. The valve labels shall be complete with a corrosion resistant secure tag facility.

Water systems valves should at minimum note principle Drain or Isolation valves (DV or IV) as well as areas which may restrict or reduce water flow and present an area of stagnation or debris collection.

Principle DV or IV **should not** be left in a Lock-shield State or fitted with lock-shield device if they are **intended for emergency use.**

BEMS Graphics – Labelling of rooms on drawings and BEMS graphics must be consistent with no conflict on room/plant/device/valve numbering. This aspect should be reviewed in detail prior to handover by the Contractors Commissioning Manager and the Contractors Building Services Manager.

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17.0 Design for Safe Operation and Maintenance

17.0 Design for Safe Operation and Maintenance

17.1 Maintenance Operations

- Safe access to all services equipment for inspection, maintenance and monitoring shall be provided. Care with respect to the capability to service the systems predominantly during normal working hours shall be accounted for, to ensure minimal disruption to the operation of the University
- Lifting beams appropriately located for a safe and efficient removal of parts
- All roof area plant rooms shall be provided with 'demountable' louvres, which are normally fixed, but facilitate access and egress of items of plant as required during the life of the facility. These shall be linked to the designated access and maintenance routes within each plant room
- The design proposals shall fully comply with these Guidelines in that all water and HVAC systems shall be designed to meet the current Scottish Building Standards and manufacturers installation guidance requirements as well as be designed to meet the requirement of HSE Approved Code of Practice (ACoP) and Guidance, L8, "Legionnaires disease; The control of legionella bacteria water systems". Submit details of all design risk assessments
- Maintenance access shall be from areas which are not readily accessible to the general public, to ensure a safe working environment.
- For heat dissipating equipment such as ICT equipment or freezers, the operational parameters of the equipment should be clearly defined in the handover documentation. This should include the recommended environmental conditions in which the equipment is located.

17.2 Access and Maintenance Strategy

- The Designer shall submit a design stage Access and Maintenance Strategy to the UoE as part of their Stage 3 and Stage 4 proposals
- The Contractor shall submit an Access and Maintenance Strategy to the UoE as part of their as-built documentation
- Defined access routes shall be identified with routes for personnel and plant considered. Routes shall be delineated by robust walkway anti-slip matting system on flat roofs and with plant room areas highlighted by means of a hatched painted pattern on the plant room floors
- Major plant replacement shall be facilitated through designated routes and demountable louvre panels strategically located within each plant room or plant area

- A plant uplift/set down zone shall be defined in each external plant space, complete with a SWL notice
- The transportation of material and consumables shall be achieved without entering access-controlled areas
- It should be noted that access to replace major plant items, which require the use of specialist lifting equipment external to the respective building, shall be highlighted in the Access and Maintenance Strategy.
- The Access and Maintenance Strategy shall identify any hatches required in walls, ceilings etc. These hatches and the maintainable items which they provide access to shall be clearly identified within handover documentation and drawings. Means of access to roof plant shall also be clarified.

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18.0 Mechanical Engineering Services Working Group (MESWG)

18.0 Mechanical Engineering Services Working Group (MESWG)

The MESWG shall keep under review and update the Mechanical Engineering Services Design Guidelines (Assets & Standards) on an annual basis.

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19.0 Appendices

19.0 Appendices

19.1 Appendix A: Schedule of Approved Equipment

Item	Manufacturer	Description

The design team should populate and provide the above schedule of proposed manufacturers.
All manufacturers are only provided on 'equal and approved' basis for the reasons of competitive tender.
All products shall be 'open source' allowing competitive maintenance tender and part replacement.

19.2 Appendix B: Schedule of Approved CDP Contractors

Item	Specialist	Description

The design team should populate and provide the above schedule of proposed trade contractors.

All manufacturers are only provided on ‘equal and approved’ basis for the reasons of competitive tender.

All products shall be ‘open source’ allowing competitive maintenance tender and part replacement.

19.3 Appendix C: Mechanical Engineering Services Group

TERMS OF REFERENCE

Purpose:

The Mechanical Engineering Working Group (MESWG) shall keep under review and update the Mechanical Engineering Services Design Guidelines (Assets & Standards) on an annual basis.

The MESWG will ensure that: suitable, sufficient, current and relevant Mechanical Engineering Services Design Guidelines information is readily available to Design Teams and Contractors undertaking project works on behalf of the University of Edinburgh.

The MESWG must ensure that Mechanical Engineering Services Design Guidelines upholds the Health and Safety arrangements in respect of Mechanical Engineering Services for the University Estate, in order to safeguard all in its community including students, staff, contractors, partners and visitors.

The MESWG will promote the application of Mechanical Engineering Services Design Guidelines with the respective Project Manager.

The MESWG will respond in a timely manner to comments and feedback via the Building Services Group Manager in respect of accuracy and emphasis of content of the guidelines.

The MESWG will endeavour to seek out best practice from other Universities with regard to Mechanical Engineering Services Design Guideline matters and where applicable, to incorporate these into University Mechanical Engineering Services Design Guidelines, Mechanical Engineering Services related policies and procedures, etc, and share.

The MESWG will discuss legislative, policy and operational effectiveness of the Mechanical Engineering Services Design Guidelines and review the impact upon the University of Edinburgh Estate and its communities.

The MESWG will support the Health and Safety communications strategy with key stakeholders, e.g., Estates Department, Design Teams, Contractors, Student Services, etc. This includes issues such as; building design, environments, passive and active Mechanical Engineering Services management and control measures, etc.

The Mechanical Engineering Services Working Group will escalate unresolved matters associated with operational effectiveness of the Mechanical Engineering Services Design Guidelines on the University Estates and its communities to the Director of Estates Operations.

The MESWG will annually review of Terms of Reference of the Mechanical Engineering Services Working Group.

The MESWG will submit updated versions for the Mechanical Engineering Services Design Guidelines for consideration and approval to the Estates Management Group.

MESWG Membership:

Building Services Engineer – Mechanical (Chair)
UoE Development Engineer – Mechanical (Deputy Chair)
Building Services Engineer (Mechanical)
Estates Health and Safety Manager
Specialist attendees by invitation

Quorum: 3

Frequency of Meetings: 2 meetings per year

MESWG Standard Agenda Items:

Welcome, introductions and apologies
Review of previous minutes for accuracy
Update of actions from last meeting and feedback
New matters and issues for discussion, update and version control
Actions and matters to be escalated to the Director of Estates Operations
Any other business
Date and time of next meeting

19.4 Appendix D: Fire Stopping

To provide a method of future proofing of fire sealed services penetrations to allow the easy installation of additional cables etc, the use of proprietary fire stopping devices should be considered rather than intumescent mastic. The most appropriate system will be dependent on the quantity of cables/services and containment system utilised. The designer shall consider the following suggested products:

- EZ Path fire stopping devices and grommets - https://www.legrand.co.uk/en/catalog/ez-path-fire-stopping-devices?current_tab=tab-A
- Fire rated cable baskets - https://envirograf.com/product/firoblok-for-cable-baskets/
- Fire stop blocks, putties and plugs - https://www.hilti.co.uk/content/hilti/E1/GB/en/business/business/engineering/fire-protection/electrical-penetrations.html

Other similar products can also be considered. All fire stopping products must be fully certified for the intended application.

The design team shall follow the guidance within the ASFP Fire Stopping of Services Penetrations - Best Practice and Design and Installation. The final selection and method of fire stopping of primary services routes shall be reviewed and agreed with UoE BSG/FSU prior to tender.

Where sockets and other electrical accessories are installed within fire compartment walls, the back boxes shall be fitted with intumescent putty pads. The back boxes must not be installed back-to-back. This requirement is in addition to any acoustic requirements for sockets in walls between rooms.