University of Wales Trinity Saint David (UWTSD)

Peninsular Site. SA1, Swansea

Phase 1 : FACE Building and Library

RIBA Stage 3, Developed Design Report

Environmental / Mechanical & Electrical Building Services Engineering

Rev 3, 9th March 2016 (Final)

PRIFYSGOL CYMRU
Y Drindod Dewi Sant
UNIVERSITY OF WALES
Trinity Saint David

Stride Treglown

TROUP
BYWATERS
+ ANDERS

CONTENTS

1 Introduction 5
1.1 The Proposed Development 5
1.2 Building Regulations in Wales 5
1.3 Future Legislation: 'Nearly Zero Energy Buildings' (nZEB) 6
1.4 Building Research Establishment Environmental Assessment (BREEAM) "Excellent" Rating 6
1.5 Low Energy Design Approach and Considerations 6
1.6 The Scope of the Building Services Engineering (BSE) 7
1.7 Natural Resources 7
1.8 Fire Engineering Strategy 8
1.9 'Secure-By-Design' Provisions 8
1.10 Noise and Acoustics 8
1.11 Health and Safety 8
1.12 Maintenance, Design and Access Statement 8
1.13 Information Communications Technology (ICT) 9
1.14 Furniture, Fixtures & Equipment (FF&E) 9
1.15 Passenger Lifts 9

2 Sustainable Development: The Underpinning Design Approach 11
2.1 Introduction 11
2.2 Understanding what Sustainable Development looks like 11
2.3 A shared vision for SA1 12
2.4 Our shared objectives 12
2.5 The Planning Context 12
2.6 The "High Level" Benefits of Sustainable Buildings 13
2.7 Local Requirements for Sustainable Buildings 13
2.8 Our Specific Approach To Sustainable Design 13
2.9 Micro-Climate 13
2.10 Overshadowing and Solar Access 13
2.11 District Heat Networks 13
2.12 Orientation and Solar Access 14
2.13 Building Form and Internal Layouts 14
2.14 Building Fenestration, Daylight, Solar Control 14
2.15 Off Site Construction Principles 14
2.16 'Fabric First' Energy Efficiency Principles 15
2.17 External Noise Criteria 16
2.18 Procurement 16
2.19 Building Services Engineering 16
2.20 Demand Reduction and Renewable Energy Sources 18
2.21 Whole Life Costs 18
2.22 Water Management 18
2.23 Waste Management 19
2.24 Building Management and Post Occupancy Evaluation 19
2.25 Soft Landings and Controls 19
2.26 Performance Monitoring 20
2.27 Energy Metering 20
2.28 Maintenance and Security 20

3 Energy Analysis 22
3.1 Setting the Scene 22
3.2 FACE/Tech 22
3.3 Library 31

4 Flexibility and growth 36
4.1 Heating, Ventilation & Air-Conditioning 36
4.2 Lighting 36
4.3 Control Systems 36
4.4 Power Distribution Systems 36
4.5 ICT Provisions 36
4.6 Public Health 36
4.7 Fire Protection 36
4.8 Addition of Kitchen Facilities 36
4.9 Lifts 36
4.10 Security 36
4.11 Plant Rooms 36
4.12 General Services Distribution Routes 36

5 Resilience and safety 38
5.1 Systems resilience 38
5.2 Design stage documentation 38
5.3 Areas over which the designer has direct influence 38
5.4 Unsafe maintenance and cleaning work 39
5.5 Unsafe demolition 39
5.6 Risk Assessment Schedule 39

Prepared by: Troup, Bywaters + Anders

Approved by: Chris Lynn BEng(Hons) CEng MCIBSE MIET FFB
Partner

Date: 9th March 2016

6 Technical design performance 41
6.1 Practical guidelines to comfort 41
6.2 Mechanical Systems 41
6.3 Electrical Systems 41
6.4 Public Health Services 41
6.5 Fire Protection Services 41
6.6 Vertical Transportation 41
6.7 M&E Design Criteria 41
6.8 General Legislation & Codes of Practice 43
6.9 CIBSE Guides 43
6.10 Building Services Inspection & Handover Procedures 44
6.11 Building Services Commissioning 44
6.12 MEP Services As-Built Documentation 45
6.13 The As-Built Information 45
6.14 Building Management Systems (BMS) 45
6.15 Electrical Services Manufacturers/Suppliers 46
6.16 Mechanical Services Manufacturers/Suppliers 47

7 Utilities Infrastructure and Public Realm Provisions 49
7.1 Electrical Power (Western Power Distribution) 49
7.2 Telecommunications 50
7.3 Water 51
7.4 Natural Gas 51
7.5 Centralised Services 51
7.6 A District Heating Network 51
7.7 Site Drainage 51
7.8 Low Voltage Emergency Standby Generator 52
7.9 Renewable Sources 52
7.10 Energy Metering Strategy 52
7.11 Public Realm 52

8 Mechanical proposals 55
8.1 F.A.C.E. Building 55
8.2 Library Building 63

9 Electrical proposals 69
9.1 F.A.C.E. Building 69
9.2 Library Building 76

10 Public health engineering proposals 79
10.1 Sanitary Systems 79
10.2 Laboratory System 79
10.3 Condensate Waste 79
10.4 Underground Drainage 79
10.5 Rainwater Harvesting 79
10.6 Dry Risers 79
10.7 Hydrants 79
10.8 Sprinklers 80
10.9 Smoke Extract 80

11 Information communications technology (ICT) .. 82
11.1 Introduction 82
11.2 Outline Strategy 82
11.3 Core ICT Requirements 82
11.4 Extracts from UWTSD's SA1 IT Infrastructure Standards 82
11.5 Installation requirements 87
11.6 Cable Routes 87
11.7 Cable Performance Standards 87
11.8 Underfoor Box 88
11.9 Underfloor duct 88
11.10 User Outlet Terminations 88

12 Security Systems 90
12.1 Discussion of Key Considerations – FACE Building 90
12.2 Closed Circuit Television (CCTV) 90
12.3 Intruder Alarm 91
12.4 Access Control 91
12.5 Third Party Consultation 91
12.6 Security Lighting 91
12.7 Public Realm Areas 92

13 Design Assumptions 94

14 Information Required 96

15 Design Risks 98

16 Appendix 100

1 Introduction

1 Introduction

*This part of the **RIBA Stage 3 - Developed Design Report** for Phase 1 provides details of the MEP (Mechanical, Electrical, Public Health and associated environmental engineering services) design development & strategies for the phase 1 development located on the Peninsular Site at SA1 Swansea for the University of Wales Trinity Saint David.*

This report builds upon the RIBA Stage 2 Report issued in October 2015 and forms the basis of the design teams interpretation of the current brief, including any assumptions made to date. The next stage of design is RIBA Stage 4 – Technical Design where the intent is that the design will be further developed into technical solutions sufficient for RIBA Stage 5 – Construction.

Phase 1 comprises the Faculty of Architecture, Computing & Engineering (FACE) formed by the 'Tech/Flexi Building', the Library , infrastructure to serve the buildings and public realm works.

*The report has been prepared by consulting MEP Building Engineering Services design practice **Troup Bywaters + Anders** (www.TBandA.com) in conjunction with architects and lead consultant Stride Treglown. The report provides the deliverables outlined within Stride Treglown's "Fee Proposal to UWTSD Document Ref:70266, Rev C dated 12/10/15".*

This MEP Stage 3 report forms a part only of the overall report compiled by Stride Treglown entitled RIBA Stage 3 Report for Phase 1 Developments along with contributions from other designers and specialists. It comprises:

- *Discussion of a what makes a Sustainable Development in terms of planning context and in general within the built environment*
- *Narratives describing the MEP Services Startegies*
- *Technical Room Data Sheets (RDS),*
- *Drawings to supplement the understanding of the MEP Strategies*

1.1 The Proposed Development

The building engineering solutions take account of the low-energy sustainability aspirations of The Welsh Governments approach for a sustainable development.

The University, all stakeholders and the design team are committed to creating a sustainable development (SD) including environmental, economic and social aspects. SD will be the central organising principle and include how decisions are made and how the sustainable values of the engineering solutions are evaluated.

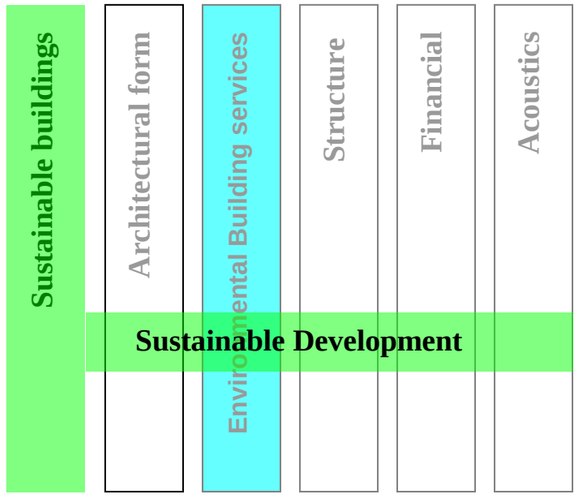


Figure 1-1 Sustainable development as the central organising principle

1.2 Building Regulations in Wales

The Building Regulations previously applied to England and Wales. The UK Government in "Building a Greener Future: Policy statement (2007) confirmed the intention to achieve the target and interim steps to achieve zero-carbon through the progressive tightening of the Building Regulations in 2010, 2013 and 2016 in a move toward carbon zero by 2019.

*The Welsh Government (WG) secured the devolution of the Building Regulations, which came into effect on 31 December 2011 and came into force as the **Wales Building Regulations in 2014**.*

In Wales, the new powers and functions relate to the Building Regulations include most of the powers in:

- *the Building Act 1984*
- *the Sustainable and Secure Buildings Act 2004*
- *the Climate Change and Sustainable Energy Act 2006.*

Practical guidance on how to comply with the Building Regulations is provided within the 'Approved documents'. As guidance is reviewed and changes made, WG publish separate Approved Documents.

Each document contains:

- *guidance on the performance expected of materials and building work to comply with the Building Regulations*
- *examples and solutions on how to achieve compliance for some building situations.*

The Wales Building Regulations were published in 2014 are on a journey of taking incremental steps toward the delivery of the European Union defined 'nearly zero carbon' developments from 2019.

However, at present it is unclear from the governments at UK or Wales level whether the full requirements of 'nearly zero-carbon' will be adopted by either government, although it is clear that the requiremnt for 'nearly Zero Energy Buildings' will become a requirement as described in section 1.3 below.



The primary vehicle for the implementation of the 'nearly zero-carbon' requirement is the Building Regulations Part L:conservation of fuel and power.

Part L2A is the Approved Document applicable to new buildings other than dwellings.

1.3 Future Legislation: 'Nearly Zero Energy Buildings' (nZEB)

Future legislation includes a tightening of the regulations in connection with the maximum permitted energy use in buildings.

The EU Energy Performance of Buildings Directive (EPBD). Directive 2010/31/EU (EPBD recast) Article 9 requires that "Member States shall ensure that by 31 December 2020 all new buildings are nearly zero-energy buildings; and ***after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings****".*

Member States shall furthermore "draw up national plans for increasing the number of nearly zero-energy buildings" and "following the leading example of the public sector, develop policies and take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings".

A nearly zero-energy building is defined in Article 2 of the EPBD recast as "a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby".

1.4 Building Research Establishment Environmental Assessment (BREEAM) "Excellent" Rating

BREEAM®

*In line with the Welsh Governments core sustainability standard for all new non-domestic buildings the phase 1 development will be designed and built to conform to the Building Research Establishment Environmental Assessment Method (BREEAM) "****Excellent****" standard, or equivalent.*

Stride Treglown's BREEAM Assesor has engaged with the project team and undertaken a formal workshop assessment which includes the MEP related credits that have been taken, most notably (but not exclusively) a relatively high number of credits relate to the energy "ENE" category of the assessment.

1.5 Low Energy Design Approach and Considerations



The University is looking to the future and applying a low energy sustainable approach for its buildings with an aspiration of reducing energy usage levels and running costs to an "excellent standard".

The University have stated that the design will not currently be required comply with the future EU Energy Performance of Buildings Directive (EPBD) which requires 'nearly zero-energy' buildings (as referenced within section 1.3) but would wherever reasonably possible and cost-effective to do so apply the principles of this approach.

However, it must be stressed that there is currently no allowance within the Stage 3 design for nZEB as it has been discussed at length with the contractor, cost consultant and project managers, and all parties agree that there is a cost-enhancement to incorprate any provisons, be they passive measures, low energy or renewable technolgies, and the options will be further considered as part of the stage 4 design works. That is, the "future-proofing" elements will be considered further and costed as appropriate to allow the University to make a decision whether or not to include them.

Most notably the desire for some degree of future-proofing and the targets for high levels of carbon and energy efficiency can only be achieved through an integrated design strategy and therefore the design has focused heavily upon the need to take a "fabric first" approach.

Passive design measures are explored fully across the whole design team along with prioritising the minimising of energy demands and maximising system efficiency for equipment used within the building's fixed services. This approach is supplemented with the use of low carbon technologies such as Combined Heat and Power (CHP) and the provision of clean/renewable technologies where necessary to meet the legislative standards.

In summary, the design approach is to:

- *maximise passive measures*
- *prioritise minimising energy demands*
- *maximising system efficiencies*
- *using low carbon technologies*
- *provision of clean/renewable technologies.*

The university and its design team recognise the need for an affordable sustainable development that meets its aims and aspirations.

It is no longer acceptable for a building to be designed as a "glass box" and for the building services engineer to take on the uneviable task of attempting to introduce sufficient cooling (or heating) equipment to overcome any excessive (or inadequate) temperatures in order to create spaces that are comfortable for the occupiers.

Working alongside the architectural designers ESHA and Stride Treglown the design solution developed for the facades is a balance of daylight penetration into the spaces and reduction of solar gain to avoid excessive mechanical ventilation and/or cooling requirements and heat loss in winter.

The increased focus on low energy and renewables in the planning process also supports the requirement for a robust energy strategy being developed by the design team at the earliest possible stages of design.

A significant amount of thermal performance analysis has been undertaken and assessment of energy demands. Feasibility work has been undertaken (the results of which are discussed later in section 3 of this report) to assess possibilities for energy efficiency improvements and looking to minimise the requirements for renewable energy solutions that are often expensive to maintain when compared to more passive measures.

An appropriate balance of passive measures, minimising energy usage and the introduction of renewable energies is provided.

Energy is not the only issue to be considered of course and the designs also address a broader range of sustainability issues including reducing water demand and reducing waste wherever possible. The building contractor Kier Construction has also been working alongside the project team in identifying further opportunities for sustainable design and cost-optimal construction solutions.

The design is aimed at aiding the university's aspiration to create a culture where wastage of resources are a taboo in design, construction, operation, and the end of life of any building.

The new buildings will be designed to be long-standing with the flexibility for both alteration and construction whilst remaining within the cost envelop for the project. Building services systems selected will be chosen on the basis of quality as well as cost offering greater overall value to the University in terms of reduced maintenance and replacement.

1.6 The Scope of the Building Services Engineering (BSE)

The Chartered Institution of Building Services Engineers

Virtually everything inside a building which makes it safe and comfortable comes under the generally accepted title of 'Building Services Engineering'. A building must do what it was designed to do - not just provide shelter but also be a vibrant environment where people are provided with greatest opportunity to work, learn and achieve their maximum potential.

Energy usage is a key factor when considering the sustainable development credentials of any project. The building services engineers Troup Bywaters + Anders have taken a lead role working closely with Stride Treglown in determining the energy footprint of the proposed University buildings and undertaken extensive computer modelling to predict the energy usage and any predicted over-temperatures within the buildings along with compliance with Building Regulations Part L2 (2014).

The balance of passive measures, minmising energy and use of renewables to arrive at an optimum position has been a key driver throughout the whole design development to date. This is of course balanced with the aesthetic aspirations and requirements of the building which are under the responsibility of the architectural designers and the University.

Building services engineering is also what makes a building come to life and in general includes:

- *energy supply - gas , electricity and renewable sources*
- *heating and ventilating*
- *water , above ground drainage and plumbing*
- *daylighting and artificial lighting*
- *ventilation*
- *harnessing solar energy*
- *communications networks*
- *security and alarm systems*
- *fire detection and protection*
- *room cooling, air conditioning and refrigeration*
- *electical power distribution*
- *facade engineering*

1.7 Natural Resources

As described already within this section the new buildings seek to minimise the energy demand and carbon emissions associated with the development through implementation of the energy hierarchy, and aspire to deliver low energy and carbon emissions standards.



The design concepts have been developed through Stage 3 exploring the potential for natural ventilation wherever possible. This approach has been coupled with the aim to recover any waste heat where possible through the use of high efficiency natural ventilation heat recovery (NVHR) devices where possible.

Internal environmental comfort conditions have been 'tested' and where possible an approach that limits close control and over

engineering of solutions. Some areas may for example allow some internal temperatures to rise to an upper threshold in summer, and lighting levels that are suited and targeted to tasks areas.

The design solutions aim to empower the University to actively monitor and improve on their resource efficiency through the lifetime of the building through the provision of advance sub-metering of utilities (energy and water) and automated Environmental Management System (EMS) software.

The design will provide wherever possible good levels of natural lighting within the spaces. Occupied areas aim to have a daylight factor of at least 2% and aspire for 3% wherever possible.

This is a design challenge as 'compromises' are often required and there is a balance between reducing the amount of solar energy entering the occupied spaces in the peak of summer considered against the desire to maximise the amount of daylight into the spaces for the wellbeing of the occupants and prevention of the need for artificial lighting. The design team has worked hard to develop an appropriate balance that meets all the criteria of high quality buildings. It is anticipated that shallow depth layouts will be provided wherever possible, effective glazing areas and high performance selective glazing, and building atria / light shafts. Natural daylight is prioritised over artificial lighting through the inclusion of localised zonal control and daylight dimming.

Renewable energy technologies appropriate for the local context will be incorporated into the new development to reduce the reliance on fossil fuels and act as a demonstration and learning facility to the local community and students of the university..

Investigations into the feasibility of all renewable sources include reliable sources of fuels, storage, maintenance, quality and cost. The performance of photovoltaic currently proposed will be highlighted as a learning resource for students.

The new University site will incorporate materials with a low environmental impact (embodied energy), reduced energy inputs (A rated materials according to the Green Guide), sourced sustainably (i.e. Forestry Stewardship Council timber), and where feasible locally sourced (to reduce transport emissions). Used, reclaimed and recycled materials will form significant part of the new site design.

Water use within the new development will be minimised through rainwater harvesting tanks and system serving WCs. Sanitary fittings will be selected to be water efficient. The development will aim to minimise the additional burden to the local water table.

Wastage of resources will be taboo both in construction, operation, and end of life. The new building will be designed to be longstanding with the flexibility for alteration and deconstruction. During construction the contractor will employ best practice in terms of waste minimisation and recycling. The new University site proposals should aid the University in following The Welsh Government policy targets for recycling and including the provision of appropriate facilities for sorting, storing and recycling of waste in buildings and across the site.

The development will seek to maximise the natural ventilation potential of the building. The urban context of the development creates immediate constraints to this approach predominantly due to the potentially elevated external noise levels and exposed coastal 'marine-type' environment due to the location of the site. It has been necessary to measure acoustic noise levels in order to determine the strategy for ventilation. In addition the space planning and usage has been carefully considered to deliver adequate natural airflow and to minimise the risk of overheating during the peak summer months.

The strategy developed is one of natural ventilation heat recovery unless the heat loads within the occupied spaces dictate the need for additional measures to achieve compliance with comfort requirements or where higher temperatures have been advised to the University.

All equipment selection will need to take account of the marine enviornment and the effects of the adverse weather conditions possible, wind and corrosive nature of the environment.

1.8 Fire Engineering Strategy

Fusion Fire are specialist responsible for the development of the fire engineering startegy. A report has been issued at stage 3 and it has been considered in the design proposals for the building services engineering proposals described. Refer to sections 8 and 9 in particular.

1.9 'Secure-By-Design' Provisions

Stride Treglown met with the ACPO and a 'secure-by-design' report was issued to the design team for considerations. A number of the requirements have been impliemented with the buidling services engineerng design.

1.10 Noise and Acoustics

Mach Acoustics have advised the design team with regard to limitations imposed upon the design of the buildings due to noise and vibration, both existing and that anticpated.

1.11 Health and Safety

As designers, the team are under a legal obligation to consider the implications of their design proposals in terms of the health & safety of those installing, maintaining and replacing the services & systems proposed. No major issues have been identified at stage 3 but the risk assessments will be further considered at stage 4 and mitigating measures proposed.

1.12 Maintenance, Design and Access Statement

Stride Treglown have prepared a Design & Access Statement report for submitting to the local planning authority, with contributions to the report from Troup Bywaters + Anders. This report includes requirements for maintenance including the design philosophy adoped for maintaining all building services engineering systems. In all cases, the recommendations of the Health & Safety Executive (HSE) and CIBSE Part M should be adopted and have been assumed.

1.13 Information Communications Technology (ICT)

The University places a huge amount of importance upon the ICT provisons proposed for the campus and have employed the dervices of an external ICT Consultant Chris Handley. The University has also established an ICT Task Group to determine the requirements of the brief and inform the design team.

The design team have incorporated the spatial requirements for cabling and data rooms, along with allowances for power and cooling for the active equipment. It should be noted that the power and cooling is estimated and may need to be reviewed further as details of the active equipment becomes available.

Final data outlet quantities have been advised by the University and the details are captured within the Room Data Sheets (RDS). These data outets will be provided as part of the base-build contractors installation works along with the cabling. The ICT equiment itself is not included within the base build allowances.

1.14 Furniture, Fixtures & Equipment (FF&E)

The FF&E works are excluded. For avoidance of doubt TB+A have no appointment to undertake any FF&E works and any contributions within this report are provided in 'good failth' to assist with the readers understanding or offering 'free' advice.

1.15 Passenger Lifts

The Building Regulations require that certain means of access are provided to the extent of the building. The minimum size lifts permitted for compliance are 8 person lifts. However, the design proposals must take account of the anticipated usage and traffic and the provision of lifts included as appropriate to obtain a "good" service. The proposals include for electrically powered lifts to enable the ease of travel by passengers between floors. Further details are included in section 9 and the Appendix.

2 Sustainable Development – The Underpinning Design Approach

2 Sustainable Development: The Underpinning Design Approach

2.1 Introduction

This section of the report aims to explain the general design principles and the approach taken to meet the University's brief for a sustainable development.

The planning system in Wales plays an important part in improving the sustainability of the built environment including the energy performance of new developments such the phase 1 development whilst helping to address the impact of climate change.

As set out in Planning Policy Wales (PPW) the planning system must provide for buildings in a way which is consistent with sustainability principles.

The FACE and Library buildings will have an inherent environmental impact and unavoidably contribute to carbon emissions. They will consume natural resources in their construction and use, and of course the way in which they are designed has a significant effect on how occupants use and maintain the buildings over their lifetime.

Wales Building Regulations set mandatory standards for the design and construction of buildings, which include aspects of health, safety and environmental protection. They are updated periodically to reflect changes in required standards and development in technology as discussed in Sections 1, 2 & 3 of this report.

This section is included within the report to assist the University, designers, decision makers and the delivery team to find the routes to better sustainability outcomes for the delivery of the phase 1 buildings and public realm.

The opportunities for good design quality, building performance and sustainable outcomes has been considered during these early RIBA stages of the design process which leads to maximising added value.

Sustainable development is a core principle within the founding statute of the Welsh Government (WG). The Welsh Government has specific duties regarding equal opportunities and sustainable development under the Government of Wales Act. Sections 120 and 121 respectively set out the Welsh Government's duty to ensure that in the exercise of its functions it has regard to the principle that there should be equality of opportunity for all people and that it promotes sustainable development.

The Welsh Government is one of the few administrations in the world to have a distinctive statutory duty in relation to sustainable development.

The Welsh Government supports the UK strategic framework for sustainable development through its own strategy at a national level (this is consistent with the approach for all administrations).

The Welsh Governments supporting strategy for sustainable development is set out in the 'One Wales: One Planet' section of the 'One Wales' strategy for government document.

The 'One Planet' targets include: 80-90% cut in carbon-based energy use; move towards 'zero waste' by recycling/re-using; changes to the way people live and work to cut car travel; make sustainable development a core objective of NHS Wales; support more sustainable development schemes in education; use more seasonal local produce; reduce the gap between rich and poor; and tackle child and fuel poverty.

2.2 Understanding what Sustainable Development looks like

The 'One Wales: One Planet; Strategy for Sustainable Development in Wales set the vision of what a Sustainable Wales will look like. Those of particular application to the Peninsular site development are summarised below:

- Across society there is recognition of the need to live sustainably and reduce our carbon footprint. People understand how they can contribute to a low carbon, low waste society, and what other sectors are doing to help. Individuals have become stewards of natural resources.

- Economic regeneration is undertaken with sustainable development at its core, and promotes low carbon, low waste ways of working. There has been a huge growth in businesses that supply the goods and services needed to support a sustainable economy. This growth has been underpinned by the development of training and qualifications. The emphasis is on durable, recycled, recyclable and re-usable goods, and goods which are low carbon.

- The energy intensity of society has decreased significantly. There has been a consistent drop in energy and water demand. There has been a major increase in renewable energy generation, offshore and onshore

- Waste - whether of energy or other resources is taboo - both from a cost and societal impact. There is less light pollution. Resources are valued, and as a result there has been a huge reduction in waste production and a much greater emphasis on reuse.

- Walking and cycling are much more commonplace. There is greatly enhanced provision for cyclists and pedestrians within towns and cities, with improved walking and cycling networks, as well as better street design and traffic management measures. There are fast, reliable, affordable public transport services connecting major settlements. There are frequent, reliable mass transit services within cities and more heavily urbanised regions. There is a coherent network of sustainable transport options within rural Wales. Travel Plans are part of all new developments. All employers develop and implement Travel Plans.

- Homes and businesses are far more energy efficient and sustainable - all existing buildings, at least meet Energy Performance Certificate Standard C, and many are on the way to becoming carbon neutral. All new buildings are

constructed to the highest standards of energy and water efficiency and are zero carbon. New development and infrastructure is located, designed and constructed for the climate it will experience over its design life, and to minimise travel needs.

- The public sector has led the way in this area, and sustainable development is the central organising principle of public service. Public buildings, schools, further and higher education institutions, hospitals and community buildings have been early, visible demonstrators of greater energy efficiency and renewable technology. They have also pioneered staff and service delivery approaches that minimise the need to travel. Many services are available locally and IT is used extensively to connect to specialist services.

- Sustainable development and global citizenship is firmly embedded into all levels of educational provision and lifelong learning in Wales, and all schools are Eco and Fair Trade schools. Levels of educational attainment are high.

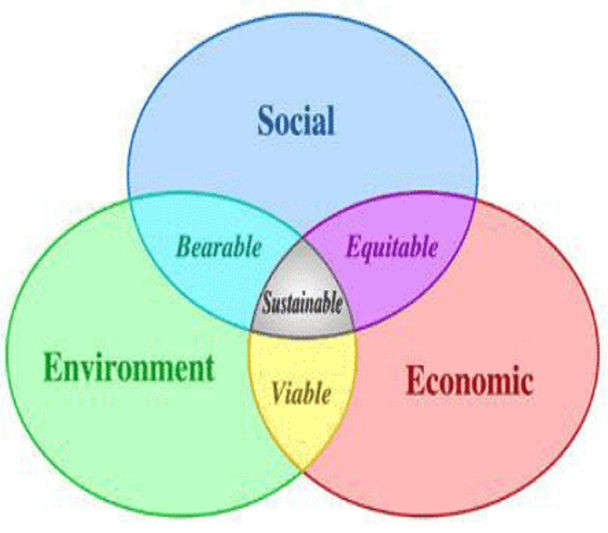
- Wales' historic landscapes have been preserved. We are now also managing land for the wider ecosystem services it can deliver, including carbon storage, water quality, flood management, and landscape quality and connectivity for wildlife to adapt to climate change. As a result, the loss of biodiversity has been halted and there is a greater number, range and genetic diversity of wildlife.

2.3 A shared vision for SA1

Promote and deliver more sustainable lifestyles to individuals who work in, and learn at the university through: enabling a sense of personal ownership; engagement with local networks; encouragement of action; and exemplify as a leader in sustainable development to inspire others.

2.4 Our shared objectives

- Utilise goods and services that promote resource efficiency: much less waste, less energy to operate
- Reduce and recycle waste in construction and operation and promote a zero waste strategy
- Promote environmental and sustainable policies under recognised environmental management systems, or broader sustainability management systems
- Monitor performance and resource use and report publicly on them
- Engage with the staff and students in adopting sustainable practices and encourage people to become sustainable champions in their own communities
- Engage with and support local communities
- Provide leadership on sustainable development to catalyse other businesses, shareholders and customers
- Provide a development that positively supports and assists revitalisation and regeneration of Swansea Water Front. .



2.5 The Planning Context

As mentioned in section 2.1, the PPW sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs). Procedural advice is provided in circulars and policy clarification letters. PPW translates the Welsh Government's commitment to sustainable development into the planning system, so that it can play an appropriate role in moving towards sustainability.

2.5.1 Wales Building Regulations

As discussed in Section 1, on 31 December 2011, the Welsh Government became responsible for new powers and functions related to the Building Regulations.

The Building Regulations set standards for design and construction which apply to all new University buildings including alterations to existing buildings. They ensure the health and safety of people in and near buildings, including responsible use of energy.

In Wales, adherence to and compliance with Building Regulations is checked by Building Control Bodies. There are two types of Building Control Bodies - Local Authority Building Control provided by each of the local authorities in Wales, and private sector Approved Inspectors. The option is available to choose one of the two to ensure that building work complies with the Building Regulations.

Practical guidance on how to comply with Building Regulations is provided in Approved Documents. These contain guidance on the performance expected of materials and building work to comply with Building Regulations, along with examples of ways to achieve compliance for some building situations. The Approved Documents cover different topics and are titled Part A – Part P. As guidance is reviewed and changes are made, separate Approved Documents are published.

Part L (Approved Document L) of the Building Regulations covers requirements with respect to the conservation of fuel and power, and is therefore the most relevant of the Approved Documents to planning for sustainable buildings.

2.6 The "High Level" Benefits of Sustainable Buildings

Building sustainably and designing, procuring and delivering good quality sustainable University buildings and neighbourhoods is important for our economy, quality of life, environmental stewardship and climate change resilience.

Planning for sustainable buildings is a vital part of the design and build process, and if integrated into the design will capture significant benefits and be in the public interest, contributing to the achievement of a sustainable development.

The benefits of good sustainable design include:

- Efficient use and management of materials and natural resources
- Long life buildings which cost less to maintain and hold their value
- Good energy performance which reduces consumption, wasted energy, expensive bills and running costs for businesses and residents alike
- Good, comfortable places to learn and work which support well-being and aid productivity
- Environments that enhance learning outcomes
- Good neighbourhoods and green spaces that support quality of life, well-being and public health
- Improved biodiversity and landscape networks
- Greater access to green infrastructure which encourages healthy, active lifestyles
- Excellent development practice which is good for business

2.7 Local Requirements for Sustainable Buildings

When proposing any local requirements for higher sustainable building standards planning authorities must be able to provide sufficient justification through a robust evidence base.

TAN 12 states that local requirements should:

- Be set out in the Local Development Plan (LDP) so as to ensure examination by an independent inspector. This is so that standards and requirements are properly consulted on and tested to ensure their ambition reflects local potential and are deliverable
- Be specified only in terms of a specific level against a recognised sustainable building standard such as BREEAM and not seek to identify individual categories or credits in any such scheme
- Ensure they are consistent with current and anticipated future changes to Building Regulations and/or other relevant national policy changes
- Be considered and consistent with the key objectives of good design
- Relate to a specific area or site and include justification

In preparing policies in an LDP which seeks higher sustainable building standards, TAN12 also states that Local Planning Authorities (LPAs) will need to establish:

- The proposals are evidence-based and deliverable, having regard to the overall costs of bringing sites to market and the need to avoid any adverse impact on the development needs of communities
- The need for the proposed greater than minimum sustainable building standards
- The costs and benefits of delivering these standards
- The specific opportunities of the proposed development and/or site, which enables the achievement of higher sustainable building standards

When preparing such policies, LPAs would benefit from considering the impact of any sustainable building policies or principles in the LDPs on neighbouring authorities and likewise, the impact of their LDP proposals on neighbours. It may be that aligning strategic sites across boundaries could enhance the sustainable building benefits of each site.

2.8 Our Specific Approach To Sustainable Design

This section of the report sets out to provide an introduction to a range of best-practice approaches to planning for sustainable buildings that have been considered as part of the design process during this stage 3 of the project. Later sections expand on the detail of where these principles have been applied and the findings of the design assessments.

At the outset of the project, the principles of the energy hierarchy have formed a useful starting point and have guided the design as has reference to PPW TAN 12: Design.

There are many factors that could be taken into account and the following are considered as a general introduction to the key design considerations undertaken upon the project.

2.9 Micro-Climate

Buildings and clusters of buildings in particular, create their own micro-climate which influences air movement, ventilation opportunities, sunlight conditions and shadow effects.

The general wind and solar conditions of the site have been considered at this pre-planning stage as these micro-climate effects can have positive or negative impacts on a building's comfort control strategy.

2.10 Overshadowing and Solar Access

It has been critical to analyse the site in order to maximise the potential benefits of solar gain in particular, as it is difficult to change later. Analysis has considered solar paths, and the impact of any physical elements that could shade the site.

The site is largely uninfluenced by overshadowing that can block access to good sunlight for the proposed buildings. Overshadowing can be caused by natural obstructions or man-made buildings and infrastructure.

2.11 District Heat Networks

All new developments and major refurbishment can benefit from taking a strategic approach to energy supply which reviews on-site and off-site energy supply opportunities.

As part of the initial site analysis and development, investigations into the possible connection to a planned district heat network have been considered. This could provide a source of low carbon heating where the district heating is served by a Combined Heat and Power (CHP) plant or other low carbon energy source.

The suitability of a district energy network depends on there being sufficient thermal demand and a strategy for maintaining and operating the plant. Following analysis of the cost and the limit upon available budgets it was deemed not to be viable for phase 1 and

there will be no heat network included as a primary part of the Phase 1 development. However, connections will be made available within the main plantroom of the FACE Building as a provision for future connection to a potential district heat network, should it be installed later.

2.12 Orientation and Solar Access

Consideration has been given to limiting unwanted solar heat gains which can arise when large areas of glazing are proposed for east, south or west facing elevations. External shading or an appropriate balance of glazed areas helps reduce risks of overheating that can arise from high solar gains. Troup Bywaters + Anders have continuously reminded the design team of the need to balance the benefits of large areas of glazing with the challenges of reducing too much solar gain leading to over-temperatures. The design team have struck a balance between solar reduction and the benefits of large glazed areas as demonstrated by the elevational architectural drawings.

2.13 Building Form and Internal Layouts

The building form and layout is designed to maximise energy efficiency and take advantage of passive energy. The following aspects contribute to the preliminary passive sustainability strategy:

- Building physics
- Space planning
- Form factor ratios
- Fenestration, daylight and solar control
- Off-site construction

At this stage of design, it has been useful to set specific energy targets for the building. Testing and analysis tools have been used to test and optimise building form in order to get closer to the “excellent” targets that have been set.

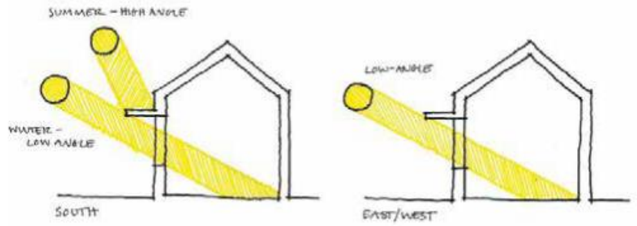
Space Planning

The size of the building reflects the needs of the University users, not only in the total area provided but also the configuration of rooms, layout of the rooms within the building and provision of storage space including utilities and plantrooms.

2.14 Building Fenestration, Daylight, Solar Control

In conjunction with Stride Treglown and ESHA Architects the windows are designed with the intention to provide sufficient daylighting and useful solar gain, without creating uncomfortable glare or overheating.

Generally, when considering heating requirements of spaces, south facing, and high performance windows will incur a net energy gain which is useful for heating effect in winter. The high angle of midday summer sun means that for south facing windows overheating is more easily controlled by shading, whereas this is more difficult to achieve



with east and west glazing, due to the lower angle of the sun. However, additional south glazing beyond what is useful for daylight and views is a very expensive way to heat a building.

North glazing can be beneficial for good internal daylighting but will result in a net energy loss.

Extensive use of glazing throughout the building is an essential element of the design to permit the essential requirement to allow the external environment to flood into the building.

Careful design balances the benefits of light entering the buildings against potential for solar gain increasing temperatures, particularly during summer. Controlling techniques will be used to make use of the natural light to assist in achieving savings in energy running costs (maintenance & energy savings), ‘extending’ the life of lamps and providing a bright vibrant internal environment promoting the well-being of the occupants.

Analysis of site noise may also influence the planning of fenestration.

It is better, and more sustainable, to prevent summer overheating in buildings by the careful design of fenestration and passive ventilation strategies, than to require a mechanical cooling system.

2.15 Off Site Construction Principles

Sustainable buildings can be constructed using on-site and off-site methods of construction, or a combination of both. If done well, off-site construction offers improved quality control, a reduction in waste material, faster on-site assembly and cost efficiency. An early decision to use off-site construction during Stage 4 design will allow good communication with manufacturers and better integration of the system with the design of the building.

Module or panel sizes may influence design of the building form and layout.

Off-site fabrication of plant and equipment will require consideration to realise the following benefits:

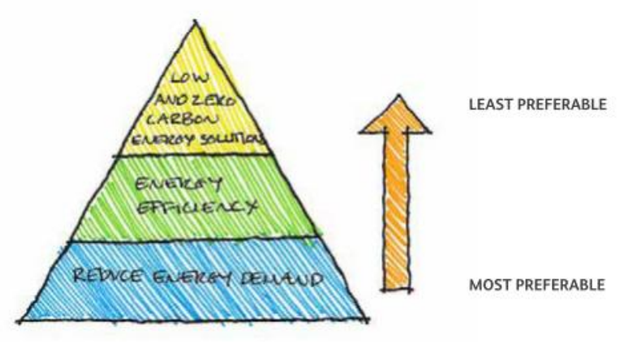
- reduced health & safety issues due to factory environment
- reducing waste and rework leading to cost savings
- no hold-ups due to bad weather, avoiding risk of delays
- built concurrently with other works to reduce programme periods
- installation time can be reduced by up to 90%
- higher quality ensuring less maintenance
- modularity of solution allowing bulk-replacement
- Adaptability of systems to be extended
- BSRIA tested cost savings

2.16 'Fabric First' Energy Efficiency Principles

2.16.1 Energy Performance of the Buildings

The Welsh Government's guidance in TAN 12 has been used as the primary approach to energy performance and may be explained using the Energy Hierarchy as below which is considered best practice to maximise the energy performance of a building during the early design process, with energy reduction and fabric efficiency measures prioritised over fuel sources and renewable energy. This approach has been fully embedded into the approach for phase 1 of the development.

Fuel sources will undoubtedly change in their nature and cost in the future, and renewable energy technologies may not last the lifetime of the building or might be changed or added as viable and economic options become available. However, the building is only



designed and built once.

Critical factors which affect the performance of the building are the:

- orientation of the building and extent of glazing
- levels of insulation of fabric, glazing and doors
- level of airtightness
- thermal bridging: elements of structure and fabric that penetrate the thermal envelope

2.16.2 Insulation and U-Values

Typically, two thirds of the heat generated in a building is lost through the building fabric itself; that is, the ceiling, walls, windows, floors and doors of a building.
Increasing insulation levels (for both the building fabric and building services) and specifying materials with low U-values is typically a cost effective means of improving the efficiency of building fabric.

U-value, expressed as W/m ^{2} K, is a measurement of the rate of heat transfer through a building envelope, usually from inside to outside. The lower the U-value, the better the material is at preventing heat loss.

The current design improves upon the minimum design standards set by Building Regulations part L2 by around 10%. However, this level of u-values is currently being reviewed by the design team in an attempt to improve the insulation values without increasing cost.

2.16.3 Airtightness

Airtightness is often confused with ventilation, despite most professionals being aware of the maxim, 'build tight, ventilate right'.

Unplanned air leakage through building fabric makes it difficult to achieve reliable healthy ventilation. Aiming for the best possible level of airtightness improves performance. Airtightness standards and testing requirements are set in Part F of the Building Regulations.

To achieve air tight building for phase 1, a high build quality and adequate inspection regime is required as air leakages are usually due to imperfections in the building construction such as cracks, gaps or porous joints.

Air tightness is measured by the degree of air leakage (uncontrolled ventilation) through the building fabric over a specified period of time and at a defined pressure. This is referred to as a building's air permeability rate or airtightness index.

The lower the air permeability rate, the more air tight the building becomes and consequently with increasing air leakage through the building envelope (walls, roofs and penetrations), the energy performance of buildings significantly diminishes.

It is recommended that two air tests are carried out on the phase 1 buildings – one before 'Second Fix', when any issues can be identified and corrected, and one at completion, for compliance.
Targets for airtightness are set based on the Wales Building Regulations and user requirements for comfort, energy efficiency, etc. The minimum air permeability rate is set by the Wales Building Regulations, but the better airtightness will help to make a building more energy efficient. The targets set are identified in section 3 Energy Analysis of this report.

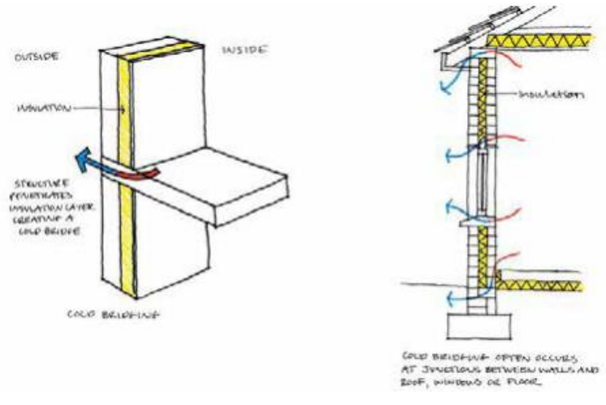
Airtightness is designed in, at this stage 3, as it is considered to be one of the most cost effective energy efficiency measures.

Whilst airtightness has a significant impact on energy consumption, reducing air leakage is also important in reducing discomfort due to drafts and the potential for condensation leading to decay, within the building fabric.

Good levels of airtightness also require the design of a robust ventilation strategy to provide sufficient fresh air for occupants. Refer to later section on ventilation.

2.16.4 Thermal Bridging

Thermal bridges are localised areas of reduced thermal insulation or resistance in a building, which lead to a higher rate of heat transfer than the surrounding area. Thermal bridging often occurs at floor-to-



wall, roof-to-wall, or ceiling-to-wall junctions.

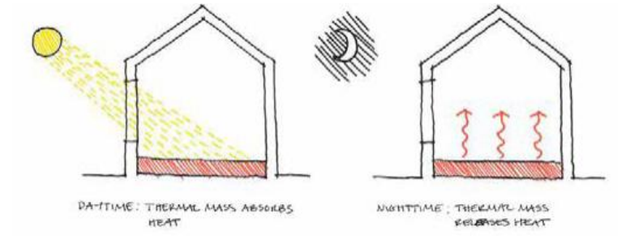
Thermal bridges have an adverse impact on buildings as they cause unnecessary heat loss and create the potential for condensation, mould growth and fabric decay, as well as causing discomfort for occupants and "destroy" the anticipated performance of the thermal envelope.

Thermal bridges will be designed out at detailed design stage and if this is not practical their impact on heat loss will be calculated. Minimum thermal bridging standards are set by the Building Regulations.

An effective way to design out cold bridges is to keep the structural elements of the building wholly inside or outside of its thermal envelope, and avoid any elements of structure penetrating through this. Such penetrations can also increase the risk of water penetration.

2.16.5 Thermal Mass

Strategically, the current design strategy takes advantage of thermal mass wherever possible which is the ability of a material to absorb



and retain heat.

Materials with a high thermal mass will retain heat and release it slowly over time, balancing external temperature fluctuations.

This ability to store and release heat is being utilised to reduce summer overheating in the buildings by exposing concrete slabs and structure, wherever possible, provided this can be cooled overnight.

Night time cooling of structures with thermal mass, facilitated by an appropriate ventilation strategy, will help avoid the need for mechanical cooling. The use of the concrete slabs to assist with the passive solar design for stabilising temperatures has been considered and essential component of the overall energy strategy.

In all aspects of considerations of thermal mass, air-tightness and thermal bridging, detailed designed and specification is vital.

Lifecycle assessments of concrete suggest that it is an environmentally sustainable, durable and a robust material.

2.16.6 Renewable Sources

The viability of renewable energies will be required to be assessed and the analysis demonstrated to the university. The assessment must consider the whole life cycle cost of the possible solutions. As these technologies become more popular it is expected that they will become more economically attractive. Due consideration is required to ensure full compliance with the Building Regulations Part L

2.17 External Noise Criteria

Existing noise levels have been measured at the boundary of the site by MACH Acoustics and the designs have been based upon the requirement for these values not to be increased. The design noise levels used to determine limits to noise from mechanical and electrical plant have been based upon advice from MACH Acoustics and CIBSE Guidance but will require final agreement with City & County of Swansea Council at stage 4 of the project

2.18 Procurement

The proposed development will engage the principals of sustainable development as part of the procurement process.

This will be achieved by: taking account of lifecycle costing to deliver best value for money, environmental impact of procurement decisions over the entire lifecycle, positive social aspects, and local economic aspects such as local job creation and stimulation of markets; for example through the promotion of engagement with SME's through the Buy4Wales and Sell2Wales portals.

2.19 Building Services Engineering

Passive and active building services strategies have been considered early in the design process to fully integrate them with the rest of the design, and to ensure they operate efficiently and effectively. The following services have formed part of the overall building services provisions:

2.19.1 Combined Heat and Power

Combined Heat and Power (CHP) is the simultaneous generation of usable heat and power in a single process. It requires an engine or gas turbine.

The electricity is generated in the building, allowing the capture and use of the resulting waste heat for site applications.

Refer to Energy, Mechanical and Electrical sections for further details of the CHP systems proposed for phase 1.

2.19.2 Heating, Cooling and Ventilation

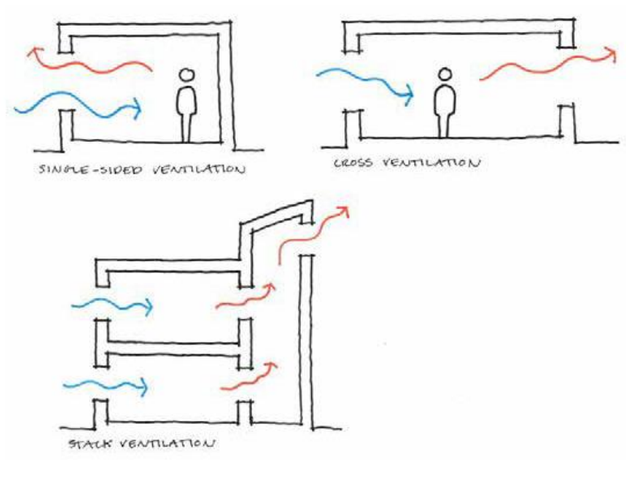
Ventilation is an important requirement in all educational buildings to provide fresh air supply for all occupants (students, staff and visitors), maintain acceptable air quality levels and moderate the internal air temperature.

Generally, the strategy for phase 1 is to minimise mechanical cooling to rooms where it is only necessary due to high occupancy levels or certain activities that generate significant heat, such as a high density of computer or other ICT, electronic equipment or plant as identified by the University.

The use of natural ventilation to provide passive dissipation of internal heat gains, and thus a passive cooling effect, has been considered as the preferred method for maintaining comfortable temperatures in the first instance.

Natural ventilation adopted for phase 1 has generally formed part of a mixed-mode ventilation strategy, meaning that mechanical ventilation systems are installed but can be modulated (turned down) or switched off when natural ventilation is sufficient. It has been very important to

consider the ventilation strategy in combination with other passive design techniques such as the provision of external shading and overhangs above windows, to reduce solar heat gain.



Noise conditions have made it more difficult to design appropriate passive ventilation strategies as the predicted ambient noise levels are high.

The objective is to design very low energy consumption buildings as demanded by Building Regulations Part L2 with the move towards mechanical ventilation with heat recovery. This is an inevitable solution because the mechanical heat recovery system can reduce overall ventilation-related heat losses over the year.

Energy efficient mechanical ventilation systems will have low fan energy consumption. The noise impact of ventilation, heating and cooling equipment is limited so that it does not cause a nuisance to occupants or neighbours. Noise nuisance to neighbours is considered a particular risk, due to the close proximity of the residential blocks and therefore an acoustic assessment to evaluate the noise impact from building services equipment and proposals for noise mitigation has been completed.

The height of flues has been driven by air quality requirements and locations have been carefully considered. Reducing the height of flues on visual grounds can have a detrimental effect on performance, as they serve an important function in dispersing flue gases. The location and height of boiler flues has been identified at this stage as they can have an impact on air quality (if close to opening windows or nearby buildings).

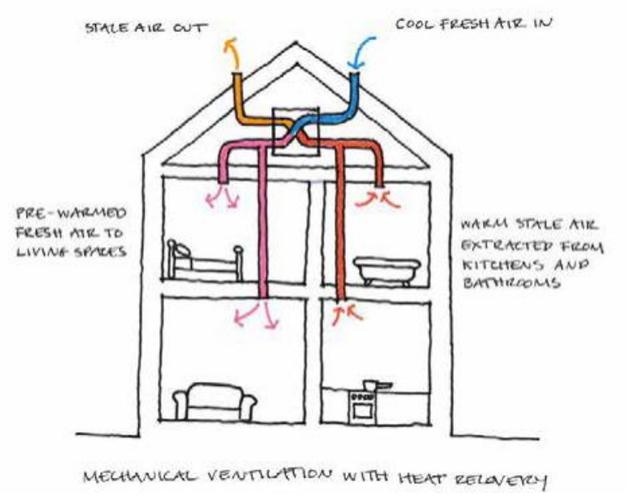
2.19.3 Hot Water

Hot water heating systems must comply with minimum Building Regulation Part L2 standards.

Reducing hot water demand by specifying water efficient taps, low flow showers and other efficient hot water appliances will help the building to use energy resources efficiently. Many modern appliances use water very effectively without any perceived reduction in user performance compared to older, less efficiently designed water appliances.

Particular attention is given to maximising the efficiency of hot water systems to reduce energy consumption. This might include reducing storage and distribution losses, and eliminating or reducing circulation losses with insulated pipes or reduced pipe runs, with localised hot water heating units.

Assessing the different options will help to identify the most efficient solutions. The design will be carefully considered to ensure that hot water systems and distribution of hot water do not cause unwanted heat gains in summer. There is a danger that heat lost through poorly insulated pipe work could lead to overheating. With clever design, capital cost and energy savings can go hand in hand.



Solar water heating panels can act as a source of low carbon hot water heating and reduce operational costs for water heating. If considered for a building they will be shown on drawings and generally be south facing and not overshadowed to achieve beneficial output.

2.19.4 Lighting

It has been important to assess opportunities for daylight, through appropriate allocation of windows and glazing configuration, at this stage 3. As discussed earlier, the windows provision providing natural daylight has to be balanced with the overheating effects of solar gain in summer. An engineering “compromise” has to be struck balancing all factors.

Artificial (electric) lighting is a significant source of energy usage and therefore selection of the lamp types is an important part of the design process to ensure the amount of energy is minimised whilst providing sufficient illumination levels to suit the use of the space.

Recent cost reductions in the price of efficient light sources such LED’s and automatic dimming or occupancy controls will reduce energy consumption, and has been considered in the pre-planning Building Regulation Part L2 assessment undertaken during stage 3, outlined in Section 3 - Energy Analysis.

Ensuring that controls are intuitive to occupants and easy to use, help in achieving predicted energy uses.

Illumination levels will be reduced to the minimum required to safely undertake the task.

Where artificial lighting is provided at night use will be made of low-energy high-performance lamps with controls linked to automatic daylighting sensors and occupancy sensors, minimising use of operation to those periods when needed. Where external lighting is provided the appropriate balance of lighting efficacy, colour render and energy saving will be required.

2.20 Demand Reduction and Renewable Energy Sources

Renewable energy sources will be appropriate for the building application and site context, as the performance of renewable energy technology can be sensitive to location and building type. The phase 1teaching and library buildings are located in a coastal environment that has contributed to the selection criteria for the most appropriate renewable technologies:

Renewable energy sources considered include:

- Solar photovoltaic (PV) modules
- Solar water heating panels
- Biomass heating or CHP systems
- CHP
- Wind turbines
- Ground source heating pumps

The University may pursue financial grants and funding to assist in support for renewable energy sources. It is important to understand the criteria for any qualifying for funding that may be necessary prior to undertaking detailed design at Stages 4b and 4c of the project as technical conditions may affect the renewable energy installation, and consequently the building appearance.

Feed-in-Tariff (FIT) support is available for a range of renewable electricity sources, such as solar PV systems and Renewable Heat Incentives (RHI) for some renewable heat sources, such as woodchip boiler systems and solar water heating systems.

It is also important that renewable energy sources are considered in the context of the approach to the energy strategy for phase 1. Whilst tariffs and grants can provide a financial return, it is not good practice to opt for solutions that are driven solely by current incentives.
Assessment of the effectiveness and appropriateness of renewable sources for phase 1 is important. The most financially rewarding option may not be the most sustainable and may not always be the most effective means of reducing energy demand.

Reducing energy demand will always be prioritised over renewable energy sources in addressing energy hungry buildings, as renewable technologies are an expensive and shorter term way of reducing carbon dioxide emissions.

As discussed elsewhere examples of demand reduction measures that could help achieve this include:

- improved building envelope: specifying walls, roofs and windows with low U-values
- minimising thermal bridging through high quality building construction details
- specifying efficient building services

Our approach is to apply these measures; any further residual reductions (carbon dioxide emissions or cost) required could be further addressed using appropriate renewable technologies. This approach is actively promoted and is illustrated in the Energy Hierarchy diagram and in TAN 12 as indicated in 2.17 earlier.

2.21 Whole Life Costs

Building services design and installations are crucial to the functionality of the University's proposed buildings, and an awareness of operational costs is necessary to enable the designs to be optimised. At the outset, the capital cost of these elements is often prioritised over their operational cost in the long term, reducing energy bills, maintenance and repair costs, replacements and disposal costs.

The design of the building services has focused upon a balanced approach aiming to find a reasonable balance between capital and operational costs.

Assessment of Whole Life Costs (WLC) allows the systematic consideration of all relevant costs and revenues associated with the ownership of a system or building component. Whole life costing thus aims to capture the true cost of any building service option or building component and justifies the long term cost effectiveness of an option. For example, a low capital cost system may end up costing more in the long run, say over 15-30 years, than a high capital cost system that is easier to maintain and repair.

2.22 Water Management

Whilst water use is closely linked to user behaviour, water efficient fittings can save significant amounts of water and energy whilst improving function. The design is led by the Building Regulations that sets the minimum standards for water efficiency.

Good quality regulated aerator fittings for taps prevent splashing and save water when rinsing under a running tap. Specially designed shower-heads can provide a very effective shower with around 6 to 8 litres per minute flow. By regulating the flow to individual fittings, the flow rates and temperatures throughout the system are more stable.
WC flush volumes have reduced to close to optimal levels but cisterns that use a valve-flush mechanism rather than the traditional UK siphon, are prone to leakage which may go unnoticed leading to very high water consumption.

As appliances are easily changed it is arguably more important to optimise the hot water system layout and design. It is not uncommon for hot water system losses to be greater than 50%

Whilst some losses during the heating season contribute to space heating, over half may be unutilised. Compact plumbing layout and small bore hot water pipes dramatically reduce the wait for water to run hot. This saves energy, reduces summer overheating and saves water.

Long, oversized hot water pipes waste a lot of energy through distribution, as well as through water run to waste waiting for the hot water to come through. Even if the cool water is not wasted, the pipe is left full of hot water that will then cool down.

This issue is not covered by Building Regulations, but careful consideration of the plumbing layout at the design stage can save installation costs as well as energy and water, in use. Insulating hot water pipes helps delay the cooling off between uses but cannot stop it, so it is important to keep pipes as short as possible. Many plumbers tend to oversize pipes to ensure adequate flow rate but this exacerbates the problem. A growing number of domestic and commercial buildings are now using micro bore pipe to very good effect. Building Regulations require that reasonable provision will be

made to limit heat gains and losses from pipes used for new heating and hot water services.

2.23 Waste Management

2.23.1 Construction Waste

Opportunities to reduce the amount of demolition and construction waste sent to landfill during the construction process will be sought.

It is good practice to consider reclaiming and recycling materials where feasible and employing a specialist waste contractor to maximise the amount of construction waste that can be recycled off-site.

Many suppliers of materials now offer their own recycling schemes so that, for example, thermal insulation and plasterboard does not have to be discarded to landfill. Utilising recycled materials in the new building itself will be considered, so that demand for raw materials is reduced.

2.23.2 Recycling Facilities and Space for Waste Storage

Adequate space will be provided in new buildings to allow for separation of different types of waste generated in the function of the building.

The University need to undertake an assessment needs to be made of the likely types of materials to be generated by the building users, and a strategy prepared for arranging removal of separated waste for off-site recycling.

2.23.3 Strategically Located Plant

The off-site manufacturing and 'pod' approach to plantrooms will require consideration along with the locating of primary plant on central spines and adjacent to the load centres.
This approach has improved likely efficiencies and minimises both capital and running costs. Major M&E plant selection ensure optimum energy performance, efficiency and reliability.

Low cost, low quality items will not be selected in the design and selection process, and full attention will be given to life cycle costing to ensure that best value is achieved.

Air handling plant will be located within plant rooms, roof/ceiling voids or roof mounted to best suit the relevant application and aid ductwork distribution.

Boilers, CHP, calorifiers and cold water storage tanks will be located in rooms with conductivity to service risers to enable safe and efficient distribution of all services throughout the development.

High voltage transformers and ring main units will be located in dedicated plant rooms. Main switchboards will be located within dedicated switch rooms.

Standby generators will be located within the confines of the building as shown upon the architects' plans.

2.24 Building Management and Post Occupancy Evaluation

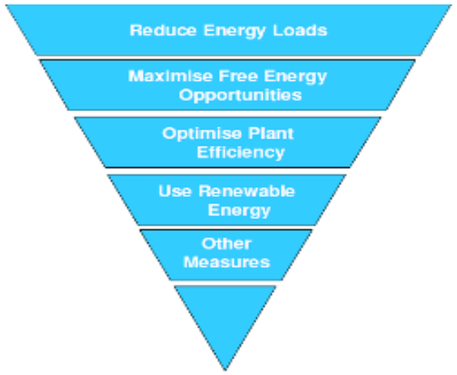
2.24.1 Construction Building Energy Management Systems

Poor control of heating, ventilation, cooling and lighting is responsible for excessive energy consumption in many completed buildings.

Simple, effectively designed and commissioned controls will be used to help optimise energy use and limit wastage by turning down or turning off equipment when it is not required.

Some controls, such as those for the heating systems, are minimum requirements for Building Regulations.

Additional controls, over and above those necessary to comply with Building Regulations, are recommended for best practice energy performance of the University buildings and will help achieve comfort conditions effectively.
Building Management Systems (BMS) are relevant for phase 1 buildings and are discussed further in later sections. They are computer-based management systems that provide the facility to closely control and monitor the performance of building services, including heating, cooling, ventilation and lighting. The BMS can be set up to display useful data on a computer screen for building managers.



If used correctly, a BMS can reduce total energy costs by 10%-20% whilst also increasing comfort. It will be acknowledged, however, that building control strategies will aim to be intuitive and easy to understand, as there is evidence that systems that are overly complex can be difficult to manage. Good practice testing, commissioning and training is essential for the value of building management systems to be fully appreciated.

Poor performance and occupancy dissatisfaction can occur if adequate time is not allocated for the proper validation of building engineering services and control systems. To be of most benefit, this process will also entail a period of evaluation and fine-tuning after construction completion to ensure that set points and control strategies have been appropriately set up for the building users.

2.25 Soft Landings and Controls

It is an endemic problem that building users are often given insufficient training and support to enable them to operate sustainable buildings effectively and efficiently and the University's intention to employ and engage with a post-handover team is a positive action to be commended.

Adopting a full programme of 'Soft Landings' can resolve this problem cost effectively and by adopting this approach at the outset of a project, it can involve users and building managers in discussion about building performance and operation, afford particular attention to the proper commissioning of systems, and then provide specific support to building users over the first 12-24 months of occupation.

'Soft Landings' might include simple user guides in addition to full Operation and Maintenance (O&M) manuals, and regular support and training workshops.

The monitoring of building performance, to inform further seasonal commissioning, building system optimisation, and to enable further appropriate user guidance to be prepared, can also be included.

A 'Soft Landings' approach is more cost effective than the maintenance of poorly understood and poorly used systems.

2.26 Performance Monitoring

The ability to monitor building performance, through appropriate metering systems and post occupancy evaluation can help demonstrate how well a building is performing in practice. Metering systems will be provided to measure the primary energy supplies to the building as well as particular end-uses and areas which can be measured in detail.

2.27 Energy Metering

Systems will be provided with energy meters to ensure at least 90% of the estimated energy consumption of each fuel can be assigned to the various end uses in the building.

The Building Energy Management system will be provided with automatic meter reading and data collection / targeting facilities.

In addition to the primary utility supply meters, sub metering will be provided to satisfy the requirements of Part L2 of the Building Regulations and BREEAM Ene 02

2.28 Maintenance and Security

It is important to the ongoing cost-effective operation of the University's buildings; it will be beneficial to have a clearly defined maintenance strategy in place to ensure up-keep of the building fabric, landscape and building services technologies.

Poor maintenance of the buildings and public realm can be detrimental to their environmental performance, and they may no longer be used as intended.

Poor maintenance may also be detrimental to the sense of pride, ownership and care that represents the critical success factor in good places and neighbourhoods that the University wishes to create.

Places where people feel safe and where social interaction in good communal and public spaces supports community cohesion and well-being are frequently also those which hold their value and which remain attractive places where people want to live.

3 Energy Analysis

3 Energy Analysis

3.1 Setting the Scene

This section discusses the results of the Wales Building Regulations Part L2A energy calculations undertaken at RIBA Stage 3 of the design.

A large number of iterations has been undertaken during the design process due to changing architectural requirements, most notably the facades, the extent of glazing and information regarding uses of the spaces becoming available, developing or being revised.

Initial calculations and analysis was undertaken with consideration of achieving an ambitious target of achieving compliance with 2019 legislation for Nearly Zero Energy Buildings (nZEB).

However, following due consideration the University have taken the recent decision that the building will not currently be required to meet these future standards and therefore the design will be required to achieve the current Wales Building Regulations AD Part L2A requirements only.

In addition to Part L2A the University has requested that the design team consider including reasonable measures towards future proofing the building and the services to allow for future nZEB requirements that could be applied at a later date. As noted within Section 1 of this report this process is ongoing but currently not within the Stage 3 design proposals or cost allowances and requires further consideration during the early part of Stage 4.

The buildings are also being assessed under BREEAM 2014 New Construction with a target rating of Excellent. Therefore, calculations have been completed to assess the availability and method of achieving BREEAM target credits under ‘ENE01’ for each option considered (minimum of 5 credits). This process has informed the overall design both architecturally and the building services.

Further assessment and calculations have been undertaken for each design option and the requirements to reflect a Part L2A compliance ‘PASS’ completed, without consideration for nZEB, but still achieving sufficient BREEAM ENE01 credits.

Building Services Engineering

The Part L2A study explores the architectural, building services and LZC options being considered at Stage 3, as discussed earlier in Section 2, including the following:

- Passive measures: fabric performance and external shading
- Varying sizes of natural gas CHP systems including micro CHP
- Solar photovoltaic panels, both on-site and near-site
- Solar thermal hot water collectors
- Air source heat pumps, both electric and gas absorption
- Wind turbines

3.2 FACE/Tech

3.2.1 Summary of Analysis

In summary, the maximum possible performance determined uses:

- natural gas CHP for hot water and heating support,
- split DX units for cooling in areas of high heat gains,
- 1,800sqm of solar PV, and
- 100sqm of solar thermal hot water collectors.

There are a number of similarly performing options which all achieve a circa 50% improvement over the Part L2A target emission rate, but to achieve a zero regulated building emissions could require near-site provision of low or zero carbon energy such as solar PV on a neighbouring building, or a large wind turbine. [Options 9 and 10 in table overleaf]. These results provide a significant strength to the argument to maximise the use of passive measures and minimising of the energy used within the building, as the exclusive reliance on low or zero carbon energy technologies to achieve nZEB is likely to be, as a minimum, challenging.

3.2.2 Technical Assessment Detail

Throughout this section of the report the following terminology is used which is industry recognisable:

TER = Target Emission Rate. Measured in kg $CO_2/m^2/yr$

BER = Building Emission Rate. Measured in kg $CO_2/m^2/yr$

TPEC = Target Primary Energy Consumption. Measured in $kWh/m^2/yr$.

BPEC = Building Primary Energy Consumption. Measured in $kWh/m^2/yr$.

Both the Target Emission Rate (TER) and the Target Primary Energy Consumption (TPEC) must be met to pass Part L2A (Wales) 2014.

The definition of Nearly Zero Energy Buildings is yet to be confirmed by the UK government, so the assumption has been made that zero regulated emissions as defined by UK Part L national calculation methodology would be equivalent to a Nearly Zero Energy Building (nZEB).

This means that if the University chose to instruct the design team to implement nZEB into the design, a 100% improvement over the Target Emission Rate for Part L2A would be necessary.

3.2.3 Results

A summary of the iterations tested is shown within the adjacent table, with each option explained further in the next section.

BREEAM Credits and Part L2 % Compliance:

The current options achieve at least:

- 7 out of 15 BREEAM 'ENE01' credits, and

Most options provide improvement over the Part L2A (Wales) 2014 Target Emission Rate (TER) of:

- circa 50%

Further explanation and detailed analysis of each option is provided overleaf.

Option	Summary	TPEC	BPEC	TER	BER	BER/TER Pass	BREEAM 2014 ENE01 Credits
1	91% efficient gas boilers, with ENER-G 25 gas CHP serving a wet system. 1800sqm of solar PV	116.9	106.8	16.7	8	52%	10 of 15
2	As option 1, with a larger CHP unit 50kWe	116.9	107.1	16.7	8.1	51%	10 of 15
3	As option 1, with a larger CHP unit 70kWe	116.9	108.7	16.7	8.4	50%	10 of 15
4	As option 1, with 100sqm of solar thermal hot water tubes	116.9	104.6	16.7	8.2	51%	11 of 15
5	As option 1, with less solar PV (900sqm down from 1800sqm)	116.9	106.8	16.7	13.2	21%	9 of 15
6	Micro CHP 5kWe	116.9	111.3	16.7	8.8	47%	9 of 15
7	ASHP pre-heat. Gas CHP serving DHW only	120.4	113.1	17.3	9	48%	10 of 15
8	Gas absorption ASHP serving space heating. Gas CHP serving DHW only	123.9	**125.9**	15.2	8.8	42%	8 of 15
9	Option 1, with near site PV sized at 3190sqm	116.9	106.8	16.7	**0**	**100%**	10 of 15
10	Option 1, with near site 120kW wind turbine 35m hub height	116.9	106.8	16.7	**-0.9**	**105%**	10 of 15
11	Option 4, with brise soleil to east, south and west windows	116.9	102.3	16.7	7.8	53%	11 of 15
12	Option 1, with reduced solar PV to meet Part L2A	108.96	101.52	15.3	14.3	6.5%	7 of 15
13	Option 12 with Brise Soleil to east, south and west windows	108.96	99.24	15.3	14	8.5%	7 of 15

3.2.3.1Part L2A Model Options Tested

1. Option 1 Gas CHP with Solar PV

All key assumptions are recorded in our assumptions sheet contained within support documentation. However the key data used is summarised as:

- Gas CHP with natural gas boilers providing heating and hot water. Model ENER-G 25. Gas boilers at 91% efficiency.
- Heating and ventilation strategies in line with Stage 3 ventilation strategy layouts, including natural ventilation where possible, mechanical ventilation in the Tech building and some other rooms with limited openings, some mixed mode ventilation, some comfort cooling in computer based rooms, and radiators with natural ventilation elsewhere.
- Mechanical supply and extract ventilation with a respective specific fan power of 0.9 W/l/s in line with the Wales Part L2A notional value.
- Solar PV covering as much of the roof as estimated to be practical. Following amendments to the roof layouts, it is estimated that 1,800sqm of solar PV could be supported on the roof, pending detailed shading analysis.

This option exceeds the Part L2A requirements by 52% which makes this a very highly performing building in terms of energy performance.

The Building Emission Rate exceeds zero, so is not seen as a Nearly Zero Energy Building.

2. Larger CHP Test [ENER G 50]

This iteration of the model swaps the gas CHP ENER G 25 for a larger unit [ENER G 50] to test the change in performance with a larger unit.

The results perform marginally moor poorly with the larger CHP system, which can be explained due to the operating range of the CHP. This technology operates at anywhere between 50% and 100% of rated load, and therefore when demand is low, the CHP unit would be over-generating heat and is turned off in favour of the gas boilers.

3. Larger CHP Test [ENER G 70]

This iteration of the model swaps the gas CHP ENER G 25 for a larger unit [ENER G 70] to test the change in performance with a larger unit.

As with option 2, the performance decreases for the same reasons previously envisaged.

4. Option 1, with 100sqm solar thermal hot water collectors

This option tests the impact of solar thermal hot water collectors on the energy performance using a 100sqm area of collectors mounted on the roof. This area has been deducted from the total area of solar PV to leave 1700sqm of solar PV and 100sqm of solar thermal hot water collectors.

The results of this model show an increase in the building emission rate, but an improvement in building primary energy consumption.

The building emission rate increases because the solar PV has been reduced, and the solar PV is more effective at reducing carbon dioxide emissions [as it displaces grid electricity].

The building primary energy consumption improves because the resultant energy demand for hot water production reduces. This reduction in demand is reflected in the building primary energy consumption improvement.

While the Building Emission rate is higher, the improved primary energy consumption results in an additional BREEAM ENE01 credit, to 11No. in total.

This option is considered to be the most highly performing of the options tested, and is the model option taken forward to test brise soleil in option 11.

5. Option 1, with reduced area of Solar PV

The amount of solar PV was reduced by half [1800sqm to 900sqm] to demonstrate the impact on performance.

The results show a much poorer performance against the Target Emission Rate, but the Primary Energy Consumption performance does not change, allowing 9 No. BREEAM ENE01 credits to still be achieved.

This shows how BREEAM rewards both carbon dioxide emissions performance and energy consumption performance.

6. Micro CHP [Dachs 5.5kWe]

Micro CHP was tested using product data from the SenerTec 5.5kWe Dachs unit to serve the LTHW space heating and hot water system.

This smaller sized system would be able to serve a lower baseline energy demand, and would be running for more hours than a large system would be able to. The drawback is that only a small amount of electricity is generated by the unit once it is running.

The results show a reduction in performance when compared with the larger CHP systems, due to the reduction in electrical generation.

7. Electric Air Source Heat pump (ASHP) pre-heating

Electric air source heat pump technology was tested, using an air to water system with a coefficient of performance of 3.5, providing low grade heat to ‘pre-heat’ the LTWH heating and hot water circuit.

Air to water heat pumps cannot typically produce water at a temperature high enough to serve a traditional wet heating system. Therefore this technology is used to provide heat up to 45 degrees, with the gas boilers used to heat up to 60+ degrees for heating and hot water. The model assumes 30% of annual heat is provided by the ASHP system.

Due to the ASHP providing the initial heating, the CHP system is changed to provide only domestic hot water.

The results show a 47% improvement over the Target Emission rate, but an increase in primary energy consumption when compared with the options previously considered. For this reason this option is not seen as being in the spirit of the Nearly Zero Energy Building aspiration.

8. Gas Absorption air source heat pump Space Heating

Gas absorption air source heat pump technology allows heat to be produced at up to 65 degrees C, at a coefficient of performance of 1.12. This means the low carbon dioxide emission factor of natural gas can be used to result in significant efficiency savings over a traditional natural gas system.

Gas absorption air source heat pump technology does not suffer from reductions in coefficient of performance in cold climates, which is an advantage over electric air source heat pumps.

This system has been simulated to provide all space heating, with the natural gas CHP system serving domestic hot water only.

The results of the model show the primary energy consumption fails the Part L2A requirement, which is most likely due to the national calculation methodology assuming a higher notional coefficient of performance than the 1.12 specified. For this reason gas absorption air source heat pump technology is not considered further.

9. Option 1, with Near Site solar PV provision

To reduce the regulated Building Emission Rate to zero, a directly linked near-site solar PV array would be required with a size of 1,385sqm, south facing at 30 degrees monocrystalline, in addition to the 1,800sqm on the roof of the proposed building.

The total area of solar PV to reduce the regulated Building Emission Rate to zero is 3,185sqm.

10. Option 1, with 120kW Wind Turbine

To reduce the regulated Building Emission Rate to zero, a directly linked near-site wind turbine with a hub height of 35m and a generator power of 120kW would be required. This is assuming the wind speed at a height of 35m is between 5 and 6 m/s.

Whilst this seems to be an extreme measure, it demonstrates how a Building Emission Rate of zero can be achieved.

3.2.3.2 IMPACT OF BRISE SOLEIL ON ENERGY AND CO_2 PERFORMANCE

The impact of introducing brise soleil has been assessed using a recalculation of the energy model option 4, as this is considered the 'best performing' option when excluding the unlikely options of adopting 'near-site' solutions.

As shown to the right of this page, an image has been extracted from the overall building model which includes the introduction of the brise soleil can be seen below.

The results of the modelling indicate that both the Building Emission Rate and the Building Primary Energy Consumption are reduced, which is likely to be due to the reduced summertime cooling energy demand.

When the results of the BRUKL report are interrogated, the heating energy demand appears to increase, which is likely to be due to the reduction in passive solar gain in the winter.

However, this also means the CHP system needs to work harder and produces more 'free' electricity, which makes the energy model perform better.

Pending the detailed elevations proposals, it is likely that brise soleil of other solar control device would be required to limit summertime overheating and to pass criterion 3 of Part L2A.

Therefore the development of a brise soleil proposal is strongly recommended.

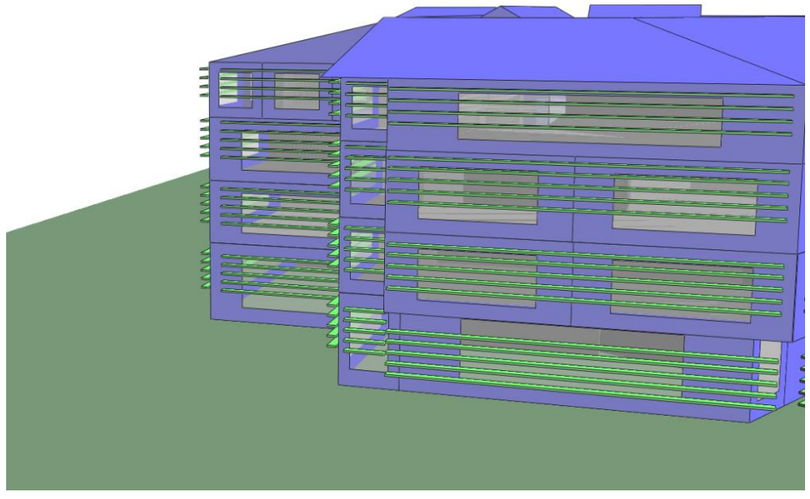
TER = Target Emission Rate. Measured in kg $CO_2/m^2/yr$

BER = Building Emission Rate. Measured in kg $CO_2/m^2/yr$

TPEC = Target Primary Energy Consumption. Measured in $kWh/m^2/yr$.

BPEC = Building Primary Energy Consumption. Measured in $kWh/m^2/yr$.

Option	Summary	TPEC	BPEC	TER	BER	BER/TER Pass	BREEAM 2014 ENE01 Credits
4	No brise soleil	116.9	104.6	16.7	8.2	51%	11 of 15
11	Includes brise soleil	116.9	102.3	16.7	7.8	53%	11 of 15



3.2.3.3Part L2A (2014) PASS, with sufficient BREEAM 'ENE01' Credits for BREEAM 'Excellent'

Energy models have been constructed and developed to identify the specification required that will be sufficient to achieve a PASS compliance with Building Regulations Part L2A (Wales) 2014.

Whilst achieving compliance with Part L2A, a sufficient performance to meet the minimum credit ENE01 standard of BREEAM Excellent is also necessary.

The strategy is very similar to Option 1 described earlier, but with less solar PV.

The key data used and specification required is summarised as:

- Gas CHP with natural gas boilers providing heating and hot water. Model ENER-G 25. Gas boilers at 91% efficiency.
- Heating and ventilation strategies in line with Stage 3 ventilation strategy layouts, including natural ventilation where possible, mechanical ventilation in the Tech building and some other rooms with limited openings, some mixed mode ventilation, some comfort cooling in computer based rooms, and radiators with natural ventilation elsewhere.
- Mechanical supply and extract ventilation with a specific fan power of 0.9 in line with the Wales Part L2A notional value.
- Solar PV with an area of 540sqm which is slightly below the 'notional' amount of PV which the Wales Part L2A (2014) assumes.

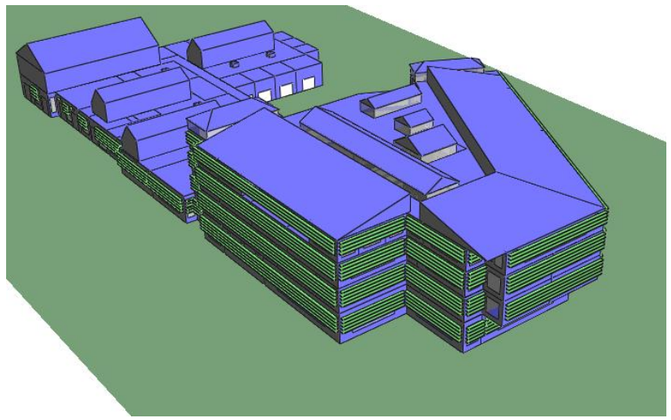
This option exceeds the Part L2A requirements by a small amount (6.5%) to give a level of comfort.

The Building Regulations PartL2A (2014) BRUKL results have been reviewed against the BREEAM 2014 requirement for ENE01, which shows 7No. credits could be achieved, and the minimum standard for Excellent would be met.

3.2.3.4 Part L2A (2014) PASS, all spaces passing Part L2A Criterion 3, with Sufficient BREEAM 'ENE01' Credit for 'Excellent'

This iteration of the energy model is essentially identical to the previous step in all aspects apart from the inclusion of brise soleil.

This **external shading** was added to all glazing on the south, east and west facing facades of the building.



In the previous iteration, several spaces in the building were exceeding the acceptable limit of solar gain to meet compliance with Part L2A criterion 3. However, with the addition of the brise soleil as modelled all spaces were brought into compliance.

In terms of the overall PASS margin for Part L2A, the inclusion of brise soleil resulted in a reduction in both the Building Emission Rate (BER) and the Buildings Primary Energy Consumption (BPEC).

This improvement in the buildings energy performance is attributable to the balance between the reduction in beneficial solar gain received during winter in respect to heating loads, and the reduction in solar gain during summer that impacts upon the buildings cooling requirements.

The difference in the overall energy performance between iterations is not sufficient to alter the number of credits achieved in the 'ENE01', 7No. credits are still achieved.

The results based on the addition of brise soleil from the previous iterations are presented in the table above.

Option	Summary	TPEC	BPEC	TER	BER	BER/TER Pass	BREEAM 2014 ENE01 Credits
12	No brise soleil	108.96	101.52	15.3	14.3	6.5%	7 of 15
13	Includes brise soleil	108.96	99.24	15.3	14	8.5%	7 of 15

Solar PV Cost Information

Potential cost impact of solar PV is reported below, based on data from the SPONS Mechanical and Electrical Services Price Book 2016.

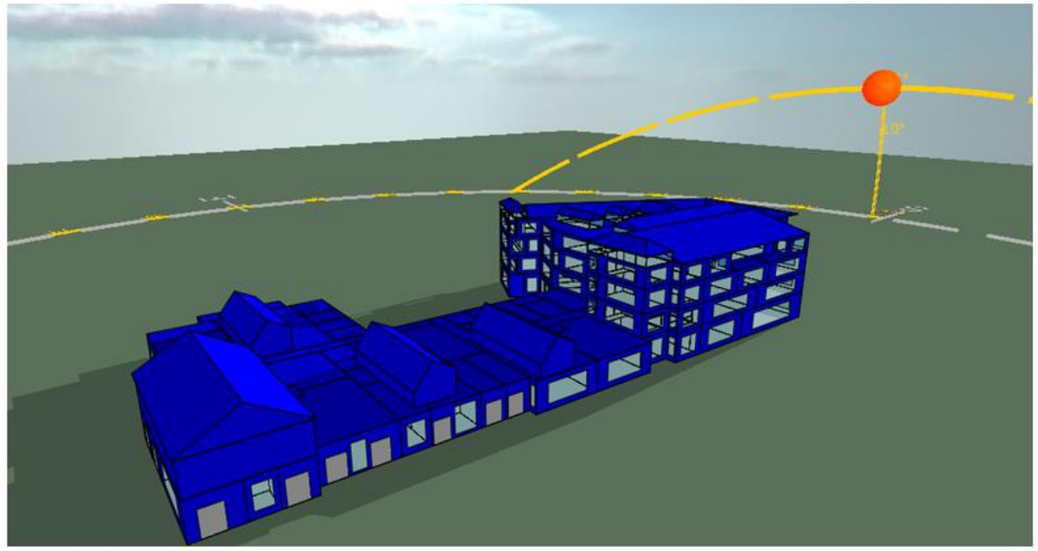
The roof area is approximately 4500sqm, although due to shading and roof mounted plant, a maximum on-roof provision of 1,800sqm is anticipated. Option 9 is based on a near-site provision in addition to the roof mounted PV and not considered appropriate for phase 1.

Solar Shading

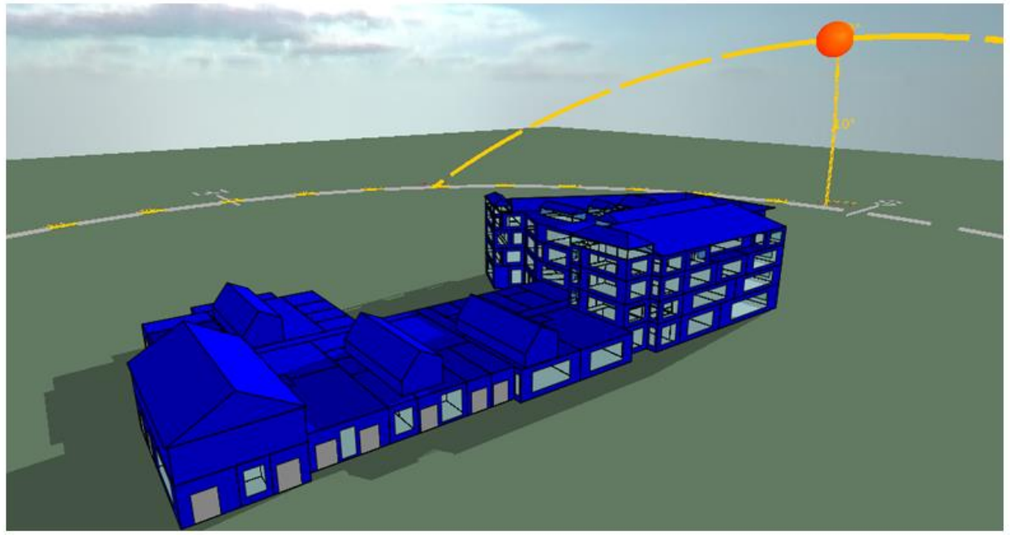
Solar shading may limit the proportion of the roof which can be used to support solar PV, and will be confirmed by a solar PV specialist at stage 4. The images overleaf are taken from the IES model and demonstrate how areas of the roof are shaded at different period of the year from January through to June at midday.

	Estimated Solar PV Costs Only. Based on Spons 2016 High and Low Range Estimates		
Model	Amount of Solar PV	Low Cost Range	High Cost Range
1	1800sqm	£334,286	£707,143
2	1800sqm	£334,286	£707,143
3	1800sqm	£334,286	£707,143
4	1700sqm	£334,286	£707,143
5	900sqm	£167,143	£353,571
6	1800sqm	£334,286	£707,143
7	1800sqm	£334,286	£707,143
8	1800sqm	£334,286	£707,143
9	3190sqm	£592,429	£1,253,214
10	1800sqm	£334,286	£707,143
11	1800sqm	£334,286	£707,143
12	540sqm	£100,286	£212,143
13	540sqm	£100,286	£212,143

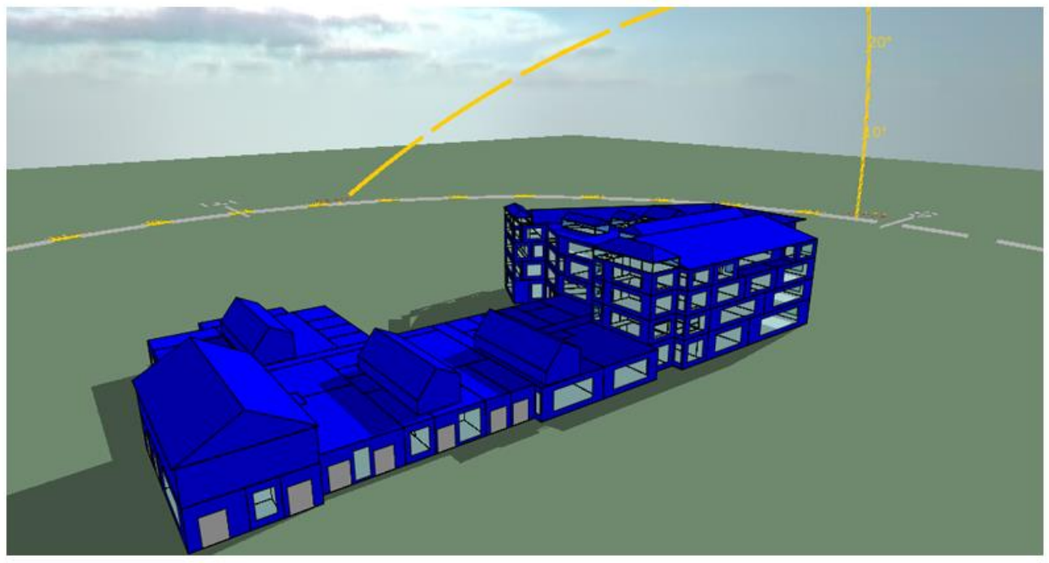
1st January at midday



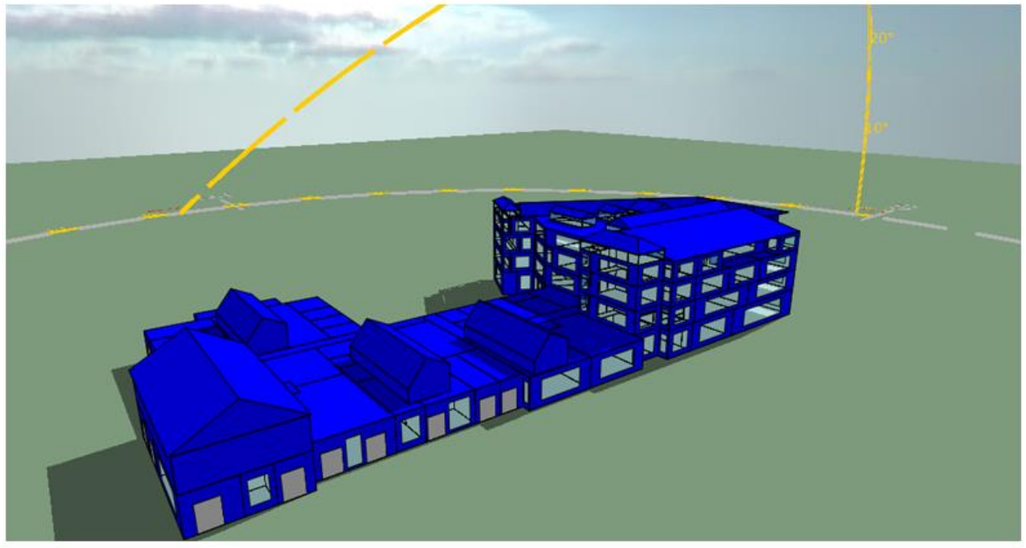
1st February at midday



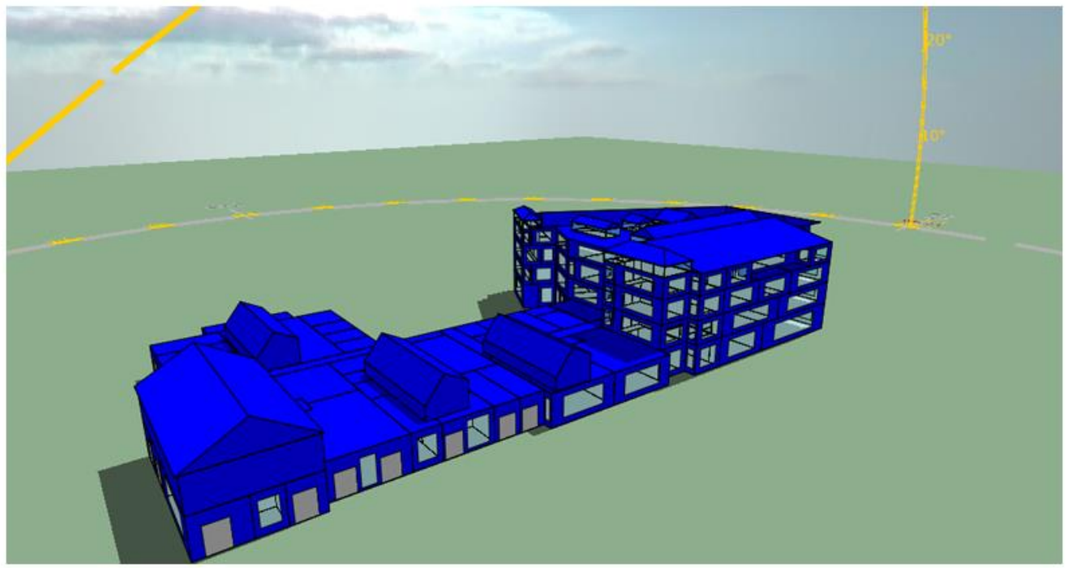
1st March at midday



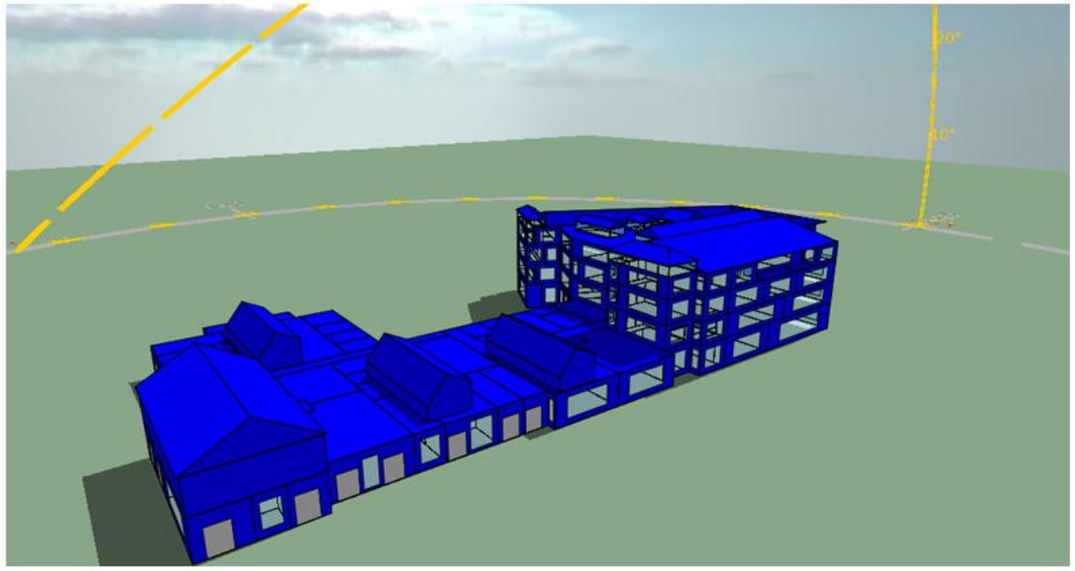
1st April at midday



1st June at midday



1st May at midday



Further IES Model Images





3.3 Library

A summary of the iterations tested is shown within the adjacent table, with each option explained further in the next section.

3.3.1 BREEAM Credits and Part L2 Compliance

The current options achieve at least:

- 4 to 11 out of 15 BREEAM 'ENE01' credits, and

Improvement over the Part L2A (Wales) 2014 Target Emission Rate (TER) of:

- 16 to 91%

Further explanation and detailed analysis of each option is provided overleaf

Option	Summary	TPEC	BPEC	TER	BER	BER/TER Pass	BREEAM 2014 ENE01 Credits
1	Base case with double height cellular spaces on 2nd floor, horizontal louvres to West facade, 400m2 PV	140	154	20.6	16.3	21%	N/A
2	As Option 1 but with: • reduction of glazing U-value to 1.3 W/m2K, G-value to South and West facades of 0.3, • lighting efficacy increased to 80 lum/W, • chiller efficiency increased to 550% • heat recovery increased to 70%	139	147	20.6	15.1	27%	N/A
3	As Option 2 but with: • Vertical louvres to the West façade • FCU SFP reduced to 0.2 W/l/s • lighting efficacy increased to 85 lum/W	153	152	22.9	15.7	31%	4
4	As Option 3 but with: • 2nd floor cellular spaces single height	143	132	21.1	12.6	40%	7
5	As Option 4 but with: • Natural ventilation to all open plan and perimeter cellular spaces	109	95	15.7	7.6	52%	8
6	As Option 5 but with: • Additional 100sqm PV on vertical South and West Facades	109	95	15.7	4.8	69%	8
7	As option 6 but with: • PV panel efficiency increased to 19%	109	95	15.7	1.7	89%	8
8	As Option 7 but with: • Wall, roof and floor U-values reduced to 0.13 W/m2K	109	**94**	15.6	1.5	90%	9
9	As Option 8 but with: • Percentage glazing on East and West facades reduced to 50%	109	93	15.6	**1.4**	**91%**	11
10	As Option 9 but with: • The vertical PV panels on the South and W facades (Option6) removed	109	93	15.6	**5.1**	**67%**	11
11	As Option 1 but with: • 2nd floor cellular spaces single height	149	146	22.2	**12.3**	**45%**	6
12	As Option 11 but with: PV area reduced to 200m2	149	146	22.2	**18.6**	**16.2%**	5

3.3.2 Part L2A Model Options Tested

1. Option 1 Base case with 400m^2 of PV

All key assumptions are recorded in our assumptions sheet contained within support documentation. However the key data used is summarised as:

- Natural gas boilers providing heating and hot water. Gas boilers at 91% efficiency.
- Heating and ventilation strategies in line with Stage 3 ventilation strategy layouts, including FCU heating and cooling to open plan and high gain cellular spaces, mechanical ventilation to medium gain cellular spaces and natural ventilation to perimeter cellular spaces.
- Mechanical supply and extract ventilation with a specific fan power of 1 W/l/s
- Solar PV covering as much of the roof as estimated to be practical. Subject to the South-facing plant room moving to the northern end of the building, 400sqm of PV can be accommodated by the South-facing roof.

This option exceeds the Part L2A TER/BER requirements by 21% which makes this a highly performing building in terms of energy performance. However, it fails on the primary energy consumption and therefore is not Part L compliant.

The Building Emission Rate exceeds zero, so is not seen as a Nearly Zero Energy Building.

2. Option 2 Improving fabric and plant efficiency

The large glass surfaces on the East and West façade have a significant impact on the energy performance in terms of winter heating loads and summer cooling loads. To reduce that impact, the glazing U-value and the G-value on the South and West facades were reduced to1.3 W/m2K and 0.3, respectively. At the same time lighting efficacy was increased moderately to 80 lum/W, chiller efficiency increased to a SEER of 5.5 and AHU heat recovery increased to 70%.

The combination of these measures increased the CO_2 savings by 6% but the building still failed on the BPEC.

3. Option 3 Vertical louvres and further plant efficiency improvements

In order to pass the BPEC, a reduction in primary energy consumption is required, most effectively via reduction of an electrical load, such as cooling. The horizontal louvres on the West-facade were replaced with angled vertical fins to mitigate more effectively against the afternoon sun. This was accompanied by modest improvements to FCU SFPs and lighting efficacies.

These measures were now sufficient to pass both on BER and BPEC and increased the CO_2 reduction over Part L to 31%.

4. Option 4 Reduce room height of cellular spaces on the second floor

The cellular spaces on the 2nd floor had been modelled as double-height, intersected by the pitched roof, thereby inflating the heating and cooling demands of those spaces. Introducing ceilings into those spaces further reduced the heating and cooling demand, resulting in CO_2 savings of 404 over Part L 2A

5. Option 4 Natural ventilation

The fan energy consumption is a major contributor to CO_2 emissions in this building; hence a switch to natural ventilation was investigated. The theoretical possibility of natural ventilation from an overheating point of view was confirmed in the Thermal Comfort Report. All open plan spaces and cellular spaces along the perimeter with windows were set to natural ventilation only. This boosted the CO_2 savings by another 12% to 52% better than Part L.

6. Option 6 More PV

Additional PV capacity on the vertical South and West facadeswas modelled. This could be either facade integrated or in the form of shading devices. This boosted CO_2 savings by another 17% to 69%.

7. Option 7 Improved PV efficiency

The PV panels modelled so far had an efficiency of 15%, while there are now commercially available panels with 19% efficiency, i.e.yielding 26% more without increasing the size of the array. This boosted CO_2 savings by another 20% to 89% better than Part L.

8. Options 8 to 11 ENE 01

While the fabric improvements in Options 8 and 9 improved the CO_2 savings by another modest 1-2%, the main purpose of these and subsequent iterations was the improvement of the Ene01 score (see Section 3.3.3).

3.3.3 Part L2A (2014) PASS, with sufficient BREEAM 'ENE01' Credits for BREEAM 'Excellent'

Whilst iterations 3 to 12 all achieve compliance with Part L2A, performance must also be sufficient to achieve the minimum 5 mandatory ENE01 credits for BREEAM Excellent

As illustrated by the table below, Option 3, while Part L2A compliant, only achieves 4 ENE01 credits.

Only from Option 4 onwards does the Ene01 score meet or exceed 5 credits. As illustrated by Options 5 to 7, while additional PV capacity has a profound effect on the CO_2 emissions, it does not improve the ENE01 score at all. The 400m^2 South facing PV from the base case is sufficient.

In order to achieve much higher ENE 01 scores, the heating & cooling demand would need to be targeted, as illustrated by the interventions in Options 8 and 9. Eleven ENE01 credits would be possible by switching to natural ventilation and improving the fabric performance.

The recommended strategy (Option 12) for achieving 5 ENE01 credits is very similar to Option 1 described earlier, but with single height cellular spaces on the second floor and PV reduced to 200m^2.

The key data used and specification required is summarised as:

- Natural gas boilers providing heating and hot water. Gas boilers at 91% efficiency.
- Heating and ventilation strategies in line with Stage 3 ventilation strategy layouts, including FCU heating and cooling to open plan and high gain cellular spaces, mechanical ventilation to medium gain cellular spaces and natural ventilation to perimeter cellular spaces.

- Mechanical supply and extract ventilation with a specific fan power of 1.0 W/l/s
- Solar PV covering 200m^2 of the South-facing roof.

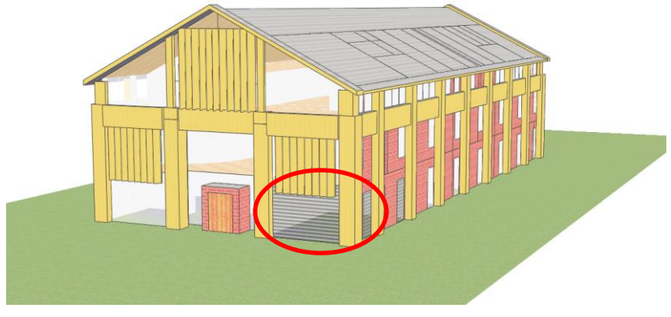
This option exceeds the Part L2A requirements by 16% to give a level of comfort. Any further reduction in the CO_2 savings would adversely affect the ENE 01 score.

The Building Regulations PartL2A (2014) BRUKL results have been reviewed against the BREEAM 2014 requirement for ENE01, which shows 5 No. credits can be achieved, and the minimum standard for Excellent would be met.

3.3.4 Part L2A (2014) PASS, with all spaces passing Part L2A Criterion3, with sufficient BREEAM 'ENE01' Credit for 'Excellent'

In the previous iterations, the Research Lounge on the South-West corner of the Ground Floor slightly (6%) exceeded the acceptable limit of solar gain to meet compliance with Part L2A criterion 3. However, the addition internal blinds to the glazing of the Research Lounge external façade brought the solar gain limit into line with Part L 2A.

The inclusion of internal blinds also resulted in a small reduction in both the Building Emission Rate (BER) and the Buildings Primary Energy Consumption (BPEC).



This improvement is due to the reduced cooling loads without sacrificing beneficial winter solar gains.

The difference in the overall energy performance between iterations is not sufficient to alter the number of credits achieved in the 'ENE01', 5No. credits are still achieved.

Solar PV Cost Information

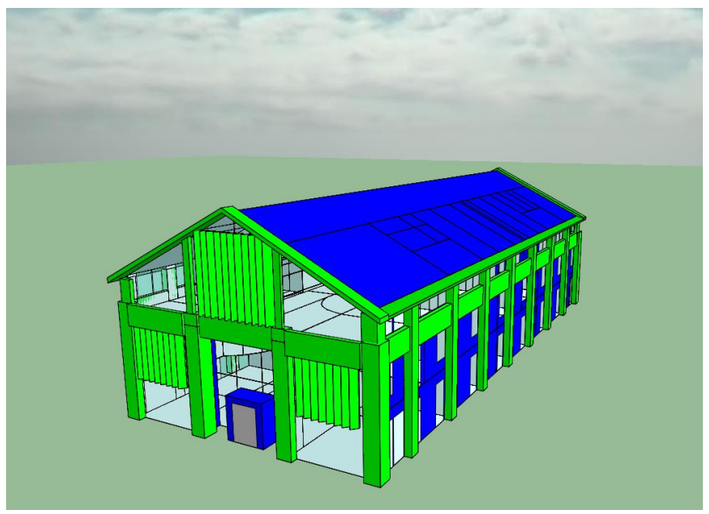
Potential cost impact of solar PV is reported in the table opposite, based on data from the SPONS Mechanical and Electrical Services Price Book 2016.

The South-facing roof area can accommodate up to 400sqm of PV. An additional 100m^2 were estimated as feasible on the South and West facades, either building integrated or as shading devices. The recommended Option 12 comprises 200sqm of PV.

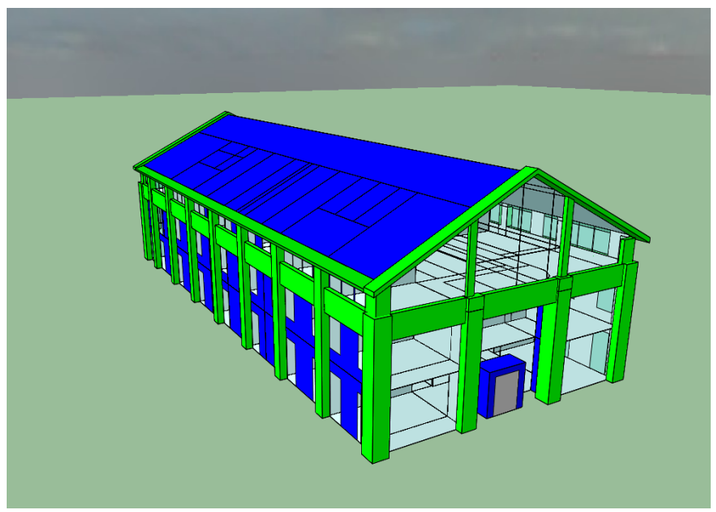
Solar Shading

The South facing roof is presently not overshaded. However, future developments to the South of the building may have shading implications for the building.

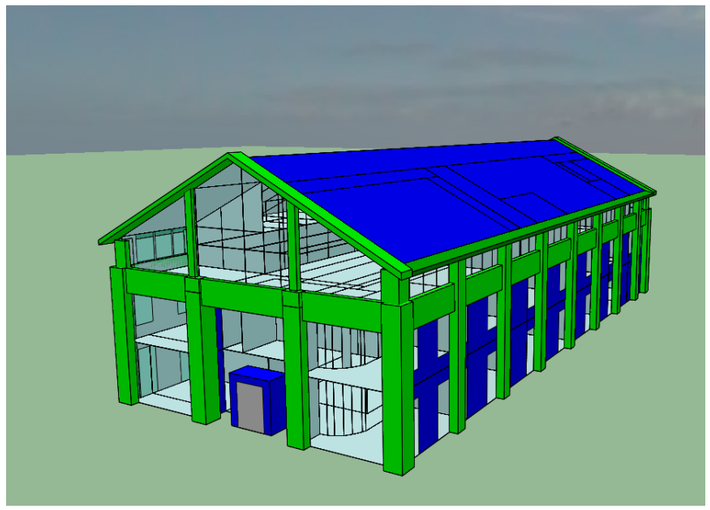
Option	Amount of Solar PV	Low Cost Range	High cost Range
1	400sqm	74,000	157,000
2	400sqm	74,000	157,000
3	400sqm	74,000	157,000
4	400sqm	74,000	157,000
5	400sqm	74,000	157,000
6	600sqm	100,286	212,143
7	600sqm	100,286	212,143
8	600sqm	100,286	212,143
9	600sqm	100,286	212,143
10	400sqm	74,000	157,000
11	400sqm	74,000	157,000
12	200sqm	37,000	78,400



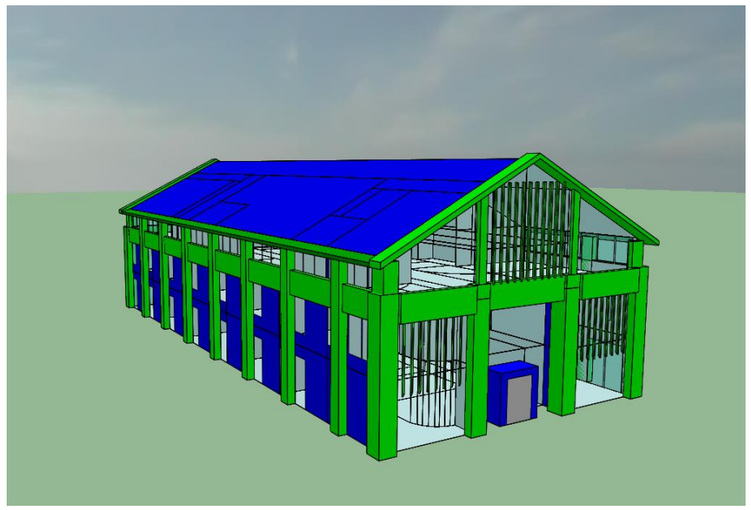
SW View



SE View



NE View



NE View

Flexibility and growth

4

4 Flexibility and growth

The anticipated electrical distribution has a spatial growth allowance of 20% over-n-above that anticipated to deliver the LV and ICT distribution services for the current design.

Similarly, the mechanical services plant growth allowance will be designed for 15% growth.

The following allowances are included within the design for future flexibility.

4.1 Heating, Ventilation & Air-Conditioning

- Provide increased fresh air rates to cater for higher future occupancy densities or meeting rooms
- Provide spare capacity in cooling systems for increases in internal gains or oversize distribution systems and provide space for future plant
- Make provision for spare valved connection in distribution systems for future additional terminal units
- Make provision to connect heating distribution mains to City and County of Swansea district heating infrastructure.
- Provide space in air handling plant to install humidification and or cooling in the future.
- Provide variable speed drives on all fans & pumps
- Locate terminals (e.g. fan coil units) relative to partitions

4.2 Lighting

- Provide plug-in lighting track and luminaires
- Provide task lighting

4.3 Control Systems

- Integrate HVAC controls with other systems (e.g. fire and security) to simplify cabling and increase user control
- Make provision for future tenant/departmental billing of HVAC and power where feasible.
- Provide spare capacity in BMS for future additional plant or allow space for future outstations / motor starters

4.4 Power Distribution Systems

- Size risers for high flexibility in office equip loads (in offices min 25W/m2 as BCO guide) but use 15W/m2 for overall building demand
- Provide 20% spare ways on main LV board and floor distribution boards for future plant, IT equipment, kitchens etc.
- Assess / provide space for future standby generation & associated fuel storage and exhaust flues

4.5 ICT Provisions

- Allow space for additional patch panels as advised by ICT Task Group
- Provide for future wireless systems WiFi
- Provide ‘increased’ floor void depth for high radii cable bending for future additional cabling/types (cat 7+)
- Allow space for future cooling plant & pipework to serve future additional ICT facilities

4.6 Public Health

- Water storage is not a statutory requirement – as a minimum consider space required for future water storage for kitchens areas (hot and cold) etc.
- Provide inverter drives on boosted cold water systems
- Provide additional capped connections in drainage systems (particularly GF slab) for kitchens etc.
- Make allowance on gas supply for future CHP plant.

4.7 Fire Protection

- Provide fully addressable zoned fire alarm system

4.8 Addition of Kitchen Facilities

- Assess future additional ventilation requirements - dedicated plant
- Incorporate future loads into capacity of utility supplies, boilers chillers etc.
- location for future kitchen (top or bottom of building will simplify services) e.g. drainage at ground floor but ventilation simpler at roof level – fume discharge and riser space minimised
- Make allowance on gas supply for future hot water generation for catering use

4.9 Lifts

- Make allowance for future increased occupancy in lift sizing or
- Incorporate pit and knock out panels in the building structure for a future additional lift

4.10 Security

- Use modular systems where possible

4.11 Plant Rooms

- Provide distributed plant rooms
- Avoid narrow rectangular or L shaped plant rooms

4.12 General Services Distribution Routes

- Avoid services buried in slabs
- Incorporate spare space in risers and or additional risers.

Resilience and safety

5

5 Resilience and safety

5.1 Systems resilience

System resilience will be provided as follows:

- Cold water storage: Tanks sized for 100% of daily storage requirement, configured with 2 x 50% compartments to allow for maintenance drain downs.
- Heating plant (plate heat exchangers, calorifiers, boiler plant, etc.): multiple units will be provided each sized at poportion of full load to provide sufficient resilience as highlighted within later sections of this report.
- Pumps and booster sets: All pumps configured as run and standby units.
- Cooling plant: Redundancy provision of N+1. This applies to process cooling systems also.
- Ventilation Plant: Generally one air handling plant for each system, sized at 100% load, with no standby capacity.
- Extract Fans: Generally one extract fan unit for each system sized at 100% load, with no standby capacity. There may be special cases where run & standby extract fan capability is justified or required, e.g.
- Some critical process extract applications
- Communications Systems Centre: Refer to sub-section on ICT later within this section of the brief. All stakeholders will be involved in the decision to determine the resilience requirements for systems supporting data centre areas: Power supply; UPS; Standby power.

5.2 Design stage documentation

The design team will provide copies of all risk assessments to the University and fully engage with the relevant staff to ensure all health & safety matters are agreed prior to completion of design stage 4 and ongoing.

All designers are required to supply other designers with information about residual hazards: hazards that it has been unable to eliminate at the design stage. The purpose of this information is to allow the other designers to review each other's assessments of risks to health and safety, and to address them at an early stage in the design process, when it will be possible to alter a design without too many implications for cost.

At these reviews, it is important that critical health and safety-related design decisions are not reversed, without very good reasons for doing so.

5.3 Areas over which the designer has direct influence

The designers are required to demonstrate a proactive approach to Safety In Design. The hazards or hazardous work situations that the Health and Safety Executive considers designers will try to eliminate (or reduce) include:

5.3.1 Risks from site hazards by selecting the position of plant to minimise the chances of contact with:

- buried services, including gas, water pipelines;
- overhead cables;
- buried cables low and high voltage;
- traffic moving to, from and around the site;

5.3.2 Health hazards:

- specifying less hazardous materials, e.g. solvent free or low solvent adhesives and water-based paints;
- avoiding processes that create hazardous fumes, vapours, dust, noise or vibration, including disturbance
- of existing asbestos, cutting chases in brickwork and concrete, flame cutting or sanding areas coated with
- lead paint or cadmium;
- Specifying materials that are easy to handle, e.g. lighter valves and components.

5.3.3 Safety hazards:

The University wish to have all 'heavy' plant located at ground floor level for ease of maintenance where possible. The designers will also include for:

- eliminating the need to work at height, particularly where it would involve work from ladders, or where
- safe means of access and a safe place of work is not provided;
- not locating plant on fragile roofing assemblies;
- not requiring deep and long excavations in public areas or on highways;
- Not specifying materials that could create a significant fire risk during construction.

5.3.4 Hazardous work by designing plant to allow pre-installation work to be carried out in more controlled conditions off site including:

- design elements such as process plant, so that sub-assemblies can be erected at ground level and then safely lifted into place;
- Arrange for cutting to size to be done off site, under controlled conditions, to reduce the amount of dust released.

5.3.5 The risk of falling/injury where it is not possible to avoid work at height, by, for example, designing to allow early installation of:

- anchorages, such as proprietary cast-in anchors, to reduce the use of ladders;
- Edge protection or other features that increase the safety of access and construction.

5.3.6 Unsafe construction:

- providing lifting points and marking the weight, centre of gravity of heavy or awkward items requiring slinging both on drawings and on the items themselves;

- making appropriate allowance for temporary works required during construction;
- designing joints in vertical components so that bolting up can easily be done by someone standing on a platform
- designing connections to minimise the risk of unsafe

5.4 Unsafe maintenance and cleaning work

- making provision for safe permanent access;
- designing plant rooms to allow safe access to plant and for its removal, replacement and maintenance;
- designing safe access for roof-mounted plant, and roof maintenance;
- making provision for safe temporary access to allow for painting and maintenance, etc.,
- Involve allowing for access by mobile elevating work platforms or for the erection of scaffolding.

5.5 Unsafe demolition

By identifying hazards for inclusion in the health and safety file, including:

- sources of substantial stored energy;
- unusual stability concepts;
- Alterations that have changed the structure.



5.6 Risk Assessment Schedule

UWTSD
26th February 2016

Designers Hazard Elimination Risk Assessment Form

Hazard	Who could be harmed and how?	What risk mitigation is included in the design?	What further action is necessary?	How will the assessment be actioned?
Electricity and connections to live services	Demolition, construction, and maintenance workers; building occupiers' employees and visitors. The building's electrical record drawings have been requested but the Client has confirmed that these are not available. It is clear from the nature of the building that electrical services are concealed within the structure. There is therefore a risk of electrocution due to unknown live conductors; to those undertaking demolition and preparatory excavation etc.	The design provides the means of safe working, by means of electrical isolation, identification, and secure enclosures; and there is no need for working on live conductors. Provided that the installation is operated and maintained as intended, there is minimal risk to construction, and maintenance workers; building occupiers' employees and visitors. In order to complete the design to a sufficient level to enable the tender process, certain assumptions have been necessary concerning the length and capacity of concealed conductors. The Client, design team and those tendering for demolition and construction works are aware of this situation, by means of the design specification and drawings.	The Client has been advised to undertake a detailed survey of the electrical distribution to trace all concealed electrical services; to corroborate the assumptions made in the design, and to provide those tendering for demolition and construction with sufficient information to enable them to consider the risks involved.	The Principal Contractor should take the findings of the detailed survey into consideration, and employ the necessary methods of safe working. All information concerning concealed electrical services should be inserted in the H&S File, including identification of any areas of uncertainty. The maintenance contractors should assess the remaining risks and arrange their work accordingly.
Roof Installations	Construction, and maintenance workers; building occupiers' employees and visitors.	To mitigate risk, safe walkways must be installed on the roof along with safe access to the roof, in order to install and maintain panels and equipment.	The detailed design must reflect the need for safe access for installation and maintenance.	Co-ordination of PV layout and architectural design, including safe access routes.
Buried Utility Services	Demolition, construction, and maintenance workers; building occupiers' employees and visitors.	Request maps and all related information of utility services to/near this site. Full GPR survey of all areas.	Development of the design to co-ordinate with utility company record information. Carry out trial excavations as necessary, by way of liaison with concerned utility companies.	Liaise with the utility companies to obtain quotes/scopes of works for any subsequent required existing service diversions.
Atrium Lighting	Construction, and maintenance workers; building occupiers' employees and visitors.	A system of access for installation and on-going maintenance is required. This could comprise a method of lowering the lighting on a frame to an easily accessible level. Alternatively a route and method of maintenance with a mobile raised working platform may be agreed.	Development of the method of access.	Co-ordination of access with the client, architect and structural engineer.
Atrium Natural Ventilation	Construction, and maintenance workers; building occupiers' employees and visitors.	A system of access for installation and on-going maintenance is required. Thus a route and method of maintenance with a mobile raised working platform needs be agreed.	Development of the method of access.	Co-ordination of access with the client, architect and structural engineer.

6

Technical design performance

6 Technical design performance

6.1 Practical guidelines to comfort

The following are practical guidelines to good practice in providing a comfortable environment for normally clothed people in a sedentary occupation (summer temperatures relate to air-conditioned buildings):

- Air temperature within range 21° C in winter to 23 ° C in summer
- In summer mean radiant temperature below air temperature
- In winter mean radiant temperature above air temperature
- Relative humidity normally within 45–60 per cent
- Air movement not greater than 0.15 m/s
- Carbon dioxide concentration below 0.1 per cent
- Temperature gradient between feet and head not greater than 1.5 per cent
- Floor surface temperature between 17 ° C and 26 ° C
- Radiant asymmetry not greater than 10 ° C horizontal and 5 ° C vertical.

Where a natural/mixed mode solution is proposed the summertime temperatures may be increased to an appropriate upper threshold value to enable energy saving measures or other economies.

These conditions may be exceeded for short periods, say up to a maximum of 5 per cent and preferably for not more than 2 per cent of time on average, however it must be demonstrated through calculation that these temperatures are not exceeded for an excessive amount of time to cause unreasonable discomfort conditions.

Guidance will be sought from CIBSE Guide A and BB 101.

Anticipated M&E Systems will include but not be limited to:

6.2 Mechanical Systems

- Comfort Cooling & Heating System
- General Supply & Extract System
- Natural Ventilation Provisions
- Toilet Extract Ventilation
- Local Exhaust Ventilation, dust, fume extraction.
- Compressed Air.
- BEMS Control System.
- Fuel Oil

6.3 Electrical Systems

- Utility Company Substation & Incoming HV Supply
- Low Voltage Distribution
- Small Power Installation
- Lighting Installation
- Emergency Lighting
- Intruder Detection System
- Access Control
- CCTV
- Lightning Protection
- Facilities For The Disabled
- Data & Telecommunications Installation
- Works Associated with Mechanical Plant and Equipment
- External Lighting
- Car Park Lighting
- Earthing and Bonding

6.4 Public Health Services

- Incoming Utility Connection
- Mains Cold Water System
- Boosted Cold Water System
- Domestic Hot Water
- Domestic Foul Water Drainage

6.5 Fire Protection Services

- Fire Detection and Alarms Installation
- Dry Riser
- Sprinklers Dynos 1 and 2 only.
- Smoke Extract, Atrium only.

6.6 Vertical Transportation

- Passenger Lifts

6.7 M&E Design Criteria

External Temperature:

Winter:	-4°C db 100% RH (Fabric heating)
	-8°C db 100% RH (Air Handling systems)
Summer:	28°C db 50% RH

Internal Temperature
(summer values assume air-conditioning):

Teaching Spaces:

Winter	21°C +/- 2°C (min)
Summer	uncontrolled

Computer Labs:

Winter	21°C +/- 2°C (min)

Summer	23°C +/- 2°C (min)
Library:	
Winter	21°C +/- 2°C (min)
Summer	23°C +/- 2°C (min)
Meeting Rooms:	
Winter	21°C +/- 2°C (min)
Summer	uncontrolled
Offices:	
Winter	21°C +/- 2°C (min)
Summer	uncontrolled
Toilet Areas:	
Winter	18°C +/- 2°C (min)
Summer	uncontrolled
Staircases & Circulation:	
Winter	18°C +/- 2°C (min)
Summer	uncontrolled
Stores:	
Winter	16°C +/- 2°C (min)
Summer	uncontrolled
Kitchen / Dining:	
Winter	18°C +/- 2°C (min)
Summer	uncontrolled
Plant Rooms:	
Winter	10°C +/- 2°C (min)
Summer	uncontrolled
Occupancy:	
Typical rooms	Refer to room data sheets
Overall	To be advised
Ventilation Rates:	
Toilet Areas:	10 Air changes per hour
Kitchen:	In accordance with any Specialist Kitchen Consultants requirements.

Mechanically ventilated spaces:

To suit minimum fresh air requirements of occupants and equipment gains.

Local Exhaust Ventilation:

In accordance with equipment specialists recommendations and HSE guidelines.

All other areas: Natural Ventilation in compliance with Building Regulations Approved Document Part F, BB101 and AM10

Outside Air Requirement: 30°C maximum

Teaching Spaces:	10 l/s per person of fresh air minimum

Meeting Rooms / Offices:
10 l/s per person of fresh air minimum

Air Filtration Standards

Air Handling Units	F7
Fan Coil Units	F2

Internal Heat Gains:

Occupancy:	75 Watts sensible per person 55 Watts latent per person
General Lighting:	12 Watts/m^2 sensible
Specialist Lighting:	To be determined.
Equipment (offices):	25 Watts/m^2 sensible
ICT Server Rooms	An equipment load of 20kW worst-case is typically allowed for thermal modelling & M&E plant selection purposes, for the main FF FACE Comms Room subject to confirmation by the University during the detailed design.
Generator Loads	Refer to relevant section for allowances for power.

Illumination Levels:

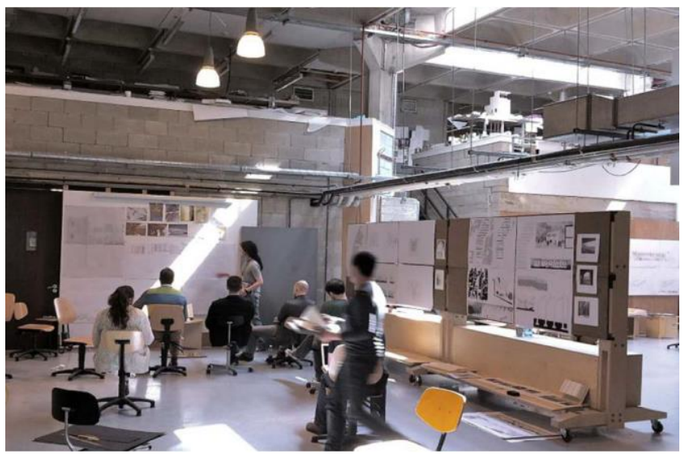
Average illumination over area:

Lecture Theatres:	300-500 lux
Teaching Spaces:	400 lux
Meeting Rooms:	400 lux
Offices:	400 lux
Kitchen:	300 lux
Dining:	300 lux
Toilet Areas:	100 lux
Staircases & Circulation:	100 lux
Plant Rooms:	200 lux
Car Parking Areas	10lux (External)
Walkways	10lux (External)

Emergency lighting:
In accordance with BS 5266; generally 1 lux

Cold Water Storage:
6.5 litres/person to provide cover for eight hours interruption of supply.

Fire Systems:
System Classification: L1 in accordance with BS 5389: Part 1 (2002)



Internal Noise Criteria:
Criteria used for the specifying of the M&E plant equipment only (where these values differ from criteria given elsewhere, e.g. room data sheets, the more onerous value will apply).

Lecture Theatres:	NR 30 - 35
Teaching Spaces:	NR 35
Meeting Rooms:	NR 30
Offices:	NR 35
Toilet Areas:	NR 45
Staircases & Circulation:	NR 40
Kitchen / Dining	NR 40
Plant Rooms:	not to exceed 80dB(A)

Note: The internal noise levels above may be exceeded in naturally ventilated areas.

6.8 General Legislation & Codes of Practice

The environmental M&E building services designs will comply with the current editions of the following regulations:

- The Building Regulations (in particular Part L: fuel and power conservation)
- EU Energy Performance of Buildings.
- BS 7671:2008 IEE Wiring Regulations 17th Edition
- The Gas Safety Regulations
- The Water Regulations
- Health and Safety at Work Act.
- The Construction Design & Management Regulations
- BS 8900 Guidance for Managing Sustainable Development
- All current British Standards and European Directives
- All current HSE Approved Codes of Practice and guidance.

6.9 CIBSE Guides

- SLL CODE FOR LIGHTING
- SLL LIGHTING GUIDE 4: Sports
- SSL LIGHTING GUIDE 5 Lecture, Teaching and Conference room Lighting
- SLL LIGHTING GUIDE 7: Office Lighting
- SLL LIGHTING GUIDE 11:Surface Reflectance and Colour
- SLL LIGHTING GUIDE 12: Emergency Lighting Design Guide
- Guide A: Environmental Design
- Guide B: Heating, Ventilating, Air Conditioning & Refrigeration
- Guide B3: Ductwork
- Guide B5: Noise and Vibration Control for HVCA
- Guide B4 Refrigeration and Heat Rejection
- Guide C: Reference data
- Guide D: Transportation systems in buildings
- Guide F: Energy efficiency in buildings
- Guide G: Public health engineering
- Guide H: Building Control Systems
- Guide J: Weather, solar and luminance data
- Guide K: Electricity in Buildings
- Guide L: Sustainability
- Guide M: Maintenance Engineering and Management
- Solar Heating Design and Installation Guide
- Electronic Protection and Security Systems 2nd Edition
- TM13 Minimising the risk of Legionnaires' disease
- TM39 Building Energy Metering (a guide to energy sub-metering in non-domestic buildings
- TM52 Limits of Thermal Comfort Avoiding Overheating.
- AM10 Natural Ventilation in Non-Domestic Buildings
- CIBSE Commissioning Codes Series

References will also be made to: Relevant British Standards

Building Services Research and Information Association (BSRIA) Application Guides

AG 2/93	Water Treatment
AG 8/91	Pre-commission cleaning of Water System
AG 4/94	Guide to Legionellosis
BB101	Building Bulletin 101 Ventilation of School Buildings

6.10 Building Services Inspection & Handover Procedures

The remaining sub-sections of section 6 primarily relate to the requirements placed upon the contractor team to ensure a well managed and delivered handover of the building services engineering systems.

The Contractor team will be required to develop a comprehensive MEP Services Handover Management Plan for University of Wales Trinity Saint David approval which must identify how the Developer will allow suitable provisions for:

- Site wide snag list (defects list) entries to be accepted by any party, including University of Wales Trinity Saint David
- Snag list monitoring and circulation procedures
- Snag list closure procedures

Ensure that the management processes include:

- Change management co-ordination
- Pre-snagging inspection by trade contractors
- Co-ordination with all necessary tests and demonstrations
- Main Contractor snagging before offer to the professional team
- MEP Services Designer and Architect snagging
- University of Wales Trinity Saint David snagging
- The identifiable and accountable recording of desnagging
- Final acceptance byUniversity of Wales Trinity Saint David



6.11 Building Services Commissioning

The Contractor team will be required to develop a comprehensive MEP Services Commissioning Management Plan for University of Wales Trinity Saint David approval which must identify how the Developer will provide Specialist Commissioning Management for:

- Design (Health & Safety) Risk Management and Site (Health & Safety) Risk Management processes
- Ensuring during the RIBA Stage 4 and 5 Design Stages that the installations are designed for ease of buildability, commissioning, future maintenance and future adaptation
- Planning the phasing of the development, construction programming and work parcel integration
- Identifying specialist interfaces and specialist technical input for Designers required during RIBA Stages 4
- Also identifying specialist interfaces and specialist technical input required during the installation, commissioning, performance testing and fitting-out (FF&E) stages
- Completion of all pre-commissioning and commissioning tests and reports in accordance with BREEAM, CIBSE, IET and CSA requirements; in particular CIBSE Guide M.
- Employ a specialist commissioning manager to meet the requirements of BREEAM 2014 credit Man 01

The Contractor will also provide a comprehensive MEP Services Commissioning Programme for University of Wales Trinity Saint David approval which must identify how they will ensure:

- Design (Health & Safety) Risk Management and Site (Health & Safety) Risk Management processes
- MEP Services Commissioning Programme
- Sufficient time is allowed for desnagging, University of Wales Trinity Saint David acceptance, testing, commissioning, fitting-out (FF&E) and demonstration
- Regular review of the MEP Services Commissioning Programme, with necessary updating according to progress
- Testing and revisited testing appropriate to time of day, seasons and weather
- Provides sitewide and other district services analysis, building-by-building analysis and area-by-area analysis
- Indicates the exact commissioning activities to be undertaken
- Includes building fabric testing: Solar Control, Air Leakage and Thermography
- Co-ordinates the Mechanical, BMS, Electrical, IT/Data, Public Health, Acoustic, Audio Visual and Specialist Services; separate sub-programmes will not be acceptable
- That specialist commissioning of any University of Wales Trinity Saint David equipment is properly co-ordinated with the Developer's MEP Services Commissioning Programme
- Shows key milestone events such as Gas On, Water On, Power Distribution On, Lighting, Fire Alarm and Fixed Fire Protection Active, IT/Data and BMS Functional, Datacentre Communications Active, Fitting-Out and Performance Demonstrations
- Includes all Regulatory Inspections
- Includes time and reasonable opportunities for test witnessing by University of Wales Trinity Saint David
- Makes suitable allowance for furniture and IT equipment deployment, room cleaning, fitting out and other University of Wales Trinity Saint David activities concurrent with Practical Completion

- Co-ordination with any outstanding or additional works programmes
- Satisfactory completion of Post-Occupancy Demonstrations and Seasonal Commissioning

6.12 MEP Services As-Built Documentation

The Contractor will be required to develop comprehensive MEP Services As-Built Information for University of Wales Trinity Saint David approval a complete collection of As-Built Information which must:

- Cover all buildings, plant areas and associated infrastructure
- Be presented completely in an approved electronic format
- Consistently satisfy University of Wales Trinity Saint David standards for the arrangement of As-Built Information

6.12.1 Standards and Regulations

The current requirements for information provision to end users in current building regulations and planning are found within the following documents:

- Approved Document Part L – Conservation of fuel and power
- Approved Document Part F – Ventilation
- Approved Document Part B – Fire Safety
- Technical Advice Note 18 (TAN 18)
- Microgeneration Certification Scheme

The requirement for the O&M Manuals is to create a building user guide in line with the BREEAM requirements and would be an enhancement of the O&M manuals and building log book produced in line with the CIBSE TM31 log book toolkit.

6.13 The As-Built Information

The As Built information must include:

- BREEAM Simple User Guides in General User Format and Building Manager Format
- A complete catalogue of all As-Built Information including a schematic key to the buildings and all sitewide infrastructure districts
- Safety Instructions
- Designer Hazard Identification
- Plant Replacement Strategies
- Any other significant risk management issues that were encountered during construction
- Applicability of CDM Regulations
- Relevant Regulations and Standards
- Disposal Instructions (eg. WEEE Directive)
- EN 378 Information
- F-Gas Schedule
- EC and other Regulatory Compliance Certification
- Completion Documents from Approved Inspector / Building Control Officer
- Planning Consent information
- BREEAM Certification
- Design Criteria
- Key Project Team Contacts
- General Description of the Works in each building
- List of Suppliers and Contact Details
- General brochures
- Installation Instructions
- Wiring Diagrams
- Operating Instructions
- Maintenance Instructions
- Asset Schedules including Equipment Descriptions, Quantities, Manufacturers, Types, Serial Numbers in an approved format
- Recommended spare parts and consumables to be held on site.
- All Commissioning Test Results, including the addition of Seasonal Commissioning Tests at a later stage
- Microbiological, Chemical and Filtration Test Results
- Electrical Test Results
- Electrical Completion Certificates
- All Manufacturer Extended Warranties
- As-Built Drawings

6.14 Building Management Systems (BMS)

As detailed further in the MEP Section, the requirement will be provide a fully-integrated, IP-Addressable Building Management System which meets University of Wales Trinity Saint David Cabling Infrastructure Design Specification.

All control systems, including fire and security systems must be open protocol and in accordance with the University's Interoperability Specification.

6.15 Electrical Services Manufacturers/Suppliers

The following schedules indicate the list of manufacturers/suppliers preferred by the University.

Equipment / System	Supplier/ Manufacturer
Low Voltage Switchgear & Distribution Equipment	Merlin Gerin / Schneider √ Eaton
Energy Metering	As switchgear manufacturer with Modbus RS485 link to BMS system
Protection Devices	As switchgear manufacturer
Isolators	Merlin Gerin / Schneider √
Contactors	Merlin Gerin / Schneider√
Lighting	Thorn Lighting √ Concord √ Zumtobel √
Small Power & Lighting Accessories	MK Electric √ Crabtree √
Automatic Lighting Controls	Ex-Or √
Fire Detection and Alarm System (open protocol)	Advanced Electronics √
Access Control System	Paxton √ Salto √ **Compatibility will need to be discussed and agreed upon as the system will be linked with existing systems across the Universities buildings**.
Security Detection and Alarm System	Honeywell Galaxy 60, Open Protocol√
	Chubb√ **Open protocol systems will be required.**
CCTV System	Vigilant √ Axis √ Indigo Vision √
Lightning Protection System	EES √ Omega "Red Group" √
Disabled Call System	Wandsworth √ Baldwin Boxall √
Audio Frequency Loop Induction Systems	Audio Visual √
Steel Conduit & Trunking Systems	Legrand √ Walsall √ Armourduct √
UPVC Conduit and Trunking Systems	MK Electrical √ Marshall Tufflex √ Mita √
Cabling Systems	BASEC APPROVED - Low smoke zero halogen BICC Prysmian Delta To Be Confirmed Belden Fire Rated Cabling Draka Prysmian
Floor Boxes	MK Electric √ Ackerman √

6.16 Mechanical Services Manufacturers/Suppliers

Equipment / System	Supplier/ Manufacturer
Boilers	Hamworthy Heating Ltd √ Hoval Ltd ? Broag Ltd √ MHS (Elco) ? Viessmann √
Pumps	Grundfos Pumps Ltd √ Willo √
Pressurisation Units	Grundfos Pumps Ltd √ Hamworthy Heating Ltd √ Dutypoint √
Extract Fans	Ventaxia √ Systemair √ Xpelair √
Air Handling Units	Moducel √ Systemair √ Lennox √ Nordair √ Swegon √
Radiators	Marriott Radiators Ltd √ Zhender √ MHS √ Stelrad √
Radiant Panels	Zhender √ S&P Coil Products Ltd √ Amibrad Dimplex √ Marriott √ MHS √
Supply Fans	Ventaxia √ Systemair √ Swegon √
Cold Water Storage Tanks	Balmoral Tanks Ltd √ Brimar Plastics Ltd √
Cold Water Booster	Grundfos Pumps Ltd √ Duty point √ Willo √
Hot Water Storage Calorifiers	Hoval Ltd √ Andrews Water Heaters √ MHS (Elco) √ Viessmann √
Sprinkler Specialist	Tyco Fire & Integrated Solutions UK Ltd √
Split Comfort Cooling	Mitsubishi Electric Europe √ Daikin Airconditioning UK Ltd √
Fire Dampers	Advanced Air (UK) Ltd √
Controls	Johnson Controls√ Siemens √ Schneider Electric√

Utilities infrastructure & Public Realm Provisons

7

7 Utilities Infrastructure and Public Realm Provisions

The SA1 Swansea site is provided with an existing network of utilities



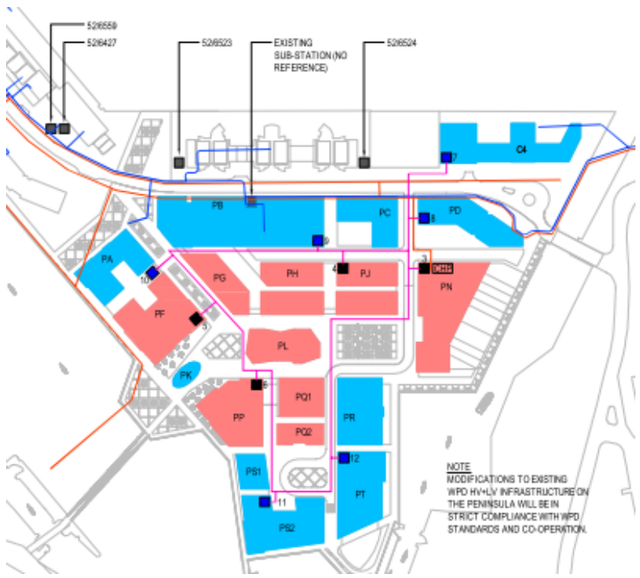
services infrastructure of gas, water, electrical power and telecommunications ducts as part of the Welsh Government's strategy for partly facilitating redevelopment of the site. These services generally follow the primary circulation routes around SA1 along Kings Road and Langdon Road.

Investigations undertaken as part of the RIBA Stage 3 works have determined that there are adequate primary infrastructure services to deliver the estimated utilities demands to the development. Discussions have been held with the following utilities companies:

- Western Power Distribution – Electrical Power
- Wales & West Utilities - Gas
- Dwr Cymru Welsh Water – Water Supplies
- British Telecom - Telecommunications
- Virgin Media- Telecommunications

The precise utility services capacities for phase 1 will require detailed calculation as soon as possible upon commencement of the (Stage 4b) detailed design and negotiations undertaken with the utility companies to secure the appropriate capacities to serve the development. In the case of the power, gas and water demands, discussions have determined that adequate capacities are currently available within SA1 and the extent of works to facilitate new services to the FACE Building and Library are relatively straight forward.

With regards to the telecommunications requirements whilst record drawings have been obtained from BT and Virgin Media (formally NTL) and Welsh Government have installed a network of underground ducts and chambers, it is not possible to obtain firm availability of services until an order is placed with the telecoms provider of choice. It is expected that the University will undertake all negotiations with the Telecoms providers directly and the contractor team will merely provide the cable containment to link the services in the main spine roadways into the relevant buildings.



7.1 Electrical Power (Western Power Distribution)

Western Power Distribution (WPD) has confirmed details of their power network within the SA1 site for serving all the plots on the peninsular site.

The WPD services comprise of a number of underground 11kV service cables routed around the whole of the SA1 site with the primary routes following those of the primary transport infrastructure routes.

The underground cabled services are generally rated with a capacity to deliver typically up to 12MVA of power. The network indicated upon the WPD drawings is sufficient to deliver the required electrical power to the FACE and Library Buildings.

Electrical power will be provided via the installation of new high voltage 11,000 volt 50Hz services infrastructure entering the site of the FACE Building in the northern corner of the building to serve a new integrated HV/LV sub-station. The supply to the Library will be taken from an existing LV service in North/South Way.

7.1.1 Anticipated Maximum Demand

7.1.1.1 FACE Building

Based upon the initial calculations of the building and the room uses as currently as indicated within the room data sheets, the maximum demand for the development is anticipated to be in the region of 757kVA.

This figure has been calculated utilising typical watts per m^2 rates for typical buildings. The "Rules of Thumb – Guidelines for building services (5th editions)" issued by BSRIA provides typical watts per m^2 rates for estimating maximum demand load of buildings.

Generally a typical rate of 55 watts per m2 rates for Schools – mechanically ventilated has been used as the most similar "typical rate" and adjusted to suit particular areas, such as 'Tech' on ground floor as details are made available by the University academics.

The total estimated maximum demand figure of 757kVA includes a future-expansion factor of 15 watts per m^2 to cover reasonable changes in future use of the building.

7.1.2 Discussion of Key Considerations

7.1.2.1 Electricity Infrastructure Procurement

Detailed discussions have been held with WPD to determine their precise requirements and availability of supplies.

Western Power Distribution (WPD) have confirmed the following clarification with regard to the existing infrastructure that:

FACE Building - a new connection will be required at 11kV from the local network and an on-site substation will be required to distribute electricity internally to the development;
Library Building – a new connection will be required at 400/230V from the existing local Low Voltage network;

7.1.2.2 Procurement Options

Two main options exist for providing electricity infrastructure:

Option one relates to procurement direct from Distribution Network Operation (DNO);

Option two a more flexible procurement agreement through an Independent Connection Provider (ICP) and Independent Network Operator (IDNO).

The following background information describes the main details and constraints of both options.

WPD is the Distribution Network Operation (DNO) for this area of South Wales and would be responsible for either the low voltage (LV) or high voltage (HV) electricity supply to the site. WPD as such have specific requirements for their equipment (switchgear and transformers) to reflect their operational requirements, their Health and Safety obligations, and their commitments to OFGEM (Office of Gas and Electric Markets) for supply continuity and billing, plus other requirements based on their experience as a DNO for South Wales.

These requirements are formally identified within their Substation Design Standards, FAQ data sheets and other guidance material is freely available and in the main part, these are non-negotiable.

For all projects involving WPD as a DNO, meeting all of these requirements is a challenge and will result in some loss of prime lettable space or will present some aesthetic challenges in terms of their demised areas. Failure to meet these requirements may result in delays to the project and power on, or to their rejection of the scheme and servicing strategy as proposed.

There are in addition Independent Distribution Network Operators (IDNO) who can facilitate some of the WPD connection agreements thereby offering some competition to WPD in the market place, but these operators are still required to obtain WPD adoption of their designs and as such are required to work to the same WPD rules as negotiated. Lastly, there are Independent Connection Provider (ICP) that are registered and licensed by OFGEM and these providers can work in general isolation and outside of the usual rules of WPD.

7.1.2.3 Project Strategy Procurement Options

The preference for the development is to limit plant areas across premium ground level, optimal number of transformers for power distribution, limit the number and size of back-up generators for secondary power supply and optimal underground utility infrastructure.

It is proposed that a formal agreement is established with WPD and ICP whereby only one substation and one diesel generator for secondary power supply will be required.

7.1.3 WPD Offer to Provide New Services

The offer for electrical connection works from Western Power Distribution (South Wales) plc (“WPD) at:

FACE Building - Summary of the electricity connection requirement:

- 757kVA three-phase low-voltage electricity connection,
- new 11kV cables,
- 1000kVA substation plant within suitable substation room (FACE building), LV cable and
- 1250A LV MCCB meter –panel.
- Substation dimension WxLxH (m): 4m X 4m X 2.3m (min)

Library Building - Summary of the electricity connection requirement:

- 150kVA three-phase low-voltage electricity connection,
- new 400V cables,
- 400A cut-out
- CT meter panel (250A Fuse).

An alternative formal engagement with SSE as ICP is being considered by the University as of date of 22/Jan/2016. It should be emphasised that the size of incoming supplies are based upon information available at stage 3 of the design and are subject to change as further information becomes available from the university’s work in developing the equipment schedules and the fit-out works.

	WPD	SSE (ICP)
Non-contestable / Contestable	YES	TBC
Provide Contestable Connection Works	YES	TBC
Arrange legal documentation (wayleave, easement, lease of transformer as applicable to the site and WPD policy) to be completed in WPD’s name prior to adoption of the equipment by WPD	NO	TBC
Other Works to be undertaken by the Customer : A suitable ground-floor substation room to WPD specification All on site cable excavation and reinstatement works. The programme of excavation must be agreed with WPD. Where required, the Customer will be responsible for the provision of a stone duct bed around cables to WPD’s specification.	NO	TBC
Civil works at Connection Point, to WPD specification, to accommodate WPD’s LV MCCB meter panel.	NO	TBC

7.2 Telecommunications

Detailed discussions are believed to be ongoing between the Information Communication and Technology (ICT) University team (James Cale and Chris Handley) and BT ‘Openreach’ to determine ICT requirements and availability of supplies.

British Telecommunications plc (BT) ‘Openreach’ have confirmed details of their telecoms network within the site area, general available capacity and BT connection charges.

The BT services in the area of the proposed development comprise of a number of underground ducted cabled services and distribution chambers.

The network provision indicated upon the BT details, at this stage, is understood to be likely to be sufficient capacity to serve the new development requirements. However, BT will not confirm this until a formal order is placed by the University.

The telecommunication supplier(s) lines will enter the site via suitably sized underground cable ducts and chambers located at two separate building entry points for diverse routing required for resilience.

The lines will be installed in below ground ducts throughout their length from the chambers into the buildings.

Refer to the section regarding public realm 7.11.1 for details of the duct routes as proposed.

Similarly, the broadband services in the area of the proposed development comprise of a number of underground cabled services and distribution chambers. The network provision indicated upon the drawings suggests, at this stage, that there is likely to be sufficient capacity to serve the new development.

7.3 Water

The SA1 Swansea site is provided with an existing mains water supply as part of the Welsh Government's plans for partly facilitating redevelopment of the site. These services generally following the primary circulation routes around SA1 along Kings Road and Langdon Road.

Discussions are underway with Welsh Water based on our initial calculations.

It is anticipated that Welsh Water will further investigate the impact of the development on their infrastructure during the coming months with a view to confirming that their current network will be capable of providing a suitable distribution system to serve the site without the need for reinforcement.

A new metered mains water supply will be provided to serve the FACE building.

The incoming water main will enter the site at the development boundary and be distributed underground to enter the plant room. The new supply will be connected to the on-site storage tanks and a boosted cold water supply will be distributed throughout the building.

An incoming fire water main will be provided to the site by Welsh Water to meet with the final requirements of the Local Building Control and Fire Officers.



7.4 Natural Gas

The SA1 Swansea site is provided with an existing network of gas as part of the Welsh Government's plans for partly facilitating redevelopment of the site. These services generally following the primary circulation routes around SA1 along Kings Road and Langdon Road.

Discussions have taken place with Wales and West Utilities based on our initial load profiles and an initial budget quotation has been prepared which will need to be developed further during RIBA stage 4.

An incoming natural gas supply will be provided which will enter the site at the development boundary and will be routed underground to enter the mechanical plant room. The supply will comprise of a suitably rated polyethylene pipe, complete with pressure reducing sets, meter and housing as provided by Wales & West Utilities or equivalent.

7.5 Centralised Services

A city-wide district heating systems is currently being evaluated by City and County of Swansea.

Discussions have taken place between the University and the City and County Council resulting in details of the Load Profiling for the proposed developments upon SA1 being provided to the Council's consultants for consideration of a future connection to the city-wide system.

Notwithstanding the above, considerable evaluation has been undertaken into the setting up of a district heating systems to serve the Peninsula area of SA1. The system is subject to further detailed cost analysis but technically there appears to be a viable opportunity to serve the Peninsula area as a self-contained area system, with the potential to connect to a city-wide system at some point in the future if that system is developed by the Council.

7.6 A District Heating Network

The development of FACE and the Library will include future provision for connecting to a site wide district heating network which would form part of a later phase of the development.

Each plant room will be provided with a space allowance for future connections and plant to facilitate this works and ducted service points will be included as part of the base build,

This would allow the future connection to the proposed district heating system being considered by the City and County Of Swansea (CCS)

7.7 Site Drainage

Sustainable Urban Drainage will require to be fully considered for the development. The rainfall data (Environment Agency requirements), quantity and discharge design criteria, hydrology of catchment and level of local water table will need to be fully established. Design outputs will include the run-off, design treatment volume, the type, location and size of drainage devices, flow rates for discharge off-site, material options which meet the expected service life of the system.

A robust below ground drainage system will require to be fully considered for the development taking account of any phased construction of the buildings and the distance between the development and public sewer (if available) and invert levels at point of connection, building type and usage, number of building occupants and occupancy patterns number and type of sanitary fittings. The pipe sizes, gradient and layout will require to be assessed along with pumping and anti-flooding requirements.

The system will comply with the requirements of Approved Document H1 – Foul Water Drainage, Local Authority Requirements and Discharge Consents.

7.8 Low Voltage Emergency Standby Generator

Emergency standby generation will be required with suitable capacity and diesel storage (at least 12 hours capacity) to serve the "essential power" supplies during periods when the electricity company has a power outage.

These “essential power” supplies will support essential equipment and systems, including life safety systems, main ICT server rooms supplies, lifts and other equipment deemed essential to the University.

The generator will be located adjacent to the substation or main electrical switch room as appropriate. Emergency power will be required to the FACE and Library buildings. Additional information can be found within Section 9.8 “Back Up Generator Resilience Criteria”.

7.9 Renewable Sources

Renewable energy sources have be considered for serving the development and discussed further in greater detail within Section 3 of this report.

7.10 Energy Metering Strategy

Extensive metering is a prime requirement for identifying energy users. Utility supply metering is a requirement at the incoming point of each fuel entering the site and at each entry point to each building located across the site.

Full compliance with Wales Building Regulations Part L2A will be required and building services systems will require energy meters to ensure at least 90% of the estimated energy consumption of each fuel can be assigned to the various end uses in the building.

Building Energy Management systems will be provided with automatic meter reading and data collection / targeting facilities.

Additional sub metering will be provided as required to achieve BREEAM ‘Ene 02’ and satisfy the University’s expectations.

7.11 Public Realm

It is good practice for the public realm schemes and large areas of landscaping to have an external lighting strategy, which can significantly enhance the public perception and experience of external spaces at night.

The effect of ‘light pollution’ from external lighting will be minimised by directing lights downwards, where possible.

7.11.1 Underground Cable Containment Network

A “figure 8” type duct network is the accepted principle for providing a flexible and resilient underground containment network for services cabling between buildings and across the public realm.

The principle involves encircling each building and permitting cables to be routed both around and between each building.

Suitably rated underground cable chambers will be provided at all junctions and building entry points. Each building will have at least two completely independent entry points for resilient diverse routing from the independent telecommunications points at the boundary of the site.

Similarly, separate duct and chamber networks will be required for other underground services as follows:

- *Incoming power supplies*
- *Incoming gas supplies*
- *Incoming water supplies*
- *Incoming telecommunications supplies (refer to University’s sketch drawing)*
- *University’s interconnecting power supplies*
- *University’s water supplies*
- *University’s interconnecting data cabling (refer to University’s sketch drawing – Appendix 16, Section Information and Communication Technology)*
- *University’s interconnecting telecoms cabling (refer to University’s sketch drawing - Appendix 16, Section Information and Communication Technology).*
- *Drawing WA0155-X-00-00-002 provides information related to underground ducting installation for University’s interconnecting data cabling and interconnecting telecoms cabling. “Deveopers Gide to Telecommunications Infrastructure and Installation”- Issue 7 by BT provides the technical conditions and specifications for external infrastructure: ducts, typical footway chamber (non-traffic / traffic), pre-formed chamber system..*
- *University’s CCTV cabling*
- *University external power services, e.g. for external exhibition power, batter chargers.*
- *University’s external water services*
- *Ancillary services*
- *Spare for future unknown services*

7.11.2 MEP Provisions

The scope of MEP services within the public realm is currently under consideration. However, the following services are anticipated as being possibly required:

- *Facilities for ICT information displays to reduce journeys between sites*
- *Battery charging points for electric vehicles*
- *Electrical power points for supporting outside events.*
- *External community area & feature lighting*

- *Roadway and footpath lighting*
- *Signage lighting*
- *CCTV*

The design of the campus should take cognisance of the University signage strategy, University access policy and BS8300.

The following key points should be addressed within the future public realm design to ensure the creation of an accessible campus environment: -

Lighting schemes must be carefully considered to ensure the even illumination of principle pedestrian surfaces which prevent glare or visual hotspots and which do not compromise the operation of CCTV.

All stairs and steps should be fitted with appropriate balusters.

All obstacles to pedestrian movement such as bollards, bins, seats and signs should be differentiated from the pedestrian area by a contrasting material.

8

Mechanical proposals

8 Mechanical proposals

8.1 F.A.C.E. Building

8.1.1 Heating Systems

The design strategy is to keep the building heat loads at low values in order to help achieve compliance with the low energy targets and Building Regulations Part L2A (2014). This involves the following:

- High performance building envelope with low leakage and low U – values for the external structure developed with the Architects.
- High efficiency heat reclamation on the ventilation air handling units.
- Reducing the amount of distribution losses where possible
- Utilising piping distribution systems with low mean water temperatures to limit the plant and pipe-work standing losses.

The following systems have been selected to satisfy the building heating requirements:

- High efficiency modular gas fired condensing boilers.
- Small scale/micro combined heat and power.
- District heat/large scale CHP was discounted during Stage 2. However, space has been allocated within the plant room for the installation of localised heat interface units should they become viable during future phases and/or development of the heat network by City and County of Swansea.

8.1.2 Heating

The heating system will consist of an accelerated two pipe low pressure hot water heating circuit with a flow of 70°C and a return of 40°C provided via a low NOx gas fired modular high efficiency condensing boiler installation which will be fully integrated with a micro CHP scheme to provide a primary low pressure hot water heating system.

The gas fired boiler plant will comprise a minimum of 4No modular boilers complete with flues and fully modulation burners. The boilers will be sized to provide a minimum of 120% peak load with each boiler being capable of meeting 30% of the total load excluding CHP contribution to provide system resilience.

The gas fired boilers will act as support to the CHP installation to maintain the system flow temperature. The boilers will be arranged for cascade control with duty share and automatic changeover in the event of failure.

All boilers will be complete with the following equipment and fittings:
Insulated metal casings, burner modulating control, manual reset high limit temperature and alarm reset, no flame lock-out and alarm indication, boiler temperature gauge, boiler pressure gauge, safety/relief valve, in accordance with BS 759, with discharge pipe terminating 150mm above floor level, hose union and valved drain outlet, flue outlets, electrical isolators, acoustic shroud, volt-free contacts for enable and high/low cut-out indication to the control system, anti-vibration mounts, pre-wired instrument panel with on/off switch, all necessary valves, mountings and fittings to BS 759, manufacturer's standard cleaning tools, condensate drain pipework.

A gas isolating valve and governor/regulation station will be provided at each boiler/burner.

A Primary low pressure hot water heating circuit will supply a low loss header which will be provided with the following circuits as a minimum.

1. 1 No constant temperature.
2. 5 No Variable temperature
3. 1 No Spare (65mm valved connections).

All circuits will be provided with inverter drive twin head pumps.

Both primary and secondary distribution circuits will be provided with all regulation and monitoring devices, insulation, couplings, expansion devices, commissioning components and safety equipment and ancillaries to ensure proper, safe and efficient commissioning, operation and maintenance of the complete system including: isolation valves, strainers, flexible mounts, couplings and anti-vibration devices, flow regulation valves, double regulation valves, temperature and pressure gauges, test points, vent and drain points, control sensors and transducers, control valves, chemical dosing set, flushing valves, air and dirt separator, expansion loops and bellows and pipe guides, anchor points and ancillaries to form a complete installation.

The contractor will be required only to use insulating materials that have a global warming potential (GWP) of less than 5 to achieve BREEAM Pol 1 credit.
Insulating materials will have a low embodied environmental impact relative to its thermal properties and will be responsibly sourced to achieve BREEAM Mat 04 credit.

8.1.3 CHP Installation

A small scale micro gas fired self-contained and integrated combined heat and power (CHP) installation will be provided to include prime mover, heat recovery systems, electricity generation, fluid flow connections, heat rejection, acoustic attenuation and all other system controls necessary to deliver the CHP required performance.

The CHP unit will be selected based on the developments energy requirements and will operate in preference to the gas fired boiler installation.

The system selected will be capable of operating continuously in access of 8000 hours per year to achieve an availability of not less than 91.3% except when shut down for maintenance.

The CHP unit will be designed to operate in parallel with the grid; connection will therefore comply with Engineering Recommendation G59/2 (Issue 2 2010) published by the Electricity Networks Association.

The CHP Control Panel will include a mains monitoring and protection relay as required by ER G59/2. In addition permission must be sought from the DNO through an application process. The specialists CHP supplier will include within their scope for the administration of the G59/2 application and provide on-site G59/2 testing.

The average NOx emissions for the plant installed to meet the heating and hot water demand will be no more than 40mg/kW (at 0% excess O^2) to achieve BREEAM Pol 02.

8.1.4 Terminal Heating devices/systems

8.1.4.1 Radiators:

Variable temperature weather compensated circuits will be distributed throughout the FACE building to serve steel panel radiators

All radiators will be fitted with TRVs on the flow & lock shield valves on the return.

All radiators will be hydraulically tested and supplied with the final painted coating before leaving the works. The colour and finish will be agreed with the Architect.
Radiator connections will be properly set to suit the width of the radiator supplied and connections from the main will be of the long sweep type

Radiators will be wall mounted unless specifically agreed or indicated otherwise. Radiators will serve the following areas typically:

- Circulation spaces, staircases, toilets, etc.
- UG Architectural Studio
- Flexi/Learning Studios
- Changing Rooms
- Third Floor Faculty
- PG Architecture

The advantage being that occupants are familiar with their operation, there low maintenance and have good temperature control.

The one consideration with a radiator system being that furniture needs to be positioned sympathetically to avoid obstructing heating output.

8.1.4.2 Radiant panels:

Variable temperature weather compensated circuits will be distributed throughout the Tech FACE building to serve radiant panels typically in the following areas:

- Project Teaching.
- Engineering Science.
- Flexi Learning Studio Ground Floor.
- Fabrication/Welding Workshops.
- Construction Workshops.
- CNC Manufacturing.
- Robotics.
- Engine Rigs.

The Areas served will generally be where floor space is at a premium, areas where they are large areas of floor to ceiling glazing and rooms where there are high levels of external air entering from opening doorways, or to suit architectural requirements.

The Radiant panels offer the benefits of providing heating in workshop environments where no air movement is preferred to distribute heat and where spot heating can be considered for providing local heating to work areas which benefit from high levels of natural ventilation.

In high bay workshops radiant panels will be mounted at high level supported from the structure.

In teaching areas where suspended ceiling may be present they will be integrated into the suspended ceilings.

8.1.4.3 Underfloor Heating:

Variable temperature weather compensated circuits will be distributed throughout the FACE building to serve underfloor heating manifolds.

Underfloor heating is best suited to large open plan spaces and provide an invisible heating solution which leaves floor space virtually free. It can provide a relatively even temperature distribution throughout the space with minimal or no stratification at high level and over comes the problem of cold surfaces associated with stone or tiled floors.

Areas where underfloor heating will be provided are:

- Learning Commons Workstations.
- Learning Commons Café.
- Reception.
- Ground Floor circulation areas.

8.1.5 Natural Ventilation

The location of the University Site requires that air quality and ambient noise levels will need careful consideration when planning a natural ventilation strategy.

Natural ventilation enables occupants to make their own decisions on trade-offs between ventilation rate and external noise and has further benefits that:

- Offers high ventilation rates under favourable conditions.
- Good occupant control for cellular spaces with low occupancies with room depths of 6 – 7m.
- Low cost.
- Low energy.

The following options have been considered as part of the natural ventilation strategy:

8.1.5.1 Façade ventilator in conjunction with passive acoustic ventilators.

This will consist of an automatic ventilation system via a facade mounted ventilator and passive acoustic attenuators to connect each space to the atrium.

Each space will be designed to meet the ventilation and overheating criteria of TM52. The ventilation system will be capable of achieving a daily average CO^2 concentration of not more than 1500ppm and will have the capability of boosting to 8l/s/person at any time.

Each system will include one or two façade mounted mixing ventilators which will incorporate the following; insulated damper; one internal mixing fan, an integral controller, and a duct temperature sensor to control the temperature of mixed air delivery.

The units will be connected to grilles in the room and external via bespoke weather louvre and plenum arrangement on the external façade of the individual rooms at locations co-ordinated with the Architect.

In winter the facade units will be used for fresh air intake. Each unit will mix the incoming cold air with sufficient hot interior air using a low energy fan prior to the fresh air entering the occupied space in order to minimize the risk of cold draughts.

Warm room air will be drawn through into the atrium by passive acoustic attenuators which provide acoustic attenuation between the space and the atrium.
In summer the unit will operate as a buoyancy-driven natural ventilation system. Where windows are present on the façade these will be sized to work in conjunction with the facade units for summer operation.

The unit will be capable of automatic secure night cooling when appropriate, allowing cool air to enter the space via the unit and using fan assistance if required.

All modes of operation will require high level openings within the atrium which will be controlled by the manufactures control panel. The control panel will provide a 0-10V modulating signal to control openings.
Openings will be sized to be sufficient for both summertime and wintertime operation and with consideration of the neutral pressure level within the building.

Each space will be automatically controlled via a combined temperature/CO^2 sensor in each room and a common external temperature sensor to determine the operation of the units.

A key switch with timed override and integrated indicator light to signal when windows will be open/closed will be located in each room.

Areas where this solution is being considered are:

- Flexi person Learning Studios

The above being subject to the final fire strategy option for the Atrium.

All external plant will be to marine quality and be suitable treated to suit a coastal environment.

8.1.5.2 Natural ventilation with heat recovery (NVHR)

The system will include ventilation mixing units incorporating the following; insulated damper; two low energy internal mixing fans with at least two speed settings and an integral controller.

The units will be connected to the external façade via a bespoke louvre and plenum arrangement. Final louvre positions will be agreed with the Architect.

In winter the NVHR units will be used for fresh air intake and exhaust. The unit will mix the incoming cold air with sufficient hot interior air using low energy fans prior to the fresh air entering the occupied space in order to minimize the risk of cold draughts. Air will be exhausted via a passive section of the insulated damper.

In summer the space will primarily operate as a buoyancy-driven natural ventilation system, with provision for automatic fan assistance when required. Windows are required on the façade, and these will be sized to work in conjunction with the NVHR unit for summer operation.

The outlet from the units will be connected to louvered face grilles at the rear of the space via insulated galvanised ductwork installed above the line of the suspended ceiling.

Each space will be designed to meet the ventilation and overheating criteria of TM52. The ventilation system will be capable of achieving a daily average CO^2 concentration of not more than 1500ppm and will have the capability of boosting to 8l/s/person at any time

The unit will be capable of automatic, secure night cooling when appropriate, allowing cool air to enter the space via the unit, and using fan assistance if required.

Each unit will be automatically controlled via the equipment manufacturers smart controller using combined temperature/CO^2 sensor in each room and a common external temperature sensor to determine the operation of the unit.

A key switch with timed override and integrated indicator light to signal when windows will be open/closed will be located in each room.

NVHR's will typically serve the following areas:

- Flexi Learning Studios.
- UG Architecture Studio.
- Learning Commons.

All external plant will be to marine quality and be suitable treated to suit a coastal environment.

8.1.5.3 Roof mounted NVHR

The system will include a roof mounted NVHR consisting of ventilation mixing unit incorporating the following; insulated dampers; two internal mixing fans, two duct temperature sensors to control the temperature of mixed air delivery, and an integral controller. The units will be connected to grilles in the room and to a shaft leading to an external attenuated weatherproof roof mounted mushroom cowl.

The roof terminal unit will be a mushroom cowl type with internal vertical divider. The units will incorporate a bird guard, L-shaped divider, roof section designed to attenuate rain noise, and will be finished to the required standard RAL colour.

In winter the shaft will be used for fresh air intake & exhaust. The unit at the base of the shaft will mix the incoming cold air with sufficient hot interior air using low energy fans prior to the fresh air entering the occupied space in order to minimize the risk of cold draughts.
In summer the unit will operate as a buoyancy-driven natural ventilation system with provision for automatic fan assistance to buoyancy-driven ventilation flows when required.

Each space will be designed to meet the ventilation and overheating criteria of TM52. The ventilation system will be capable of achieving a daily average CO^2 concentration of not more than 1500ppm and will have the capability of boosting to 8l/s/person at any time assuming standard classroom occupancy, without causing cold draughts and without dedicated air preheaters

Where windows are present on the façade, these will be sized to work in conjunction with the stack unit for summer operation.

The unit will be capable of automatic secure night cooling when appropriate, allowing cool air to enter the space via the unit and using fan assistance if required.

Each unit will be automatically controlled via a combined temperature/CO^2 sensor in each room and a common external temperature sensor to determine the operation of the unit.

A key switch with timed override and integrated indicator light to signal when windows will be open/closed will be located in each room.

Roof Mounted NVHRs will typically serve the following areas:

- Auto Projects.
- Fabrication and Welding.
- Robotics Laboratory.
- Mechanical Workshop.
- CNC Manufacturing.
- Construction Workshop.
- Faculty
- PG Architecture Studio

It will be noted that adopting natural ventilation has a significant effect on the energy consumption of the building therefore further investigation will be undertaken at RIBA Stage 4 to achieve the best solution to meet the environmental requirements.

All external plant will be to marine quality and be suitable treated to suit a coastal environment.



8.1.6 Main Ventilation Systems

The systems will be designed to provide the room temperatures and air change rates as defined in the technical design performance section of this report. The majority of the central air handling plant will be located on the roof or in bespoke plant rooms. Where possible supply and extract units will be mounted adjacent to one another such that high efficiency recovery solutions can be utilised such as plate heat exchanger or heat recovery wheels.

Supply air handling units will consist of control shut off damper, frost coil, pre filter, silencer, fan, silencer, thermal wheel, heating coil and final filter, where matching extract air handling units are provided they will be complete with panel filter, silencer, fan, thermal wheel, silencer and shut off control damper.

The fresh air intake for all the air plants serving the building plant will be from the perimeter with purpose designed intake louvres. This provision will be fully integrated with the development of the architecture on the façades and the Architects will be fully involved in this process.

The general room exhaust air from the various areas within the building will be routed back to the plantrooms where any reclaimable heat or coolth can be recovered by the plant.

Supply and exhaust louvres will be located to avoid recirculation of vitiated air.

The allocation of plant will also be arranged to suit the geographical positioning of the rooms within the building and how these can be served from the plant and riser space.

Mechanical ventilation will be provided in the following Areas:

Internal habitable rooms typically:

- Autoclave
- Technician Rooms
- Engine Diagnostic Stores
- Engine Stands
- IT Technician
- Prayer/Meeting Room.
- Flexi Studios
- Learning Commons
- Tutorial.

Rooms not suitable for natural ventilation typically:

- Engineering Science Laboratory
- Learning Commons Workstations.
- Learning Commons Café and Soft Seating
- 60 Person Learning Studio First Floor.
- Engine Rigs.
- Simulator
- Engine Stands.

In Workshop areas with limited opening windows due to acoustic issues and where high heat gains are anticipated bespoke solutions will be provided consisting of attenuated fans exhausting warm air to atmosphere and delivering fresh air to the space at the external ambient temperature.

Fans will be provided with high efficiency infinitely variable electronic matched speed controllers

Locations where this solution will be provided are:

- Rolling Roads
- Dyno Cells

Teaching Areas with high occupancy and or equipment gains such as Computer Laboratory's will be provided with mixed mode ventilation.

In instances where mixed mode is provided natural ventilation will control the base conditions supplemented by mechanical ventilation to meet peek conditions. This solution can provided a pragmatic and low energy solution whist minimising central plant requirements.

Mixed mode ventilation will consist of mechanical ventilation with heat recovery air handling units provided in the individual spaces mounted at high level with supply and extract louvres located in the room façade.
Units will be attenuated as required to suit each environment.

Where required LPHW batteries will be provided to raise the supply air temperatures.

Mixed Mode will typically be provided in the following areas:

- 90 Person Learning Studio.
- Project Teaching.
- Computer Laboratory's.
- Architectural Laboratory's.
- Buck Sanding.
- Pre Preg Cutting.
- Buck GRP.
- NDT.
- Environmental Science
- Electrical and Electronic Laboratory.

Toilet and Changing Rooms will be provided with dedicated air handling units with heat recovery to temper the supply/makeup air and will be designed to provide the air change rates as defined in the technical design performance section of this report.

Units will be attenuated as required to suit each environment and where required LPHW batteries will be provided to raise the supply air temperatures.

Due to the highly transient nature of many of the teaching areas within the building, consideration will be given to the use of variable volume/shut off devices in the ventilation branches serving rooms such that a turn down in the respective air plants can occur during periods of low or no occupancy.

All the supply and extract fan motors on major plant will incorporate high efficiency motors and frequency invertors. The controls will be configured such that the fan systems can turn down as the building load reduces and this will be particularly pertinent for the teaching/laboratory/research type areas during the summer months when occupancy levels can be very limited.

This will provide savings in electrical fan energy, together with the heating energy consumption required to condition the incoming fresh air. The air handling plants and distribution systems will be designed to achieve low pressure drops such that the Building Regulation requirements for specific fan power are exceeded.

The ability for the plant to be low energy will be very much dependent on the systems having low velocities with associated low pressure drops, both in the air handling plant and the associated insulated ductwork distribution systems. Consequently it is essential that suitable plant and riser space is provided within the buildings such that these targets are achievable. The preliminary plant spaces required will follow those provided by BSRIA Technical Note for space allowances. Air handling plants using high efficiency fans/ motors and low fan speeds (with resultant low noise levels) will be utilised such that plant attenuators can be omitted from the systems wherever possible thereby providing increased energy savings.

The contractor will only use insulating materials that have a global warming potential (GWP) of less than 5 to achieve BREEAM Pol 1 credit.
Insulating materials will have a low embodied environmental impact relative to its thermal properties and will be responsibly sourced to achieve BREEAM Mat 04 credit.

All external air handling units will be to marine quality and be suitable treated to suit a coastal environment including internal components i.e. LPHW coils.

8.1.6.1 Diffusers

These devices will be designed to suit the application and will be generally ceiling mounted. They will be either conventional louvre face or swirl diffuser where the latter would be provided where good mixing of the primary /room air is necessary (i.e. high equipment load area with low temperature cooling air)

8.1.6.2 Specialist Extract

The following areas will be provided with individual local exhaust ventilation systems LEV's:

- 1No Spray Booth.
- 1No Welding Bay Extract.
- 1No Battery Charging Extract.
- 3No Extract points Buck GRP.

The above LEV's points will be discharged to atmosphere via dedicated plant areas on the roof of the building they serve.

Where the extract systems are required to be connected to free standing filter units such as PrePreg Cutting and Buck Sanding these will be located in the external court yard.

The points of discharge will be positioned away from opening windows and fresh air intakes.

Vehicle exhaust extract systems will be provided from the each of the following areas:

- Multi Engine Rigs (6No extraction points).
- Dyno 1 and 2 (1No extract point in each).
- Auto's 01 to 04 (1No extract point in each).
- Fabrication and Welding (3No extraction points).
- Rolling Roads and Car Lift (1No extract point in each).

Each system will consist of an extract fan, individual exhaust hose reel/extractor from each point connected to a range of galvanized ductwork and discharged to atmosphere via the roof away from opening windows and fresh air intakes.

The following areas will be provided with local exhaust ventilation as part of the fixed furniture and equipment contract:

- CNC Manufacturing Centre.
- Autoclave Room.
- Soldering/Work bench extract.

8.1.7 Fume Cupboard Systems

The second floor Environmental Science Laboratory will be provided with a fume cupboard.

The final location and type of fume cupboards is not known at this stage and the strategy will be developed as more information becomes available from the university during RIBA stage 4.

The current scheme reflects a fume cupboard with exhaust to atmosphere which will need to be designed in accordance with BS EN 14175-2 (2003). Dependent on the chemicals utilised the fume cupboard discharges could require that discharges be taken to a height of 125% of the building to which it is attached or the surrounding buildings if the topography has the possibility of influencing the air discharge plumes. This would have a significant impact on planning and sight lines etc. and hence this issue needs to be addressed at RIBA Stage 4.

8.1.8 General Cooling Principles

In the first instance the objective will be to limit the summer solar gain to the building and with close consultation with the architect, various studies including thermal modelling will be undertaken to minimise direct solar gains to practical limits. This will include studies on the use of solar control glazing and the use of solar shading devices (movable and fixed) to determine the optimum solution.

As the majority of the buildings are only occupied during the day strategies will be developed to exploit free cooling and night time purging to further reduce the requirement for mechanical cooling.

8.1.9 Cooling systems/refrigeration

An efficient inverter drive variable refrigerant volume (VRF) heat pump installation will be utilised to provide comfort cooling typically to the following rooms:

- Computer Laboratory's, Games Lab, Cisco Laboratory, Project Room.
- Simulator Room.
- NDT Room.
- Architectural Laboratory.
- Electrical and Electronics Laboratory.

The heat pumps will be capable of providing simultaneous heating and cooling functions to the internal fan coil units as may be required to meet the set point temperature conditions. The system chosen will also be able to provided heat recovery from different rooms/zones of the building in order to increase efficiency. COP's will be between 4-6.

External plant will be located on the roof with small bore refrigerant pipework distributed to serve fan coil units where required. Individual rooms will be served by one or more fan coils depending of the level of heating or cooling required.

All external plant will be to marine quality and be suitable treated to suit a coastal environment.

8.1.10 DX Cooling systems

Dedicated DX-based cooling systems will be utilised to serve communications rooms which have an out of hours cooling requirements.

All external plant will be to marine quality and be suitable treated to suit a coastal environment.

Redundancy provision of N+1 will be applied to DX systems serving communications rooms.

8.1.11 Specialist cooling/heat rejection plant

The following works will form part of the fixed furniture and equipment contract.

- Ballistic room comfort cooling/air conditioning.
- Autoclave Heat Rejection.
- Dyno Rooms 1 and 2 Heat Rejection.

8.1.12 Hot & cold water service system

The incoming mains water services will be brought into the development and will enter the plant room where it will serve a pre insulated sectional cold water storage tank with central divider. A boosted cold water distribution service will be provided from the tanks (2No) to serve all sanitary appliances, catering equipment, external bib taps and all ancillary items of equipment in accordance with the room data sheets, Architectural drawings and schedules.

The booster set will be packaged variable speed and have a minimum of three-pumps, two pumps will be capable of delivering the total flow rate with the third acting as standby and complete with an integral control panel.

Solenoid valves will be provided on the cold water supply to each toilet area to control the water supply to all urinals and WCs, to meet the requirements of BREEAM credit Wat 03.

A water leak detection system based on monitoring water consumption, to meet the requirements of BREEAM credit Wat 03 will be provided. In addition, sub-meters will be provided on the cold supply to each of the major water consuming plant or building areas to comply with BREEAM credit Wat 02.

Hot water will be provided by a minimum of 2No indirect unvented hot water storage cylinders feed via the LPHW boilers via a constant temperature circuit to ensure that hot water will be generated at 60°C and distributed at not less than 55°C to reduce the risk of Legionella.

Temperature within the HWS system will be maintained by a pumped secondary circulation system with regulated and balanced secondary returns to overcome distribution pipework losses and maintain adequate temperatures adjacent to draw off points.

Thermostatic self-regulating values will be provided in the returns which will enable pasteurisation of the system at regular maintenance intervals.

Thermostatic mixing valves will be installed on all wash hand basins which will be TMV3 approved and be complete with integral check valves and strainers and will be installed in accordance with the manufacturer's instructions and recommendations.

The mixing valves will control the HWS supply temperature at point of use and will be designed to be fail safe and close in the event of cold water supply failure. The maximum temperature will be set to 41.5^{O}C.

To improving the efficiency of the installation an array of evacuated tube thermal solar collectors will be installed serving 2No pre heat cylinders each range will be independent and complete with its own controls, circulation pump and fill unit.

The systems will be configured in such a way as to allow either system to be isolated but maintain service on the other.

The contractor will only use insulating materials that have a global warming potential (GWP) of less than 5 to achieve BREEAM Pol 1 credit.
Insulating materials will have a low embodied environmental impact relative to its thermal properties and will be responsibly sourced to achieve BREEAM Mat 04 credit.

8.1.13 Natural Gas

A natural gas supply and distribution system of adequate pressure and capacity will be provided from the incoming gas meter safely and reliably to serve the CHP, LPHW heating boilers, Science Laboratory's and catering equipment.

An automatic gas shut off valve will be provided interfaced with the CHP and boiler plant safety systems, plant room gas detection system and building fire alarm system in the plantroom.

Provide heat detectors/electro thermal links above the gas fired boilers and CHP within the plantroom which will operate the gas solenoid valve together with emergency 'knock off' buttons located at the main exits of the plant room.

The gas supplies to the Laboratory's will each be provided with a gas solenoid safety system which will be interfaced with the fire alarm system ensuring that the gas supply will be automatically shut off when the alarm is activated.

The solenoid valves will also be interfaced with the ventilation system to ensure that the gas supply remains shut off until the ventilation system is operational.

An emergency push button will be provided at each room exit which will shut off the solenoid valve when activated.

All gas meters and sub meters will be of the pulsed type and will be interfaced with the BMS.

8.1.14 Compressed Air

A clean, dry, oil free compressed air distribution ring main will be provided fed via a packaged floor mounted compressor complete with acoustic enclosure located in the space to serve the following areas:

Fabrication and Welding.
Auto Project Rooms 01 – 04.

The ring main will be distributed at high level and will be provided with connections terminating at high level for continuation as part of the Clients fixed furniture and equipment contract.

No allowance will be made for connections to equipment, hand tools or flexible/retractable hoses.

A separate standalone system will be provided in the Autoclave Room as part of the Clients fixed furniture and equipment contract

8.1.15 Fuel Distribution System

A piped fuel distribution system will be provided from the external fuel storage tank to supply the engines located in Dynos 1 and 2

8.1.16 Carbon Monoxide Detection

Carbon monoxide monitoring and detection will be provided in the following locations:

- Engine Rigs.
- Dyno 01, 02 and Dyno Control.
- Fabrication and Welding.
- Rolling Roads
- Car Lift.

8.1.17 Building Management System

Building management system will be provided to control and monitor the mechanical engineering systems and plant installed within the building, along with the monitoring of the status of certain items of electrical and other plant and equipment. The following description is not exhaustive and additional items may be added as the scheme moves forward

The automatic controls system will comprise, as a minimum, the following:

- Communication network and communication peripherals.
- Outstations installed in motor control centre panels (MCCPs).
- Controllers, controls sensors (e.g. temperature, humidity, pressure), actuators (e.g. valve, damper) and switches as necessary to achieve the design intent.
- Motor control centre panels containing all necessary controls, starters, etc.
- Control and indication/alarm panels.
- All mechanical systems power wiring, isolators and containment for equipment supplied via MCCPs.
- All sensor and communications wiring and containment.
- Supervisor terminal, software and database.

Typically the following equipment will be controlled by the BMS system and its associated time schedules.

- LPHW Heating boilers, CHP Unit, air handling units, extract fans and hot water calorifiers.

MEP Services will be controlled by one operator from a central head end supervisor monitoring the complete Site. The BMS will monitor all the following MEP Services in all Site buildings, plant areas, remote treatment and pumping facilities:

- Fire Alarm Systems (interfaced)
- Emergency Lighting (interfaced)
- Lifts (interfaced)
- HVAC Controls
- Lighting Controls

- CCTV Systems
- Intruder Alarm Systems
- Access Control Systems
- Disabled Alarm Systems
- Uninterruptable Power Supplies
- Power Conditioning and Surge Protection Systems
- Standby Power Generation
- Energy and Water Metering
- Fuel Storage
- Leak Detection Systems

Hardwired inter locks will typically be provided to the following items:

- Boilers, dedicated high and low pressure switches, primary and secondary pump flow proving, gas valves, gas detection, heat detectors and panic buttons.
- Fire alarm signal to cause shut down of ventilation plant and closing of gas solenoid valves via a direct interface.
- Pressurisation units to boilers and pumps.
- Frost coil stats to supply fans.
- Underfloor heating manifold high limit thermostat to two-port shut-off valve.
- HWS high limit safety cut-outs, secondary pumps.
- Interlocks to prevent booster sets running dry.
- Fireman's control of plant.

Typically the following items will be monitored by the BMS flow and return temperature sensors in all air and water systems both primary and secondary, status of all pressurisation units, all mechanical and electrical meters and sub meters, status of VRF and DX units, smoke extract system, carbon monoxide alarms, lift car alarms, all water tank temperatures and water levels, differential pressure switches across fans, pumps and filters, generator, power factor correction unit and lifts.

Allowance will be made to integrate the following standalone systems with the BMS installation: natural ventilation control systems, access control, fire alarm, PV, lighting control, CCTV, security and other systems required by the University.

Where other plant and equipment items are provided with integral control panels they will be provided with an open protocol interface to enable exchange of information.

The data placed upon the ICT infrastructure will be "media light" and not cause the primary ICT data networks to reduce in performance resulting from and standalone systems described above making use of the infrastructure.

8.2 Library Building

8.2.1 Heating Systems

The emphasis shall be to keep the building heat loads at low values for compatibility with the low energy target for the building. This shall involve the following:

- High performance building envelope with low leakage and low U – values for the external structure which shall be developed with the Architects.
- High efficiency heat reclamation on the ventilation air handling units.
- Reducing the amount of distribution losses where possible
- Utilising piping distribution systems with low mean water temperatures to limit the plant and pipe-work standing losses.

The following systems have been selected to satisfy the building heating requirements:-

High efficiency modular gas fired condensing boilers.

Small scale/micro combined heat and power.

District heat/large scale CHP was discounted during the Stage 2 Report however space has been allocated within the plant room for the installation of localised heat interface units should they become viable during future phases and/or development of the heat network by City and County of Swansea.

8.2.2 Heating

The heating system shall consist of an accelerated two pipe low pressure hot water heating circuit with a flow of 70°C and a return of 40°C provided via a low NOx gas fired modular high efficiency condensing boiler installation which shall be fully integrated with a micro CHP scheme to provide a primary low pressure hot water heating system.

The gas fired boiler plant shall comprise a minimum of 3No modular boilers complete with flues and fully modulation burners. The boilers shall be sized to provide a minimum of 120% peak load with each boiler being capable of meeting 40% of the total load excluding CHP contribution to provide system resilience.

The gas fired boilers will act as support to the CHP installation to maintain the system flow temperature. The boilers shall be arranged for cascade control with duty share and automatic changeover in the event of failure.

All boilers shall be complete with the following equipment and fittings:
Insulated metal casings, burner modulating control, manual reset high limit temperature and alarm reset, no flame lock-out and alarm indication, boiler temperature gauge, boiler pressure gauge, safety/relief valve, in accordance with BS 759, with discharge pipe terminating 150mm above floor level, hose union and valved drain outlet, flue outlets, electrical isolators, acoustic shroud, volt-free contacts for enable and high/low cut-out indication to the control system, anti-vibration mounts, pre-wired instrument panel with on/off switch, all necessary valves, mountings and fittings to BS 759, manufacturer's standard cleaning tools, condensate drain pipework.

A gas isolating valve and governor/regulation station shall be provided at each boiler/burner.

A Primary low pressure hot water heating circuit shall supply a low loss header which shall be provided with the following circuits as a minimum.

1. 1 No constant temperature.
2. 3 No Variable temperature
3. 1 No Spare (65mm valved connections).

All circuits shall be provided with inverter drive twin head pumps.

Both primary and secondary distribution circuits shall be provided with all regulation and monitoring devices, insulation, couplings, expansion devices, commissioning components and safety equipment and ancillaries to ensure proper, safe and efficient commissioning, operation and maintenance of the complete system including: isolation valves, strainers, flexible mounts, couplings and anti-vibration devices, flow regulation valves, double regulation valves, temperature and pressure gauges, test points, vent and drain points, control sensors and transducers, control valves, chemical dosing set, flushing valves, air and dirt separator, expansion loops and bellows and pipe guides, anchor points and ancillaries to form a complete installation.

The contractor shall only use insulating materials that have a global warming potential (GWP) of less than 5 to achieve BREEAM Pol 1 credit.
Insulating materials shall have a low embodied environmental impact relative to its thermal properties and shall be responsibly sourced to achieve BREEAM Mat 04 credit.

8.2.3 CHP Installation

A small scale micro gas fired self-contained and integrated combined heat and power (CHP) installation shall be provided to include prime mover, heat recovery systems, electricity generation, fluid flow connections, heat rejection, acoustic attenuation and all other system controls necessary to deliver the CHP required performance.

The CHP unit shall be selected based on the developments energy requirements and shall operate in preference to the gas fired boiler installation.

The system selected shall be capable of operating continuously in access of 8000 hours per year to achieve an availability of not less than 91.3% except when shut down for maintenance.

The CHP unit shall be designed to operate in parallel with the grid; connection shall therefore comply with Engineering Recommendation G59/2 (Issue 2 2010) published by the Electricity Networks Association.

The CHP Control Panel shall include a mains monitoring and protection relay as required by ER G59/2. In addition permission must be sought from the DNO through an application process. The specialists CHP supplier shall include within their scope for the administration of the G59/2 application and provide on-site G59/2 testing.

The average NOx emissions for the plant installed to meet the heating and hot water demand shall be no more than 40mg/kW (at 0% excess O2) to achieve BREEAM Pol 02.

8.2.4 Terminal Heating devices/systems

Radiators:

Variable temperature weather compensated circuits shall be distributed throughout the Library to serve steel panel radiators

All radiators shall be fitted with TRVs on the flow & lock shield valves on the return.

All radiators shall be hydraulically tested and supplied with the final painted coating before leaving the works. The colour and finish shall be agreed with the Architect.

Radiator connections shall be properly set to suit the width of the radiator supplied and connections from the main shall be of the long sweep type

Radiators shall be wall mounted unless specifically agreed or indicated otherwise.

Typical areas where radiators are being provided are:

- Toilet Areas
- Group Rooms
- First Floor Classroom
- Quiet Rooms
- Home Base Work Room

The advantage being that occupants are familiar with their operation, there low maintenance and have good temperature control.

The one consideration with a radiator system being that furniture needs to be positioned sympathetically to avoid obstructing heating output.

8.2.5 Natural Ventilation

The location of the Library requires that air quality and ambient noise levels will need careful consideration when planning a natural ventilation strategy.

Natural ventilation enables occupants to make their own decisions on trade-offs between ventilation rate and external noise and has further benefits that:

- Offers high ventilation rates under favourable conditions.
- Good occupant control for cellular spaces with low occupancies with room depths of 6 – 7m.
- Low cost.
- Low energy.

The simplest form of natural ventilation is openable windows typical areas where openable windows are being provided are:

- Group Rooms

Natural ventilation with heat recovery (NVHR)

The system shall include ventilation mixing units incorporating the following; insulated damper; two low energy internal mixing fans with at least two speed settings and an integral controller.

The units shall be connected to the external façade via a bespoke louvre and plenum arrangement. Final louvre positions shall be agreed with the Architect.

In winter the NVHR units shall be used for fresh air intake and exhaust. The unit shall mix the incoming cold air with sufficient hot interior air using low energy fans prior to the fresh air entering the occupied space in order to minimize the risk of cold draughts. Air will be exhausted via a passive section of the insulated damper.

In summer the space shall primarily operate as a buoyancy-driven natural ventilation system, with provision for automatic fan assistance when required. Windows are required on the façade, and these shall be sized to work in conjunction with the NVHR unit for summer operation.

The outlet from the units shall be connected to louvred face grilles at the rear of the space via insulated galvanised ductwork installed above the line of the suspended ceiling.

Each space shall be designed to meet the ventilation and overheating criteria of TM52. The ventilation system shall be capable of achieving a daily average CO^2 concentration of not more than 1500ppm and shall have the capability of boosting to 8l/s/person at any time

The unit shall be capable of automatic, secure night cooling when appropriate, allowing cool air to enter the space via the unit, and using fan assistance if required.

Each unit shall be automatically controlled via the equipment manufacturers smart controller using combined temperature/CO^2 sensor in each room and a common external temperature sensor to determine the operation of the unit.

A key switch with timed override and integrated indicator light to signal when windows should be open/closed shall be located in each room.

NVHR's shall typically serve the following areas:

- First Floor Classroom.

All external plant shall be to marine quality and be suitable treated to suit a coastal environment.

8.2.6 Main Ventilation Systems

The mechanical ventilation shall be designed to provide the room temperatures and air change rates as defined in the technical design performance section of this report. The central air handling plant shall be located on the in bespoke plant rooms; supply and extract units shall be mounted adjacent to one another such that high efficiency recovery solutions can be utilised such as plate heat exchanger or heat recovery wheels.

Supply air handling units shall consist of control shut off damper, frost coil, pre filter, silencer, fan, silencer, thermal wheel, heating coil and final filter, and shall be complete with matching extract air handling unit complete with panel filter, silencer, fan, thermal wheel, silencer and shut off control damper.

The air intake and exhaust for the air handling units serving the building shall be from the perimeter facade with purpose designed intake and exhaust louvres provided. This provision shall be fully integrated with the development of the architecture on the façades and the Architects shall be fully involved in this process.

The exhaust air from the various areas within the building shall be routed back to the plantroom where any reclaimable heat or coolth can be recovered by the plant.

Supply and exhaust louvres shall be located to avoid recirculation of vitiated air.

The allocation of plant shall also be arranged to suit the geographical positioning of the rooms within the building and how these can be served from the plant and riser space.

Mechanical ventilation shall be provided in the following Areas:

Internal habitable rooms typically:

- Quiet Rooms
- Library Area (Book Stacks & Seating)
- Study Carrels/Group Tables

Rooms not suitable for natural ventilation typically:

- Librarian Home Base/Work Room
- Multi Media Workroom
- Seminar Room
- Research Lounge
- Computer Workstation Zones

General insulated ranges of supply and extract ductwork shall be distributed above suspended ceilings and where necessary in purpose provided bulkheads.

Toilet and Cleaning Stores shall be provided with dedicated air handling units with heat recovery to temper the supply/makeup air and shall be designed to provide the air change rates as defined in the technical design performance section of this report.

Units shall be attenuated as required to suit each environment and where required LPHW batteries shall be provided to raise the supply air temperatures.

Due to the highly transient nature of many of the areas within the building, consideration shall be given to the use of variable volume/shut off devices in the ventilation branches serving rooms such that a turn down in the respective air plants can occur during periods of low or no occupancy.

All the supply and extract fan motors on major plant shall incorporate high efficiency motors and frequency invertors. The controls shall be configured such that the fan systems can turn down as the building load reduces and this shall be particularly pertinent for the Library during the summer months when occupancy levels may be limited.

This shall provide savings in electrical fan energy, together with the heating energy consumption required to condition the incoming fresh air. The air handling plants and distribution systems shall be designed to achieve low pressure drops such that the Building Regulation requirements for specific fan power are exceeded.

The ability for the plant to be low energy shall be very much dependent on the systems having low velocities with associated low pressure drops, both in the air handling plant and the associated ductwork distribution systems. Consequently it is essential that suitable plant and riser space is provided within the buildings such that these targets are achievable. The preliminary plant spaces required shall follow those provided by BSRIA Technical Note for space allowances. Air handling plants using high efficiency fans/ motors and low fan speeds (with resultant low noise levels) shall be utilised such that plant attenuators can be omitted from the systems wherever possible thereby providing increased energy savings.

The contractor shall only use insulating materials that have a global warming potential (GWP) of less than 5 to achieve BREEAM Pol 1 credit. Insulating materials shall have a low embodied environmental impact relative to its thermal properties and shall be responsibly sourced to achieve BREEAM Mat 04 credit

All external air handling units shall be to marine quality and be suitable treated to suit a coastal environment including internal components i.e. LPHW coils.

8.2.7 Diffusers

These devices shall be designed to suit the application and shall be generally ceiling mounted. They shall be either conventional louvre face or swirl diffuser where the latter would be provided where good mixing of the primary /room air is necessary (i.e. high equipment load area with low temperature cooling air)

In Toilet areas and Cleaner Stores egg crate grilles with removable cores shall be utilised for extract systems.

8.2.8 General Cooling Principles

In the first instance the objective shall be to limit the summer solar gain to the building and with close consultation with the architect, various studies including thermal modelling shall be undertaken to minimise direct solar gains to practical limits. This shall include studies on the use of solar control glazing and the use of solar shading devices (movable and fixed) to determine the optimum solution.

It is anticipated that the Library will be occupied mainly during the day and strategies shall be developed to exploit free cooling and night time purging to further reduce the requirement for mechanical cooling.

8.2.9 Heat pump systems/refrigeration

An efficient inverter drive variable refrigerant volume (VRF) heat pump installation shall be utilised to provide simultaneous heating and comfort cooling typically to the following rooms:

- Library Area (Book Stacks & Seating).
- Computer Workstations.
- Study Carrels/Group Tables.
- Research Lounge

The heat pumps shall be capable of providing simultaneous heating and cooling functions to the internal fan coil units as may be required to meet the set point temperature conditions. The system chosen shall also be able to provided heat recovery from different rooms/zones of the building in order to increase efficiency. COP’s shall be between 4-6.

External plant shall be located on the roof with small bore refrigerant pipework distributed to serve fan coil units where required. Individual rooms shall be served by one or more fan coils depending of the level of heating or cooling required.

All external plant shall be to marine quality and be suitable treated to suit a coastal environment.

8.2.10 DX Cooling systems

Dedicated DX-based cooling systems shall be utilised to serve the server rooms which have an out of hours cooling requirements.

All external plant shall be to marine quality and be suitable treated to suit a coastal environment.

Redundancy provision of N+1 shall be applied to DX systems serving communications rooms.

8.2.11 Hot & cold water service system

The incoming mains water services shall be brought into the development and shall enter the plant room where it shall serve a pre insulated sectional cold water storage tank with central divider. A boosted cold water distribution service shall be provided from the tanks (2No) to serve all sanitary appliances, catering equipment, external bib taps and all ancillary items of equipment in accordance with the room data sheets, Architectural drawings and schedules.

The booster set shall be packaged variable speed and have a minimum of three-pumps, two pumps shall be capable of delivering the total flow rate with the third acting as standby and complete with an integral control panel.

Solenoid valves shall be provided on the cold water supply to each toilet area to control the water supply to all urinals and WCs, to meet the requirements of BREEAM credit Wat 03.

A water leak detection system based on monitoring water consumption, to meet the requirements of BREEAM credit Wat 03 shall be provided. In addition, sub-meters shall be provided on the cold supply to each of the major water consuming plant or building areas to comply with BREEAM credit Wat 02.
Hot water shall be provided by a minimum of 1No indirect unvented hot water storage cylinders feed via the LPHW boilers via a constant temperature circuit to ensure that hot water shall be generated at 60°C and distributed at not less than 55°C to reduce the risk of Legionella.

Temperature within the HWS system shall be maintained by a pumped secondary circulation system with regulated and balanced secondary returns to overcome distribution pipework losses and maintain adequate temperatures adjacent to draw off points.

Thermostatic self-regulating values shall be provided in the returns which will enable pasteurisation of the system at regular maintenance intervals.

Thermostatic mixing valves shall be installed on all wash hand basins which shall be TMV3 approved and be complete with integral check valves and strainers and shall be installed in accordance with the manufacturer's instructions and recommendations.

The mixing valves shall control the HWS supply temperature at point of use and shall be designed to be fail safe and close in the event of cold water supply failure. The maximum temperature shall be set to 41.5^{O}C.

The contractor shall only use insulating materials that have a global warming potential (GWP) of less than 5 to achieve BREEAM Pol 1 credit.
Insulating materials shall have a low embodied environmental impact relative to its thermal properties and shall be responsibly sourced to achieve BREEAM Mat 04 credit.

8.2.12 Natural Gas

A natural gas supply and distribution system of adequate pressure and capacity shall be provided from the incoming gas meter safely and reliably to serve the CHP and LPHW heating boilers,

An automatic gas shut off valve shall be provided interfaced with the CHP and boiler plant safety systems, plant room gas detection system and building fire alarm system in the plantroom.

Provide heat detectors/electro thermal links above the gas fired boilers and CHP within the plantroom which shall operate the gas solenoid valve together with emergency 'knock off' buttons located at the main exits of the plant room.

All gas meters and sub meters shall be of the pulsed type and shall be interfaced with the BMS.

8.2.13 Building Management System

Building management system shall be provided to control and monitor the mechanical engineering systems and plant installed within the building, along with the monitoring of the status of certain items of electrical and other plant and equipment. The following description is not exhaustive and additional items may be added as the scheme moves forward

The automatic controls system shall comprise, as a minimum, the following:

- Communication network and communication peripherals.
- Outstations installed in motor control centre panels (MCCPs).
- Controllers, controls sensors (e.g. temperature, humidity, pressure), actuators (e.g. valve, damper) and switches as necessary to achieve the design intent.
- Motor control center panels containing all necessary controls, starters, etc.
- Control and indication/alarm panels.
- All mechanical systems power wiring, isolators and containment for equipment supplied via MCCPs.
- All sensor and communications wiring and containment.
- Supervisor terminal, software and database.

Typically the following equipment shall be controlled by the BMS system and its associated time schedules.

- LPHW Heating boilers, CHP Unit, air handling units, extract fans and hot water calorifiers.

Hardwired inter locks shall typically be provided to the following items:

- Boilers, dedicated high and low pressure switches, primary and secondary pump flow proving, gas valves, gas detection, heat detectors and panic buttons.
- Fire alarm signal to cause shut down of ventilation plant and closing of gas solenoid valves via a direct interface.
- Pressurisation units to boilers and pumps.
- Frost coil stats to supply fans.
- Underfloor heating manifold high limit thermostat to two-port shut-off valve.
- HWS high limit safety cut-outs, secondary pumps.
- Interlocks to prevent booster sets running dry.

- Fireman's control of plant.

Typically the following items shall be monitored by the BMS flow and return temperature sensors in all air and water systems both primary and secondary, status of all pressurisation units, all mechanical and electrical meters and sub meters, status of VRF and DX units, smoke extract system, carbon monoxide alarms, lift car alarms, all water tank temperatures and water levels, differential pressure switches across fans, pumps and filters, generator, power factor correction unit and lifts.

Allowance shall be made to integrate the following standalone systems with the BMS installation: natural ventilation control systems, access control, fire alarm, PV, lighting control, CCTV and security.

Where other plant and equipment items are provided with integral control panels they shall be provided with an open protocol interface to enable exchange of information

Electrical proposals

9

9 Electrical proposals

9.1 F.A.C.E. Building

This section of the report details the design strategy for electrical services.

The scope of the electrical installation will include but limited to the following elements:

- Incoming supply substation by DNO;
- LV distribution;
- Lighting and emergency lighting;
- Small power installation
- Fire detection & alarms
- Lightning protection system
- ICT Structured Wiring and Associated Containment
- Security (intruder, access control, CCTV) installations
- Specialist Systems
- Disability Discrimination Act provisions
- External services
- Public realm services

9.1.1 Primary Low Voltage Distribution

LV switchboards will be manufactured in accordance with BS EN 60439-1. The form of separation will be defined in accordance with the EIEMA guide, which forms the National Annex to BS EN 60439-1.

The main switchboard standard for the university will be Form 4 of the EIEMA guide .

The primary LV switchboard will generally comprise of ACB's (withdrawable) for loads over 800A. Where automatic changeover between primary and secondary supplies is required this will be achieved via pairs of interlocked motorised ACB's. The switchboards will be designed so that it is fed from transformer or from diesel generator, with the provision to automatically disconnect one supply. Electrical and mechanical interlocks will be required to prevent paralleling of mains & generator supplies.

This arrangement will allow the best use of two incoming supplies and allow normal operation to be maintained in the event of a loss of one of the supplies, or maintenance on the system.

Provision will be made for both building power factor and future active harmonic filters at each of the main switchboards. Sub-main circuits emanating from these switchboards will either be routed to their terminal loads via bus-bar or multi-core XLPE/SWA/LSF cable, depending on the load and geographic location.

Power factor correction (PFC) equipment will be provided to ensure a minimum of 0.95 PF is achieved overall throughout the buildings.

Surge protection will also be provided to the main LV switchboard.

9.1.2 Final Low Voltage Distribution

In general, a floor sub-main distribution board will be provided on each floor, which will feed the entire primary floor loads directly (mechanical and equipment) and a local distribution board (dual metered split load lighting and power distribution boards).

The local distribution boards will be provided with digital multifunctional metering to comply with Building Regulations Part L2A and to enable sub-metering of specific area's energy usage, if required. Typically, they will include LCD displays, capable of providing phase-phase voltage, phase-neutral voltage, phase current, kVA, kVA Maximum Demand and power factor (as a minimum). All metering will be 'Modbus' compatible and will be linked to the university's site wide open protocol Building Management System with status visible via the front end server.

Emergency power shutdown switches in a shielded enclosure will be provided in all engineering laboratories/workshops at the point of exit, to facilitate emergency switching.

The distribution boards will be fed from the panel board via multi-core armoured XLPE/SWA/LSF cables. Sub-main cables will in general be distributed vertically in risers and horizontally down communal corridors, and raised floors or ducts, as required except in the ground floor FACE Building where there is no raised floor being provided.

Final Circuit Wiring Details

Cable Sizes

The following minimum cable sizes will be adopted unless otherwise instructed by the University. No fixed wiring cable will be less than 2.5mm^2 except where otherwise instructed.

Lighting Circuits

Wiring will comprise 2.5mm^2 single core, stranded conductors with LSOH insulation housed within a galvanised steel conduit and trunking system. Lighting circuits will be protected by 10 amp MCBs.

Final connections will comprise 0.75mm^2 3 core LSOH flexible heat resistant double insulated cable for normal luminaires and 4 core LSOH flexible heat resistant double insulated cable for emergency type, wired to the first luminaire on each circuit and then on a 'loop in' ' loop out' basis.

Final connection to recess mounted luminaires (other than connected to Lighting Control Modules) will be carried out using plug-in pattern KLIK type ceiling rose and a maximum length of 1.5 metres of heat resistant flexible double insulated cable.

Final connections to surface mounted and suspended luminaires will be from a concealed 'besa' box housing a terminal block and a maximum length 1.5 metres of heat resistant cable from the terminal block to the luminaire terminal block.

Socket Outlets

Cables feeding 13 ampere socket outlet final circuits will be either 2.5mm^2 single core stranded conductors with LSOH insulation in the form of ring circuits and protected by a 32 amp MCB or 4mm^2 single core stranded conductors with LSOH insulation in the form of radial circuits and protected by a 32 amp MCB. For the purposes of maintenance, all small power accessories will be labelled with their respective circuit reference, the type and nature of the labelling will be agreed with the University.

Labels and Circuit Schedules

Panel boards, switchboards and distribution boards will have permanently attached, in a conspicuous position, a rating plate of non-corrodible material. Each label will be engraved with any identifying name, type or serial number, together with ratings and details of the loading conditions under which the item of plant in question has been designed to operate.

All switchgear will be labelled with white on black 10 mm high letters on traffolyte labels. The labels will be secured with self-tapping screws.
Panel boards, Distribution Boards and Mechanical Control Centres will be constructed such that all live parts are fully shrouded to provide maximum safety to personnel when inspecting or removing circuit breakers with the distribution board energised. Distribution boards will be fully labelled

All circuit charts will be typed on white paper and protected within a Clear Polycarbonate Faced Frame and Fixed to the wall adjacent or opposite each Board / Panel. Distribution boards will be suitable for providing the necessary 'high integrity' earthing in accordance with the latest edition of the IEE wiring regulations BS7671.

Cable Containment
Main containment for LV power, fire alarm, ICT, security and other cabling will be routed within ceiling voids, along corridors, up/down risers, in dado or skirting trunking or other surface containment and flush within walls. Containment will be concealed in void spaces between floors.

Cable Tray / Basket / Ladder
Cable trays / basket will be of the galvanised steel type, and secured to supporting framework with easy bends and reducers as necessary. Where cable tray / basket passes through fire barriers a rock wool or intumescence infill will be provided. Cable trays / basket will be standard duty with a hot dipped galvanised finish.

Conduit
Conduit will be standard duty with a hot dipped galvanised finish.

9.1.3 Small Power Installation



A number of 13Amp 230V 50Hz outlets will be provided within all spaces as identified within the room data sheets

Dado Trunking: Dado trunking will be mounted throughout the spaces as required and populated with power outlets as specified on the room data sheets within this room Appendix.

Surface/Recessed Outlets: Single and three phase outlets will be mounted throughout the space as specified on the latest room data sheets. All mechanical services and specialists systems will be provided with power as necessary.

Outlets will generally be stand-alone flush mounted white plastic finish served via recessed conduit where plastered walls and surface mounted where non-plastered. Three- compartment white PVC dado trunking will be used in all offices and general except plant and workshops where surface conduit and metal-clad outlets will generally be used.

General Allowance for Socket Outlets
In general, in rooms where there are no defined work stations or activities these rooms will contain 1No. twin switched socket outlet per 5m^2 of floor space and at least 2no. twin switched socket outlets irrespective of size of room. Any specific equipment led requirements will be in addition to this provision. Likewise corridor and circulation areas will contain 1No. twin switched socket outlet every 10metres, as a minimum cleaning provision.

Emergency power off buttons will be required in all rooms with machinery or moving equipment and plantrooms, switchrooms etc

In all toilets, an allowance of at least 2no. 13A fused outlets will be provided serving hand dryers (only 1no. required within disabled toilet). The preferred hand dryers type and quantity will be provided as agreed with the University.

Generally plastic accessories will be used, with metallic finish covers to public spaces such as corridors, and to cleaners and plant rooms.

The precise requirements for socket outlets and other small power provision will be determined as part of the ongoing design development process.

Where appropriate, final circuits will meet the requirements for areas of high computer usage, in accordance with Section 607 of BS 7671 (IEE Wiring Regulations).

Power to ICT racks will be provided via dedicated circuits and 16A commando type outlets mounted under floor.

9.1.4 Electrical Lighting

9.1.4.1 Artificial Lighting

The majority of spaces within the FACE building propose luminaires that are suitable for mixed-use type spaces requiring flexible lighting solutions and levels. Due to the suspending ceiling finishes, many of the teaching rooms require ceiling recessed downlight. Some areas will require pendant lighting and industrial lighting. The selection of all luminaire fittings will be in conjunction with the architect and university.

Energy efficient light sources will be proposed throughout, with the use of LED lighting according to their merits in each space. The choice of fittings will be driven by many factors including maintenance, flexibility, conservation and cost efficiency, as well as the desires of the client and architect.

9.1.4.2 Illumination Levels

Illumination levels in each area will be in accordance with the CIBSE Lighting Codes and BS EN 12464-1:2002.

The Room Data Sheets and section 6 of the stage 3 report provide typical illumination levels of lighting in each area. These illumination levels will be reviewed with the university to determine opportunities to reduce the levels and hence minimise the energy usage (accepting that energy controls will greatly assist this aim. Refer to Lighting Controls section below).

Luminaires will be selected to minimise the number of different lamp types to ease maintenance.

Generally, LED's will be used wherever possible due to their longevity of life and low energy characteristics.

Careful consideration will need to be given to maintenance of luminaires and other ceiling mounted services at high level in the stairwells.

Generally, lighting will be controlled via occupancy detection with local override switches, however, where it would be viable, day light linked control will be considered for energy efficiency.

The precise requirements for lighting control will be determined as part of the design development process. However, the following section includes a discussion regarding lighting controls.

9.1.4.3 Lighting Controls

Lighting controls can dramatically affect the amount of energy used as well as the usability of spaces.

The majority of rooms will be provided with both manual and automatic lighting controls. The manual control, in the form of a traditional light switch, will be able to turn the lights on and off, regardless of the presence of automatic controls, and also dim up and down where possible. The automatic lighting controls will control DALI or similar dimmable ballasts within the luminaires, which will allow the luminaires to be dimmed in response to sufficient daylight being present, and deactivation should the room become unoccupied.

It is important that the lighting controls are integrated into the building and daylighting design. For rooms, which have large amounts of even daylight it, may be acceptable that all the lights are dimmed and controlled as one. However, with rooms which have more daylight at the front of the room than at the back it may be more appropriate to control them in zones. Controlling the luminaires in zones will allow the luminaires to respond in areas of high daylighting only, to retain an appropriate lit effect across the room.

To deliver this level of control it is proposed to employ an open protocol control system that will link to an IP backbone and integrate with an open protocol head end for overall display and management. The same head end also being used for management of the metering and other BMS systems within the building. An open protocol systems that will be future-proofed and not tied to one manufacturer's equipment will be employed.

9.1.4.4 External Lighting

External lighting will be provided to perform three primary functions:

- To provide illumination for safe access and egress to the building and its vicinity
- To provide architectural lighting to enhance the night time appearance of the building facade and entrance areas
- To provide a safe and secure feeling environment in the vicinity of the building

Facade lighting will be provided via discharge or LED lamp sources. This will be designed to provide a subtle illumination of the building facade to fit in with the surrounding illumination level, and provide some accent lighting to emphasise the building architecture.

All external lighting will be time switch and photocell controlled to ensure that lighting is only provided when required and when necessary, hence saving on energy usage. Compliance with "dark sky" criteria and control of obtrusive light is to be achieved using precise light control from the luminaire head/optic.

Lantern fittings will be mounted on the building OR pole-mounted - but not both in the same location. Ideally, building mounted fittings are preferred as they are less susceptible to damage and serve to bring out the architectural character of the building.

The fittings proposed are, as agreed with ESHA Architects, are as follows:

A Thorn CESAR up and down lighters.
B Wall-mounted down lighters only. Simpler fitting than CESAR, suitable for industrial character.
C Pole-mounted lights - similar to Thorn ALUMET STAGE - but much simpler.
D Soffit mounted down lighters.
G Thorn E/FACT recessed walk-over luminaires - circular.

- All lights typically 5m above ground level.
- Lights to pick up grid of building and accentuate brick piers and coloured panels, etc.
- Soffit lights to colonnade at 1 no. fitting per bay, mounted centrally.

The design should avoid fancy 'effect' lights like Satin 2, Vioot Jalon as the University is on a tight budget for both construction and maintenance.

Public Realm Areas:
Refer to specific sections detailing public realm requirements.

Entrance Areas:
Lighting will be required to illuminate the entrance and immediate vicinity, as well as providing emergency egress illumination.

Other Areas:
Footpaths, roadway and plaza lighting needs to be developed further at stage 4.

9.1.4.5 Emergency & Standby Lighting

Emergency and escape lighting will be provided in accordance with BS 5266 Emergency Lighting: Code of Practice for the Emergency Lighting of Premises: 2005.

Emergency lighting with integral batteries, charger, changeover unit and automatic central testing system to allow the lighting to operate for period of 3 hours without normal supply will be provided.

A full system of illuminated signage will be included to ensure the safe evacuation of the building, to match the fire strategy.

9.1.5 Back Up Generator Resilience Criteria

9.1.5.1 Introduction

This section considers various backup power generator options and provides an understanding of the need for a back-up power system.

The section of the report has been guided by information provided in the technical brief relating to essential power resilience and the planning documents.
The current scheme allows one life safety system to comply with BS9999 requiring electrical supplies to 'Life Safety' and 'Fire Fighting' systems are backed up by a secondary supply source independent of the primary power supply to the building.

This design development note requires a number of essential client queries to be answered in order to provide an accurate strategy proposal. To outline some technical items to consider moving forward, three preliminary approaches have been discussed that will ultimately be directed by the client responses to the questions highlighted in the next section.

Option 1) – Backup generators supplying property owner's life safety loads only;

Option 2) – Backup generators directly supplying property owner's life safety loads and building's essential load (loads to be defined by university);

Option 3) - Install fully rated generators to back up all university building loads.

The **Option 2)** is proposed as the University have not expressed a preference. Option B) is the backup generators directly supplying the buildings life safety loads and ICT equipment (via USP) only.

9.1.5.2 Back Up System Options

The following approaches have been developed as preliminary strategy proposals for client consideration. In order to fully establish any additional constraints or limitations, further investigation will be required.

Option A) – Back-up generators supplying property owner's life safety loads for individual building.

Option B) – Back-up generators supplying property owner's life safety loads for more than one.

Option C) – Back-up generators supplying property owner's life safety loads and essential loads for individual buildings.

Option D) – Back-up generators supplying property owner's life safety loads and properties essential load for more than one building.

Option E) – Back-up generators supplying the full peninsula site wide loads.

The above information has been taken from "Rules of Thumb – Guidelines for building services (5th editions)" issued by BSRIA provides information about Diesel generators.

No preference has been indicated by the University and therefore the current proposal is to adopt option C. **Option C**) is Back-up generator supplying property owner's life safety loads and essential loads for individual building.
Therefore the overall arrangement is proposed is option 2C from above.

9.1.6 Electrical Design Criteria – Life Safety

The following section identifies the design criteria concerning life safety system and the developments bask up (essential power) resilience.

9.1.6.1 The Life Safety System

Chapter 56 Safety Services – BS 7671: 2008(2011) considers a safety (essential) power supply to be additional to the primary (non-essential) source, which is generally the public supply network. Chapter 56 covers within its scope a large number of subject areas:

- Emergency Lighting
- Fire pumps
- Fire detection and alarm system
- CO detection and alarm systems
- Fire evacuation systems
- Smoke ventilation systems
- Fire and Rescue Services communication systems

9.1.6.2 Firefighting Lift

Fire Safety Strategy Report "Fire Safety Overview for UWTSD – Tech Building date 19.02.2015" by Fusion Fire Engineering does not require the provision of a fire fighting lift.

9.1.7 Load Assessment Back Up Generator

The client has requested that standby power is included to provide emergency electrical power to a number of key systems. A standby generator is required to serve these systems and is also common to other emergency systems, these other systems will also be powered by the generators to ensure that a reliable power supply is provided that can handle the full emergency load.

The scope for secondary (essential) power supply shall be reviewed by the client as the design progresses, but is likely to include:

- Cooling Server (typical power consumption 20kVA)
- IT Labs (typical power consumption 10kVA)
- ICT HUB (typical servers power consumption 20kVA)

In order to develop the primary and secondary power supply capacities, it is important to understand what performance is expected from each system.

In estimating the required size of generator we have assessed the following loadings, these loads are all estimated at this stage and will require a detailed analysis during the next stage of design:

LIFE SAFETY SYSTEM ONLY	LOAD (W)	TYPE
Emergency Lighting	1,000	Luminaires with battery pack / Back-up Generator
Fire pumps	10,000	Backup Generator
Fire detection and alarm system	700	Battery pack /Backup Generator
CO detection and alarm systems	100	Battery pack /Backup Generator
Smoke ventilation systems	7,000	Backup Generator
Fire and Rescue Services communication systems	500	Battery pack /Backup Generator
Total	19,300	

TOTAL GENERATOR LOADS	LOAD (W)	TYPE
Life Safety System (as above)	19,300	Luminaires with battery pack / Back-up Generator
Cooling Server	20,000	Back-up Generator
ICT HUB (4 x Server Rooms)	20,000	Back-up Generator/UPS
IT Labs	10,000	Back-up Generator/UPS
Total	69,300	

The scope for secondary (essential) power supply for FACE building shall be reviewed by the university as the design progresses through stage 4. However, allowing for voltage variances and loads / capacity of generators we have estimated rating of the back-up generator to be 300kVA.

The anticipated space requirement for a 300kVA automatic diesel generator is 4000mm(length) x 1500mm(width) x 2400mm(height)

Diesel Generator running time in full load up to 12 hours.

Fully Automatic Diesel Generator in Sound Proof Acoustic Enclosures will be installing. Sound Proof Acoustic Enclosures will be in accordance with the relevant BS standards.

9.1.8 Uninterruptable Power Supplies (UPS)

During power outage, the ICT equipment will revert to Uninterruptible Power Supply (UPS) with batteries until the back-up generator comes online, duration of UPS power supply is up to 30 minutes.

The only central UPS system provided as part of the base-build systems in the proposed building will be located in the ICT server room at first floor of the FACE building only. The electrical supply for each rack will be presented on two 32A commando type sockets with integral isolators. Typically, these sockets will be wall mounted and a cable tray route will be provided between the socket and the rack.

It is therefore assumed that any UPS requirements will be met from local units provided with the technical equipment that it supplies. Rack-mounted UPS with batteries will be provided and installed by the University. Ratings and scope to be determined at stage 4.

.

9.1.9 Disability Discrimination Act

As this is a building open to the public, special emphasis will be given to providing access in accordance with the Disability Discrimination Act (DDA), including heights of switches and outlets, the provision of disabled call alarms, refuge emergency voice communication system and hearing induction loops.

Other facilities will also include:

- Audio announcements within lifts;
- Electric hoists in disabled toilets;
- Door hold open mechanisms on corridor doors;
- Alarm pagers to relay any alarms;
- Automatic doors where practical and necessary.

Generally switching for lighting will be automatic, based on occupancy, however where manual over-ride is provided switching will be recessed mounted adjacent to door entries within rooms. Consideration will be given to contrasting switch plate colours in line with DDA (Disability Discrimination Act) recommendations and Building Regulations Part M.

9.1.10 Disabled Refuge Alarms

A Disabled Refuge Alarm system will be provided in accordance with BS 5839, Disability Discrimination Act (DDA) and Building Regulations for safe efficient emergency evacuation. The Disabled Refuge Alarm system will be interfaced with the fire alarm system, so as to operate only when fire alarm system is in fire evacuation mode.

The intended uses for the system are as follows:

- Use by the management of the building for its initial evacuation;
- Use by the fire service during and after evacuation;
- Use by disabled people.

The Disabled Refuge Alarm master station will be located within the main entrance lobby adjacent to the fire alarm panel with 24 hour battery backup, intercom, audio/visual alarm and a remote intercom unit with reassurance lamp at the refuge outstation.

Outstations for use by disabled people will be located in designated refuges and be mounted at a height appropriate to the application.
All wiring associated with the Disabled Refuge Alarm system will be carried out using Enhanced fire resisting pliable red sheathed cables manufactured to BS 7629 and will meet the PH120 classification in accordance with EN 50200 clipped direct or installed on dedicated cable tray/basket.

9.1.11 Disabled Call Systems

As recommended by Part M of the Building Regulations a call system will be provided within disabled toilets and staircase refuges, to allow assistance to be summoned should the need arise.

9.1.12 Fire Detection & Alarm Systems

Fire Safety Strategy Report “Fire Safety Overview for UWTSD – Tech Building date 19.02.2015” by Fusion Fire Engineering request to provide an L3 alarm and detection system install in accordance with BS 5839 Part 1:2013. This system will provide detection in all rooms that open on to an escape route.

An analogue addressable fire detection and alarm system is proposed to meet the requirements of local Building Control, Building Insurers, BS 5839 Part 1:2002 and the relevant sections of BS 5588.

The system will comprise individual detectors, infra-red beam detectors, sounders, xenon beacons, break glass units, relay and interface units, with the main indicator panel installed near the main entrance. The main fire alarm panel will be electrically fed directly from the main switch-panel. The precise level of coverage will be subject to further discussions during the design development phase.

The system will include the relevant equipment for remote monitoring and auto-dialling communication to the duty key-holder.

The main control panel will be capable of full alarm, fault and health monitoring status of the loops and will indicate the continuous status of the various zones / devices. Upon activation, a text display on the panel will indicate the zone, loop number, device location and device address of the particular fault.

Fire detection will initiate the building sounders to provide a full evacuation of the building. Visual beacons will be provided in WC and communal areas as appropriate to aid people with hearing impairments. Remote indicators will be provided in a visible location where detectors are out of normal visibility.

Wiring will be carried out in fire resistant, LSOH cabling to preserve the system’s fire integrity and will be selected and installed to suit the requirements of BS 5839.

Interface units will automatically isolate the incoming gas supply and shut down any central ventilation system. Local fans, e.g. wall fans, will be switched off manually by those present. The mechanical control panels(s) will be provided with an override facility to ensure continuous plant run during fire alarm tests.

All interfaces will be wired direct to the appropriate devices; the fire alarm will not be activated via any mechanical control equipment. The fire alarm

will additionally interface with the mechanical controls, but only to bring up an alarm message for information only.

In the event of a fire, the following will occur to the mechanical services, via the BMS and interface units:

- Shut down air handling plant;
- Close dampers;
- Return lifts to access floor and open doors;
- Auto dial an alarm signal to the emergency services via a BT "Redcare" type telephone line;
- Unlock controlled access areas / doors.

9.1.13 Lightning Protection and Earthing

A lightning protection system will be provided in accordance with the requirements and recommendations of BS EN 62305.

The system will comprise an air termination network, linked to down conductors, connected to pit located earth electrodes or mats via test/disconnect links. The main switch-panel will be fitted with a mains surge protection device and all incoming / outgoing cabling to the building will be fitted with lightning surge arresting devices. The routing of the down conductors will be carefully considered and agreed with the architect.

The lightning protection system for the structure / building will be effectively bonded to the main earthing terminal in accordance with the requirements BS 7430:1998, along with all incoming services, gas, water etc.

Earthing of the building will generally be provided to comply with BS7671 and BS3740.

9.1.14 Laboratory Type Equipment

Currently little is known about the fixed items of specialist equipment, which will be required. Refer to section Room Data Sheet of this document for further details as part of the RIBA Stage 4 (Technical Design) process it will be necessary to review with the users each area in turn, to ensure that all major items of equipment are located and serviced.

9.1.15 Power Supplies to Mechanical Plant and Specialist Large Load

Generally, all Motor Control Centres (MCC) will be supplied directly from the main LV switchboards using multi-core XLPE/SWA/LSF cable. The only exception to this will be light current loads to items such as Fan Coil Units and controllers, which will be supplied from local small power distribution boards.

9.1.16 Public Address Systems

No Public Address system is proposed for this facility

9.1.17 IT and Telecommunications Infrastructure

The need to extend the existing IT and telecommunications infrastructure into the new centre site buildings will be required. Refer to section 11 of this document for further details.

9.1.18 Passenger Lift Engineering Services

Machine-roomless electric traction passenger/disabled lifts will be provided in the main circulation core to serve from ground to third floor levels.

A further traffic simulation will be carried out at stage 4 to determine a 'Good' service as defined with the latest lift directives *CIBSE Guide D "Transportation Systems in Buildings".*

CIBSE requirements are:
Universities and other education buildings are mixed function: lecture rooms, laboratory and offices. The main feature of the university campus is the lecture changeover period.

There are hourly cycles of 10 minutes of demand before and after each 50-minute lecture, tutorial or seminar session. In between the peaks the activity levels are low. To install lift in a tall building to suit this demand is not cost effective. However, the FACE Building is categorised as a low-high building.

A better solution is to try to rearrange the activities in the building to reduce the load on the lifts. It would be possible to reduce the demands made for 10 minutes every hour by:

- Placing lecture facilities in the lower levels, say basement, ground and three to four floors above the entrance level. Students can be encouraged to use stairs if they are wide, well-lit and visible.
- Laboratory, bulk service facilities (computer clusters, libraries) and student administration (registrars, bursars, careers advisory etc.) can be placed from the fourth floor upwards. These are either used for periods longer than one hour (laboratories), shorter than one hour (administration) or randomly (libraries).
- Offices should be placed at the top of the building. Their occupants will generally use the lifts on a more random basis.

Calculation details:
- Occupancy:
  Max occupancy number 1321, max lifts users: 500 or 37%,
- Building information:
  Type – Office,
  Usage – Multiple tenant, fixed working hours
- Zone information:
  Number stops – 3,
  Travel for the zone 13m
- Refer to Appendix of this document for KONE Lift calculation details
- Car size: 13 person x 2

The Lift finishes will be specified in accordance with the finishing requirements of both the University and Architect.

9.1.19 Metering

Part of L of the Building regulations is the starting point for the requirement to meter provision in a new building. Compliance with this document is achieved by compliance with CIBSE document TM39.

Thus the minimum metering provision will be that which is required to meet TM39. Whilst TM39 allows for the calculation of lighting load, our intention is to directly measure this element as split lighting and power distribution boards are to be provided. During stage 4 report, any additional meters that are required to correctly record the process load within the building will be agreed with the university.

9.1.20 Closed Circuit Television (CCTV) and Intruder Alarms

The need to extend the UWTSD's CCTV and access control system into the new Peninsular site buildings will be required. Additional information may be located within Section 12 of this document. At this stage, until preliminary layouts are available it is not possible to finalise the brief, beyond acknowledging the need to incorporate the systems. The Secure-By-Design report has been considered in sections 1 and 12.

9.1.21 Building Management System (BMS)

A Building Management System (BMS) will be provided to fulfil these requirements, however whilst it is noted that any lighting control provided needs to integrate into the BMS system, the method of achieving this requirement needs to be agreed with the university. An initial meeting with the estates department has been held and these will be ongoing throughout the design, to ensure that the delivered solution is fully compliant and fulfils the university's needs.

The system installed for the new buildings will be required to communicate and be fully compatible with the University existing based controls system.

Please also refer to section 8.1 (mechanical) for more details.

9.1.22 Photovoltaics (PV)

A Photovoltaic solar array will be provided to the roof of FACE building (to be confirmed and in line with the planning conditions).

- The photovoltaic system will consist of PV panels fixed to the roof of the building (pitched facing south) to ensure the maximum efficiency of the PV panels is achieved.
- The photovoltaic system will ideally face south at an incline of 30 degrees to the horizontal, although orientations within 45 degrees of south are acceptable.
- The photovoltaic system will be designed such that all PV panels are un-shaded.
- The system will be designed to provide maximum system efficiency using a panel area of utilising mono-crystalline panels at an orientation of 30 to 45 degrees above horizontal (facing south).
- The photovoltaic system electrical equipment will comprise inverters, isolator switches, meters and cable connections for a grid connection via the main LV switch panel.
- The photovoltaic system inverters will be located at the level below the roof.
- The works will be closely co-ordinated with drawings and details prepared by Architects and Structural Engineers and will be undertaken in accordance with CDM Requirements.

.

9.2 Library Building

This section of the report details the design strategy for electrical services.

The scope of the electrical installation will include the following elements:

- Incoming supply;
- LV distribution;
- Lighting and emergency lighting;
- Small power installation
- Fire detection & alarms
- Lightning protection system
- ICT Structured Wiring and Associated Containment
- Security installations
- Specialist Systems
- Disability Discrimination Act provisions
- External services

The requirements for the library will be based upon the requirements for the FACE Building unless specifically identified below.

Where the sub-heading is provided but no body text is shown this means that the requirements are the same as for the FACE Building.

9.2.1 Primary Low Voltage Distribution

The main LV switchboard standard for the university will be Form 4 of the EIEMA guide.

The main LV switchboard will be fed from an LV underground cable via an estimated 400A cut-out/CT meter-panel with 250A fuses. The primary LV switchboard will generally comprise of MCCB's.

Provision will be made for both power factor and harmonic control at primary LV switchboard. Sub-main circuits emanating from this switchboard will be routed to their terminal loads via multi-core XLPE/SWA/LSF cable.

9.2.2 Final Low Voltage Distribution

9.2.3 Small Power Installation

Small power layouts will need to be modified once the library furniture layouts are known.

9.2.4 Electrical Lighting

9.2.4.1 Artificial Lighting

The spaces within the Library building will be a mix of specific luminaires suitable for the library environment and other more general spaces for mixed-use type spaces requiring flexible lighting solutions and levels.

Reference will be made to CIBSE Guidance for suitable Lighting of Libraries and similar buildings.

9.2.4.2 Illumination Levels

9.2.4.3 Lighting Controls

9.2.4.4 External Lighting

9.2.4.5 Emergency & Standby Lighting

9.2.5 Back Up Generator Resilience Criteria

9.2.5.1 Introduction

9.2.5.2 Back Up System Options

9.2.6 Electrical Design Criteria – Life Safety

9.2.6.1 The Life Safety System

9.2.6.2 Firefighting Lift

9.2.7 Load Assessment Back Up Generator

The scope for secondary (essential) power supply is to be reviewed by the client as the design progresses, but is like to include:

- Cooling ICT Data Room (typical power consumption 15kVA)
- ICT Data Room (typical data power consumption 15kVA)

In order to develop the primary and secondary power supply capacities, it is important to understand what performance is expected from each system.

In estimating the required size of generator we have assessed the following loadings:

LIFE SAFETY SYSTEM ONLY	LOAD (W)	TYPE
Emergency Lighting	500	Luminaires with battery pack / Central Battery system
Fire pumps	5,000	Backup Generator
Fire detection and alarm system	200	Battery pack
Smoke ventilation systems	2,000	Backup Generator
Fire and Rescue Services communication systems	500	Battery pack
Total	8,200	

TOTLA GENERATOR LOADS	LOAD (W)	TYPE
Life Safety System (as above)	8,200	Luminaires with battery pack / Back-up Generator
Cooling Data Rooms	15,000	Back-up Generator
ICT Data Rooms (3x Data Rooms)	15,000	Back-up Generator/UPS
Total	38,200	

The scope for secondary (essential) power supply for Library building is to be reviewed by the client as the design progresses, we believe back-up generator up to 75kVA will be required.

Space requirement for back-up generator is:
Generator enclose: 1700mm(length) x 800mm(width) x 1400mm(height)
Fuel Tank Capacity: 12hours at full-load (min)

9.2.8 Uninterruptable Power Supplies (UPS)

Ratings and scope to be determined at stage 4. The University will provide its own UPS for ICT.

9.2.9 Disability Discrimination Act

9.2.10 Disabled Refuge Alarms

9.2.11 Disabled Call Systems

9.2.12 Fire Detection & Alarm Systems

An L1 classification of protection.

9.2.13 Lightning Protection and Earthing

9.2.14 Laboratory Type Equipment

None within the library.

9.2.15 Power Supplies to Mechanical Plant and Specialist Large Load

9.2.16 Public Address Systems

9.2.17 IT and Telecommunications Infrastructure

9.2.18 Passenger Lift Engineering Services

Machine-roomless electric traction passenger/disabled lifts will be provided in the main circulation core to serve from ground to second floor levels.

A further traffic simulation will be carried out at stage 4 to determine a 'Good' service as defined with the latest lift directives CIBSE Guide D "Transportation Systems in Buildings".

CIBSE requirements are:
Laboratory, bulk service facilities (computer clusters, libraries) and student administration (registrars, bursars, careers advisory etc. can be placed from the fourth floor upwards. These are either used for periods longer than one hour (laboratories), shorter than one hour (administration) or randomly (libraries).

Calculation details:

- Occupancy:

Max occupancy number: Ground Floor: 600, 1st Floor 575, 2nd 716, total 1891

- Building information:

Type – Library
Usage – Multiple tenants, flexi working hours

- Zone information:

Number stops – 2,
Travel for the zone 6m

- Refer to Appendix of this document for KONE Lift calculation details
- Car size: 10 person x 2

The Lift finishes will be specified in accordance with the finishing requirements of both the University and Architect

9.2.19 Metering

9.2.20 Closed Circuit Television (CCTV) and Intruder Alarms

9.2.21 Building Management System (BMS)

9.2.22 Photovoltaics (PV)

A Photovoltaic solar array will be provided to the roof of Library building (to be confirmed and in line with the planning conditions).

.

Public health engineering 10

10 Public health engineering proposals

10.1 Sanitary Systems

The public health system will be designed to provide a fully ventilated soil and waste system, serving all items of sanitary equipment. The stacks will be arranged to connect into vertical risers dropping through the building to ground level, from where a gravity outfall to the local sewer or underground drainage system can be made.

The above ground foul drainage will meet the performance objectives stated in BS EN 12056 and will be provided using the minimum pipework and fittings necessary to carry away all foul discharges from the building to the below ground drainage system, quickly, quietly and with freedom from nuisance or risk of injury to health.

Where possible air admittance valves will be utilised in preference to open ventilation pipework passing through the structure to atmosphere.

In general, stub stacks will be provided which will terminate with air admittance valves or access caps which will be installed above the flood level of the appliances served. A number of soil stacks will rise to roof level and terminate with a vent cowl before discharge to atmosphere, to ensure that the below ground drainage system is vented.

Falls on soil waste and vent pipes will not fall below the minimum stated in BS EN 12056-2 Gravity drainage Systems inside buildings – Sanitary pipework, layout and calculation.

Adequate drainage facilities for the mechanical services equipment and plant will be provided

10.2 Laboratory System

A chemically resistant pipework system will be provided to collect waste from the various items of laboratory equipment. This system will remain independent from other sanitary systems, until final connection into the underground drainage system. It is anticipated that chemical waste will be limited to isolated laboratory areas; however, the full extent will need to be identified during briefings at the start of RIBA Stage 4.

10.3 Condensate Waste

A gravity condensate system will be included to collect condensate waste from the various items of mechanical equipment. Generally the pipework will be arranged to discharge over gullies located within plantrooms.

Condensate from fan coil units will be trapped before connecting to the soil and waste system

10.4 Underground Drainage

The design of the underground drainage system(s) will be undertaken by the structural engineer. Any gullies, channels, outlets, pipework etc. at or below floor slab level, will be detailed and specified by the structural engineer.

10.5 Rainwater Harvesting

Rainwater from the roof areas will be piped via the rainwater down pipes and underground pipework to the underground rainwater storage tank, location to be agreed with the structural engineers.

The collected rainwater will pass through a 500 micron filter before entering the sedimentation chamber comprising the first portion of the tank to allow suspended materials to settle from the water.

An inlet calming device will be fitted to the inlet of the sediment chamber to prevent the settled particles from being disturbed and mixing with the stored water.

Water will be pumped from the below ground rainwater storage tank via a submersible pump (fitted with an inlet filter and floating inlet connection) into the building to the control/combi unit.

This unit will include storage tank, pressure set, intelligent controlled automatic backwashing filtration, system electrics, electrical processor control, WRAS compliant mains water top-up. Mains cold water will be provided to the control/combi unit for use during periods of low rain fall with all associated isolation valves and pressure reducing valves sets as required to accommodate the manufacturer's specific requirements.

An UV disinfection system including all associated valves and fittings is to be included after the control/Combi Unit to reduce the risk of disease from water borne bacteria and viruses.

The installation will incorporate metering facilities to enable both harvested and mains water monitoring.

10.6 Dry Risers

A dry riser installation will be provided at each of the three stair cores to facilitate the effective distribution of water for firefighting purposes, from Fire Brigade appliances at Fire Service access level to other levels of the building, by providing a dry rising main (dry riser) at the locations indicated on the fire strategy drawings

Each dry riser installation will be complete with all necessary, recessed inlet and outlet cabinets, inlet breeching valves, landing valves, air release valves and drain valves to form a complete installation in accordance with BS5041.

10.7 Hydrants

A reliable and suitable sized supply will be extended from Welsh Waters infrastructure for firefighting purposes.

Fire hydrants will be provided at strategic positions around the building to enable the Fire Brigade standpipes or appliances to be connected to the local water supplier's water network for firefighting purposes in accordance with the fire authority's requirements and the fire strategy report.

Ensure that hydrants are located to serve all dry risers and suggested Fire Fighting locations in accordance with relevant standards, reference should be made to the Fire Strategy report.

Final Fire Hydrant locations will be agreed with Fire Officer/Local Authority to provide adequate coverage for the site and dry riser inlets.

10.8 Sprinklers

A standalone sprinkler system will be installed as part for the Client's fixed furniture contract to serve Dyno Cells 01 and 02.

No allowance has been made to provide a sprinkler installation in the remainder of the building.

10.9 Smoke Extract

A smoke control scheme will be provided in the atrium in accordance with BS 9999 to:

- Prevent smoke and hot gases from spreading from one smoke control zone to another and to maintain integrity of fire rated constructions.
- Maintain flowing smoke levels above escape routes.
- Provide continuous dilution of smoke and hot gases to a safe concentration.
- Provide effective removal of any residual smoke from the building after the fire has been suppressed.
- The scheme will be further developed during Stage 4 in conjunction with the fire strategy report.

The stair core designated as a fire fighting core will be provided with a smoke extract system to the Stairs cores in accordance with the Fire Strategy. Automatic opening vent (AOV) will be provided at the head of each stair with a free area of 1.0m^2, AOV with a free area of 1.5m^2 sited at each level within the lobby.

The firefighting shaft smoke control will be in accordance with BS 5588 Section 13.

Information communications technology (ICT)

11

11 Information communications technology (ICT)

11.1 Introduction

The overall intent for the University is a significant reliance upon ICT for teaching and its use within the flexi learning and teaching spaces and is likely to develop considerably in the future to include the use of many new technology based teaching initiatives and devices.

Overall device support will need to include more student user owned devices such as tablet, smart phone, and eBooks, in addition to laptop support, and for the continued development of ICT based presentation methods within teaching spaces, and for the wider use of technology in learning resources centre areas.

The detailed scope of works for ICT, A-V and FF&E is outside the scope of this stage 3 report. The scope of this report does however include the spatial allowances for ICT cabling, cable containment, power and cooling provisions along with data outlets and associated small power as determined by the ICT Task Group and published within the Room Data Sheets (RDS) and ICT schedules.

11.2 Outline Strategy

The ICT Task Group has determined that the overall ICT infrastructure will be based around a backbone of copper/fibre based cabling, with supplementary wireless technology delivering flexibility and additional coverage capabilities. Wireless technology is provided via the copper/fibre backbone.

There will be a requirement for a main ICT room (server room) and subsidiary ICT distribution rooms (data rooms) throughout the FACE building. It is a requirement of the University's ICT Task Group that a large main IT server room will be located within FACE building at first floor level.

Similar provisions will be provided for the Library building as described within section 11.3.

The complete installation should be labelled to allow the systems to be handed over to the client's IT&S team; installations must also be documented on the master drawings and must carry a 25yr guarantee (where possible).

11.3 Core ICT Requirements

The following list of documents, drawings and schedules provide an understanding of the University's overall core requirements for the ICT provision for phase 1.

- S1 CAMPUS – Network Infrastructure (06/01/2016)
- University of Wales Trinity Saint David's SA1 IT Infrastructure Standards (Version1.4 January 2016)
- SA1 ICT points (scheduled)
- FACE Building Rack Diagram (option 2)
- Library Building Rack Diagram (option 2)
- Room Data Sheets

Further details are provided within Section 16 Appendix – ICT documents and Room Data Sheet (RDS).

11.4 Extracts from UWTSD's SA1 IT Infrastructure Standards

The ICT active equipment including but not limited to switches, routers, patch panels, storage devices, servers, communication modems, Rack UPS, racks, PC with Audio Visual equipment will be designed, delivered and installed by the University and will not form part of the base-build works undertaken by the contractor.

Paragraph 4.1.1 Communication with IT&S

The IT&S department will need to be involved at every stage of the project (feasibility, planning, pre-tender, first fix, fit out, etc.) to sign off the IT components as this has a direct effect on the end service the IT&S department supports. Also, any client IT requirement needs to be discussed with the IT&S and TEL department in advance. For example, AV needs can be as simple as a reception information screen to as complex as a video wall.

Paragraph 4.2.1.3 IT Network Infrastructure
The infrastructure service summary describes what the end user interacts with, for example, a telephone, credit card terminal, copier, etc. The user doesn't see the support infrastructure which lies behind this but any project plan must include it.

See section 5 for IT&S infrastructure standards.

Paragraph 5.1 Data Cabling
All data and voice cabling shall be structured and conform to the standards in this document. Any analogue line into a building will be terminated at the main ICT room with the actual end service being carried on the building's structure data cables. Note analogue lines are being deprecated and specific contact should be made with IT&S before specifying any solution involving analogue telephone lines.

Paragraph 5.1.1 Cabling Standards
A combination of Copper and Fibre cabling throughout is recommended for SA1. Structured copper cabling has a very long operational life and this standard appears to offer the best value.

For SA1 the copper cabling standards planned to be used will be based on performance, to achieve 10Gbps over 100m. This factors in the delays before implementation and doesn't tie the standards in to any existing cabling standard at this point. This type of cabling would be utilised from all data cabs to the desktop. In addition to these cables we would also ask that provision is made for Fibre cabling runs to duplicate those of the copper cabling but not to be terminated at the data cabinets or desktop ends. Fibre cabling ensures that the infrastructure is futureproof and limits future requirements to replace/upgrade the core IT infrastructure.
For all cab to cab connectivity, then Fibre shall be used and will be double fed for resiliency.

Installed data cabling systems shall, where possible, be sourced from a single manufacturer/supplier from an IT&S approved list, this includes fixed cables, patch panels and patch leads. Cabling shall be installed to the manufacturer's best practice guidelines and to be handed over with the

suppliers' 25-year installation warranty. The installation may need to be inspected by the manufacturer's representative before they will award this guarantee.

Infrastructure	*Details*	*Minimum Specification/Model*
Fibre Cable	*- The fibre installers must conform to UWTSD standards and must show evidence of this. Installed fibre specification shall be discussed with IT&S on a per-project basis, but will typically be as per the specs listed here.* *- Double fed to Data Cabs and in place to desktops in addition to the copper cabling.*	*- 50/125 microns (IT&S will require consulting as there are exceptions)* *- OM4* *- SC or LC termination* *- 24/48 core* *- Mono-mode* *- CST armoured* *- Low Smoke Halogen Cables* *-Terminated in 12 pair duplex SC 1U patch panel* *- IT&S to be supplied with OTDR results*
Fibre Patch Panel	*- SC/LC terminations* *- Clearly labelled according to the labelling standard defined earlier in the document. This label must not obstruct locations for labelling individual pairs.*	*All terminations shall be in 12 pair duplex SC/LC 2U patch panels.*
Copper Cable	*- Cables lengths to be kept under 100m* *- Cable installation shall be according to manufacturer's best practice recommendations.* *- Cable, patch panels and face plates shall all be sourced from the same product range of a single manufacturer.* *- When terminated all cable terminations shall be labelled according to the labelling standard detailed earlier in this document.*	*- Minimum of 10Gbps over 100m* *- Cabling must be fully compatible with RJ45 connections (be it via RJ45 or GG45 connections)* *- IT&S to be supplied with Copper cabling certification*
Copper patch panel	*- 48 port* *- All Building services (CCTV, etc) data network points to be terminated to IT&S own patch panel which shall typically be installed at the top of the rack.* *- Cable, patch panels and face plates shall where possible, all be sourced from the same product range of a single manufacturer.*	*- 48 port* *- Patch panel must be labelled in sequence with existing panels. Horizontal cable management is to be inserted between every patch panel.*
Wired Network Point	*- All wired network points must be marked on the estates master building drawings* *- All network points shall be labelled according to the labelling standard detailed earlier in this document.* *- Cable, patch panels and face plates shall, where possible, all be sourced from the same product range of a single manufacturer*	*-Floor boxes are preferred to increase flexibility of room usage* *-But wall mounted faceplate sockets can be utilised*
Cable trays	*- Data cables shall be supported over the full length of their run on cable tray according to best practice guidance of cabling manufacturer.* *- Cable tray shall not be more than 50% full at installation.* *Recommended bend radiuses shall be observed at all times.* *Velcro cable ties are to be used to avoid damaging the data cables.* *- Cables shall be secured in bundles of no more than 24 in all cases.*	

Paragraph 5.2 Site Data Connection
With regards to SA1 the specific requirement is detailed below:

Infrastructure	*Details*	*Minimum Specification/Model*
Site Network LAN Connection	*The site must be connected to the Janet network via PSBA.* *The setup must be fully resilient based on the following:* *- 2 x data connections* *- Separate entry points in separate buildings* *- Isolated ducting for each* *LAN/WAN – As part of the wider WAN there will be a requirement to connect to existing other local sites. The proposed connection location from the new SA1 sites is to Technium 2 (SA1 8PH).*	*- 2 x 1Gbps* *- Two separate physical entry points* *- Ducting via each entry points to be fully isolated from each other to the existing BT Openreach services* *- Fibre connectivity from SA1 server rooms to Technium 2*

Paragraph 5.3 Underground Ducts
Paragraph 5.3.1 Standard

Infrastructure	*Details*	*Minimum Specification/Model*
Underground Duct	*Project dependant but unless otherwise stated all ductwork shall be 100mm single tubes laid to telecoms standards*	*- IT requirements* *Bend Radii* *Inclusion of duct draw cords* *- All installations will be to New Roads and Street Works Act*

	with marker tape above the duct and a copper/fibre trace wire in the duct. *All chamber covers shall be of a lockable design and suitable for their location. Chamber lids must be cast iron where they are in the carriageway, but may be concrete and steel in the footway. Pressed steel lids are not acceptable at any point. The chamber lids shall feature the agreed text.* *With reference to the Site Data connections, entry points to the 2 x server rooms must be isolated from each other to ensure resilience. This will be right up until they connect to BT Openreach services at separate points.*	*standards and specification SROH used (Specification for Reinstatement of Openings in Highways).* *- The duct shall be 100mm subsurface type carrying the agreed text at intervals.* *- All civil construction work shall be warranted for a minimum of two years from completion of the project, in line with the highways liability period for defects.*

Paragraph: 5.4 Server Room

A dedicated UWTSD IT&S server room is required for the SA1 site, with no shared occupancy envisaged. A server room is defined as containing the main site connection, servers, cable termination and switching. In all cases no ladders or special equipment shall be required to access the server room or the communications rack. The room shall be secured ideally using the sites ID card electronic lock or equivalent code/lock system.

Paragraph 5.4.1 Standard

Infrastructure	*Details*	*Minimum Specification/Model*
Server Room	*The server room must be identified on the drawing and must be big enough to accommodate the required racks and a working space all around the rack.* *- The server room must be on the first floor or above* *- Nearby access to service areas to install outdoor cooling units* *- In all cases no ladders, special equipment shall be required to access the data room or the communications rack. The room shall be secured using a ID card electronic lock or equivalent code/lock system* *- The room must be maintained at a temperature of no more than 23° C* *-Server Rooms must not have a dual role, for example: cleaners store, electrical switch room etc.* *- Access to rooms must not be by means of another room* *- Lighting shall be provided to a minimum of 500lux.* *- Light fittings shall be positioned to the front and rear of rack to maintain light levels when racks are installed.* *- Raised floor required (2ft recommended)*	*- Dimensions 1200mm x 800mm per rack + 1000mm on all sides' front and rear. Thus minimum size room for 1 rack is 3200mm x 2800mm* *- Room size will be dependent on the SA1 infrastructure footprint*
	- Floor grid system should contain pedestals, bolted stringers and tiles *- Floor tile dimensions should be 600x600* *- Floor load capacity should meet the following criteria:* *- Point load of approximately 3KN.* *- Uniform distribution load of approximately 15KN* *- Floor should have pedestals, primary and secondary stringer bars of steel.* *- Perforated tiles to be used as exit points for under the floor air conditioning* *- Suspended Ceiling (12 feet clearance above raised floor)* *- Overhead cabling required* *Preferred internal cab layout (patch panels/switching) – See section 5.5.2* *- 24/7 access for authorised staff* *- Data distribution redundancy – fibre feeds from different routes* ***- No water, steam, hot, cold, drain piping etc. should run above/below/adjacent to the server room*** *- CCTV surveillance both inside and outside of the server room*	

	- Fire alerting/suppression system *- Environmental monitoring system with real time monitoring, alerting of intrusion, AC power failure, high/low voltage, generator failure, UPS failure, temperature/humidity, breaker trips and water leak detections*	
Electrical	***- The electrical supply for each rack shall be presented on two 32A commando type sockets with integral isolators. Typically, these sockets shall be wall mounted and a cable tray route shall be provided between the socket and the rack. (In smaller installations, two 13A feeds are sufficient.)*** ***- Power redundancy – dual electrical service feeds and distribution from different power grid sub-stations, with backup generator supply and local or room UPS.*** ***- An earth bar shall be fitted and racks shall be individually earthed to earth bar.***	*- Each supply shall be from a separate MCB. These power supplies shall not be used to supply any additional equipment.*

Paragraph 5.5. Data room

A dedicated data room per floor is required for all normal installations. A data room is defined as containing only cable termination and switching (no servers etc.). For SA1 this may also include the secondary site data connection entry. For smaller installations of less than about 72 points, the data room can be to the more relaxed data room small specification. In all cases no ladders or special equipment shall be required to access the data room or the communications rack. The room shall be secured ideally using the sites ID card electronic lock or equivalent code/lock system.

Paragraph 5.5.1.Standard

Infrastructure	*Details*	*Minimum Specification/Model*
Data Room	*The data room must be identified on the drawing and must be big enough to accommodate the standard rack and a working space all around the rack.* *-In all cases no ladders, special equipment shall be required to access the data room or the communications rack. The room shall be secured using a ID card electronic lock or equivalent code/lock system* *-The room must be maintained at a temperature of no more than 23o C. Free air cooling is likely to be satisfactory for all rooms except data centres. (Air circulation to the outside or suitable large volume provided by a temperature controlled fan.)* *-Internal rooms with no ventilation will overheat* *-Rooms must not have a dual role, for example: cleaners store, electrical switch room etc.* *-Access to rooms must not be by means of another room* *-Lighting shall be provided to a minimum of 500lux. Light fittings shall be positioned to the front and rear of rack to maintain light levels when racks are installed.* *- Overhead cabling preferred to underfloor* *- Preferred internal cab layout (patch panels/switching) – See section 5.5.2* *- Double fed Fibre connectivity to site server room*	*-Dimensions 1200mm x 800mm per rack + 1000mm on all sides front and rear. Thus minimum size room for 1 rack is 3200mm x 2800mm*
Data Room (small)	*The data room must be identified on the drawing and must be big enough to accommodate the standard rack and a working space on one side and to the rear of the rack.* *-In all cases no ladders, special equipment shall be required to access the data room or the communications rack. The room shall be secured using a ID card electronic lock or equivalent code/lock system* *-The room must be maintained at a temperature of no more than 23o C. Free air cooling is likely to be satisfactory for all rooms except data centres. (Air circulation to the outside or suitable large volume provided by a temperature controlled fan.)* *-Rooms that are also house electrical switch gear or other building infrastructure may be acceptable, with the*	*-Dimensions 800mm x 800mm per rack + 500mm on one side, front and rear, thus the minimum size room for 1 rack 1300mm wide x 1800mm deep.*

	agreements of estates, but must be secured using the ID card access controlled system or dedicated code/lock system, NOT an A sub master. Locating a rack in an office is not acceptable. Locating the rack in a store room is not acceptable. *-If access is via another room, then access control for this room must also be achieved using the ID card electronic lock or equivalent code/lock system* *- Lighting shall be provided to a minimum of 500lux. Light fittings shall be positioned to the front and rear of rack to maintain light levels when racks are installed.* *- Open framed racks may be specified and may allow smaller working spaces – to be agreed on a case by case basis. Open racks shall not be used in any shared space.* *- Preferred internal cab layout (patch panels/switching) – See section 5.5.2* *- Double fed Fibre connectivity to site server room*	
Electrical	***- The electrical supply for each rack shall be presented on two 32A commando type sockets with integral isolators.***	*-Each supply shall be from a separate MCB. These power supplies shall not be used to supply any additional equipment.*
	Typically, these sockets shall be wall mounted and a cable tray route shall be provided between the socket and the rack. (In smaller installations, two 13A feeds are sufficient.) ***-In new builds consideration shall be given to a central UPS which shall feed one of the 32A supplies to each rack in the building.*** ***-An earth bar shall be fitted and racks shall be individually earthed to earth bar.***	

Paragraph 5.5.2Data Cabinet

Infrastructure	*Details*	*Minimum Specification/Model*
Cabinet	*- For every 48 port patch panel to be installed in the cabinet, the specialist shall allow 3U of cabinet space for associated equipment and cable management.* *- Each cabinet to be supplied with 2 PDUs* *- Power is to be supplied to the PDUs by 32A commando sockets.* *- Lockable door at front and rear* *-80% free area doors front and rear* *- Not wall mounted* *- Room heat load must be considered* *- Must be floor standing* *- All racks shall be grounded* *- All cables to be supported by cable trays (see cable tray section)* *- Double fed Fibre connectivity to site server room*	*- PDU spec varies with application, consult IT&S.* *- Dimensions 800mm wide, 1200mm deep, 42u high*
Cabinet (small installation)	*-For every 48 port patch panel to be installed in the cabinet, the specialist shall allow 3U of cabinet space for associated equipment and cable management.* *-Each cabinet to be supplied with 2 PDUs* *-Power is to be supplied to the PDUs by 13A sockets.* *-Lockable door at front and rear* *-80% free area doors front and rear* *-Not wall mounted* *-Room heat load must be considered* *-Must be floor standing* *-All racks shall be grounded* *All cables to be supported by cable trays (see cable tray section)* *Double fed Fibre connectivity to site server room*	*-PDU spec varies with application, consult IT&S.* *-Dimensions 800mm wide, 800mm deep, 42u high. Shorter racks are acceptable in small installations where height is limited.*

Paragraph 5.8 Patch Leads
Paragraph 5.8.1 Standard

Infrastructure	*Details*	*Minimum Specification/Model*
Patch Leads	*If patch leads are supplied for new installations, they shall be either Fibre or copper standard and sourced from the same manufacturer as the remainder of the installation.*	*Fibre or Copper cabling* *Hooded plugs where applicable* *For budgetary purposes assume a mix of 0.5m and 1m for comms area/cabs and 1-2m for desktop cables.*

	If patch leads are supplied for new installations, then a range of colours shall be supplied. *If patch leads are supplied for a new installation then IT&S shall be consulted concerning the quantity, colours and lengths required.*	

Paragraph 5.10 CCTV

Infrastructure	*Details*	*Minimum Specification/Model*
CCTV	*- All cameras ideally to be IP* *-All cameras to be authorised by IT&S* *- Fibre compatible cameras to be used where possible* *- Double RJ45 network socket– external cable to be ruggedized* *- Consider PoE CCTV cameras where possible* *- Lighting and other setup considerations must be reviewed before installation*	*- IP Cameras* *- Support for IP and IPv6 in dual stack environment*

11.5 Installation requirements

The concept for the structured wiring throughout the building is indicated upon TB+A Drawings Ref:

FACE Building:
WA0155-E-65-00-101-P2
WA0155-E-65-01-101-P2
WA0155-E--65-02-101-P2
WA0155-E-65-03-101-P2
WA0155-E-65-LM-101-P2

Library Building:

WA0155-E-61-00-201
WA0155-E-61-01-201
WA0155-E-61-02-201

And it shall be noted that the contractor team will provide the following only:

- appropriate spatial allowances - data/server rooms, vertical (risers) & horizontal cable support baskets/trays/trunking
- cabling in terms of infrastructure within the buildings (as per the Room Data Sheets and ICT documents),
- RJ45 outlets throughout the building (as per the Room Data Sheets and ICT documents)
- Patch panels within the data/server rooms
- Allowance for power in data/server rooms and selected outlets (as per the Room Data Sheets and ICT documents)
- Allowance for suitable ventilation/cooling (as per the Room Data Sheets and ICT documents)

The above provisions have been determined in conjunction with the University's ICT Task Group.

11.6 Cable Routes

No cable lengths shall be greater than 100m from any outlet to the data/server room. The server room will be located on the first floor and data rooms will be on ground, second and third floor levels.

All cable routes and location of outlets / termination points will be agreed with the ICT consultant and architect before commencement of their installation.

In most areas a raised access floor will be provided. However, within the ground floor of the FACE Building no raised access floor will be provided and therefore a different strategy to other areas shall be applied.

In the FACE ground floor area a matrix of buried and integrated underfloor screed trunking and floor boxes will be adopted. A comprehensive provision will be provided in the flexi teaching classrooms in the form of underfloor trunking and boxes.

Within the workshop type areas wall dado trunking and wall mounted data outlet boxes will be adopted.

All cables will be either:

- Enclosed in floor trunking system with floor boxes. The 4 power sockets with 4 data outlets inside the floor box will be provided within flexi learning space (as per the Room Data Sheets);
- Data outles and power sockets in dado trunking and/ or wall mounted boxes will be provided in the Engineering part of FACE Building (as per the Room Data Sheet).
- The Room Data Sheets provide the number of data outlets and power socket outlets
- Pulled in through ducts;
- Placed & tied onto mesh tray within suspending ceiling voids;
- Pulled in through external underground ducts and cable chambers

All ducts will have draw-wires/ropes for future cable installation.
Where cables pass through floors, floor trunking system with floor boxes will be installed to at least skirting height.

Holes drilled through walls or floors for the routing of cables and floor boxes will be suitably sleeved to prevent damage to installed cables.

All routes will follow public spaces for easy access after project completion and hand over. All vertical cables will be secured to installed cable tray.

11.7 Cable Performance Standards

All cabling components will have been successfully tested for EMC compliance as specified in the European EC Directive 89/336/EEC as amended by Directive 92/31/EEC.

As a minimum, the structured cabling solution supports the following transmission requirements:

- IEEE 802.3 Ethernet (10BaseT), Fast Ethernet (100BaseTX) and Gigabit Ethernet (1000BaseT)
- EIA RS 232-D (asynchronous)
- 100 Mbit/s services - i.e. TPDDI/CDDI/TP-PMD
- ATM standards (including 25Mbit/s, 155Mbit/s and 622Mbit/s)
- Analogue and Digital Voice Telephony

The cable sheath must be LSOH and of purple colour.

All installation works must be undertaken in line with applicable standards and manufacturer's installation instructions:

- British Standards BS6701 Parts 1 and 2
- BS EN 50174
- 17th Edition IEE Regulations (BS7671)

Particular attention will be paid to cable segregation, cable fixing spacing and defined cable routes in under floor, external and screed-buried routes.

All data cables will be installed in accordance with relevant standards and the manufacturer's instructions and recommendations. Particular care will be taken to ensure the minimum bend radius is not exceeded thereby preventing kinks in the cable construction.

11.8 Underfoor Box

Floor boxes to accommodate data outlets for category 6 or 7 cables and power sockets will be provided.

Floor Box will consist of 4 compartments to install 4 plates:

- Data Plate: One an angled, 4 port data plate suitable for RJ45 data outlets;
- Power Plate: Two twin 13A sockets or Two twin 13 A sockets with USB charger
- Spare Plate: for future extension



Category 6 or 7 cables compliance can also be met by buying a standard RJ45 plate and floor boxes 85mm or deeper to give 50mm bend radius for cat 6 and cat cables



11.9 Underfloor duct

Underfoor ducts system will consist of 3 compartment 225 x 65 mm trunking One data compartment is 75 x 65mm (4875mm2), and up to 30 cat 7 cables will be able to install in one compartment. Second compartment should be used to install power cables. Third compartment is for future extension.

11.10 User Outlet Terminations

All four pairs of the data cable will be terminated onto the rear of the faceplate via Insulation Displacement Connection (IDC) techniques.

The cables will be terminated as per the EIA/TIA 568B wiring scheme so that there is presentation of the pairs onto the RJ45 socket.

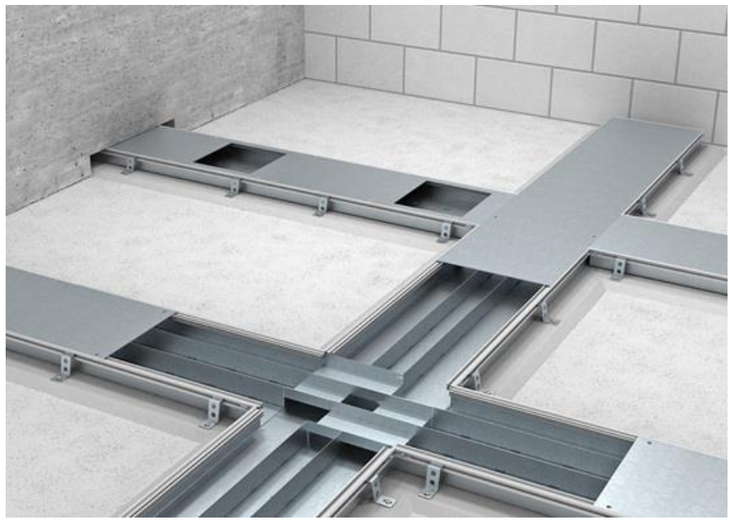
All terminations will be tested upon installation and certified accordingly to the appropriate standards.

Patch Cords

The project is required to include patch cords according to the number of active parts required that will be identified by the ICT Task Group.

The project will also require patch cords for WAPs and any other special services.

The ICT Task Group will provide the quantity of standard data cables and data cables for VOIP during Stage 4.



12 Security systems

12 Security Systems

12.1 Discussion of Key Considerations – FACE Building

Security of University staff and student population is a priority to the University, particularly given the Proposed Development's integration of public facilities and open spaces in amongst academic land uses and space.

The security system proposals will be further developed in agreement with the architect and University during stage 4. However, in terms of intruder and closed circuit television systems it is currently anticipated that the systems will be designed and installed to ensure that the principles of "Secure by Design" are adopted where appropriate.

Where necessary the overall security system specification will be confirmed and clarified with the work stream team leader at the university, the local police, CCTV liaison officer and be in compliance with ACPO and insurance documents.

12.2 Closed Circuit Television (CCTV)

An operational CCTV system will be provided to serve the building and surrounding site. The CCTV system will comply with the recommendations of Local Building Control Officer, the requirements of the British Standards Institute, the Data Protection Act and the specific requirements of the University.

The system will cover all external areas including:

- Main entrances, to record people entering and leaving the building;
- The car park, vehicular entry / exit barriers and road junction;
- Courtyards;
- Entrances to any high value areas (as determined by the client);
- All external cameras to be pan, tilt, & zoom [PTZ].

Internal coverage will comprise entrance and exits:

- Main circulation spaces;
- Specific areas within the site building;

The CCTV system will be controlled and administered at the Main Security Office 24 hours. Operator hierarchy will be a standard feature of the system to enable limited access in relation to camera, monitor, and function selection.

The cameras within the site will be installed within the current scope of making the university feel like an open and welcoming environment- whilst providing recorded images of key defined areas of personnel trafficking and risk.

The CCTV cameras installed in all common entrance areas will be of a high quality; High Definition (HD) or Megapixel types, to allow for clearer retrospective image interrogation. The system needs to be designed in coordination with external lighting and landscaping.

Provide a lighting scheme to support both CCTV and natural surveillance of the building. Well-positioned luminaires deter potential intruders, and if intruders do enter the perimeter then the lighting can maximise the use of the CCTV system in recording the incursion.

The CCTV system within the university will share recorded images (within confines and restrictions of Date Protection Act - DPA), with other university recording devices.

This transmission of CCTV data will utilise the university ICT network, to allow for multi viewing of system information.

The proposed CCTV system will utilise the ICT structured wiring system and Power over Ethernet (PoE) technology to power and, control and receive images through the structured cabling system. All of the cameras and control equipment would utilise IP based (Internet Protocol) technology over the structured wiring system.

The CCTV system through the structured approach of digital recorded images of the CCTV cameras on the ICT network connected via an authorised internet accessible portal. This system automatically alerts the monitoring control room when; centrally controlled and specifically located external detection devices detect movement in defined areas, within programmed parameters of usage.

Other CCTV system applications to be considered as part of the CCTV system are as follows:

- Networked system of CCTV Networked Digital Video Recorders (NVR) – min 30 days storage capability
- Analytical software enable on NVR units
- Facial recognition software and interfacing software
- PoE and IP based CCTV technology
- ANPR (Automatic Number Plate Recognition) system
- BS8418 system (detection devices to enable monitoring of system)
- Tagging alert integration
- Other security proposals:
- Asset tagging and tracking
- Tagging (RFID or AM)
- Lone worker protection systems
- IP based intercom systems
- Perimeter protection
- Perimeter intrusion detection systems
- Infrared (IR) security lighting



12.3 Intruder Alarm

A full intruder detection system will be provided to meet the following requirements:

Dual Tech movement sensors to all rooms with windows in basement, ground floor and first floor (including coverage to all external ground floor areas);

- All computer rooms / ICT rooms will be provided with 2 dual tech movement sensors;
- Magnetic door contacts to all external doors;
- Zoning of the system to allow different parts of the complex to be alarmed while others are still usable;
- Multiple, inter-linked key pads for activation of the system from more than one entry point;
- Audio visual alarm will be provided where required. Placement externally may be subject to conservation constraints.
- The system will comply with DD243 standards. A silent alarm option to alert police/red care before the audible alarm operates.
- The system and system supplier will be NACOSS and LPC approved.

Where required the intruder alarm system will be linked with the CCTV installation to provide event notification and visual identification of any intrusion. In any case all CCTV will be permanently recording.

The specific grade of system to be installed will be decided in conjunction with the relevant client insurers.

12.4 Access Control

The proposals will provide for a new system to the site development that is able to communicate and be fully compatible with the University's existing systems and will be extended to incorporate all university classrooms with a universal integrated time table management for all sites and buildings. All of the access systems will be linked in both sharing data of users and parameters of areas, to enable a seamless transit of students and staff between university buildings.

The concept of utilising such devices as PDA's and mobile phones to provide the vehicle for access control verification with such other additional benefits as cashless vending and other applications based on the use of smart card technologies. The method of interfacing the needs of an access control system and that of a possible ID badge will need to be developed in line with the university's' security ethos.

Other aspects of access control and their application upon other methods of control and restriction are as follows:

- Cashless Vending
- Printer Management
- Access control barriers
- Access control turnstiles (mechanical or optical
- Student attendance system (access control application)
- Multi- site access control management
- Secure and Integrated DDA access door furniture
- Signature verification
- Fire alarm and Muster evacuation reporting
- Time and attendance reporting

12.5 Third Party Consultation

A consultative process involving the local Police Architectural Liaison Officer will be undertaken to assess any impacts arising from the design of the security systems for the building and in relation to local policing requirements.

12.6 Security Lighting

Lighting for security purposes – including effective automatic control – will complement the general lighting design in order to maintain a high degree of security on site. Particular attention will be paid to external illumination. The scheme design for the illumination will attempt wherever possible within the cost plan to follow the Secure by Design criteria to accommodate the enhancement of the lighting levels above the normal requirements of the CIBSE standards.

All external areas would be adequately illuminated to deter unauthorised access to the University site. Public rights of way will also be adequately illuminated. The location of luminaries will be carefully determined to avoid the creation of shadowed areas that could provide cover for possible attackers in external and public areas.

CCTV cameras should be coordinated with the external lighting sources to ensure the avoidance of glare.



12.7 Public Realm Areas

Refer to section 7 for the public realm. In general terms there will be CCTV cameras located to cover the whole areas determined by the phase 1 works as the public realm. The cameras will be integrated with the site-wide system and the views themselves will be co-ordinated with the external lighting.

Cabling will be concealed installed underground and/or within the building fabric as appropriate.

Design Assumptions

13 Design Assumptions

The following key design assumptions are those considered to have a significant cost impact if not correct or where many options exist and we wished to communicate the assumption to the University and wider team.

A list of assumptions was published at Stage 2 and again as part of the draft Stage 3 report issued to 4Projects in February 2016. Any feedback received has been incorporated into the Stage 3 Report herein.

Assumptions

1. The base assumption is that the client has read the stage 2 report and unless a formal comment has been issued is satisfied with the basis of the stage 2 assumptions.
2. The stage 3 report is to be used as the basis for the Stage 4 design to be commenced in March 2014.
3. Please refer to section 3 of this report for 'flexibility and growth' allowances.
4. We have not currently included for the full provisions of section 4 Resilience and Safety as per stage 2.
5. Existing utility infrastructures provided offsite are adequate to serve the development.
6. Passive design measures and in particular zero-energy strategy will be implemented to reduce requirement for cooling.
7. Plant spaces have been based on BSRIA rules of thumb.
8. CIBSE Guidelines have been used as the basis of design proposals outlined in this report.
9. Load profiles for CHP selection are outline estimates of annual energy loads and therefore not based on actual data but bench mark figures.
10. Roof mounted photovoltaic are anticipated as the primary means of renewable energy source in order to meet Building Regulations Part L2A.
11. BREEAM "Excellent" and The "BREEAM Awards "are held annually and recognise and reward those involved in the design and construction of the highest scoring buildings registered under BREEAM. A BREEAM Excellent rating is a pre-requisite, so winners represent examples of excellent sustainable design. In order to win an award, each building must have excelled in every environmental category within BREEAM (e.g. from energy to ecology) and therefore winners represent a holistic approach to delivering environmental sustainability.
12. Energy Performance Certificate EPC of "A" rating
13. The computer laboratories will be comfort cooled.
14. A 250mm raised floor is acceptable in the Library and Academic part of the FACE Building to accommodate ICT and provide added flexibility.
15. Where a naturally ventilated solution is not viable a mixed mode ventilation and cooling strategy will be provided to best suit each application.
16. No allowance has been made for a sprinkler installation.
17. The sprinkler installation in Dyno Cells 1 & 2 will form part of the clients FF&E contract.
18. No allowance has been made for a smoke control scheme other than in the Atrium.
19. Chemical resistant waste pipework will be limited to Laboratory areas.
20. Local exhaust ventilation will be provided in the following areas: spray booth, welding bay, battery charging and Buck GRP.
21. Vehicle exhaust will be provided in the following locations, Multi Engine Rigs, Dyno 1 and 2, Auto's 01 – 04, Fabrication and Welding, Rolling Roads and Car Lift.
22. The following areas will be provided with LEV's as part of the clients FF&E contract, CNC Manufacturing Centre, Autoclave Room, Soldering/Work Bench extract.
23. Allowance has been made for a fume cabinet in the second floor Environmental Science Laboratory further details will be required during stage 4.
24. The following specialist cooling/heat rejection plant will form part of the clients FF&E contract Ballistic room comfort cooling/air conditioning, Autoclave heat rejection, Dyno rooms 1 & 2 heat rejection.
25. A high level compressed air ring main has been allowed for to serve the Fabrication and Welding and Auto Project Rooms 1 – 4. No allowance has been made for connections to equipment etc.
26. A fuel distribution system has only been allowed for to serve Dyno's 1 and 2.
27. Provision for carbon monoxide detection has been provided in the following areas, Engine Rigs, Dyno 01 and 02 and Dyno Control, Fabrication and Welding, Rolling Roads and Car Lift.
28. In workshop areas with limited windows due to acoustic issues mechanical ventilation will be provided.
29. The Rolling Roads and Dyno Cells have not been provided with cooling, air will be delivered to the space at the external ambient.
30. BMS system can be accommodated upon the ICT infrastructure cabling services.
31. Distilled and de-ionised water supplies will be provided as part of the Client fit out.
32. ICT data cabling will be provided from patch panels in data rooms to individual outlets terminated by Kiers contractor. All active equipment and external services cabling by University, including interconnecting services between buildings.
33. Cable chambers and ducts to be provided for external ICT cabling. Details within section 11.
34. The substation location at ground level and louvre strategy will need to be further developed and co-ordinated
35. The generator located at ground level, Power is available for the duration of the emergency outage; Standby: 300kVA/240kVA for FACE; 75kVA for Library.
36. The existing load assessment has been based on BSRIA rule of thumb and it will need to be verified with more accrue load
37. The infrastructure and public realm requirements will be developed at the next design stage.
38. The allowances for ICT are purely spatial, power and cooling loads at this stage based upon similar projects. No client ICT Strategy has been made available.
39. No specific allowances have been made for external third party tenants at this stage.
40. We assume that GSL will be required and will be developed further at Stage 4.
41. A general allowance has been included for serving user equipment has been included until a detailed Equipment Schedule is made available to the design team.
42. All easements for utilities companies are assume to be dealt with by others.
43. We have not undertaken a BIM Model for MEP at Stage 3.
44. Lifts will be provided to meet Building Regulations and a "good" vertical transport provision in both the Library and FACE Building.
45. No special measures will be required for MEP due to any abnormal ground conditions that may be encountered.
46. Rainwater harvesting will be provided as part of the scheme.
47. Room Data Sheets have been developed in draft form
48. Cost of utilities as stated; used in calculations of payback.

Information Required 14

14 Information Required

The following key information required is considered to have a significant cost impact if not correct or where many options exist and we wished to communicate the requirement to the University and wider team.

1. Feedback on the design assumptions contained in section 13.
2. Room occupancies and utilisations required.
3. Section 4 - Resilience and Safety. Feedback from the University (items not currently included).
4. List of client provided equipment cross referenced to Architectural room references complete with mechanical and electrical services requirements.
5. Sanitary ware/equipment layouts for all areas indicating all equipment requiring a provision for hot & cold water and above ground drainage connections.
6. Laboratory Layouts confirming service provision, gas, water, above ground drainage and electrical requirements.
7. Layouts of technical areas confirming equipment locations to co-ordinate service provision with room data sheets and equipment schedules.
8. Confirmation of fume cabinet requirements.
9. Completed room data sheets populated by the client and design team.
10. Confirmation that our design assumptions are correct.
11. Finalised fire strategy report confirming the chosen solution to the Atrium.
12. Client specification for the compressed air installation.
13. Copies of risk assessments undertaken in respect of materials likely to be utilised at the facility to comply with DSEAR Regulations 2002.
14. Details of the contaminant cloud characteristics associated with the LEV requirements.
15. Below ground drainage scheme.
16. List of Client provided packages and required interfaces.
17. Supplier contact details for Items 3.
18. Does the Client have a preferred manufactures list for any particular items/packages which are present on their other University sites/campuses?
19. Are there likely to be any acidic to caustic solutions discharged into the above ground waste installation.
20. Acoustics strategy and any special limitations/constraints.
21. Review and feedback of Stage 3 Report from Estates Department team at UWTSD.

Design Risks 15

15 Design Risks

The following key designers risks are those considered to have a significant cost impact if realised or where many options exist and we wished to communicate the risk to the University and wider team.

Project Risks

1. Assumptions stated in section 13 are incorrect.
2. Insufficient and/or under-developed information forming brief to allow design/contractor team to develop precise proposals.
3. Existing utility infrastructures are inadequate (i.e. always a risk until orders placed).
4. Changes to legislation impact on affordability and buildability.
5. Changes to energy tariffs impact on affordability of renewables.
6. Occupancies and equipment gains impact on the viability of a naturally ventilated solution.
7. Changes to elevations and or fabric design may impact on energy requirements, plant sizes and renewable provisions.
8. Changes to the façade may have an effect on the perimeter louvres and associated ventilation strategy.
9. Changes to Room Data Sheet information impacting upon design provisions included in stage 3 report.
10. Smoke control options may impact on the utilisation of the Atrium for a naturally ventilated solution.
11. Planning restriction may impact on plant selections and locations.
12. Changes to equipment information leading to additional flues or similar and planning issues.
13. Changes (increases) to the current estimates in heating, cooling or power loads impacting upon the current design strategies.
14. Up front capital cost of renewables i.e. PV.
15. Inadequate time provided for analysis of late client changes during stage 3.
16. Poor communication in terms of nZEB and misunderstanding of “reasonable allowances” for future compliance having cost increases.
17. Changes to specification during stage 4 that leads to failure of as-fitted installation compliance with BRUKL, EPC or BREEAM.
18. Public Realm insufficiently developed going into stage 4 giving rise to planning and cost risk.
19. Fire engineering strategy requiring more than currently included.
20. Inadequate inter-building and general cabling ducts and chambers for ICT and other services.
21. Practical inability to achieve diverse routing of incoming IT service providers.

Appendix 16

16 Appendix

Room Data Sheets

Lifts

ICT Infrastructure Specification

Drawings

ROOM DATA SHEETS

The following Room Data Sheets (RDS) are based on the first draft issued to the contractor for pricing, the RDS's received from the client on the 26th February have not been incorporated, these will need to be scutinised as part of the ongoing cost plan to ensure the additional items can be provided and remain within budget.

The Library RDS have not been included and will be developed as part of Stage 4.

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**NDT Lab**	Sheet	
Room Number:	**B001**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21 deg° C +/- 2 ° C***		Noise sensitivity	
Summer Temperature	***23 deg° C +/- 2 ° C***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	10 l/s per person		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Filtration (%DSE & arrestance)			CARBON	
Other	Fume cupboard recirculation type		*Other*	

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Hot and cold for wash up only		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste		From wash up area		
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp	25			
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	14			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Ballistics Lab**	Sheet	
Room Number:	**B002A**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2 °C***		Noise sensitivity	
Summer Temperature	***23°C +/- 2 °C***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other	***-10°C to +60°Climate area***			

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other	External plant area for condenser			
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		4		
Sockets 230V 16amp		1		
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	4			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Materials Testing**	Sheet	
Room Number:	**B002**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21 deg C +/- 2 deg C***		Noise sensitivity	
Summer Temperature	***26***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	10 l/s per person		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Filtration (%DSE & arrestance)			CARBON	
Fumigation req			*Other*	
Other	Ventilation for Ascot chamber			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water		0.5-5 Bar for Ascot test chamber		
De-onised Water		0.5-5 Bar for Ascot test chamber		
Potable Water		Yes		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air		Clean, dry oil free 4-6 Bar		
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste			Floor drain for Ascot chamber	
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		5		
Sockets 230V 16amp		2		
Sockets 230V 32amp		2		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		2		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	14			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**General Store**	Sheet	
Room Number:	**B003**	revision	
Layout Drawing:		date	**12/01/216**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***16°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR40
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour		Filtered Supply	HEPA
Fresh Air Supply Volume			CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 300 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control			
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		4		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	3			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Technician Rooms**	Sheet	**4 of 4**
Room Number:	**B004 A and B005 A**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	10 l/s per person		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Filtration (%DSE & arrestance)			CARBON	
Fumigation req			*Other*	
Other				

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp	15			
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	6			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Arch Laboratory**	Sheet	
Room Number:	**B004**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***23°C +/- 2°C***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH		Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person			CARBON
Room Extract Volume				*Other*
Equipment / Vacuum Exhaust			Filtered Extract	HEPA
Filtration (%DSE & arrestance)				CARBON
Fumigation req				*Other*
Other				

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		15		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	12			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Construction Workshop (Arch)**	Sheet	**4 of 4**
Room Number:	**B005**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21 deg C +/- 2 deg C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other	Mobile dust/fume extract units		

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water	Yes			
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste	Yes		Yes	
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		15		
Sockets 230V 16amp		4		
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	12			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Comms Room**	Sheet	**4 of 4**
Room Number:	**B006**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***23°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***23°C +/- 2°C***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other	Comfort cooling required.			

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour		Filtered Supply	HEPA
Fresh Air Supply Volume			CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control			
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste		Condense from fan coil		
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp				
Sockets 230V 16amp				
Sockets 230V 32amp		4		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit		2		
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	10			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Architecture Store**	Sheet	**4 of 4**
Room Number:	**B007**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***16°C +/- 2°C***	
Summer Temperature	***Uncontrolled***	
Pressure Relative to Adj Space		
Pressure monitor req		
Humidity	max 70%	min N/A
Close control temperature range	max	min
Other		

Noise sensitivity	
Room NR Level	NR40
Laser Radiation	
Electrical Radiation	
X -Ray Radiation	
Other Restrictions	

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	
Fresh Air Supply Volume	
Room Extract Volume	
Equipment / Vacuum Exhaust	
Filtration (%DSE & arrestance)	
Fumigation req	
Other	

Filtered Supply	HEPA	
	CARBON	
	Other	
Filtered Extract	HEPA	
	CARBON	
	Other	

Lighting

Average Lux Level	Lighting - 150 Lux	switching + wiring
Average Lux Level (night)	Lighting - 150Lux	switching + wiring
Task Lighting Lux Level		
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control		
PIR control	Yes	
Dimming Control		
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		4		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	3			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Female Changing**	Sheet	**4 of 4**
Room Number:	**B008**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***18°C +/- 2°C***	
Summer Temperature	***Uncontrolled***	
Pressure Relative to Adj Space		
Pressure monitor req		
Humidity	max 70%	min N/A
Close control temperature range	max	min
Other		

Noise sensitivity	
Room NR Level	NR45
Laser Radiation	
Electrical Radiation	
X -Ray Radiation	
Other Restrictions	

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	10 ACH
Fresh Air Supply Volume	Provide make up air
Room Extract Volume	
Equipment / Vacuum Exhaust	
Filtration (%DSE & arrestance)	
Fumigation req	
Other	

Filtered Supply	HEPA	
	CARBON	
	Other	
Filtered Extract	HEPA	
	CARBON	
	Other	

Lighting

Average Lux Level	Lighting - 150 Lux	switching + wiring
Average Lux Level (night)	Lighting - 150Lux	switching + wiring
Task Lighting Lux Level		
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control		
PIR control	Yes	
Dimming Control		
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Hot & cold with TMV3 valves		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste		From all items of sanitary ware		
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other		2 x SFCU		
Data and Telephone				
Data Outlets	1			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Male Changing**	Sheet	**4 of 4**
Room Number:	**B009**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***18°C +/- 2°C***	
Summer Temperature	***Uncontrolled***	
Pressure Relative to Adj Space		
Pressure monitor req		
Humidity	max 70%	min N/A
Close control temperature range	max	min
Other		

Noise sensitivity	
Room NR Level	NR45
Laser Radiation	
Electrical Radiation	
X -Ray Radiation	
Other Restrictions	

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	10 ACH
Fresh Air Supply Volume	Provide make up air
Room Extract Volume	
Equipment / Vacuum Exhaust	
Filtration (%DSE & arrestance)	
Fumigation req	
Other	

Filtered Supply	HEPA	
	CARBON	
	Other	
Filtered Extract	HEPA	
	CARBON	
	Other	

Lighting

Average Lux Level	Lighting - 150 Lux	switching + wiring
Average Lux Level (night)	Lighting - 150Lux	switching + wiring
Task Lighting Lux Level		
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control		
PIR control	Yes	
Dimming Control		
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Hot and cold with TMV3 valves		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste		From all items of sanitary ware		
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other		2 x SFCU		
Data and Telephone				
Data Outlets	1			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Pre- Preg Cutting**	Sheet	**4 of 4**
Room Number:	**B010 A**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	10 l/s per person		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Filtration (%DSE & arrestance)			CARBON	
Other	Dust extraction from Prep cloth cutting (carbon fibre/resin)		*Other*	

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 750 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp		2		
Sockets 230V 32amp		1		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		1		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	6			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Buck Sanding**	Sheet	**4 of 4**
Room Number:	**B010 B**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH		Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person			CARBON
Room Extract Volume				*Other*
Equipment / Vacuum Exhaust			Filtered Extract	HEPA
Filtration (%DSE & arrestance)				CARBON
Other	Particulate extract, sanding of MDF & glass fibre			*Other*

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting -750 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp		2		
Sockets 230V 32amp		1		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		1		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	3			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Changing Area C and D**	Sheet	**4 of 4**
Room Number:	**B010 C_D**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR45
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	10 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	Provide make up air		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 150 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 150Lux	switching + wiring	
Task Lighting Lux Level			
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control			
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Hot and cold with TMV3 valves		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste		Waste from all sanitary wary		
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other		2 x SFCU		
Data and Telephone				
Data Outlets	1			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Buck GRP**	Sheet	**4 of 4**
Room Number:	**B010 E**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***	
Summer Temperature	***Uncontrolled***	
Pressure Relative to Adj Space		
Pressure monitor req		
Humidity	max 70%	min N/A
Close control temperature range	max	min
Other		

Noise sensitivity	
Room NR Level	NR35
Laser Radiation	
Electrical Radiation	
X -Ray Radiation	
Other Restrictions	

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH
Fresh Air Supply Volume	10 l/s per person
Room Extract Volume	
Equipment / Vacuum Exhaust	
Filtration (%DSE & arrestance)	
Other	Dust/solvent local exhaust ventilation

Filtered Supply	HEPA	
	CARBON	
	Other	
Filtered Extract	HEPA	
	CARBON	
	Other	

Lighting

Average Lux Level	Lighting - 300 Lux	switching + wiring
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring
Colour Matching	80 Ra; 19 UGR	
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring
Local Lighting Control	light switch	
PIR control		
Dimming Control	Yes	
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		4		
Sockets 230V 16amp		2		
Sockets 230V 32amp		1		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		1		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	3			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Changing Area F and G**	Sheet	**4 of 4**
Room Number:	**B010 F_G**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR45
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	10 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	Provide make up air		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Filtration (%DSE & arrestance)			CARBON	
Fumigation req			*Other*	
Other				

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 150 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 150Lux	switching + wiring	
Task Lighting Lux Level			
Colour Matching	80 Ra; 19 UGR		
Safety Lighting			
Local Lighting Control			
PIR control	Yes		
Dimming Control			
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Hot & cold with TMV3 valves		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste		From all items of sanitary ware		
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other		2 x SFCU		
Data and Telephone				
Data Outlets	2			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**CNC Tech**	Sheet	**4 of 4**
Room Number:	**B010 H**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

Average Lux Level	Lighting - 300 Lux	switching + wiring
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control		
PIR control	Yes	
Dimming Control	Yes	
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp	15			
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	6			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Autoclave**	Sheet	**4 of 4**
Room Number:	**B010 J**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	10 l/s per person		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Filtration (%DSE & arrestance)			CARBON	
Other	Specialist extraction from autoclaves by manufacturer		*Other*	

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Autoclave and cleaning station		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air		Dedicated CA supply		
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Heat Rejection Unit				External unit by UWTSD
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		4		
Sockets 230V 16amp		2		
Sockets 230V 32amp		2		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		2		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	4			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Spray Booth**	Sheet	**4 of 4**
Room Number:	**B010 K**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH		Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person			CARBON
Room Extract Volume				*Other*
Equipment / Vacuum Exhaust			Filtered Extract	HEPA
Filtration (%DSE & arrestance)				CARBON
Fumigation req				*Other*
Other	Solvent extract from spray booth			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 750 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	1			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**CNC Manufacturing Centre**	Sheet	**4 of 4**
Room Number:	**B010**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Other	Particulate extract required from CNC + future provision.		*Other*

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Autoclave and cleaning station		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		8		
Sockets 230V 16amp		4		
Sockets 230V 32amp		4		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		4		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	32			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Auto Project Rooms**	Sheet	**4 of 4**
Room Number:	**B011 A to D**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Other	Vehicle exhaust extract 4 No		*Other*

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas		CO_2 Monitoring		
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				CA Ring main minimum 16No outlets at high level
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		1		
Sockets 230V 16amp		1		
Sockets 230V 32amp		1		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		1		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	16			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Auto Project Rooms**	Sheet	**4 of 4**
Room Number:	**B011 E_F_G**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 - 180 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Other	Vehicle exhaust extract 1No/bay		*Other*
Other	Process extract 180ACH/Bay		

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas		$C0_2$ Monitoring required		
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		1		
Sockets 230V 16amp		1		
Sockets 230V 32amp		1		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)		1		
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	0			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Centre Storage**	Sheet	**4 of 4**
Room Number:	**B011 H**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***16°C +/- 2°C***	
Summer Temperature	***Uncontrolled***	
Pressure Relative to Adj Space		
Pressure monitor req		
Humidity	max 70%	min N/A
Close control temperature range	max	min
Other		

Noise sensitivity	
Room NR Level	NR35
Laser Radiation	
Electrical Radiation	
X -Ray Radiation	
Other Restrictions	

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	
Fresh Air Supply Volume	
Room Extract Volume	
Equipment / Vacuum Exhaust	
Filtration (%DSE & arrestance)	
Fumigation req	
Other	

Filtered Supply	HEPA	
	CARBON	
	Other	
Filtered Extract	HEPA	
	CARBON	
	Other	

Lighting

Average Lux Level	Lighting - 300 Lux	switching + wiring
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring
Task Lighting Lux Level		switching + wiring
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control	light switch	
PIR control		
Dimming Control		
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		4		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	3			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Auto Tech**	Sheet	**4 of 4**
Room Number:	**B011 J**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

Average Lux Level	Lighting - 300 Lux	switching + wiring
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control		
PIR control	Yes	
Dimming Control	Yes	
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp	15			
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	6			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Fabrication & Welding Area**	Sheet	**4 of 4**
Room Number:	**B011**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH		Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person			CARBON
Room Extract Volume				*Other*
Equipment / Vacuum Exhaust			Filtered Extract	HEPA
Other	3No Vehicle exhaust, Battery charging extract, welding extract & mobile grinding extract unit.			CARBON
				Other

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Supply for cleaning station		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas		CO_2 Monitoring		
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				CA Ring main
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		8		
Sockets 230V 16amp		4		
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	16			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Mechanical Workshop**	Sheet	**4 of 4**
Room Number:	**B012A**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		Supply for cleaning station		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		10		
Sockets 230V 16amp		10		
Sockets 230V 32amp		6		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	12			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Mechanical Tech**	Sheet	**4 of 4**
Room Number:	**B012 B**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***	
Summer Temperature	***Uncontrolled***	
Pressure Relative to Adj Space		
Pressure monitor req		
Humidity	max 70%	min N/A
Close control temperature range	max	min
Other		

Noise sensitivity	
Room NR Level	NR35
Laser Radiation	
Electrical Radiation	
X -Ray Radiation	
Other Restrictions	

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH
Fresh Air Supply Volume	10 l/s per person
Room Extract Volume	
Equipment / Vacuum Exhaust	
Filtration (%DSE & arrestance)	
Fumigation req	
Other	

Filtered Supply	HEPA	
	CARBON	
	Other	
Filtered Extract	HEPA	
	CARBON	
	Other	

Lighting

Average Lux Level	Lighting - 300 Lux	switching + wiring
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control	light switch	
PIR control		
Dimming Control	Yes	
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp	15			
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	6			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Robotics Lab**	Sheet	**4 of 4**
Room Number:	**B012**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	10 l/s per person		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Filtration (%DSE & arrestance)			CARBON	
Fumigation req			*Other*	
Other				

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		10		
Sockets 230V 16amp		5		
Sockets 230V 32amp		3		
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	16			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Simulator**	Sheet	**4 of 4**
Room Number:	**B013**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***23°C +/- 2°C***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH		Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person			CARBON
Room Extract Volume				*Other*
Equipment / Vacuum Exhaust			Filtered Extract	HEPA
Filtration (%DSE & arrestance)				CARBON
Fumigation req				*Other*
Other	Comfort cooling			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		4		
Sockets 230V 16amp		4		
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	5			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Engine Diagnostics Stores and Prep**	Sheet	**4 of 4**
Room Number:	**B014**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***18°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 300 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		For future drench shower		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		5		
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	4			
Telephone				
Integrated AV				

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Dyno Control and Cell Area**	Sheet	**4 of 4**
Room Number:	**B015 A,B & C**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***18°C +/- 2°C***	
Summer Temperature	***Uncontrolled***	
Pressure Relative to Adj Space		
Pressure monitor req		
Humidity	max 70%	min N/A
Close control temperature range	max	min
Other		

Noise sensitivity	
Room NR Level	NR35
Laser Radiation	
Electrical Radiation	
X -Ray Radiation	
Other Restrictions	

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 - 180 ACH
Fresh Air Supply Volume	10 l/s per person
Room Extract Volume	
Equipment / Vacuum Exhaust	
Filtration (%DSE & arrestance)	
Other	Process extract (200kW) 180 ACH, vehicle exhaust extract.

Filtered Supply	HEPA	
	CARBON	
	Other	
Filtered Extract	HEPA	
	CARBON	
	Other	

Lighting

Average Lux Level	Lighting - 300 Lux	switching + wiring
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring
Colour Matching	80 Ra; 19 UGR	
Safety Lighting	10 % Each fitting, Self-Contained	switching + wiring
Local Lighting Control	light switch	
PIR control		
Dimming Control	Yes	
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				Fuel supply from external tank
O2 Gas				
CO2 Gas		CO_2 Monitoring		
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other				External heat rejection units
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		1 per DYNO		
Sockets 230V 16amp		1 per DYNO		
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	10			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	Drench type by Dyno supplier
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Engine Stands**	Sheet	**4 of 4**
Room Number:	**B016 A**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***18°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water		*Cleaning station & drench*		
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste			Floor drain for drench shower	
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		10		
Sockets 230V 16amp		5		
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	4			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Engine Diagnostics Lab**	Sheet	**4 of 4**
Room Number:	**B016 B**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21 °C +/- 2 °C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA	
Fresh Air Supply Volume	10 l/s per person		CARBON	
Room Extract Volume			*Other*	
Equipment / Vacuum Exhaust		Filtered Extract	HEPA	
Other	6No Vehcile exhaust extract. Process extract 15ACH (30 - 50kW).		CARBON	
			Other	

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas		CO_2 Monitoring		
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		12		
Sockets 230V 16amp		6		6
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				6
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	8			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Low Bench_ Eng Diag**	Sheet	**4 of 4**
Room Number:	**B016 C**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH		Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person			CARBON
Room Extract Volume				*Other*
Equipment / Vacuum Exhaust			Filtered Extract	HEPA
Filtration (%DSE & arrestance)				CARBON
Fumigation req				*Other*
Other				

Lighting

			Emergency Lighting
Average Lux Level	Lighting - 300 Lux	switching + wiring	1 Lux, Self-Contained,
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring	
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring	
Colour Matching	80 Ra; 19 UGR		
Safety Lighting	10 % Each Fitting, Self-Contained	switching + wiring	
Local Lighting Control	light switch		
PIR control			
Dimming Control	Yes		
Special Fittings			
Other			

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp		2		
Sockets 230V 16amp		1		
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	1			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ROOM DATA SHEET

ENGINEERING SERVICES

Floor Level:	**0 - Ground Floor**		
Room Name:	**Engine Tech**	Sheet	**4 of 4**
Room Number:	**B016 D**	revision	
Layout Drawing:		date	**12/01/2016**
User Representative:		by	
Tel:			

Required Conditions For Space

Note - Grey areas on this sheet denotes not required or not applicable

Temperature,Humidity & Pressure

Winter Temperature	***21°C +/- 2°C***		Noise sensitivity	
Summer Temperature	***Uncontrolled***		Room NR Level	NR35
Pressure Relative to Adj Space			Laser Radiation	
Pressure monitor req			Electrical Radiation	
Humidity	max 70%	min N/A	X -Ray Radiation	
Close control temperature range	max	min	*Other Restrictions*	
Other				

External Design Criteria to CIBSE Guidelines

Ventilation

Min Air Changes / Hour	4 ACH	Filtered Supply	HEPA
Fresh Air Supply Volume	10 l/s per person		CARBON
Room Extract Volume			*Other*
Equipment / Vacuum Exhaust		Filtered Extract	HEPA
Filtration (%DSE & arrestance)			CARBON
Fumigation req			*Other*
Other			

Lighting

Average Lux Level	Lighting - 300 Lux	switching + wiring
Average Lux Level (night)	Lighting - 300 Lux	switching + wiring
Task Lighting Lux Level	Lighting - 500 Lux	switching + wiring
Colour Matching	80 Ra; 19 UGR	
Safety Lighting		
Local Lighting Control	light switch	
PIR control		
Dimming Control	Yes	
Special Fittings		
Other		

Emergency Lighting

1 Lux, Self-Contained,

	BENCH/DADO MOUNTED	WALL MOUNTED	FLOOR-MOUNTED	OTHER (OVERHEAD)
Piped Services				
Trade Water				
Process Water				
Distilled Water				
De-onised Water				
Potable Water				
Non Potable Water (Domestic)				
Non Potable Water (Laboratory)				
Other water - specify				
O2 Gas				
CO2 Gas				
CO Gas				
He Gas				
N2 Gas				
CH4 Gas				
Compressed Air				
Natural Gas				
Ar Gas				
H2 Gas				
Special Gas				
Vacuum				
Waste				
Other waste				
Electrical Services				
Sockets 110V				
Sockets 230V 13amp	15			
Sockets 230V 16amp				
Sockets 230V 32amp				
Sockets 230V *other* amp				
415V Supply 3-phase (current rating)				
Sockets 115V 400Hz				
Sockets 28V a.c.				
Sockets 28V d.c.				
Local UPS unit				
Equipment alarm				
Other				
Data and Telephone				
Data Outlets	6			
Telephone				
Integrated AV	Yes			

Security / PA / CCTV / Alarms

Key lock to doors		Intruder alarm	Yes	Smoke Detection	L1
Key pad access		CCTV		Heat Detection	
Doors with key overide		Disabled Persons Alarm		Sprinklers	
Card Access	Yes	PA system		Other	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A001**	
Function	**Reception**	
Location / Area	**Ground Floor**	32 sq m

ENVIRONMENT

Lighting	Average 300 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (10 DADO Mounted, general)
Telephone	NTE5 Master Socket	1 (DADO Mounted)
IT	Data Socket	8 (DADO Mounted)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A002**	
Function	**General Store**	
Location / Area	**Ground Floor**	sq m

ENVIRONMENT

Lighting	Average 200 Lux
Lighting Control	PIR control
Heating	16°C +/- 2°C
Ventilation	

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	4 (4 DADO Mounted, general)
Telephone		
IT	Data Socket	3 (DADO Mounted)
Other Systems		

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A003**	
Function	**30 Person Flexi Space**	
Location / Area	**Ground Floor**	92 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	35 (5 DADO Mounted, general + 30 underfloor ICT equipment)
Telephone		
IT	Data Socket	8 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A004**	
Function	**20 Person Flexi Space**	
Location / Area	**Ground Floor**	56 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	25 (5 DADO Mounted, general + 20 underfloor ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A005**	
Function	**IT Tech**	
Location / Area	**Ground Floor**	26 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	15 (5 DADO Mounted, general + 10 DADO Mounted, ICT equipment)
Telephone		
IT	Data Socket	10 (DADO Mounted)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A006**	
Function	**90 Person Learning Studio**	
Location / Area	**Ground Floor**	265 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	95 (5 DADO Mounted, general + 90 underfloor ICT equipment)
Telephone		
IT	Data Socket	22 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A007**	
Function	**Learning Commons**	
Location / Area	**Ground Floor**	225 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	40 (5 DADO Mounted, general + 35 underfloor ICT equipment)
Telephone		
IT	Data Socket	35 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A008**	
Function	**30 Person Flexi Space**	
Location / Area	**Ground Floor**	104 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor ICT equipment)
Telephone		
IT	Data Socket	40 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A009**	
Function	**Project Teaching**	
Location / Area	**Ground Floor**	104 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	49 (5 DADO Mounted, general + 44 underfloor ICT equipment)
Telephone		
IT	Data Socket	44 (underfloor, ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A010**	
Function	**Engineering Science**	
Location / Area	**Ground Floor**	143 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	
	35 (5 DADO Mounted, general + 30 underfloor ICT equipment)	
Telephone		
IT	Data Socket	30 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor
Skirting
Walls
Ceiling
Doors (External)
Doors (Internal)
Ironmongery
Screens
Sun pipes
Windows
Cills

FURNITURE

Fixed furniture
Loose furniture
Soft furniture
Equipment
Fire fighting

GENERAL NOTES

1
2
3

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A010A**	
Function	**Store for Engineering Science**	
Location / Area	**Ground Floor**	25 sq m

ENVIRONMENT

Lighting	Average 300 Lux
Lighting Control	PIR control
Heating	16°C +/- 2°C
Ventilation	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	30 (5 DADO Mounted, general + 25 underfloor ICT equipment)
Telephone		
IT	Data Socket	4 (underfloor, ICT equipment)
Other Systems		

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A011**	
Function	**First Aid Room**	
Location / Area	**Ground Floor**	10 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	6 ACH

SERVICES AND APPLIANCES

Gas	N/A	
Water	Hot and cold for WHB fit TMV3 mixing valve.	
Electric	Sockets 230V 13amp	4 (4 DADO Mounted, general)
Telephone		
IT	Data Socket	2 (DADO Mounted)
Other Systems	Drainage from WHB	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A012**
Function	**Café Learning Commons**
Location / Area	**Ground Floor** 178 sq m

ENVIRONMENT

Lighting	Average 500 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A
Water	Hot and cold foe WHB and catering equipment. Fit TMV3 mixing valve to WHB
Electric	Sockets 230V 13amp 50 (10 DADO Mounted, general + 88 Underfloor, general)
Telephone	
IT	Data Socket 88 (underfloor)
Other Systems	Drainage from WHB and catering equipment.

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A012A**	
Function	**Store for Café Learning Commons**	
Location / Area	**Ground Floor**	178 sq m

ENVIRONMENT

Lighting	Average 300 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	16°C +/- 2°C
Ventilation	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	6 (6 DADO Mounted, General)
Telephone		
IT	Data Socket	1 (DADO Mounted)
Other Systems		

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A101**	
Function	**60 Person Flexi Space**	
Location / Area	**First Floor**	177 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	65 (5 DADO Mounted, general + 60 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	42 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A102**	
Function	**60 Person Flexi Space**	
Location / Area	**First Floor**	177 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	65 (5 DADO Mounted, general + 60 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	42 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A103**	
Function	**20 Person Flexi Space**	
Location / Area	**First Floor**	57 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	25 (5 DADO Mounted, general + 20 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	14 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A104**	
Function	**60 Person Flexi Space**	
Location / Area	**First Floor**	181 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	65 (5 DADO Mounted, general + 60 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	42 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A105**	
Function	**Prayer Room**	
Location / Area	**First Floor**	28 sq m

ENVIRONMENT

Lighting	Average 200 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	1 (1 Underwall, general)
Telephone		
IT		
Other Systems		

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A106**	
Function	**IT Technician**	
Location / Area	**First Floor**	18 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (5 DADO Mounted, general + 5 DADO Mounted, ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A107**	
Function	**Cleaner's Room**	
Location / Area	**First Floor**	7 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	16°C +/- 2°C
Ventilation	10 ACH
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	Hot and cold for cleaners sink	
Electric	Sockets 230V 13amp	1 (4 DADO Mounted, general)
Telephone		
IT		
Other Systems		

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A108**	
Function	**20 Person Flexi Space**	
Location / Area	**First Floor**	63 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	25 (5 DADO Mounted, general + 20 underfloor, ICT equipment)
Telephone		
IT	Data Socket	14 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A109**	
Function	**30 Person Computer Lab**	
Location / Area	**First Floor**	112 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 Underfloor, ICT equipment)
Telephone		
IT	Data Socket	40
Other Systems	Trapped waste from fan coils, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A110**	
Function	**IT Room**	
Location / Area	**First Floor**	16 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A		
Water	N/A		
Electric	Sockets 230V 13amp	5	(5 Underwall, general)
	Sockets 230V 32amp	7 UPS+DG	(7 Underwall, general)
Telephone			
IT	Data Socket	7	
Other Systems	Trapped waste from fan coils		

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A111**	
Function	**30 Person Computer Lab**	
Location / Area	**First Floor**	114 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor, ICT equipment)
Telephone		
IT	Data Socket	40
Other Systems	Trapped waste from fan coils, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A112**	
Function	**30 person Computer Lab**	
Location / Area	**First Floor**	108 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor, ICT equipment)
Telephone		
IT	Data Socket	40
Other Systems	Trapped waste from fan coils, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A113**	
Function	**30 Person Computer Lab**	
Location / Area	**First Floor**	105 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor, ICT equipment)
Telephone		
IT	Data Socket	40
Other Systems	Trapped waste from fan coils, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A114**	
Function	**30 Person Computer Lab**	
Location / Area	**First Floor**	105 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor, ICT equipment)
Telephone		
IT	Data Socket	40
Other Systems	Trapped waste from fan coils, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A115**	
Function	**30 Person Computer Lab**	
Location / Area	**First Floor**	105 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10 l/s/person
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor, ICT equipment)
Telephone		
IT	Data Socket	40
Other Systems	Trapped waste from fan coils, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A201**	
Function	**20 Person Learning Studio**	
Location / Area	**Second Floor**	55 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	25 (5 DADO Mounted, general + 20 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	8 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A202**	
Function	**Project Room**	
Location / Area	**Second Floor**	106 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	42 (5 DADO Mounted, general + 38 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	38 (ICT equipment)
Other Systems	Drainage from fan coil, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A203**	
Function	**Games Lab**	
Location / Area	**Second Floor**	108 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	40 (ICT equipment)
Other Systems	Drainage from fan coil, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A204**	
Function	**Cisco Lab**	
Location / Area	**Second Floor**	140 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 Uderfloor, ICT equipment)
Telephone		
IT	Data Socket	40 (ICT equipment)
Other Systems	Drainage from fan coil, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A205**	
Function	**Environmental Science Lab**	
Location / Area	**Second Floor**	109 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	For fume cupboard	
Water	For fume cupboard	
Electric	Sockets 230V 13amp	37 (5 DADO Mounted, general + 32 Uderfloor, ICT equipment)
Drainage	From fume cupboard	
Telephone		
IT	Data Socket	32 (ICT equipment)
Other Systems	Fume cupboard, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A205A**	
Function	**Technician Environmental Science Lab**	
Location / Area	**Second Floor**	10 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (10 DADO Mounted, General)
Telephone		
IT	Data Socket	6 (DADO Mounted)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A206**	
Function	**30 Person Computer Lab**	
Location / Area	**Second Floor**	109 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor, ICT equipment)
Telephone		
IT	Data Socket	40 (ICT equipment)
Other Systems	Drainage from fan coil , Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A207**	
Function	**Store**	
Location / Area	**Second Floor**	7 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	16°C +/- 2°C
Ventilation	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	5 (5 DADO Mounted, general)
Telephone		
IT	Data Socket	2 (ICT equipment)
Other Systems	Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A208**	
Function	**IT Technician**	
Location / Area	**Second Floor**	14 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	11 (5 DADO Mounted, general + 6 Underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (Underfloor, ICT equipment)
Other Systems	Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A209**	
Function	**Learning Commons**	
Location / Area	**Second Floor**	47 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	31 (5 DADO Mounted, general + 26 underfloor, ICT equipment)
Telephone		
IT	Data Socket	26 (ICT equipment)
Other Systems	Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A210**	
Function	**IT Technician_Stores**	
Location / Area	**Second Floor**	14 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	16°C +/- 2°C
Ventilation	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	12 (5 DADO Mounted, general + 8 underfloor, ICT equipment)
Telephone		
IT	Data Socket	8 (ICT equipment)
Other Systems	Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A211**	
Function	**QINETIQ Comp Lab**	
Location / Area	**Second Floor**	79 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	35 (5 DADO Mounted, general + 30 underfloor, ICT equipment)
Telephone		
IT	Data Socket	30 (ICT equipment)
Other Systems	Drainage from fan coil, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A212**	
Function	**Electrical and Electronics Lab**	
Location / Area	**Second Floor**	191sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p
Comfort Cooling	23°C +/- 2°C

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	45 (5 DADO Mounted, general + 40 underfloor, ICT equipment)
Telephone		
IT	Data Socket	40 (ICT equipment)
Other Systems	Drainage from fan coil, Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A213**	
Function	**Learning Commons**	
Location / Area	**Second Floor**	74 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	25 (5 DADO Mounted, general + 20 underfloor, ICT equipment)
Telephone		
IT	Data Socket	20
Other Systems	Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A214**	
Function	**30 Person Learning Studio**	
Location / Area	**Second Floor**	105 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	35 (5 DADO Mounted, general + 30 underfloor, ICT equipment)
Telephone		
IT	Data Socket	8 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A215**	
Function	**Tutorial Room**	
Location / Area	**Second Floor**	18 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (4 DADO Mounted, general + 6 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A216**	
Function	**Undergraduate Architecture Studio**	
Location / Area	**Second Floor**	211 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	39 (5 DADO Mounted, general + 34 underfloor, ICT equipment)
Telephone		
IT	Data Socket	34 (ICT equipment)
Other Systems	Integrated AV	

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A216A**	
Function	**Learning Zone_Undergraduate Architecture Studio**	
Location / Area	**Second Floor**	17 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (4 DADO Mounted, general + 6 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A216B**	
Function	**Learning Zone_Undergraduate Architecture Studio**	
Location / Area	**Second Floor**	17 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	11 (5 DADO Mounted, general + 6 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A216C**	
Function	**Learning Zone_Undergraduate Architecture Studio**	
Location / Area	**Second Floor**	17 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	11 (4 DADO Mounted, general + 6 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A301**	
Function	**20 Person Learning Studio**	
Location / Area	**Third Floor**	55 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	25 (5 DADO Mounted, general + 20 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A302**	
Function	**Post Graduate Architecture Studio**	
Location / Area	**Third Floor**	150 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	35 (5 DADO Mounted, general + 30 underfloor, ICT equipment)
Telephone		
IT	Data Socket	30 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A302A**	
Function	**Learning Zone**	
Location / Area	**Third Floor**	22 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (4 DADO Mounted, general + 6 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A302B**	
Function	**Arch Store**	
Location / Area	**Third Floor**	24 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	16°C +/- 2°C
Ventilation	N/A

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	4 (2 DADO Mounted, general + 2 DADO Mounted, ICT equipment)
Telephone		
IT	Data Socket	2 (DADO Mounted)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A302C**	
Function	**Learning Zone**	
Location / Area	**Third Floor**	18 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (5 DADO Mounted, general + 5 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (2 DADO Mounted, general + 2 DADO Mounted, ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A303**	
Function	**Tutorial Room**	
Location / Area	**Third Floor**	18 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	6 (3 DADO Mounted, general + 3 underfloor, ICT equipment)
Telephone		
IT	Data Socket	4 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A304**	
Function	**Learning Zone**	
Location / Area	**Third Floor**	18 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (4 DADO Mounted, general + 6 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

ARCHITECTS ROOM DATA SHEET

PROJECT NAME:	**UWTSD SA1_ FACE/ TECH BUILDING**
PROJECT NUMBER:	**70266_01**

IDENTIFICATION

Room Title	**A305**	
Function	**Learning Zone**	
Location / Area	**Third Floor**	18 sq m

ENVIRONMENT

Lighting	Average 400 Lux; Emergency Lighting
Lighting Control	PIR control
Heating	21°C +/- 2°C
Ventilation	10l/s/p

SERVICES AND APPLIANCES

Gas	N/A	
Water	N/A	
Electric	Sockets 230V 13amp	10 (4 DADO Mounted, general + 6 underfloor, ICT equipment)
Telephone		
IT	Data Socket	6 (ICT equipment)
Other Systems	Integrated AV	1

FINISHES SEE DRAWING

Floor	
Skirting	
Walls	
Ceiling	
Doors (External)	
Doors (Internal)	
Ironmongery	
Screens	
Sun pipes	
Windows	
Cills	

FURNITURE

Fixed furniture	
Loose furniture	
Soft furniture	
Equipment	
Fire fighting	

GENERAL NOTES

1	
2	
3	

LIFT

Conventional Control

Enter your planning information to get your required elevator solution

Metric | Imperial

Building information

Use of passenger elevator

Type: Office

Usage: Multiple tenant, Fixed working hours

Zone information

Number of Stops	3
Travel for the zone (m)	13
Population in the zone	500

Applied parameters

Edit

Up peak handling capacity (% of population/5 minutes)	13
Acceleration rate (m/s²)	1
Interval (s)	30
Travel time (s)	25

System parameters

Acceleration: Normal

Speed (m/s)

Estimated	0.5
Actual	1.6

Elevator size (persons)

Estimated	8.13
Actual	13

Required number of elevators

Required by interval	1.91
Required by handling capacity	1.38
Actually required	2

Switch to Destination Control | Front page

KONE shall not accept any liability for the data used and the results thereof. Any calculations made with the program are based on the input data and the parameter values, and should not be interpreted as any kind of representation of warranty of the performance of any actual elevator installation.

KONE Quick Traffic 2.4

Copyright © KONE Corporation, All rights reserved

Conventional Control

Enter your planning information to get your required elevator solution

Metric | Imperial

Building information

Use of passenger elevator

Type: Office

Usage: Multiple tenant, Flexible working hours

Zone information

Number of Stops	2
Travel for the zone (m)	6
Population in the zone	500

Applied parameters

Edit | Default

Up peak handling capacity (% of population/5 minutes)	12
Acceleration rate (m/s²)	1
Interval (s)	30
Travel time (s)	25

System parameters

Acceleration: Normal

Speed (m/s)

Estimated	0.2
Actual	1

Elevator size (persons)

Estimated	7.5
Actual	13

Required number of elevators

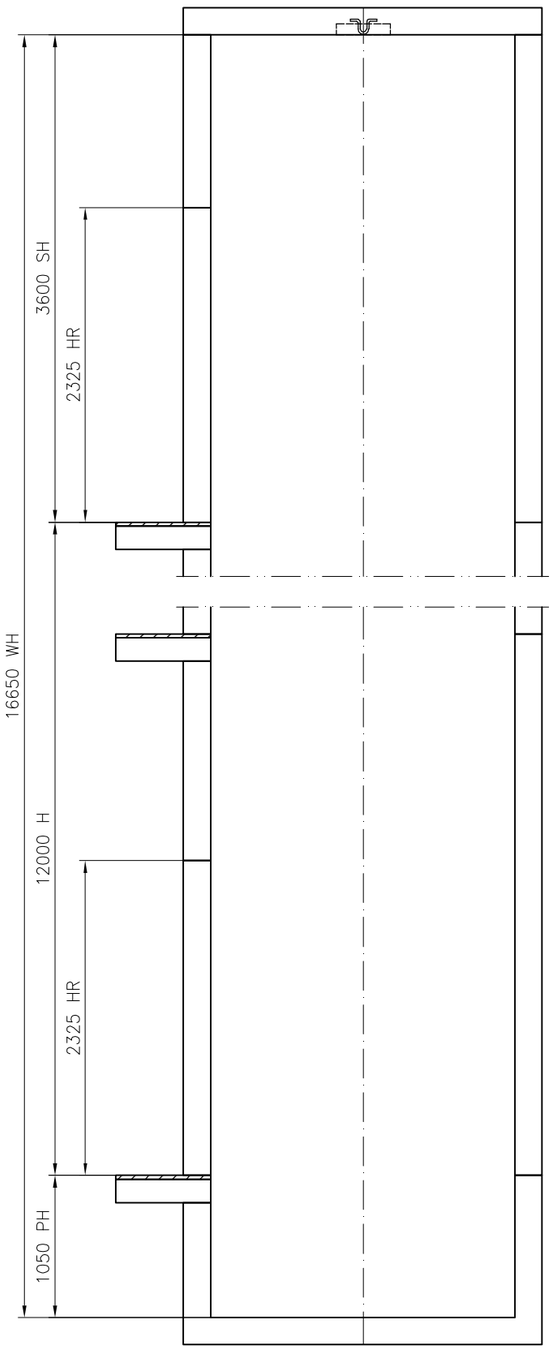
Required by interval	1.48
Required by handling capacity	1.03
Actually required	2

Switch to Destination Control | Front page

KONE shall not accept any liability for the data used and the results thereof. Any calculations made with the program are based on the input data and the parameter values, and should not be interpreted as any kind of representation of warranty of the performance of any actual elevator installation.

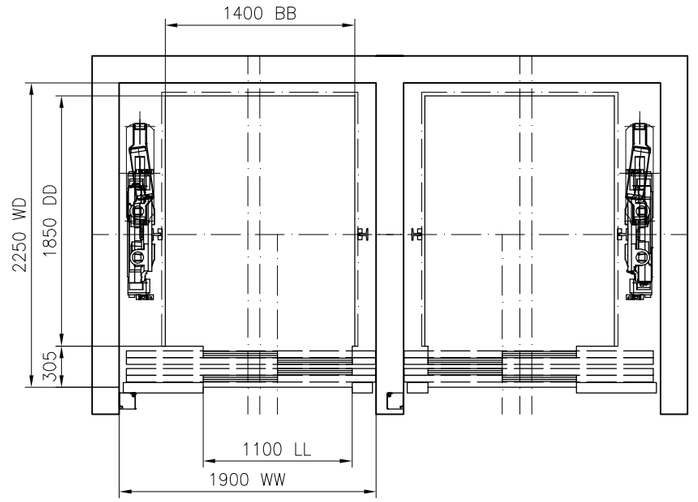
KONE Quick Traffic 2.4

Copyright © KONE Corporation, All rights reserved



PIT CLEARANCES

KEY LEGEND		
WW	=	WELL WIDTH
WD	=	WELL DEPTH
BB	=	CAR WIDTH
DD	=	CAR DEPTH
LL	=	DOOR WIDTH
LR	=	DOOR RAW OPENING WIDTH
HR	=	DOOR RAW OPENING HEIGHT
SH	=	OVERHEAD HEIGHT
PH	=	PIT HEIGHT
FW	=	LEFT FRONT WALL
FW1	=	RIGHT FRONT WALL



TOP CLEARANCES

© KONE Corporation

A3

IMPORTANT: These drawings are for initial architectural planning purposes only. KONE makes no representations or warranties to the correctness of this information. Contact KONE for further information and assistance, especially before commencing any building activity.

KONE MonoSpace 500

TECHNICAL SPECIFICATIONS

KONE PRODUCT	: PW15/10-19
GROUP SIZE	: 2
SAFETY REGULATIONS	: EN81-1
LOAD	: 1150 kg
SPEED	: 1.0 m/s
LANDINGS	: 0 / 0

KONE plc
Global House, Station Place
Chertsey
Surrey KT16 9HW
Tel: 0845 1 999 999

PROJECT NAME:

ARCHITECT:

LOCATION:

DATE: 2016-01-26

ISSUE:

www.kone.com

Dedicated to People Flow™



OPTIONS and SHAFT DIMENSIONS 1.00-1.75 m/s; 320-1150 kg

KONE MonoSpace® 500

KONE MonoSpace® 500

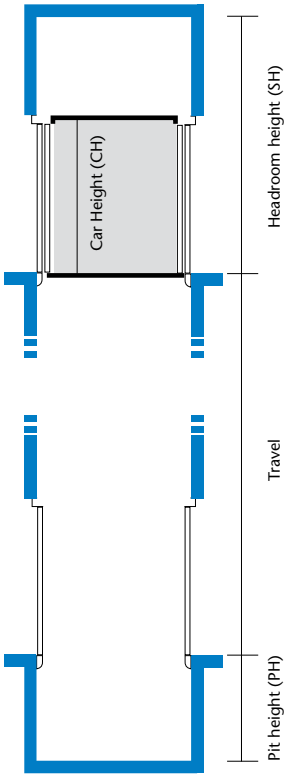
KONE MonoSpace 500 duty range			
Speed (m/s)	Load (kg)	Travel (m)	Stops
1	1150	55	21
1.6	1150	75	24
1.75	1150	75	24

KONE MonoSpace 500 minimum headroom height (SH) according to ceiling type				
Speed (m/s)	Standard ceiling (mm)	RL11 RL12	CL88L CL94L CL162	CL193
1.0	CH + 1300	CH + 1220	CH + 1380	CH + 1330
1.6	CH + 1500	CH + 1420	CH + 1580	CH + 1530
1.75	CH + 1500	CH + 1420	CH + 1580	CH + 1530

NOTE: With safety device, only CH = 2100 and CH = 2200 possible

KONE MonoSpace 500 pit height (PH)	
Speed (m/s)	Standard
1.0	1050
1.6	1200
1.75	1200
	Max 1550

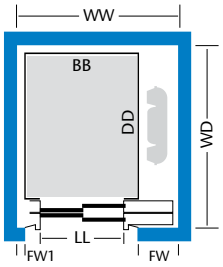
Q = Rated load of elevator
BB = Car width
DD = Car depth
CH = Car clear height
FW = Front wall width
FW1 = Side wall left - frame door application only
FW2 = Side wall right - frame door application only
HH = Door clear opening height
HR = Door raw opening height
LL = Door clear opening width
LR = Door raw opening width
LW = Right front door cover (including 30 mm tolerance)
LW1 = Left front door cover (including 30 mm tolerance)
LA = Front panel width, left
LB = Front panel width, right
FL = Front wall width, car, left
FR = Front wall width, car, right
WW = Shaft width
WD = Shaft dept



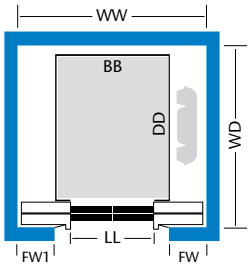
Frame and narrow frame door types

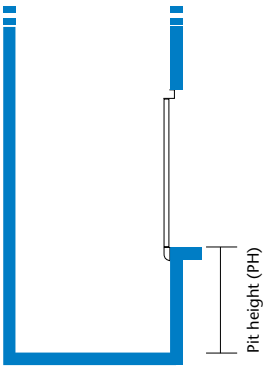
Single entrance car (SEC)

Side opening



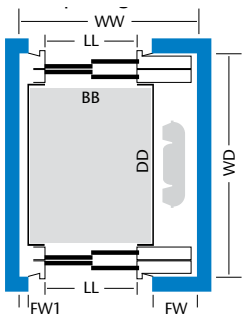
Centre opening



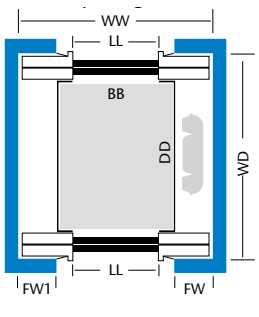


Through type car (TTC)

Side opening



Centre opening



Frame widths:

Frame door: (WW – LL – FW1 – FW) / 2 = 120 mm

Narrow frame: (WW – LL – FW1 – FW) / 2 = 50 mm

Frame and front doors (single entrance and through type cars)

Centre opening doors

Load (kg)	BB (mm)	DD (mm)	Persons	LL (mm)	WW min (mm)[1]	WW nom (mm)[1]	WD min (mm) SEC	WD min (mm) TTC	Front wall width, car* FL (mm)	Front wall width, car* FR (mm)	Shaft wall width, frame doors FW=FW1 min (mm)[2]	Shaft wall width, frame doors FW=FW1 nom (mm)[3]	Shaft wall width, frame doors LR (mm)	Panel width, front doors LA (mm)	Panel width, front doors LB (mm)	Panel width, front doors LR (mm)
630	1100	1400	8	800	1740	1750	1700	1810	145	155	320	325	1100	440	440	1740
630	1100	1400	8	900	1940	1950	1700	1810	50	150	370	375	1200	490	490	1940
630	1100	1400	8	1000	2140	2150	1700	1810	50	50	420	425	1300	540	540	2140
800	1350	1400	10	800	1840	1850	1700	1810	370	180	370	375	1100	490	490	1840
800	1350	1400	10	900	1940	1950	1700	1810	270	180	370	375	1200	490	490	1940
900	1400	1500	12	800	1900	1900	1800	1910	400	200	400	400	1100	520	520	1900
900	1400	1500	12	900	1940	1950	1800	1910	320	180	370	375	1200	490	490	1940
1000	1100	2100	13	800	1740	1750	2400	2510	170	130	320	325	1100	440	440	1740
1000	1100	2100	13	900	1940	1950	2400	2510	50	150	370	375	1200	490	490	1940
1000	1100	2100	13	1000	2140	2150	2400	2510	50	50	420	425	1300	540	540	2140
1000	1300	1700	13	900	1940	1950	2000	2110	220	180	370	375	1200	490	490	1940
1000	1300	1700	13	1000	2140	2150	2000	2110	70	230	420	425	1300	540	540	2140
1000	1300	1700	13	1100	2340	2350	2000	2110	50	150	470	475	1400	590	590	2340
1000	1400	1600	13	1000	2140	2150	1900	2010	170	230	420	425	1300	540	540	2140
1000	1400	1600	13	1100	2340	2350	1900	2010	50	250	470	475	1400	590	590	2340
1000	1450	1550	13	900	1940	1950	1850	1960	370	180	370	375	1200	490	490	1940
1000	1450	1550	13	1000	2140	2150	1850	1960	220	230	420	425	1300	540	540	2140
1000	1600	1400	13	900	2100	2100	1700	1810	450	250	450	450	1200	570	570	2100
1000	1600	1400	13	1000	2140	2150	1700	1810	370	230	420	425	1300	540	540	2140
1000	1600	1400	13	1100	2340	2350	1700	1810	220	280	470	475	1400	590	590	2340
1150	1200	2100	15	900	1940	1950	2400	2510	120	180	370	375	1200	490	490	1940
1150	1200	2100	15	1000	2140	2150	2400	2510	50	150	420	425	1300	540	540	2140
1150	1200	2100	15	1100	2340	2350	2400	2510	50	50	470	475	1400	590	590	2340
1150	1400	1850	15	900	1940	1950	2150	2260	320	180	370	375	1200	490	490	1940
1150	1400	1850	15	1000	2140	2150	2150	2260	170	230	420	425	1300	540	540	2140
1150	1400	1850	15	1100	2340	2350	2150	2260	50	250	470	475	1400	590	590	2340

*Machine on right side. [1]Includes +/-25mm tolerance. [2]Shaft wall in case of minimum WW. [3]Shaft wall in case of nominal WW.

Side opening doors

Load (kg)	BB (mm)	DD (mm)	Persons	LL (mm)	WW min (mm)[1]	WD min (mm) SEC	WD min (mm) TTC	Front wall width, car* FL (mm)	Front wall width, car* FR (mm)	Shaft wall width, frame doors FW (mm)	Shaft wall width, frame doors FW1 (mm)	Shaft wall width, frame doors LR (mm)	Panel width, front doors LA (mm)	Panel width, front doors LB (mm)	Panel width, front doors LR (mm)
320	750	1100	4	600	1220	1500	n.a	45	105	270	50	900	390	170	1220
320	750	1100	4	700	1300	1500	n.a	20	30	270	30	1000	390	150	1300
320	900	1000	4	700	1370	1450	n.a	45	155	320	50	1000	440	170	1370
400	800	1200	5	600	1270	1600	1810	45	155	320	50	900	440	170	1270
400	800	1200	5	700	1300	1600	1810	20	80	270	30	1000	390	150	1300
400	950	1100	5	700	1420	1500	1710	145	105	270	150	1000	390	270	1420
400	950	1100	5	800	1450	1500	1710	20	130	320	30	1100	440	150	1450
450	1000	1200	6	800	1470	1600	1810	45	155	320	50	1100	440	170	1470
450	1000	1200	6	800	1500	1600	1810	45	155	350	50	1100	470	170	1500
450	1000	1200	6	900	1600	1600	1810	20	80	370	30	1200	490	150	1600
480	950	1300	6	700	1420	1700	1910	145	105	270	150	1000	390	270	1420
480	950	1300	6	800	1450	1700	1910	20	130	320	30	1100	440	150	1450
480	950	1300	6	900	1600	1700	1910	20	30	370	30	1200	490	150	1600
480	1000	1250	6	800	1470	1650	1860	45	155	320	50	1100	440	170	1470
480	1000	1250	6	800	1500	1650	1860	45	155	350	50	1100	470	170	1500
480	1000	1250	6	900	1600	1650	1860	20	80	370	30	1200	490	150	1600
630	1100	1400	8	800	1570	1800	2010	145	155	320	150	1100	440	270	1570
630	1100	1400	8	800	1600	1800	2010	145	155	350	150	1100	470	270	1600
630	1100	1400	8	900	1600	1800	2010	20	180	370	30	1200	490	150	1600
680	1130	1400	9	800	1600	1800	2010	145	185	350	150	1100	470	270	1600
680	1130	1400	9	900	1600	1800	2010	25	205	370	30	1200	490	150	1600
680	1130	1400	9	1000	1750	1800	2010	20	110	420	30	1300	540	150	1750
680	1200	1400	9	900	1670	1800	2010	45	255	420	50	1200	540	170	1670
680	1200	1400	9	900	1700	1800	2010	45	255	450	50	1200	570	170	1700
800	1350	1400	10	800	1850	1800	2010	250	300	500	250	1100	620	370	1850
800	1350	1400	10	900	1850	1800	2010	150	300	500	150	1200	620	270	1850
800	1350	1400	10	1000	1850	1800	2010	50	300	500	50	1300	620	170	1850
900	1400	1500	12	800	1900	1900	2110	400	200	400	400	1100	520	520	1900
900	1400	1500	12	900	1900	1900	2110	250	250	450	250	1200	570	370	1900
900	1400	1500	12	1000	1900	1900	2110	150	250	450	150	1300	570	270	1900
1000	1100	2100	13	800	1600	2500	2710	150	150	350	150	1100	470	270	1600
1000	1100	2100	13	900	1600	2500	2710	20	180	370	30	1200	490	150	1600
1000	1100	2100	13	1000	1750	2500	2710	20	80	420	30	1300	540	150	1750
1000	1300	1700	13	900	1800	2100	2310	150	250	450	150	1200	570	270	1800
1000	1300	1700	13	1000	1800	2100	2310	50	250	450	50	1300	570	170	1800
1000	1400	1600	13	900	1900	2000	2210	250	250	450	250	1200	570	370	1900
1000	1400	1600	13	1000	1900	2000	2210	150	250	450	150	1300	570	270	1900
1000	1450	1550	13	900	1950	1950	2160	250	300	500	250	1200	620	370	1950
1000	1450	1550	13	1000	1950	1950	2160	150	300	500	150	1300	620	270	1950
1150	1200	2100	15	900	1700	2500	2710	50	250	450	50	1200	570	170	1700
1150	1200	2100	15	1000	1750	2500	2710	20	180	420	30	1300	540	150	1750
1150	1200	2100	15	1100	1900	2500	2710	20	80	470	30	1400	590	150	1900
1150	1400	1850	15	900	1900	2250	2460	250	250	450	250	1200	570	370	1900
1150	1400	1850	15	1000	1900	2250	2460	150	250	450	150	1300	570	270	1900
1150	1400	1850	15	1100	1900	2250	2460	20	280	470	30	1400	590	150	1900

*Machine on right side. [1]Includes +/-25mm tolerance.

Narrow frame doors (single entrance and through type cars)

Centre opening doors

											Shaft wall width, narrow frame doors				
					KES 600	KES 800	WD min (mm)		Front wall width, car*		KES 600		KES 800		
Load (kg)	BB (mm)	DD (mm)	Persons	LL (mm)	WW min (mm)[1)]	WW min (mm)[1)]	SEC	TTC	FL (mm)	FR (mm)	FW (mm)	FW1 (mm)	FW (mm)	FW1 (mm)	LR (mm)
630	1100	1400	8	800	1740	1750	1700	1810	145	155	395	395	400	400	950
630	1100	1400	8	900	1940	1950	1700	1810	50	150	445	445	450	450	1050
630	1100	1400	8	1000	2140	2150	1700	1810	50	50	495	495	500	500	1150
800	1350	1400	10	800	1840	1840	1700	1810	370	180	445	445	445	445	950
800	1350	1400	10	900	1940	1950	1700	1810	270	180	445	445	450	450	1050
900	1400	1500	12	800	1900	1890	1800	1910	400	200	475	475	465	475	950
900	1400	1500	12	900	1940	1950	1800	1910	320	180	445	445	450	450	1050
1000	1100	2100	13	800	1740	1750	2400	2510	170	130	395	395	400	400	950
1000	1100	2100	13	900	1940	1950	2400	2510	50	150	445	445	450	450	1050
1000	1100	2100	13	1000	2140	2150	2400	2510	50	50	495	495	500	500	1150
1000	1300	1700	13	900	1940	1950	2000	2110	220	180	445	445	450	450	1050
1000	1300	1700	13	1000	2140	2150	2000	2110	70	230	495	495	500	500	1150
1000	1300	1700	13	1100	2340	2350	2000	2110	50	150	545	545	550	550	1250
1000	1400	1600	13	1000	2140	2150	1900	2010	170	230	495	495	500	500	1150
1000	1400	1600	13	1100	2340	2350	1900	2010	50	250	545	545	550	550	1250
1000	1450	1550	13	900	1940	1950	1850	1960	370	180	445	445	450	450	1050
1000	1450	1550	13	1000	2140	2150	1850	1960	220	230	495	495	500	500	1150
1000	1600	1400	13	900	2100	2090	1700	1810	450	250	525	525	515	525	1050
1000	1600	1400	13	1000	2140	2150	1700	1810	370	230	495	495	500	500	1150
1000	1600	1400	13	1100	2340	2350	1700	1810	220	280	545	545	550	550	1250
1150	1200	2100	15	900	1940	1950	2400	2510	120	180	445	445	450	450	1050
1150	1200	2100	15	1000	2140	2150	2400	2510	50	150	495	495	500	500	1150
1150	1200	2100	15	1100	2340	2350	2400	2510	50	50	545	545	550	550	1250
1150	1400	1850	15	900	1940	1950	2150	2260	320	180	445	445	450	450	1050
1150	1400	1850	15	1000	2140	2150	2150	2260	170	230	495	495	500	500	1150
1150	1400	1850	15	1100	2340	2350	2150	2260	50	250	545	545	550	550	1250

*Machine on right side. [1)]Includes +/-25mm tolerance.

Side opening doors

											Shaft wall width, narrow frame doors				
					KES 600	KES 800	WD min (mm)		Front wall width, car*		KES 600		KES 800		
Load (kg)	BB (mm)	DD (mm)	Persons	LL (mm)	WW min (mm)[1)]	WW min (mm)[1)]	SEC	TTC	FL (mm)	FR (mm)	FW (mm)	FW1 (mm)	FW (mm)	FW1 (mm)	LR (mm)
320	750	1100	4	700	1300	1350	1500	n.a	20	30	345	105	350	150	850
320	900	1000	4	700	1370	1395	1450	n.a	45	155	395	125	395	150	850
400	800	1200	5	700	1300	1350	1600	1810	20	80	345	105	350	150	850
400	950	1100	5	700	1420	1425	1500	1710	145	105	345	225	350	225	850
400	950	1100	5	800	1450	1500	1500	1710	20	130	395	105	400	150	950
450	1000	1200	6	800	1470	1500	1600	1810	45	155	395	125	400	150	950
450	1000	1200	6	900	1600	1650	1600	1810	20	80	445	105	450	150	1050
480	950	1300	6	700	1420	1425	1700	1910	145	105	345	225	350	225	850
480	950	1300	6	800	1450	1500	1700	1910	20	130	395	105	400	150	950
480	950	1300	6	900	1600	1650	1700	1910	20	30	445	105	450	150	1050
480	1000	1250	6	800	1470	1500	1650	1860	45	155	395	125	400	150	950
480	1000	1250	6	900	1600	1650	1650	1860	20	80	445	105	450	150	1050
630	1100	1400	8	800	1570	1575	1800	2010	145	155	395	225	400	225	950
630	1100	1400	8	900	1600	1650	1800	2010	20	180	445	105	450	150	1050
680	1130	1400	9	800	1600	1600	1800	2010	145	185	425	225	425	225	950
680	1130	1400	9	900	1600	1650	1800	2010	25	205	445	105	450	150	1050
680	1130	1400	9	1000	1750	1800	1800	2010	20	110	495	105	500	150	1150
680	1200	1400	9	900	1670	1695	1800	2010	45	255	495	125	495	150	1050
800	1350	1400	10	800	1850	1840	1800	2010	250	300	575	325	565	325	950
800	1350	1400	10	900	1850	1840	1800	2010	150	300	575	225	565	225	1050
800	1350	1400	10	1000	1850	1865	1800	2010	50	300	575	125	565	150	1150
900	1400	1500	12	800	1900	1890	1900	2110	400	200	475	475	465	475	950
900	1400	1500	12	900	1900	1890	1900	2110	250	250	525	325	515	325	1050
900	1400	1500	12	1000	1900	1890	1900	2110	150	250	525	225	515	225	1150
1000	1100	2100	13	800	1600	1590	2500	2710	150	150	425	225	415	225	950
1000	1100	2100	13	900	1600	1650	2500	2710	20	180	445	105	450	150	1050
1000	1100	2100	13	1000	1750	1800	2500	2710	20	80	495	105	500	150	1150
1000	1300	1700	13	900	1800	1790	2100	2310	150	250	525	225	515	225	1050
1000	1300	1700	13	1000	1800	1815	2100	2310	50	250	525	125	515	150	1150
1000	1400	1600	13	900	1900	1890	2000	2210	250	250	525	325	515	325	1050
1000	1400	1600	13	1000	1900	1890	2000	2210	150	250	525	225	515	225	1150
1000	1450	1550	13	900	1950	1940	1950	2160	250	300	575	325	565	325	1050
1000	1450	1550	13	1000	1950	1940	1950	2160	150	300	575	225	565	225	1150
1150	1200	2100	15	900	1700	1715	2500	2710	50	250	525	125	515	150	1050
1150	1200	2100	15	1000	1750	1800	2500	2710	20	180	495	105	500	150	1150
1150	1200	2100	15	1100	1900	1950	2500	2710	20	80	545	105	550	150	1250
1150	1400	1850	15	900	1900	1890	2250	2460	250	250	525	325	515	325	1050
1150	1400	1850	15	1000	1900	1890	2250	2460	150	250	525	225	515	225	1150
1150	1400	1850	15	1100	1900	1950	2250	2460	20	280	545	105	550	150	1250
1150	1400	1850	15	1000	1900	1890	2250	2460	150	250	525	225	515	225	1150
1150	1400	1850	15	1100	1900	1950	2250	2460	20	280	545	105	550	150	1250

*Machine on right side. [1)]Includes +/-25mm tolerance.

KONE MonoSpace® 500 option and features

	Option Code	Building segment recommendation		KONE MonoSpace 500
		Residential	Commercial	
Eco-efficiency features and options				
Regenerative drive	BMV M/MU	☆	☆	
LED lighting		☆	☆	
Car light standby	OCL A	☆	☆	
Ventilation standby	OCV A		☆	
Signalization dimming		☆	☆	
Drive standby		☆	☆	
Controller standby	SBM V	☆	☆	
VDI4707 A-class energy efficiency		☆		/
VDI4707 A-class certification		☆		
People flow enhancement features				
Full collective control system	FC		☆	
Push button control system	PB	☆		
Down collective control system	DC	☆		
KONE Polaris 500 Destination control	DCS		☆	
KONE Polaris 800 Destination control	DCS		☆	-
KONE Polaris 900 Destination control	DCS		☆	-
Advance door opening	ADO		☆	
Curtain of light in car door	COL	☆	☆	
Nudging operation, warning signal to closing door (NUD)	NUD		☆	
Bypass load function, landing calls not picked if over 80% load in car	BLF	☆	☆	
Adaptation to traffic peaks	IUP/IDP/ITP	☆	☆	
Door closed button	DCB		☆	
Priority car call, with key	PRC	☆		
Quick door close from new car call	QCC	☆	☆	
Accessibility features and options				
Compliancy of EN81-70		☆	☆	
Curtain of light in car door	COL		☆	
Lift audible announcer	ACU F	☆	☆	
Door open with extended door time	DOE B	☆	☆	
Door open button	DOB	☆	☆	
Door close button	DCB		☆	
Induction loop in car for people with hearing aid	ILS		☆	
Access control with pin code locked car calls		☆		
Automatic parking at main floor	PAM	☆	☆	
Tenant directory on COP, custom COP faceplate			☆	
Loudspeaker provision in car			☆	
Call registered buzzer in car and at landing		☆	☆	
Green main floor button	GFB	☆	☆	
Folding seat in car		☆		
Out of service switch and indicator in car	OSS C		☆	
Corridor illuminating control	CIC	☆	☆	
Security features and options				
Locking of car calls with key switch	LOC E	☆	☆	
Compulsory stopping at main floor	CSM		☆	
Priority call in car	PRC		☆	
Locking of landing calls	LOL	☆	☆	
Hazard avoidance features and options				
Halogen free electrification cables	SHL	☆	☆	
Accurate leveling operation with doors open	ACL B	☆	☆	
Automatic evacuation to nearest landing	EBD A			
Car ventilation with fan	OCV		☆	
Emergency power drive, operation with emergency generator	EPD		☆	
KONE Remote Monitoring with GSM connection	KRM PW	☆	☆	
Independent dual brake		☆	☆	
Curtain of light in car door	COL	☆	☆	
Hoistway access detection, Door opening monitoring	DOM	☆		
Car door lock	CDL	☆	☆	
Car emergency light	CEL	☆	☆	
Maintenance light on the Maintenance Access Panel		☆	☆	
Maintenance intercom from Maintenance Access Panel to car	EPD		☆	
Sequencer for elevator group in recovering from the power black out, EPS G	EPS G		☆	
Safety gear in counterweight for elevators with occupied levels under the pit	CWT SG		☆	
Earthquake sensor contact option	EAQ		☆	
Fire service operation	FRD			
System options				
KONE InfoScreen to display building related information in the car and landing		☆	☆	
KONE E-link, elevator monitoring system			☆	
KONE IDE300, building door, access control and elevator integration		☆		
KONE Polaris 500 Destination control			☆	
KONE Polaris 800 Destination control			☆	-
KONE Polaris 900 Destination control			☆	-

Special elevator solutions conforming with safety codes				
EN81-72 Fire fighters lifts				
EN81-73 Behaviour of lifts in the event of fire		☆	☆	
EN81-71 Vandal resistant lifts, CAT1				
EN81-70, Elevators for passengers with disabilities		☆	☆	

☆ = recommendation = standard = option

KONE provides innovative and eco-efficient solutions for elevators, escalators, doors,loading bays and access. We support our customers every step of the way; from design, manufacturing and installation to maintenance and modernisation. KONE is a global leader in helping our customers manage the smooth flow of people and goods throughout their buildings.

Our commitment to customers is present in all KONE solutions. This makes us a reliable partner throughout the life-cycle of the building. We challenge the conventional wisdom of the industry. We are fast, flexible, and we have a well-deserved reputation as a technology leader, with such innovations as KONE UniDrive™, KONE MonoSpace®, KONE MaxiSpace™, and KONE InnoTrack™. You can experience these innovations in architectural landmarks such as 30 St Mary Axe and Broadgate and 201 Bishopsgate buildings, BAA Terminal 5, Emirates Stadium, Brunel University, Citigroup, Jubilee Line and St. Georges Wharf.

KONE employs approximately 35,000 dedicated experts to serve you globally and locally in 50 countries.

KONE plc

Head Office

KONE plc, Global House, Station Place,
Chertsey, Surrey, KT16 9HW
sales.marketinguk@kone.com

Regional Offices

KONE plc, Unit 5 Beechwood ,
Chineham Business Park, Basingstoke,
Hampshire, RG24 8WA

KONE plc, 2425 Regents Court,
The Crescent, Birmingham Business Park,
Solihull, B37 7YE

KONE plc, Suite G7/G4, Duart House,
Finch Way, Strathclyde Business Park,
Bellshill, ML4 3PR

KONE plc, Worth Bridge Road, Keighley,
West Yorkshire, BD21 4YA

KONE plc, 34 Bedford Road,
Clapham, London, SW4 7HJ

KONE plc, 1000 Birchwood Boulevard,
Birchwood, Warrington,
Cheshire, WA3 7QL

General Enquiries

Tel: 0845 1 999 999
www.kone.co.uk

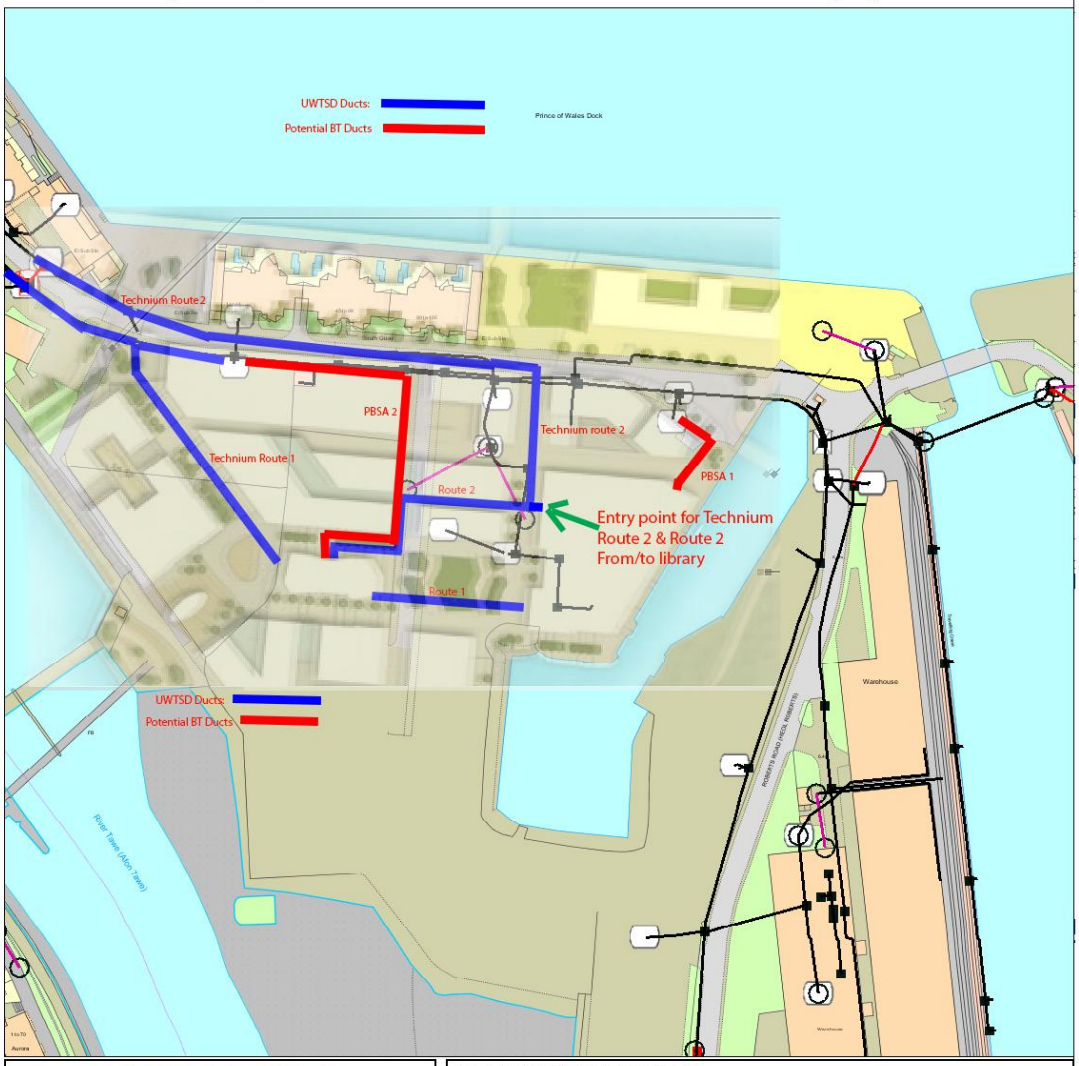


This publication is for general informational purposes only and we reserve the right at any time to alter the product design and specifications. No statement contained in this publication shall be construed as a warranty or condition, expressed or implied, as to any product, its fitness for any particular purpose, merchantability, quality or shall be interpreted as a term or condition of any purchase agreement for the products or services contained in this publication. Minor differences between printed and actual colours may exist. KONE®, Dedicated to People Flow™, KONE MonoSpace®, KONE MiniSpace™ KONE EcoDisc®, KONE MaxiSpace™, KONE InnoTrack™ are trademarks or registered trademarks of KONE Corporation. Copyright © 2012 KONE Corporation.

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

The latest public realm drawing by James Cale date 23.02.2016.

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

DIAL BEFORE YOU DIG

FOR PROFESSIONAL ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS

ADVANCE NOTICE REQUIRED
(Office hours: Monday-Friday 08.00 to 17.00)

Tel: 0800 9173993
E-mail: dbyd@openreach.co.uk
Website: www.dialbeforeyoudig.com

Reproduced from the Ordnance Survey map by BT by permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office (C) Crown Copyright British Telecommunications plc 100028040

KEY TO BT SYMBOLS

UNDERGROUND PLANT	POLE
A/C, D/W or W OVERHEAD PLANT	CABINET
JOINT BOX	BURIED JOINT
DISTRIBUTION POINT	JOINTING POST
MANHOLE	PROPOSED U/G
DP BOUNDARY	A/C, D/W or W PROPOSED O/H
OTHER BT BOUNDARY	PROPOSED BOX

Other proposed plant is shown using dashed lines. BT symbols not listed above may be disregarded. Existing BT plant may not be recorded. Information valid at the time of preparation.

openreach
a BT Group business

BT Ref : MXE03559I
Map Reference : (centre) SS6672792694
Easting/Northing : (centre) 266727,192694
Issued : 22/10/2014 15:55:25

FOOTNOTE: WARNING IT IS ESSENTIAL THAT YOU CONTACT NATIONAL NETWORK HANDLING CENTRE BY EMAIL nnhc@openreach.co.uk BEFORE PROCEEDING WITH ANY WORK IN THE HATCHED AREA

University of Wales Trinity Saint David's SA1 IT Infrastructure Standards

1 Contents

1 Contents 1
2 Introduction 2
3 Document History 3
4 Project Management 3
4.1 Project Setup 3
4.1.1 Communication with IT&S 3
4.1.2 Note about Lead Times and installation dates 4
4.1.3 Requested Documents 5
4.1.4 Drawings 5
4.1.5 Costs and Budgets 5
4.2 Project Phases 6
4.2.1 Planning 6
5 IT Standards 7
5.1 Data Cabling 7
5.1.1 Cabling Standards 7
5.1.2 Labelling 9
5.1.3 Testing 10
5.1.4 Extra cables in locations with no wireless signal 11
5.2 Site Data Connection 11
5.3 Underground Ducts 11
5.3.1 Standard 11
5.4 Server Room 12
5.4.1 Standard 12
5.5 Data room 14
5.5.1 Standard 14
5.5.2 Data Cabinet 16
5.5.3 Labelling 17
5.6 Wireless Data Network 17

DRAFT

5.6.1 Standard 17
5.6.2 Labelling 18
5.7 Data Switches 18
5.7.1 Standard 18
5.7.2 Labelling 18
5.8 Patch Leads 19
5.8.1 Standard 19
5.9 Servers 19
5.9.1 Standard 19
5.10 CCTV 19
5.10.1 Labelling 19
5.11 Audio and Visual 20
5.11.1 Screen Size and Sightline 20
5.11.2 Lighting 21
5.11.3 Lectern 21
5.11.4 Audio 22
5.11.5 Lecture Capture 23
6 APPENDIX 1 – The Services 24
7 APPENDIX 2 – Other IT&S & Estates Contact Directory 27

DRAFT

2 Introduction

The SA1 project is a critical project within the wider UWTSD transformation project that will encompass all parts of the university including the campuses in Swansea, Lampeter and Carmarthen and, eventually, the FE colleges within the UWTSD network. Information Communication and Technology (ICT) will play a crucial role in delivering this project.

The majority of ICT requirements will be academically driven and factors such as changing technologies and student experience will lead to requirements for flexible, specialist, formal and informal teaching, learning, work and social spaces, all of which will have an impact on the way that ICT will be scoped, planned and delivered. The ICT may be as obvious as a new CCTV system or data point for each desktop PC or as easily forgotten as a network point for a credit card terminal or the wireless access points; all aspects need to be planned, implemented and supported. If the planning is not done, the funding becomes difficult, the implementation becomes chaotic and the support difficult (sometimes impossible); all of which results in frustrated departments, staff and users. To

create satisfied users and avoid chaos, this document should be used to inform internal departments and any external contractors of University of Wales Trinity Saint David's (UWTSD) ICT standards.

This document has been prepared and reviewed by Information Technology & Systems (IT&S) & Technology Enhanced Learning (TEL) and therefore will make the project easier to implement. With IT&S and TEL present at crucial points in the project it will allow the project managers, consultants and suppliers to easily monitor/QA the work effectively with minimal intervention from IT&S.

The ICT standards must be adhered to; if they are not then IT&S may refuse to support the installation/service.

Please note that this document is based on current ICT standards (October 2015) and so documented current specifications of hardware is based on current trends and technologies. We reserve the right to amend such details should the need arise, such as cabling standards, minimum PC specification etc.

3 Document History

This document will be reviewed regularly during the lifecycle of the project, but technology advance at such a tremendous rate, amendments may be made outside this review period.

Any changes contact the document initial author.

Date	Version	Author	Comment
September 2015	1.0	James Cale	Initial Draft for SA1
October 2015	1.1	James Cale	Updated, input from Chris Handley and the AKU equivalent document
November 2015	1.2	James Cale	AV section added from TEL feedback
December 2015	1.3	James Cale	Updated following PSBA and JISC feedback
January 2016	1.4	James Cale	Further additions to cabling standards (RJ45)

4 Project Management

4.1 Project Setup

4.1.1 Communication with IT&S

In the first instance the project manager should contact the relevant SA1 ICT contacts below. In addition to this we have also documented relevant IT&S staff members as well for reference:

Name	Role	Contact Details
Chris Handley	SA1 ICT Consultant	chris.handley@uwtsd.ac.uk
James Cale	Executive Head of Information Technology and Systems	01267 676754 j.cale@uwtsd.ac.uk
Lyndon Shirley	Executive Head of Technology Enhanced Learning	TBC Lyndon.shirley@uwtsd.ac.uk
Nigel Lewis	Head of IT Infrastructure	01267 676762 n.lewis@uwtsd.ac.uk

Name	Role	Contact Details
Anthony Daniels	Systems Engineer – IT & Infrastructure team	Anthony.daniels@uwtsd.ac.uk
Dean Parratt	Systems Engineer – IT & Infrastructure team	dean.parratt@uwtsd.ac.uk
Lee Hopkins	IT&S Project Manager – internal IT&S project lead	Lee.hopkins@uwtsd.ac.uk

The above SA1 ICT contacts will take the lead on the ICT elements of the project or delegate to the IT&S contacts internally as relevant for the scope of work. The project will be discussed at senior level so all relevant roles are kept abreast.

The IT&S department will need to be involved at every stage of the project (feasibility, planning, pre-tender, first fix, fit out, etc) to sign off the IT components as this has a direct effect on the end service the IT&S department supports. Also, any client IT requirement needs to be discussed with the IT&S and TEL department in advance. For example, AV needs can be as simple as a reception information screen to as complex as a video wall.

4.1.2 Note about Lead Times and installation dates

Much of the equipment required to complete the ICT tasks within a building is not held by IT&S or TEL in stock and therefore must be ordered. The lead times on equipment can be as short as a few days or as long as many months. Not only is there a need to take into account the lead times on stock but there is a need by IT&S to schedule staff resource. When the ICT standards are followed we can avoid much of the project delays which relate to ICT.

4.1.3 Requested Documents

The following documents will be expected to be provided to IT&S both electronically and on paper (when available) during any initial discussion with IT&S:

- Drawings in AutoCAD format and PDF
- Directory of contacts
- Project Codes
- Project Summary
- Critical project dates

During the project the following will be required:

- Schedules of numbering of each field outlet

At project completion the following must be presented:

- Copies of the Fiber OTDR test results
- Copies of the Copper/Fiber cabling certification
- Rack/Cabinet documentation (see Label standards below)

They will form part of the contract certification pack which will be presented to UWTSD.

4.1.4 Drawings

Drawings must be supplied in electronic format (AutoCAD and PDF), and must display the following:

- Data network points
- AV equipment location and cable runs
- Wireless Access Points
- Fiber & data cable routes
- Comms cabinets

4.1.5 Costs and Budgets

Usually all ICT spend within a project must come out of the relevant project code and this must be communicated to the Executive Head of Information Technology and Systems before any IT equipment or service is purchased. With good planning all ICT expenditure can be predicted and budgeted for in advance. If IT&S are expected to cover any costs, this must be confirmed as part of the project planning.

DRAFT

4.2 Project Phases

4.2.1 Planning

4.2.1.1 LAN Connections

The SA1 site will need to be connected to UWTSD's local area network (LAN) by fiber. The proposed connection location from the new SA1 sites is to Technium 2 (SA1 8PH).

4.2.1.2 Infrastructure Service Summary

As detailed in the introduction there are many services which require the data network, and therefore must be considered during any planning process. These services include:

Service	Description
Desktop PC	Desktop PC
IT Labs	A room with many PCs which students can use
Desk Telephone	An office phone which is connected to the University data network
Wireless Access Point	WAP to provide wireless connectivity for the surrounding area
Emergency Phones or corridor phones	A corridor or emergency phone which is connected to the University data network
Lift Phone	Emergency lift phone which is connected outside of the data network for resiliency
Audio and Visual	Any fixed AV equipment a room may have
Fax	Fax machine requiring an analogue line
Printer/Copier	Any output device, typically, a printer or copier.
Digital Signage	A large flat screen normally in open, reception or common areas which displays television pictures or information
PDQ/Credit Card terminals	A credit card payment terminal, typically used for financial transactions (usually requiring an analogue line)
CCTV	IP or analogue based CCTV
Metering	Electrical metering, typically used to calculate the building's energy consumption
Access Control	Electronic door access control which is connected to the data network and require the University ID card

See APPENDIX 1 for specification

DRAFT

4.2.1.3 IT Network Infrastructure

The infrastructure service summary describes what the end user interacts with, for example, a telephone, credit card terminal, copier, etc. The user doesn't see the support infrastructure which lies behind this but any project plan must include it.

See section 5 for IT&S infrastructure standards.

5 IT Standards

This section will highlight each infrastructure element together with a recommendation. In general:

- Everything MUST be labelled. If it is not labelled IT&S will not adopt the equipment
- Installations must be documented on the Project teams master drawings, with each item recorded on the appropriate layer: AV cables, copper cable, fiber cable, network sockets and wireless access points
- All work must carry a 25 year guarantee (where possible)

5.1 Data Cabling

All data and voice cabling shall be structured and conform to the standards in this document. Any analogue line into a building will be terminated at the main ICT room with the actual end service being carried on the building's structure data cables. Note analogue lines are being deprecated and specific contact should be made with IT&S before specifying any solution involving analogue telephone lines.

5.1.1 Cabling Standards

A combination of Copper and Fiber cabling throughout is recommended for SA1. Structured copper cabling has a very long operational life and this standard appears to offer the best value.

For SA1 the copper cabling standards planned to be used will be based on performance, to achieve 10Gbps over 100m. This factors in the delays before implementation and doesn't tie the standards in to any existing cabling standard at this point. This type of cabling would be utilised from all data cabs to the desktop. In addition to these cables we would also ask that provision is made for Fiber cabling runs to duplicate those of the copper cabling but not to be terminated at the data cabinets or desktop ends. Fiber cabling ensures that the infrastructure is futureproof and limits future requirements to replace/upgrade the core IT infrastructure.

For all cab to cab connectivity, then Fiber shall be used and will be double fed for resiliency.

Installed data cabling systems shall, where possible, be sourced from a single manufacturer/supplier from an IT&S approved list, this includes fixed cables, patch panels and patch leads. Cabling shall be installed to the manufacturer's best practice guidelines and to be handed over with the suppliers' 25-year *installation* warranty. The installation may need to be inspected by the manufacturer's representative before they will award this guarantee.

Infrastructure	Details	Minimum Specification/Model

Fiber Cable	• The fiber installers must conform to UWTSD standards and must show evidence of this. Installed fiber specification shall be discussed with IT&S on a per-project basis, but will typically be as per the specs listed here. • Double fed to Data Cabs and in place to desktops in addition to the copper cabling.	• 50/125 microns (IT&S will require consulting as there are exceptions) • OM4 • SC or LC termination • 24/48 core • Mono-mode • CST armoured • Low Smoke Halogen Cables • Terminated in 12 pair duplex SC 1U patch panel • IT&S to be supplied with OTDR results
Fiber Patch Panel	• SC/LC terminations • Clearly labelled according to the labelling standard defined earlier in the document. This label must not obstruct locations for labelling individual pairs.	All terminations shall be in 12 pair duplex SC/LC 2U patch panels.
Copper Cable	• Cables lengths to be kept under 100m • Cable installation shall be according to manufacturer's best practice recommendations. • Cable, patch panels and face plates shall all be sourced from the same product range of a single manufacturer. • When terminated all cable terminations shall be labelled according to the labelling standard detailed earlier in this document.	• Minimum of 10Gbps over 100m • Cabling must be fully compatible with RJ45 connections (be it via RJ45 or GG45 connections) • IT&S to be supplied with Copper cabling certification
Copper patch panel	• 48 port • All Building services (CCTV, etc) data network points to be terminated to IT&S own patch panel which shall typically be installed at the top of the rack. • Cable, patch panels and face plates shall where possible, all be sourced from the same product range of a single manufacturer.	• 48 port • Patch panel must be labelled in sequence with existing panels. • Horizontal cable management is to be inserted between every patch panel.
Wired Network Point	• All wired network points must be marked on the estates master building drawings • All network points shall be labelled according to the labelling standard detailed earlier in this document. • Cable, patch panels and face plates shall, where possible, all be	• Floor boxes are preferred to increase flexibility of room usage • But wall mounted faceplate sockets can be utilised

DRAFT

	sourced from the same product range of a single manufacturer	
Cable trays	• Data cables shall be supported over the full length of their run on cable tray according to best practice guidance of cabling manufacturer. • Cable tray shall not be more than 50% full at installation. Recommended bend radiuses shall be observed at all times. Velcro cable ties are to be used to avoid damaging the data cables. • Cables shall be secured in bundles of no more than 24 in all cases.	

5.1.2 Labelling

5.1.2.1 Patch Panel

Patch panels shall be labelled with the following:

- Cabling standard – e.g. "Fiber"
- Sequential Reference – e.g. "C" for the third panel
- Each socket shall be sequentially numbered from 1, left to right

5.1.2.2 Network Sockets

Network sockets shall be labelled as follows:

- Unique per-building socket designation
- To be agreed on a per project basis
- If Fiber then additionally:
    - Fiber size e.g. 9/125
    - Number of cores e.g. 24 core
    - Length of fiber in metres

Where the cables terminate in the same estates building number and there is only a single rack in the comms room then this may be shortened on a per project basis.

Where network socket is in a concealed location, socket label is also to be applied to exposed connected equipment such as CCTV etc.

5.1.2.3 Rack Documents

Each rack shall contain a document (with corresponding electronic copy) with the following information for every connection from that rack:

DRAFT

- Patch panel letter
- Port number
- Room number served
- Cabling standard
  - Including Fiber size and cores if applicable
- Cable length
- Purpose of socket e.g. Rear door CCTV camera
- Notes for such items as unusual cable routes etc.

Example

Rack docs						
Panel	Port	Destination	Length	Cable	Purpose	Comments
A	01	L133/01.1	67m	Fiber	CCTV	Dewi Reception Car Park
B	23	L133/114	37m	Fiber	WAP	Cwad PC area

5.1.3 Testing

There are two forms of testing that shall take place on new installations: Connection and compliance testing. UWTSD reserves the right to witness at least 10% of the testing and if this fails the contractor will need to redo their testing and produce new test certificates. Evidence that the cabling solution manufacturer is satisfied with the installation and as such it carries the manufacturer backed extended warranty is required.

Connection testing shall:

- Confirm the cables are connected as labelled
- Confirm results indicate the cabling has no shorts, opens, miswires, split, reversed, or crossed pairs, and end-to-end connectivity is achieved.
- Fiber cables shall be tested using a visible light source to demonstrate that the cores are arranged as the labelling suggests. Fiber cables shall also be tested using OTDR equipment from both ends to demonstrate that the installation meets the standards for cabling specification installed.
- The installers shall also satisfy the manufacturer that the solution has been installed to best practice guidelines so that the installation carries the manufacturer backed extended warranty. Note that a representative of the cabling solution manufacturer may need to witness the testing.

Compliance testing shall:

DRAFT

- Confirm that the installation achieves at least the minimum standards for the type of cable installed. Tests shall include alien crosstalk tests as well as single cable tests.
- Satisfy the manufacturer that the solution has been installed to best practice guidelines so that the installation carries the manufacturer backed extended warranty. Note that a representative of the cabling solution manufacturer may need to witness the testing.

5.1.4 Extra cables in locations with no wireless signal

Consideration shall be given to installing uncommitted data sockets if there are locations which are likely to have poor wireless and mobile network coverage. Although these should be minimal and for specific reasons, with full wireless coverage a requirement of all new buildings and refurbishments.

5.2 Site Data Connection

Any new site must be connected to the University LAN by either a Janet connection, private fiber or leased line.

With regards to SA1 the specific requirement is detailed below:

Infrastructure	Details	Minimum Specification/Model
Site Network LAN Connection	The site must be connected to the Janet network via PSBA. The setup must be fully resilient based on the following: - 2 x data connections - Separate entry points in separate buildings - Isolated ducting for each LAN/WAN – As part of the wider WAN there will be a requirement to connect to existing other local sites. The proposed connection location from the new SA1 sites is to Technium 2 (SA1 8PH).	• 2 x 1Gbps • Two separate physical entry points • Ducting via each entry points to be fully isolated from each other to the existing BT Openreach services • Fiber connectivity from SA1 server rooms to Technium 2

5.3 Underground Ducts

5.3.1 Standard

Infrastructure	Details	Minimum Specification/Model
Underground Duct	Project dependant but unless otherwise stated all ductwork shall be 100mm single tubes laid to telecoms standards with marker tape above the duct and a copper/fiber trace wire in the duct. All chamber covers shall be of a lockable design and suitable for their location. Chamber lids must	• IT requirements 1) Bend Radii 2) Inclusion of duct draw cords • All installations will be to New Roads and Street Works Act standards and specification SROH used (Specification for Reinstatement of Openings in Highways). • The duct shall be 100mm subsurface type carrying the agreed text at

	be cast iron where they are in the carriageway, but may be concrete and steel in the footway. Pressed steel lids are not acceptable at any point. The chamber lids shall feature the agreed text. With reference to the Site Data connections, entry points to the 2 x server rooms must be isolated from each other to ensure resilience. This will be right up until they connect to BT Openreach services at separate points.	intervals. • All civil construction work shall be warranted for a minimum of two years from completion of the project, in line with the highways liability period for defects.

5.4 Server Room

A dedicated UWTSD IT&S server room is required for the SA1 site, with no shared occupancy envisaged. A server room is defined as containing the main site connection, servers, cable termination and switching. In all cases no ladders or special equipment shall be required to access the server room or the communications rack. The room shall be secured ideally using the sites ID card electronic lock or equivalent code/lock system.

5.4.1 Standard

Infrastructure	Details	Minimum Specification/Model
Server Room	The server room must be identified on the drawing and must be big enough to accommodate the required racks and a working space all around the rack. • The server room must be on the first floor or above • Nearby access to service areas to install outdoor cooling units • In all cases no ladders, special equipment shall be required to access the data room or the communications rack. The room shall be secured using a ID card electronic lock or equivalent code/lock system • The room must be maintained at a temperature of no more than 23^{o}C • Server Rooms must not have a dual role, for example: cleaners store, electrical switch room etc • Access to rooms must not be by means of another room • Lighting shall be provided to a minimum of 500lux. Light fittings shall be positioned to the front and	• Dimensions 1200mm x 800mm per rack + 1000mm on all sides' front and rear. Thus minimum size room for 1 rack is 3200mm x 2800mm • Room size will be dependent on the SA1 infrastructure footprint

DRAFT

	rear of rack to maintain light levels when racks are installed. • Raised floor required (2ft recommended) • Floor grid system should contain pedestals, bolted stringers and tiles • Floor tile dimensions should be 600x600 • Floor load capacity should meet the following criteria: • Point load of approximately 3KN. • Uniform distribution load of approximately 15KN • Floor should have pedestals, primary and secondary stringer bars of steel. • Perforated tiles to be used as exit points for under the floor air conditioning • Suspended Ceiling (12 feet clearance above raised floor) • Overhead cabling required • Preferred internal cab layout (patch panels/switching) – See section 5.5.2 • 24/7 access for authorised staff • Data distribution redundancy – fiber feeds from different routes • No water, steam, hot, cold, drain piping etc should run above/below/adjacent to the server room • CCTV surveillance both inside and outside of the server room • Fire alerting/suppression system • Environmental monitoring system with real time monitoring, alerting of intrusion, AC power failure, high/low voltage, generator failure, UPS failure, temperature/humidity, breaker trips and water leak detections	
Electrical	• The electrical supply for each rack shall be presented on two 32A commando type sockets with integral isolators. Typically, these sockets shall be wall mounted and a cable tray route shall be provided between the socket and the rack. (In smaller installations, two 13A feeds are sufficient.) • Power redundancy – dual electrical service feeds and distribution from	• Each supply shall be from a separate MCB. These power supplies shall not be used to supply any additional equipment.

DRAFT

	different power grid sub-stations, with backup generator supply and local or room UPS. • An earth bar shall be fitted and racks shall be individually earthed to earth bar.	

5.5 Data room

A dedicated data room per floor is required for all normal installations. A data room is defined as containing only cable termination and switching (no servers etc). For SA1 this may also include the secondary site data connection entry. For smaller installations of less than about 72 points, the data room can be to the more relaxed data room small specification. In all cases no ladders or special equipment shall be required to access the data room or the communications rack. The room shall be secured ideally using the sites ID card electronic lock or equivalent code/lock system.

5.5.1 Standard

Infrastructure	Details	Minimum Specification/Model
Data Room	The data room must be identified on the drawing and must be big enough to accommodate the standard rack and a working space all around the rack. • In all cases no ladders, special equipment shall be required to access the data room or the communications rack. The room shall be secured using a ID card electronic lock or equivalent code/lock system • The room must be maintained at a temperature of no more than 23° C. Free air cooling is likely to be satisfactory for all rooms except data centres. (Air circulation to the outside or suitable large volume provided by a temperature controlled fan.) • Internal rooms with no ventilation will overheat • Rooms must not have a dual role, for example: cleaners store, electrical switch room etc • Access to rooms must not be by means of another room • Lighting shall be provided to a minimum of 500lux. Light fittings shall be positioned to the front and rear of rack to maintain light levels when racks are installed. • Overhead cabling preferred to underfloor • Preferred internal cab layout (patch panels/switching) – See section 5.5.2	• Dimensions 1200mm x 800mm per rack + 1000mm on all sides front and rear. Thus minimum size room for 1 rack is 3200mm x 2800mm

DRAFT

	• Double fed Fiber connectivity to site server room	
Data Room (small)	The data room must be identified on the drawing and must be big enough to accommodate the standard rack and a working space on one side and to the rear of the rack. • In all cases no ladders, special equipment shall be required to access the data room or the communications rack. The room shall be secured using a ID card electronic lock or equivalent code/lock system • The room must be maintained at a temperature of no more than 23^{o} C. Free air cooling is likely to be satisfactory for all rooms except data centres. (Air circulation to the outside or suitable large volume provided by a temperature controlled fan.) • Rooms that are also house electrical switch gear or other building infrastructure may be acceptable, with the agreements of estates, but must be secured using the ID card access controlled system or dedicated code/lock system, NOT an A sub master. Locating a rack in an office is not acceptable. Locating the rack in a store room is not acceptable. • If access is via another room, then access control for this room must also be achieved using the ID card electronic lock or equivalent code/lock system • Lighting shall be provided to a minimum of 500lux. Light fittings shall be positioned to the front and rear of rack to maintain light levels when racks are installed. • Open framed racks may be specified and may allow smaller working spaces – to be agreed on a case by case basis. Open racks shall not be used in any shared space. • Preferred internal cab layout (patch panels/switching) – See section 5.5.2 • Double fed Fiber connectivity to site server room	• Dimensions 800mm x 800mm per rack + 500mm on one side, front and rear, thus the minimum size room for 1 rack 1300mm wide x 1800mm deep.
Electrical	• The electrical supply for each rack shall be presented on two 32A commando type sockets with integral isolators. Typically, these sockets shall be wall	Each supply shall be from a separate MCB. These power supplies shall not be used to supply any additional equipment.

DRAFT

	mounted and a cable tray route shall be provided between the socket and the rack. (In smaller installations, two 13A feeds are sufficient.) • In new builds consideration shall be given to a central UPS which shall feed one of the 32A supplies to each rack in the building. • An earth bar shall be fitted and racks shall be individually earthed to earth bar.	

5.5.2 Data Cabinet

Infrastructure	Details	Minimum Specification/Model
Cabinet	• For every 48 port patch panel to be installed in the cabinet, the specialist shall allow 3U of cabinet space for associated equipment and cable management. • Each cabinet to be supplied with 2 PDUs • Power is to be supplied to the PDUs by 32A commando sockets. • Lockable door at front and rear • 80% free area doors front and rear • Not wall mounted • Room heat load must be considered • Must be floor standing • All racks shall be grounded • All cables to be supported by cable trays (see cable tray section) • Double fed Fiber connectivity to site server room	• PDU spec varies with application, consult IT&S. • Dimensions 800mm wide, 1200mm deep, 42u high
Cabinet (small installation)	• For every 48 port patch panel to be installed in the cabinet, the specialist shall allow 3U of cabinet space for associated equipment and cable management. • Each cabinet to be supplied with 2 PDUs • Power is to be supplied to the PDUs by 13A sockets. • Lockable door at front and rear • 80% free area doors front and rear • Not wall mounted • Room heat load must be considered • Must be floor standing • All racks shall be grounded • All cables to be supported by cable trays (see cable tray section)	• PDU spec varies with application, consult IT&S. • Dimensions 800mm wide, 800mm deep, 42u high. Shorter racks are acceptable in small installations where height is limited.

DRAFT

	• Double fed Fiber connectivity to site server room	

5.5.3 Labelling

Racks shall be clearly labelled consecutively, front and rear, Rack 1, 2, 3 etc

5.6 Wireless Data Network

5.6.1 Standard

Infrastructure	Details	Minimum Specification/Model
Wireless Access Point	Provision for full wireless access must be included in any new build or refurbishment, even if all the APs are not fitted initially. The following procedure must be followed: • Drawings supplied to IT&S with areas wishing to have wireless cover marked • IT&S will survey the area (software based if new build) and produce a drawing with the wireless access point locations • IT&S drawing is returned to the project lead • The wireless access points are marked on the project drawings. Each AP will have a specific location; they are NOT interchangeable. • The network access points for the WAPs should lead to the same comms cabinet as the data points in the room they service • Wireless access points shall be mounted on the ceiling rails, unless special circumstances demand otherwise (such as wall for better coverage). • No part of the cabling for a wireless access point shall be accessible to the public. E.g. sockets shall be above false ceiling or out of normal reach. • The wireless access point will be labelled with the network sockets identifier • Consideration shall be given to maintaining the APs. • Patch panel locations of AP connections shall be clearly documented in rack paperwork with reference to IT&S supplied drawings. • AP locations are to be marked on estates master building drawings • APs shall be labelled according to the	Please contact IT&S for confirmed specification required from the WAPs. Below is current minimum specification required: • Currently high density 802.11ac gen 2 minimum standard • POE+ compliant • Fully Eduroam compliant • Min of two data points per WAP • Support for IP and IPv6 in dual stack environment • Common set of deployed WAPs from a single vendor • Managed APs with a centralised management system with fully compliant guest management system

DRAFT

	labelling standards. • For refurbishment projects, building restrictions may mean use of captive cabling to reduce general cable accessibility • On-going maintenance costs for 5 years should be included in pricing • Spare WAPs to be factored into costings Wireless access points will require 2 x wired network points. The wired network point shall be wired with copper cabling in all cases. If this is not followed then retrofitting wireless will be much more expensive for the University and is likely to damage the aesthetic appearance of the building.	

5.6.2 Labelling

All Wireless access points shall carry the name supplied by IT&S in addition to the label text of the socket they are plugged into. Names of access points shall be building defined e.g. ABN1-2-2 (ABN building 1, floor 2, Second AP)".

5.7 Data Switches

5.7.1 Standard

Infrastructure	Details	Minimum Specification/Model
Network Switch	• Network switches shall be labelled according to the labelling standards. • IT&S shall be responsible for installation and configuration of switches. • All switching must be secured in IT owned cabinets in IT data rooms • Spare switches to be included in provision • A single vendor is to be used • On-going maintenance for 5 years to be included in pricing	• Min 10Gb/s edge port speed • Number of Ports – project-specific • All switches PoE+ where applicable • Dual Fibre modules for resiliency • Dual PSUs where possible • Fully managed switches • Single vendor • Support for IP and IPv6 in dual stack environment

5.7.2 Labelling

Switches shall be named using the format site/building/ports/IP(XXX) – however the main requirement is that they are unique.

DRAFT

5.8 Patch Leads

5.8.1 Standard

Infrastructure	Details	Minimum Specification/Model
Patch Leads	• If patch leads are supplied for new installations, they shall be either Fiber or copper standard and sourced from the same manufacturer as the remainder of the installation. • If patch leads are supplied for new installations, then a range of colours shall be supplied. • If patch leads are supplied for a new installation then IT&S shall be consulted concerning the quantity, colours and lengths required.	• Fiber or Copper cabling • Hooded plugs where applicable • For budgetary purposes assume a mix of 0.5m and 1m for comms area/cabs and 1-2m for desktop cables.

5.9 Servers

5.9.1 Standard

Infrastructure	Details	Minimum Specification/Model	Example Suppliers
Server	IT&S to be contacted for further details	IT&S will provide quotes for Server systems depending on requirements	HP, Dell etc

5.10 CCTV

Infrastructure	Details	Minimum Specification/Model
CCTV	• All cameras ideally to be IP • All cameras to be authorised by IT&S • Fiber compatible cameras to be used where possible • Double RJ45 network socket– external cable to be ruggedized • Consider PoE CCTV cameras where possible • Lighting and other setup considerations must be reviewed before installation	• IP Cameras • Support for IP and IPv6 in dual stack environment

5.10.1 Labelling

All CCTV cameras shall carry the name supplied by IT&S in addition to the label text of the socket they are plugged into. Names of CCTV cameras shall be in format of building name/data socket number. E.g. “DewiD1062”.

DRAFT

5.11 Audio and Visual

Audio visual installations within the university vary greatly in complexity and cost, therefore, the Faculty/Department, Estates, TEL and IT&S need to fully understand the requirements and budget before starting installations.

All installations shall be carried out by HEPCW approved contractors on the framework agreement under one of the 3 categories:

I. Supply only.
II. Supply and fit.
III. Design, supply and fit.

General building contractors and computer re-sellers shall not be used for installation work and all equipment supplied shall be warrantied for commercial use at the daily hours of expected use.

5.11.1 Screen Size and Sightline

Visual aids are used extensively within the university, and ensuring students can view material on screen is crucial. These guidelines should be used to create optimum viewing conditions defining how the screen is sized and positioned with respect to the seating configuration within a learning/teaching environment. These design guidelines apply to both LED screen and projector technologies.

DESIGN GUIDELINES

The accepted normal relationship between the audience placement and the screen configuration is determined by three factors:

I. The distance to the display from the farthest viewers
II. The horizontal and vertical angle of view from the average audience perspective
III. Clear sightlines for all viewers to both the projected image and the presenter

Historically screen sizes would have had a 4 x 3 ratio screen but 16 x 9 or 16 x 10 is now the more common aspect ratio to allow for widescreen presentations. However, in order to determine the optimum screen size and position it is necessary to take note of the room dimensions, the ceiling height, the seating layout and the content of the presentation. Taking the above into account the general guidelines are:

I. Install the largest screen possible.
II. The bottom of the screen should be at least 1.2m above the finished floor level preferably 1.35m in a flat room environment.
III. In many locations, the top of the screen will be as high as practically possible
IV. The maximum viewing angle is generally considered to be 45 degrees and the recommended vertical angle is 15 degrees.
V. The minimum distance for the first row of the audience is twice the screen height.
VI. The accepted rule-of-thumb for establishing the screen size is the 4-6-8 rule. The 4-6-8 rule equates as the minimum screen size which allows viewers at the back to clearly read

DRAFT

information presented on the screen and the furthest the audience should be from the screen is no more than four, six or eight times the screen height (H) dependent on:

a. Four times H for images (CAD or Photoshop).
b. Six times H for detailed reading (spreadsheets or text with images).
c. Eight times H for video.

VII. In general, the minimum floor to ceiling height required to accommodate a standard 1.8m wide screen is 3m. As a rough guide the recommendation for ceiling height is 1.6m plus the screen height.

VIII. Thought should be given to providing additional repeater screens in larger rooms for people sitting further back.

RECOMMENDATIONS FOR LED SCREEN TECHNOLOGY

Generally, for smaller learning spaces, LED screens are the recommended display technology. However, with the advent of 80 in displays becoming increasingly available LED screens can now be considered for most learning spaces except for the very largest lecture theatres. Consideration should be given to the maximum height reachable if the LED screen is interactive.

5.11.2 Lighting

Lighting within learning spaces should be designed to enable lecturers and students to see the display screen and be able to take notes, to enable this ambient light from all sources must be controlled so that an acceptable contrast ratio is achievable at any location on the display screen and consideration must be given to ensure glare does not become an issue for students taking notes or working on tablets or laptops.

Controls for the lighting can be mounted in the lectern control panel or separately within the room but should allow for separate control of the lighting for the display area, lecturer if appropriate and note taking/workspace areas.

5.11.3 Lectern

Where lecterns or lecturer's workstations are required adequate space will be provided for the installation of standard lecturing equipment used during a session, e.g. PC, amplifier, DVD/Blu-ray player as well as backend equipment such as switches. It is recommended to mount as much of this equipment as possible in a standard sized 19in rack frame housed within the desk or lectern, though consideration can be given to other size rack installations. Inputs should be provided for connecting Laptops and other portable devices for display on screens.

The lectern shall be of a sufficient size to allow space not just for the installed equipment, but also for laptops and other teaching materials that lecturers may bring with them and shall be equipped with the relevant HDMI, VGA, Audio, USB and any other relevant cables to allow additional equipment to be connected. The lectern and workstation will need to comply with DDA requirements, and shall be supplied with an articulated monitor mount and either a fixed microphone or radio microphone if the room size dictates.

The AV equipment location, housing, and access should be planned as early as possible in the design phase. AV equipment can generate significant heat in operation, and excessive operating temperatures dramatically affect system reliability and service life, therefore, these potentially

DRAFT

enclosed areas need careful heating and ventilation design to accommodate future technology, which will likely need more cooling and power supply.

AV equipment within the lecterns will need to be easily accessible both for routine and emergency maintenance, therefore, it is important that equipment be installed in such a way that technical staff can access it from both the front and rear of a rack. Where rack frames are mounted in cabinetry, front and rear access doors should be fitted and lockable.

All exposed cabling shall be installed in protective coverings such as trunking, conduits or where necessary flexible cable mesh wrap. Cables shall be run to lecterns etc. in underfloor trunking to breakout floor boxes and not run across floors where appropriate.

All lecterns will require at least 4 x Cat6a network connections and at least 4 13 amp mains sockets. More will be required for larger complex AV installations.

5.11.4 Audio

Audio systems shall be suitable for the size of room and be appropriate for the nature of the content being taught or developed and consideration shall be given to the appropriate placement of loudspeakers.

Three general guidelines to take into consideration when installing an audio system are:

I. Do not locate loudspeakers in room corners as this negatively impacts the user experience.
II. It is better to have multiple loudspeakers working at lower volumes than it is to have only a loud single stereo pair at the front
III. Audio amplifiers for learning spaces should be specified such that in normal use they are never being used at beyond 70% power to ensure there is sufficient 'clean' headroom before distortion.

Consideration shall be given to the installation of surround sound systems where the need arises. Consideration will also have to be given to how audio feeds are sent to any translator in rooms used for meetings.

ASSISTIVE LISTENING SYSTEMS

Hearing impaired students can benefit greatly from clearer and more intelligible audio if the learning space they are in has an assistive listening system (ALS) installed. Three types of system are commonly available:

I. Infrared (IR) systems – where the user is issued with a IR receiver with its own earpieces and there has to be an unobstructed line-of-sight between the IR transmitter and the IR receiver worn by the user.
II. Frequency Modulation (FM) systems – these use licensed FM bands and require the user to wear a specific receiver with its own earpieces.
III. Induction Loop systems – these work by sending an input signal to a loop driver to produce an electromagnetic field from a number of wires placed around the space (usually under the carpet).

The recommended system for new builds and refurbishments is an induction loop system. Systems shall be so designed as to eliminate spill between adjacent rooms.

DRAFT

An important element regardless of which transmission method is used is the quality and appropriateness of the input microphone.

5.11.5 Lecture Capture

The university uses Panopto for lecture capture and dissemination. If the learning space is equipped for Panopto or to be designed with lecture capture in mind, there will be a number of considerations needed to ensure that recordings made in the space are of an acceptable standard. These may include but are not limited to:

I. A suitable microphone setup as described above
II. A fixed camera that covers a defined presentation area
III. A status indicator to show when a session is being recorded with confirmation that a suitable audio signal is working and being captured
IV. The facility to initiate an impromptu recording session

DRAFT

6 APPENDIX 1 – The Services

This section will highlight each service together with a recommendation. In general:

- Each service requires at least one network connection
- AV will require two network sockets
- Where possible double network sockets would be desirable

Service	Details	Minimum Specification
Desktop PC	• PC min specification detailed • 2 gang 13A DP switched electrical socket • Single RJ45 network socket or Fiber equivalent • Pass-through capabilities assumed for phone connection, otherwise 2 x network sockets required	Current Standard Office Desktop PC: Intel i5 Processor, 8GB Ram, 240GB SSD, Min 1Gbps NIC (10Gbps when possible), 21 inch LED screen, 5 yrs. RTB warranty, Windows 7 OEM license
PC Cluster Room	The items to consider here are: • Specification is as desktop PC, see above • How many PCs can the room accommodate? • Work space dimensions: 750H x 700D x 1000W per student • Printer Specification, see Printer Copier Below • Swivel operator chair with adjustable height and back rest for each PC • No tables/benches around corners	Standard Office Desktop PC: Intel i5 Processor, 8GB Ram, 240GB SSD (or 500GB 7200rpm HDD), Min 1Gbps NIC (10Gbps when possible), 21 inch LED screen, 5 yrs. RTB warrant Specialist Desktop PC: Intel i7 Processor, 16-32GB Ram, 500GB SSD, Min 1Gbps NIC (10Gbps when possible), 2 x 21 inch LED screen,

DRAFT

	• Heat load – air conditioning likely to be essential • Switch – on surge, no more than X PCs per circuit • Any local network switch must have a separate supply and must be contained in an appropriate secured enclosure. • Cable hole with grommet for each PC • Contact the IT lead before committing to a room design • Phone in the room • Door Access control	Dedicated relevant GPU, 5 yrs. RTB warranty, Windows 7 OEM license y, Windows 7 OEM license
Desk Telephone	• RJ45 network socket • If Pass-through used then single Desktop PC socket can be used	IP Phone
Emergency Phones or corridor phones	• Single RJ45 acceptable. • Wall mount phone required • Must be TDM or Analogue and not in corridors	IP Phone with wall mounting kit
Lift Phone	• Analogue line required to nearest UWTSD exchange.	Standard analogue phone for resilience purposes
AV	• See Section 5.11	See Section 5.11
Printer/Copier	• Depending on the size of the installation a Konica Multi-Function Device is recommended to serve most areas. For an IT lab of 20 or more PCs a single MFD will suffice. With follow me printing, this can also cater for staff printing and depending on building size it is usually 1 MFD per floor for staff. IT&S can provide further information once provided with drawings of plans.	Konica

DRAFT

	Will require: • 2 gang 13A DP switched electrical socket • Double RJ45 network socket	
Information Screen	• 2 gang 13A DP switched electrical socket for each screen • Double RJ45 network socket • Customer to consider type of information to be displayed and who will keep up to date before screen provision agreed.	No specific model of screen. To be agreed depending on space. LED technology where possible for power saving.
PDQ/Credit Card terminals	• The current Credit Card Payment devices require an analogue line. Consideration will need to be given with regards to the local telephone system and the capabilities to facilitate an additional analogue line for these machines • Network connected credit cards machines are also supported	Unknown
Access Control (internal door)	• UWTSD currently utilise several door access systems across its sites • In Carmarthen, Lampeter and London the only initial requirement is that the system put in place utilise Mifare card readers for use with existing Students and Staff cards • In Swansea any new buildings or building work need to use Paxton's Net2 software	Mifare card based system

DRAFT

7 APPENDIX 2 – Other IT&S & Estates Contact Directory

Name	Responsibility	Phone	Email
IT&S			
Anthony Daniels	Systems Engineer (Swansea)	01792 481000 ext. 4312	Anthony.daniels@uwtsd.ac.uk
IT Service Desk	IT Service Desk	0300 500 5055	ITSD@uwtsd.ac.uk
Estates			
Hywel Griffiths	Director of Operations and Planning	Ext 6852	h.griffiths@uwtsd.ac.uk
Bob Lewis	Executive Head of Property Services	Ext 4014	Robert.lewis@uwtsd.ac.uk

DRAFT

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

SA1 CAMPUS

Network Infrastructure

Abstract

This document outlines the network infrastructure and features for the new University of Wales Trinity Saint David SA1 Campus, based on Cisco's 3-layer model and technologies.

Information Technology & Systems
ITSD@uwtsd.ac.uk

SA1 Campus Network Infrastructure

The SA1 campus network infrastructure would follow the Cisco three-layer hierarchical model [1]. The three layers consist of core, distribution and access. The Infrastructure would be scalable and configured for high availability. Connections to the Internet via JANET and site-to-site VPN connections will also be configured for high availability. The Infrastructure would also make use of Cisco technologies to provide ease of management across the network.

Key objectives

- Scalable network design
- Network management
- High Availability

JANET ISP Connection

The SA1 campus would have its connection to the Internet provided by JANET in the form of two separate 10Gbps endpoints. The endpoints will terminate within two separate buildings with one building being connected via a fibre patch over to the other, bringing the two connections to the same physical location or main comms room. With each 10Gbps JANET connection being a different diverse route to the JANET network, in the event of a failure of one route the system would automatically failover to the alternative route.

As the connection to the Internet is critical to the University an alternative connection to the Internet is also needed in case the JANET network becomes unavailable via all routes. One alternative would be to switch over to use BT's G-Fast. However, as part of the SA1 network infrastructure a dedicated 10Gbps leased line will be installed to link Swansea (SA1) and the Carmarthen campus network to each other. This would provide connectivity to Inter-campus IT Systems. In the event that the JANET Internet connection fails, all SA1 campus Internet bound network traffic could be rerouted via this 10Gbps Inter Campus Link (ICL). A 3rd party 'backup' 1Gbps connection could also be used.

Cisco ASA firewall/VPN HA failover

A JANET ISP connection would typically connect to a Cisco ASA, which would provide security inbound and outbound via firewall rules, protecting the network from the internet and preventing any unauthorised/unwanted outbound connections. The Cisco ASA would also provide a site-to-site VPN service. Inside of the firewall, the ASA would then connect to the main network core Layer 3 (L3) Cisco Catalyst switch.

Once setup and configured correctly the ASA should never develop an issue where it needs a restart in order to resolve an issue. Sometimes however this may be the case due to a software bug, which may require an updated version of the ASA software, which would in itself mean some downtime while the OS is applied and the ASA is restarted. As all inbound and outbound network traffic passes through the ASA any downtime results in the loss of all internet connectivity.

Although rare, it is possible as with any hardware that as the ASA in the above scenario is a single point of failure, it could fail completely resulting again in a loss of all internet connectivity.

To prevent any downtime for example planned maintenance or failure of the device, SA1 would have two identical ASAs configured for failover. One Primary and one Secondary. Failover provides no loss on internet connectivity if one of the ASAs fails and also provides zero upgrade downtime.

There are many different Cisco recommended setups of which two of the simplest are shown in figures 1 and 2.

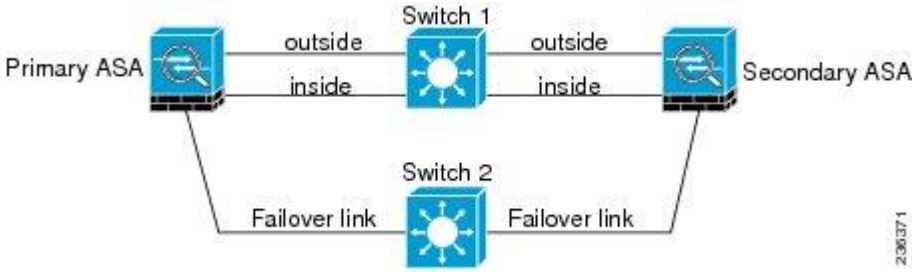


Figure 1

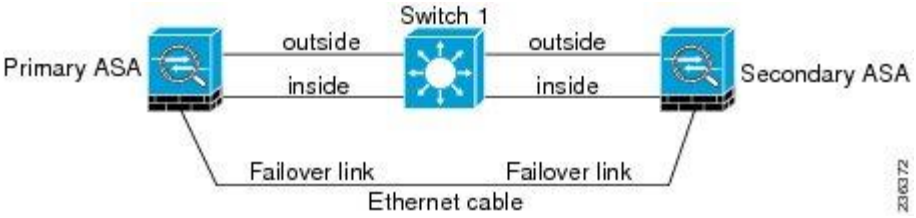


Figure 2

As there will be two JANET 10Gbps connections to the internet, both will connect to the ASA firewalls that themselves are setup for high availability. Downtime of any one of the firewalls and or one of the JANET connections will therefore not result in a loss of connectivity to the Internet.

Core Cisco Catalyst L3 Switch High Availability

The ASAs provide a firewall between the internet and the core Cisco Catalyst L3 switch located in the main comms room. Cisco Etherchannels can be used to aggregate multiple physical network connections together to maximise bandwidth and minimise the loss of a connection when only a single connection exists. There can also be times when planned maintenance would be need to upgrade the core switch and therefore result in downtime. Downtime of the core switch would result in loss of all inter VLAN connectivity, loss of internet connectivity and loss of critical IT systems.

To prevent downtime of the core switch, SA1 would have two identical Cisco Catalyst core switches configured for High Availability (HA). All connections to and from these two core switches to other secondary comms rooms and to the ASAs will then be dual homed to these two core switches. The HA core would then be capable of an In-Service Software Upgrade (ISSU). Cisco Catalysts protocols such as Hot Standby Router Protocol (HSRP) can be used to create a fault tolerant default gateway where the active router acts as a virtual router. If the primary router or core switch were to fail, the gateway IP address(s) would failover to the standby router.

With HA at the core planned maintenance and unplanned failures could take place without loss of any connectivity to the end user.

Inter Comms Room Fibre connections

From the core, each building at SA1 would have a primary connection (comms room), where a server room does not exist, which provides connectivity to the end user devices. Two 10Gbps fibre backbone connections (for redundancy) would connect to each of the core L3 switches to the distribution switches within the comms rooms (Figure 3).

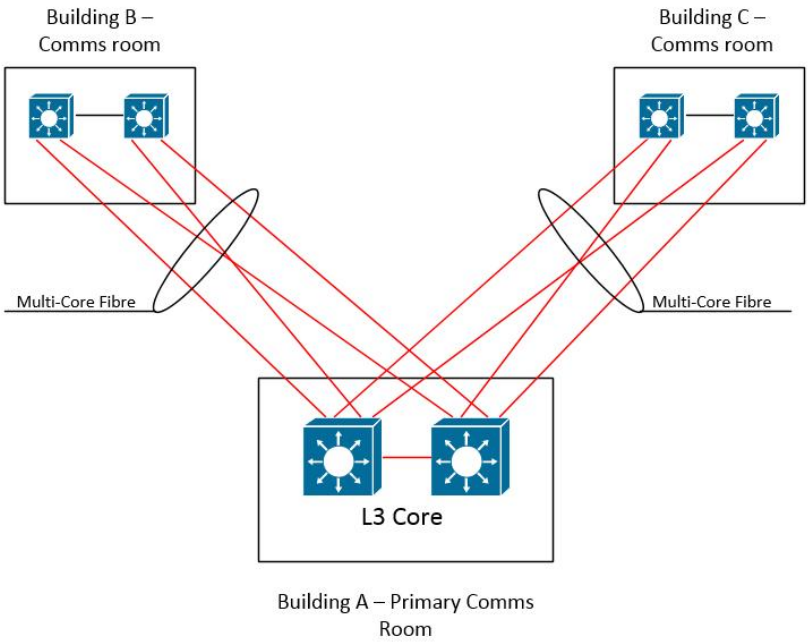


Figure 3

It is likely that all the pairs of fibre would run within a single cable and/or duct between buildings. A failure of the single fibre cable would then cause loss of network connectivity for the entire building. To prevent this, backup fibre connections can be connected between the comms room buildings to each distribution switch for redundancy. In the event of this failure, Spanning Tree Protocol (STP) would recalculate and establish a path to the disconnected building via the backup fibres automatically (Figure 4).

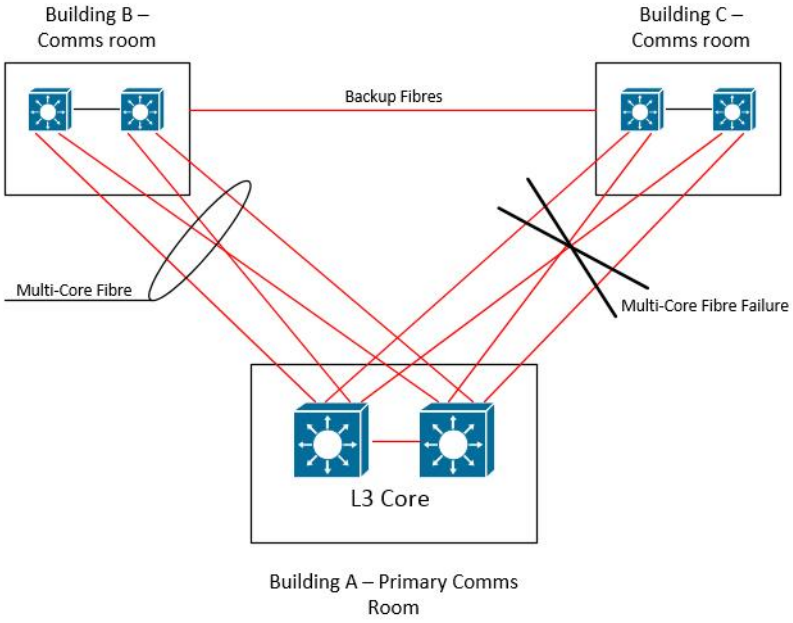


Figure 4

Distribution switch connectivity

Within each comms room at each building at SA1 would be two L3 distribution layer switches. The two separate switches would be capable of 10Gbps uplinks, which would be used to connect to the core switches. In addition, the two switches would be stacked to act as one single switch. Each of the two distribution switches would connect to each of the core switches (see Figures 3 and 4).

This topology would mean that downtime of any one of the core switches would result in no loss of connectivity at the distribution switches. Also as two switches act together as a pair of stacked switches a failure of one of them would also result in no loss of connectivity at that comms room and therefore that buildings access layer switches and end user devices.

Access Layer Switch connectivity

The access layer switches provide the end device connectivity to the rest of the network. At SA1, each access switch would connect via a minimum of one 1Gbps fibre or Ethernet connection to the distribution switches. If more access layer bandwidth is needed, Etherchannels can be used to aggregate together each 1Gbps connection.

Each access layer switch would connect to both distribution switches. In the event of a distribution switch failure, the access switch would still have connectivity back to the other distribution switch resulting in no loss on network connectivity for the end devices connected to that access switch (Figure 5).

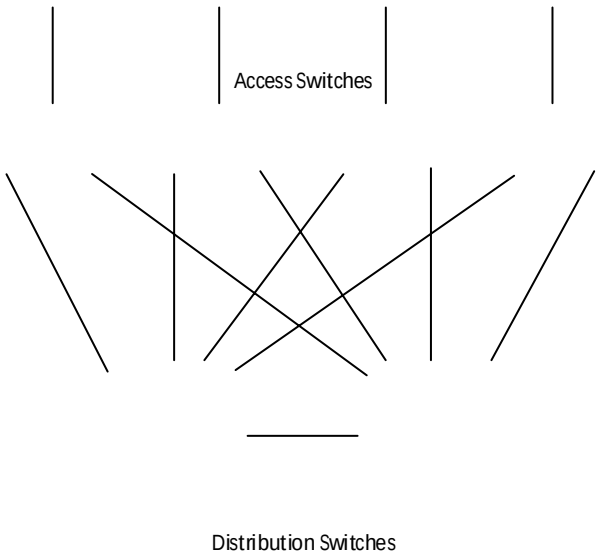


Figure 5

Loss of connectivity to the network would occur at the end device level only in the event of an access layer switch failure. This loss would affect up to 48 end devices depending on how may interfaces the access switch has in use. Preconfigured spare access layer switches would be used in the event of such a failure and minimise the downtime to end users.

Power over Ethernet (PoE) and Quality of Service (QoS)

The SA1 access switches are required to be PoE+ capable. This along with a required QoS configuration would offer the flexibility of workstations being connected through a Voice over IP (VoIP) phone, which in turn is connected to the access switch. With workstation (data VLAN) traffic routing through the VoIP phone, priority needs to be given to the voice traffic over the workstation traffic so to avoid voice packets being dropped or suffering from latency issues.

With the above network infrastructure having PoE+ enabled switches only, provides many costs savings. In a typical setup that uses VoIP phones and no QoS, PoE access switches for the VoIP phones and regular (non-PoE) 'data' switches are needed for the workstations.

Cost saving example

In this example, there are 45 staff members within a building all of which have a workstation and VoIP phone. Two 48 port access switches are required if the workstation (data) and VoIP (voice) networks have separate data ports and therefore network connections to each member of staff's office space. Costs of these switches using actual reseller prices would be £1834 for a 48 port PoE Cisco Catalyst (WS-C2960X-48FPS-L) and £1195 for a 48-port Cisco Catalyst (WS-C2960X-48TS-L) switch.

Having separate and therefore two switches for the 45 staff costs £3029. If only the one PoE switch is used, there is the saving in this example of £1195 per every 48 staff members. A two-switch setup per 48 Staff with VoIP phones also means a doubling of cost in terms of doubling the network LAN cabling, patch panels, patch cables, rack space and therefore network cabinet size. With double the switches there is also the ongoing costs due to the increase in power requirements for the switches and the air-conditioning.

It is therefore more cost effective to purchase PoE switches and setup QoS and utilise the VoIP phones built in switch, which the member of staff's workstations connects to.

Skype for Business

QoS may also be required to optimise communications with regards to a Skype for Business peer-to-peer calls, hybrid and or Enterprise Voice setup. With an ICL, more peer-to-peer calls would take place over the internal network rather than via the internet, where QoS is lost.

VLAN Trunk Protocol (VTP)

VTP would be used at SA1 across the entire network in order to easily centrally manage the VLANs. The core switches would be set up as VTP servers for the entire network or domain. All other switches would then be set up as VTP clients. Adding VLANs to the entire network is then simplified by the fact that all VLANs are only added to the VTP servers. The VTP clients then automatically add VLANs taking their information from the VTP servers.

Spanning Tree Protocol (STP)

STP would also be used over the entire network at SA1. STP is enabled by default on all Cisco switches and is used to prevent loops from occurring on the network. STP calculates a single active path throughout the network preventing loops. It would also be used to provide automatic backup paths or links becoming active in the event of a link or switch failure within the network topology.

Subnets and VLANs

The SA1 network would be divided up into multiple subnets where each subnet is a separate VLAN. Each subnet limits network broadcast traffic to within that subnet minimising the bandwidth across the network. Subnets and their corresponding VLAN would be defined to separate out different groups of devices or end user such as the following.

- Staff VLAN(s)
- Student VLAN(s)
- Tenant VLAN(s)
- Management VLAN
- Security/Facilities VLAN
- MFD/Printing VLAN
- Server VLAN(s)
- Wireless VLAN
- Voice VLAN
- Miscellaneous VLAN
- SAN VLAN(s)

A miscellaneous VLAN would be used for any device that does not fall into the other VLAN groups such as a digital signage device or audio streamer.

Separating out each subnet and VLAN in this way allows easy of management in terms of security as you can allow or deny access to an entire subnet or VLAN.

Dynamic VLAN Membership

The interfaces on each switch need to be assigned in most cases to a specific VLAN. For example, some interfaces on a switch could be assigned to a staff VLAN while the rest of the interfaces are assigned to a student VLAN. If an area of the network that previously was home to student devices which then became a staff space, all the network points in that space now need to be reconfigured on their local access switch to the staff VLAN. The reassigning or interfaces can take some time to do depending on network design and labelling.

With dynamic VLAN membership setup across the SA1 network, VLAN interface assignment would take place automatically. To do this, switches at the core would be configured as a VLAN Membership Policy Server (VMPS). With a VMPS, VLAN membership is based on the MAC address of the device connected to that interface. This allows end devices to move around the network and remain on the correct VLAN.

References

1. Campus Network for High Availability Design Guide

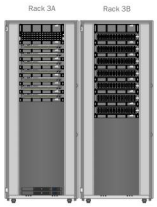
FACE Building

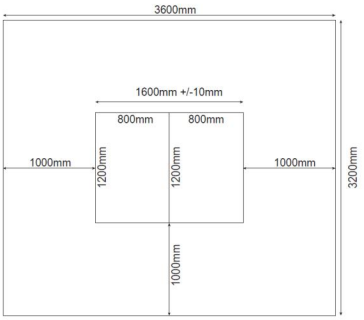
	JC Data Points Original	GF HD Data Points Original	HD throughout	
GROUND LEVEL				
Engine Diagnostics Centre				
Multi Eng Diagnostic Rigs	8	8	32	
Flow Bench	1	1	2	
Eng Stands	4	4	16	
Dyno Cell 01	0	0	0	see below
Dyno Cell 02	0	0	0	see below
Dyno Control Area	10	10	20	Covered also 2 x Dyno cell rooms
Eng Tech	6	6	6	
Centre Storage	4	4	16	
Manufacture Centre				
Buck GRP	3	3	14	
CNC Manufacturing	32	32	66	
CNC Tech	6	6	6	
Change 01	1	1	3	
Change 02	1	1	3	
Change 03	1	1	3	
Change 04	1	1	3	
Mech Tech	6	6	6	
Mechanical Workshop	12	12	48	
Autoclave	4	4	18	
Buck Sanding	3	3	14	
Buck Pre-Preg cutting	6	6	14	
Spray Booth	1	1	2	
General Store	4	4	20	
General Store	5	5	22	
ROBOTICS LAB	16	16	36	
Engineering Science				
Engineering Science Lab	46	46	46	
Balistic Lab	4	4	4	
Mat Testing	14	14	14	
Automotive Centre				
Fabrication & Welding	16	16	64	Covers 4 + 2 wheel + car lift
Auto 01-04	16	16	64	
Auto Tech	6	6	6	
4 Wheel	0	0	0	Covered
2 Wheel	0	0	0	Covered
Car Lift	0	0	0	Covered
Centre Storage	3	3	12	
Simulator	5	5	15	
NDT	14	14	14	
Architecture & Construction				
Architecture Lab	12	50	50	
Construction Lab / Architecture Lab	12	50	50	
Stores 1	3	3	12	
Technical 1	6	6	6	
Technical 2	6	6	6	
Learning Commons Workstation				
IT Tech	10	10	10	
Learning Commons / Cafe & Soft Seating	35	35	68	
Learning Commons / Cafe & Soft Seating	88	88	88	
Flexi 20 Person Learning Studio	6	25	25	
Flexi 30 Person Learning Studio	8	35	35	
Flexi 90 Person Learning Studio	22	95	95	

Project Teaching				
Project Teaching Room	44	44	44	
Flexi 30 Seat Computer Lab	40	40	40	
Reception	8	8	18	
Building Suport (wc..)	10	10	32	Inc W/C, First Aid, Store + Changing
Circulation (all levels)	38	38	148	
TOTAL GROUND LEVEL	607	802	1336	
FIRST LEVEL				
Flexible IT Lab				
Flexi 30 Seat Computer Lab	40	40	40	
Flexi 30 Seat Computer Lab	40	40	40	
Flexi 30 Seat Computer Lab	40	40	40	
Flexi 30 Seat Computer Lab	40	40	40	
Flexi 30 Seat Computer Lab	40	40	40	
Flexi 30 Seat Computer Lab	40	40	40	
Prayer Room	1	1	3	
IT Tech	6	6	6	
IT Room (SERVERS)	20	20	20	
Flexi Learning Studio				
Flexi 20 Person Learning Studio	8	8	25	
Flexi 20 Person Learning Studio	6	6	25	
Flexi 20 Person Learning Studio	14	14	65	
Flexi 20 Person Learning Studio	14	14	65	
Flexi 20 Person Learning Studio	14	14	65	
Building Suport (wc..)	33	33	130	For circulation spaces, plus WC & CLR
TOTAL FIRST LEVEL	356	356	644	
SECOND LEVEL				
Computing				
Project Room (30)	38	38	38	
Cirsco Networking Lab (30)	40	40	40	
Games Lab (20)	40	40	40	
QINETIQ	30	30	30	
Technical / Store	8	8	8	
Electrical & Electronics Lab (30)	40	40	62	
IT Tech	6	6	6	
Flexi 20 Person Learning Studio	8	8	25	
Flexi 30 Person Learning Studio	8	8	35	
Flexi 30 Seat Computer Lab	40	40	40	
Architecture & Construction				
Architecture Enviromental Science Lab	32	32	32	
UG Architecture	34	34	66	
Tutorila	6	6	6	
Learning Zone	6	6	6	
Learning Zone	6	6	6	
Stores	2	2	8	
Stores	2	2	8	
Learning Commons Grad Study	26	26	26	
Learning Commons Grad Study	20	20	20	
Building Suport (wc..)	30	30	122	For circulation spaces plus WCs
TOTAL SECOND LEVEL	422	422	624	
THIRD LEVEL				
Architecture & Construction	19	19	82	Circulation plus WCs
Learning Zone	6	6	8	
Learning Zone	6	6	8	
Learning Zone	6	6	8	
Learning Zone	6	6	8	
Stores	2	2	8	
Tutorila	4	4	8	
PG Architecture Studio	30	30	50	
IT Tech	6	6	6	
Flexi 20 Person Learning Studio	6	6	25	
Faculty	200	200	396	

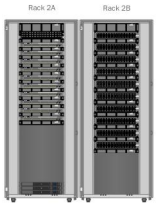
TOTAL THIRD LEVEL	291	291	607	
number	1676	1871	3211	
spare (%)	10	10	10	
TOTAL	1844	2058	3532	

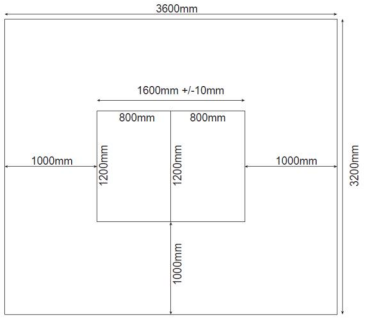
3rd Floor Comms Room



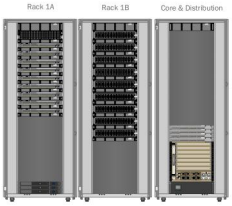


2nd Floor Comms Room

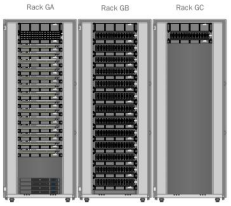


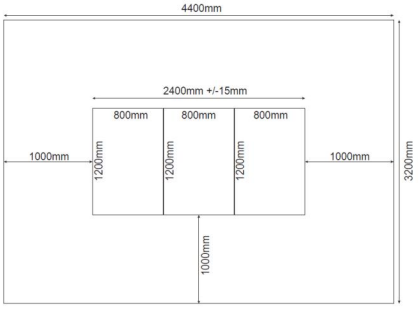


1st Floor Comms Room



Ground Floor Comms Room

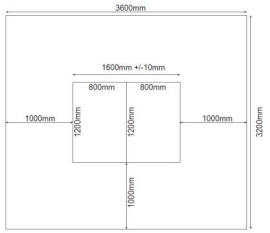




3rd Floor Comms Room

3rd floor option 2	Qty				
Data Points	331				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	7				
48 Port C2960X-48FPD-L	7				
APC Sua3000RM1U Smart-UPS 1000VA	2				
1u Cable Management	15				
2u Cable Management	2				

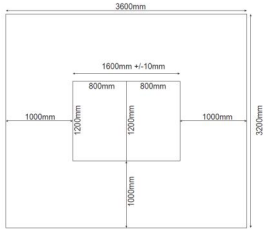




2nd Floor Comms Room

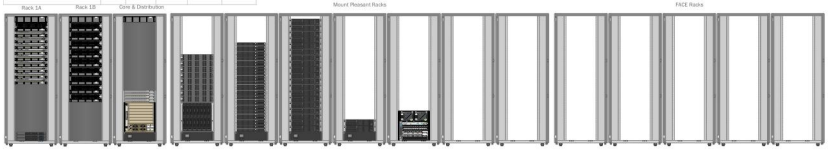
2nd floor option 2	Qty				
Data Points	462				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	10				
48 Port C2960X-48FPD-L	10				
APC Sua3000RM1U Smart-UPS 1000VA	3				
1u Cable Management	21				
2u Cable Management	2				



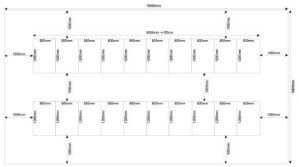


1st Floor Comms Room

1st floor option 2	Qty				
Data Points	394				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	9				
48 Port C2960X-48FPD-L	9				
APC Sua3000RM1U Smart-UPS 1000VA	5				
1u Cable Management	19				
2u Cable Management	2				
Cisco 3650 Distribution Switches	4				
Cisco 6807 Core	1				

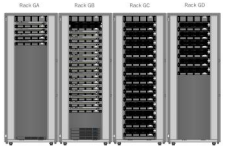


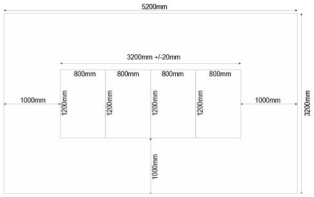
Room on plans is 10875mm x 5800mm.
With the position of the doors, I don't think we can get another row of racks into the room so the maximum number of racks for their room is 20 (800x1200) racks.



Ground Floor Comms Room

Ground floor option 2	Qty				
Data Points	883				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	19				
48 Port C2960X-48FPD-L	19				
APC Sua3000RM1U Smart-UPS 1000VA	5				
1u Cable Management	38				
2u Cable Management	4				





3rd Floor Comms Room

3rd floor option 3	Qty				
Data Points	668				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	14				
48 Port C2960X-48FPD-L	14				
APC SUA1000RMI1U Smart-UPS 1000VA	4				
1u Cable Management	29				
2u Cable Management	3				

Rack 3A Rack 3B Rack 3C



2nd Floor Comms Room

2nd floor option 3	Qty				
Data Points	709				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	15				
48 Port C2960X-48FPD-L	15				
APC SUA1000RMI1U Smart-UPS 1000VA	4				
1u Cable Management	31				
2u Cable Management	3				

Rack 2A Rack 2B Rack 2C



1st Floor Comms Room

1st floor option 3	Qty				
Data Points	709				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	15				
48 Port C2960X-48FPD-L	15				
APC SUA1000RMI1U Smart-UPS 1000VA	4				
1u Cable Management	31				
2u Cable Management	3				
Cisco 3850 Distribution Switches	6				
Cisco 6807 Core	1				

Rack 1A Rack 1B Rack 1C Core & Distribution Front & Rear



Ground Floor Comms Room

Ground floor option 3	Qty				
Data Points	1470				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	31				
48 Port C2960X-48FPD-L	31				
APC SUA1000RMI1U Smart-UPS 1000VA	6				
1u Cable Management	62				
2u Cable Management	5				

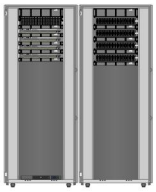
Rack GA Rack GB Rack GC Rack GD Rack GE

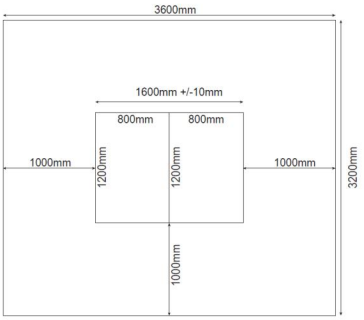


3rd Floor Library

3rd floor option 1	Qty				
Data Points	165				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	4				
48 Port C2960X-48FPD-L	4				
APC SUA1000RMI1U Smart-UPS 1000VA	1				
1u Cable Management	9				
2u Cable Management	2				

Rack 3A Rack 3B

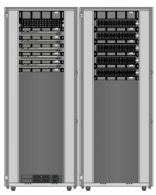


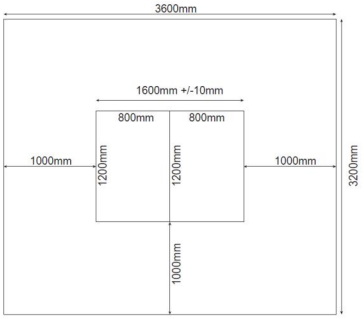


2nd Floor Library

2nd floor option 1	Qty				
Data Points	231				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	5				
48 Port C2960X-48FPD-L	5				
APC SUA1000RMI1U Smart-UPS 1000VA	2				
1u Cable Management	11				
2u Cable Management	2				

Rack 2A Rack 2B





1st Floor Library

1st floor option 1	Qty				
Data Points	187				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	4				
48 Port C2960X-48FPD-L	4				
APC SUA1000RMI1U Smart-UPS 1000VA	1				
1u Cable Management	9				
2u Cable Management	2				
Cisco 3850 Distribution Switches	2				
Cisco 6807 Core	1				

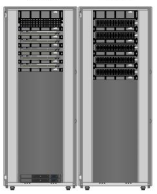
Rack 1A Rack 1B Core & Distribution

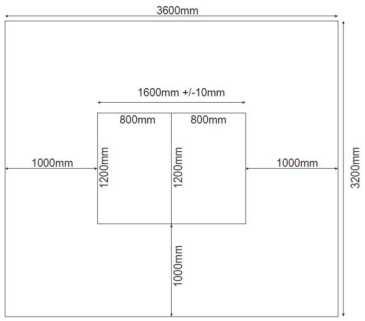


Ground Floor Library

Ground floor option 1	Qty				
Data Points	196				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	5				
48 Port C2960X-48FPD-L	5				
APC SUA1000RMI1U Smart-UPS 1000VA	2				
1u Cable Management	11				
2u Cable Management	2				

Rack GA Rack GB

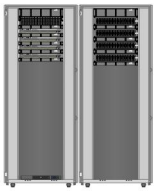


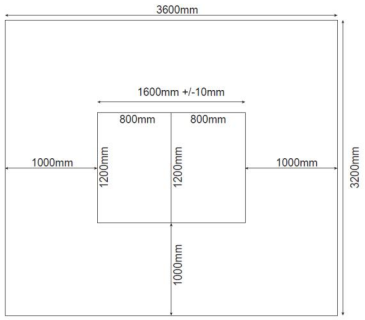


3rd Floor Library

Data Points	165				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	4				
48 Port C2960X-48FPD-L	4				
APC SUA1000RM1U Smart-UPS 1000VA	1				
1u Cable Management	9				
2u Cable Management	2				

Rack 3A Rack 3B

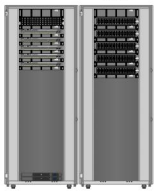


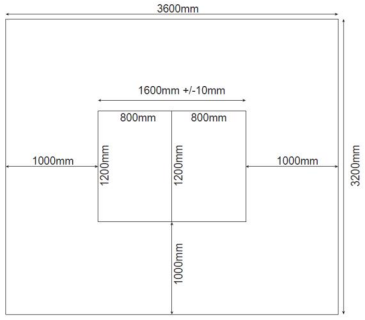


2nd Floor Library

2nd floor option 1	Qty				
Data Points	231				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	5				
48 Port C2960X-48FPD-L	5				
APC SUA1000RM1U Smart-UPS 1000VA	2				
1u Cable Management	11				
2u Cable Management	2				

Rack 2A Rack 2B





1st Floor Library

1st floor option 1	Qty				
Data Points	187				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	4				
48 Port C2960X-48FPD-L	4				
APC SUA1000RM1U Smart-UPS 1000VA	1				
1u Cable Management	9				
2u Cable Management	2				
Cisco 3850 Distribution Switches	2				
Cisco 6807 Core	1				

Rack 1A Rack 1B Core & Distribution

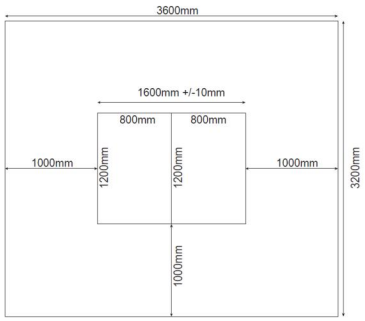


Ground Floor Library

Ground floor option 1	Qty				
Data Points	312				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	7				
48 Port C2960X-48FPD-L	7				
APC SUA1000RM1U Smart-UPS 1000VA	2				
1u Cable Management	11				
2u Cable Management	2				

Rack GA Rack GB

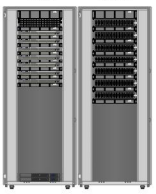


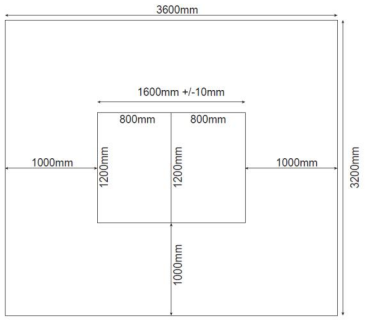


3rd Floor Library

Data Points	321				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	7				
48 Port C2960X-48FPD-L	7				
APC SUA1000RM1U Smart-UPS 1000VA	2				
1u Cable Management	15				
2u Cable Management	2				

Rack 3A Rack 3B

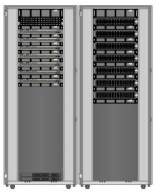


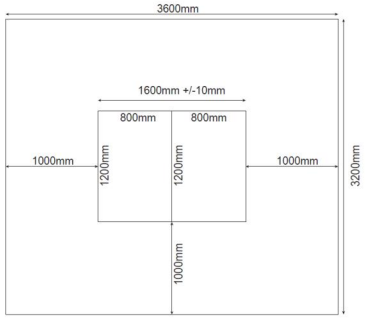


2nd Floor Library

2nd floor option 1	Qty				
Data Points	310				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	7				
48 Port C2960X-48FPD-L	7				
APC SUA1000RM1U Smart-UPS 1000VA	2				
1u Cable Management	15				
2u Cable Management	2				

Rack 2A Rack 2B





1st Floor Library

1st floor option 1	Qty				
Data Points	244				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	6				
48 Port C2960X-48FPD-L	6				
APC SUA1000RM1U Smart-UPS 1000VA	2				
1u Cable Management	13				
2u Cable Management	2				
Cisco 3850 Distribution Switches	2				
Cisco 6807 Core	1				

Rack 1A Rack 1B Core & Distribution

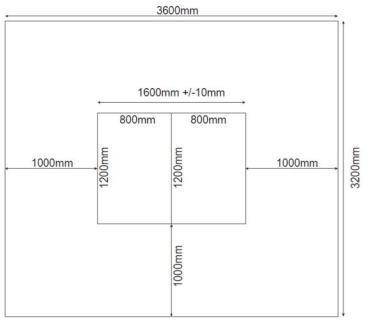


Ground Floor Library

Ground floor option 1	Qty				
Data Points	312				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	7				
48 Port C2960X-48FPD-L	7				
APC SUA1000RM1U Smart-UPS 1000VA	2				
1u Cable Management	15				
2u Cable Management	2				

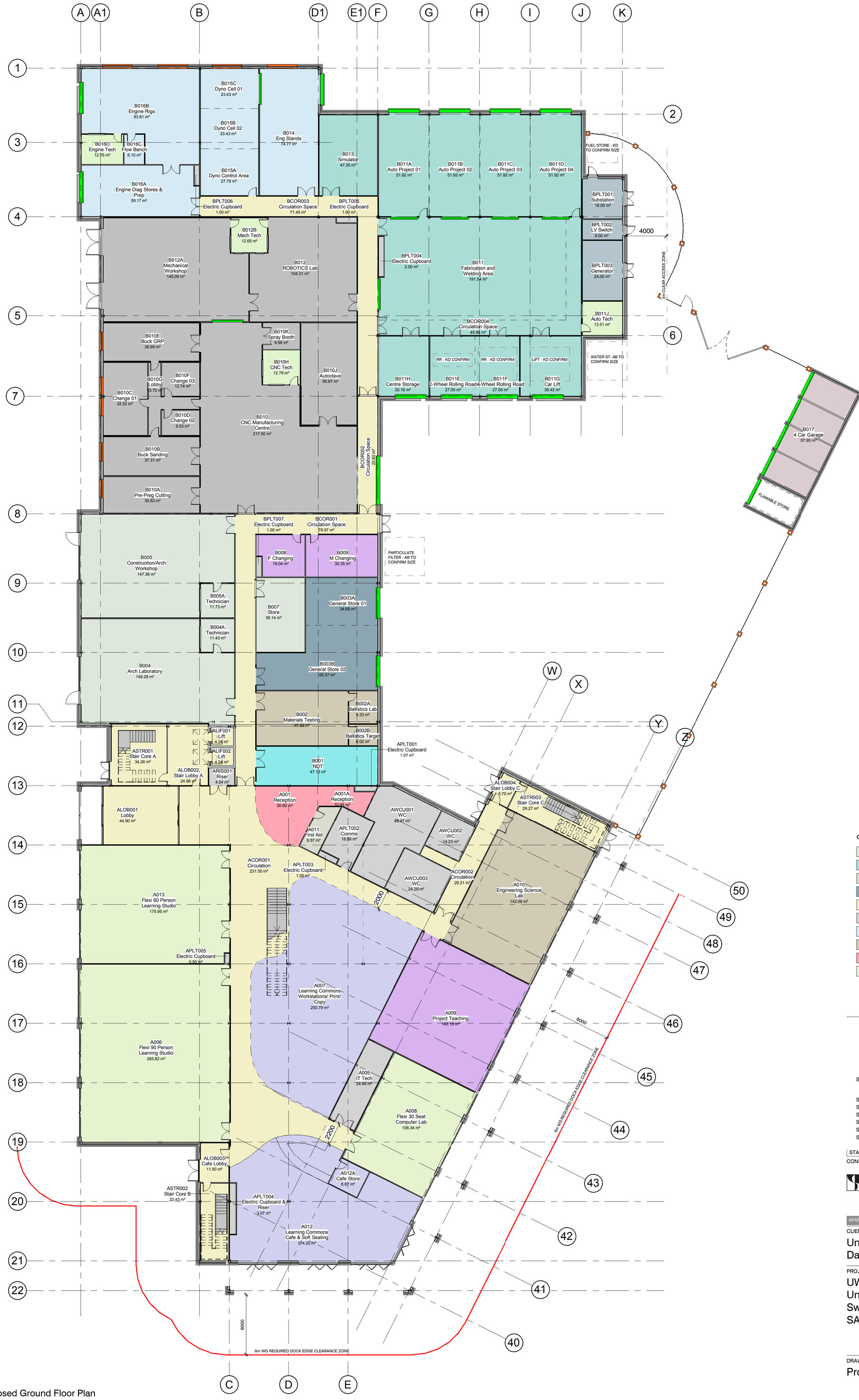
Rack GA Rack GB





Responsibility is not accepted for errors made by others in scaling from this drawing.
All construction information should be taken from figured dimensions only.

0mm 50mm 100mm



Proposed Ground Floor Plan
1 : 200

Colour Schedule

- Architecture
- Automotive Centre
- Building Support
- Central Store
- Circulation
- Core
- Engine Diagnostics
- Engineering Science
- Faculty
- Flexi
- Garage
- Learning Commons
- Manufacture Centre
- NDT
- Plant
- Project Teaching
- Tech Bases

S1	P2	12/02/16	RIBA Stage 3 Control Estimate. Building model updated to include amended layout and client requirements. Further co-ordination with ESHA elevations completed.
S2	P1	03/02/16	General revision to align with VE/comments from KD
S0	P0.7	21/01/16	Work in progress issue
S0	P0.5	18/01/16	Work in progress issue
S0	P0.3	15/01/16	Work in Progress issue for ICT integration
S0	P0.2	12/01/16	Work in progress issue
S0	P0.1	04/01/16	Minor Revision CAT 8 Removed

STATUS	REV	DATE	DESCRIPTION

CONSULTANT

Stride Treglown

REVISED BY Aled Jones
CHECKED BY Ian Standen

© Stride Treglown Limited 2015

stridetreglown.com

CLIENT NAME
University of Wales Trinity Saint David

ORIGINATOR NO
70266_01

PROJECT
UWTSD FACE and Tech
University of Wales Trinity Saint David
Swansea
SA1

DRAWING TITLE
Proposed Ground Floor Plan

SUITABILITY STATUS
S1 Co-ordination

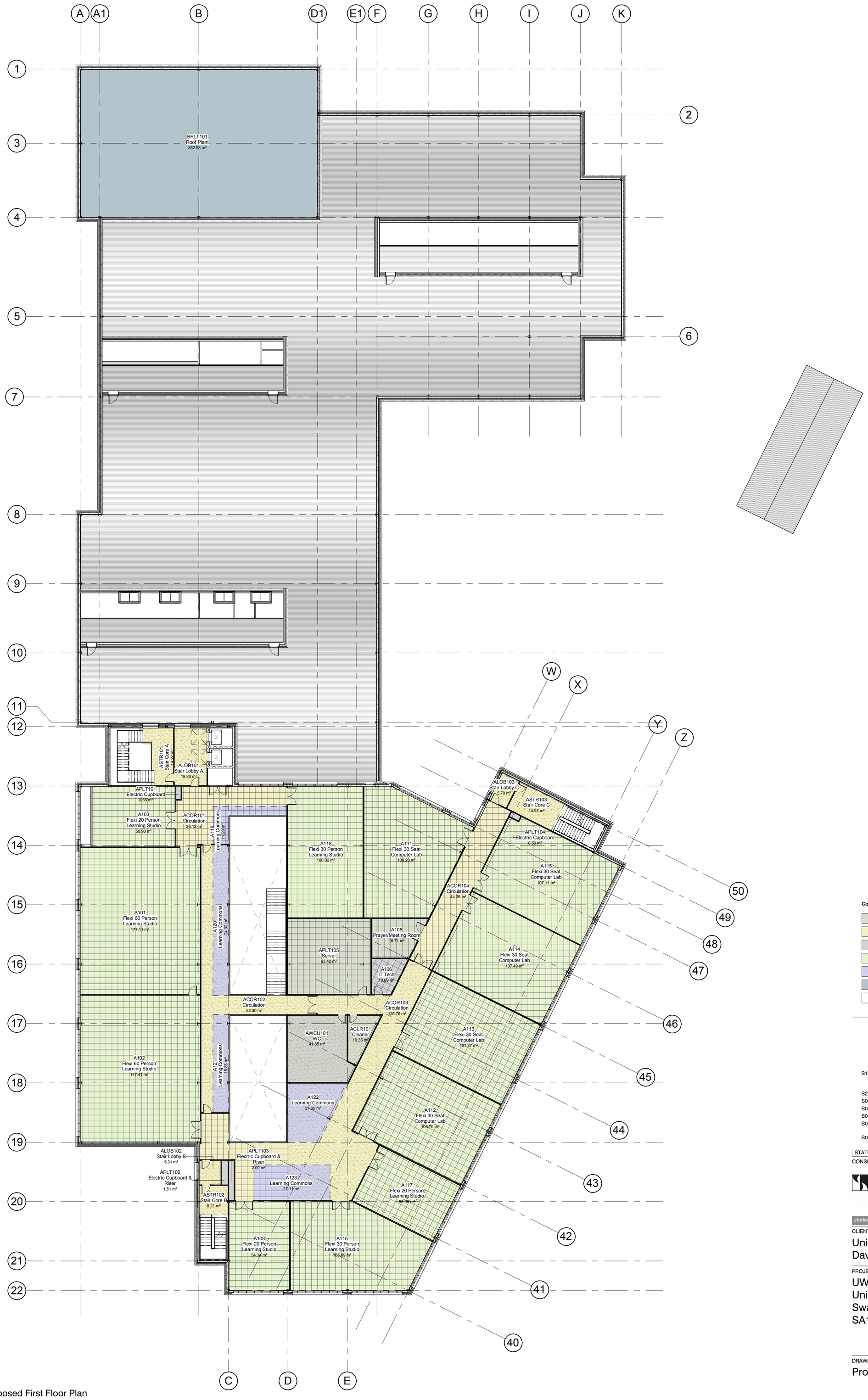
SCALE
1 : 200 @ A1

PROJECT | ORIGINATOR | ZONE | LEVEL | TYPE | ROLE | CLASS | NUMBER
UWTSD_01-STL-00-GF-DR-A-ZZ-02002

REVISION
P2

Responsibility is not accepted for errors made by others in scaling from this drawing.
All construction information should be taken from figured dimensions only.

0mm 50mm 100mm



Proposed First Floor Plan
1 : 200

Colour Schedule

- Building Support
- Circulation
- Core
- Flexi
- Learning Commons
- Plant
- Void

STATUS	REV	DATE	DESCRIPTION
S1	P2	12/02/16	RIBA Stage 3 Control Estimate. Building model updated to include amended layout and client requirements. Further co-ordination with ESHA elevations completed.
S2	P1	03/02/16	General revision to align with VE/comments from KD
S0	P0.7	21/01/16	Work in progress issue
S0	P0.5	18/01/16	Work in progress issue
S0	P0.3	15/01/16	Work in Progress issue for ICT integration
S0	P0.2	12/01/16	Work in progress issue. Drawing number amended to conform with BS
S0	P0.1	04/01/16	Minor Revision CAT 8 Removed

CONSULTANT

Stride Treglown

REVISED BY Aled Jones
CHECKED BY Ian Standen

© Stride Treglown Limited 2015

stridetreglown.com

CLIENT NAME
University of Wales Trinity Saint David

ORIGINATOR NO
70266_01

PROJECT
UWTSD FACE and Tech
University of Wales Trinity Saint David
Swansea
SA1

DRAWING TITLE
Proposed First Floor Plan

SUITABILITY STATUS
S1 Co-ordination

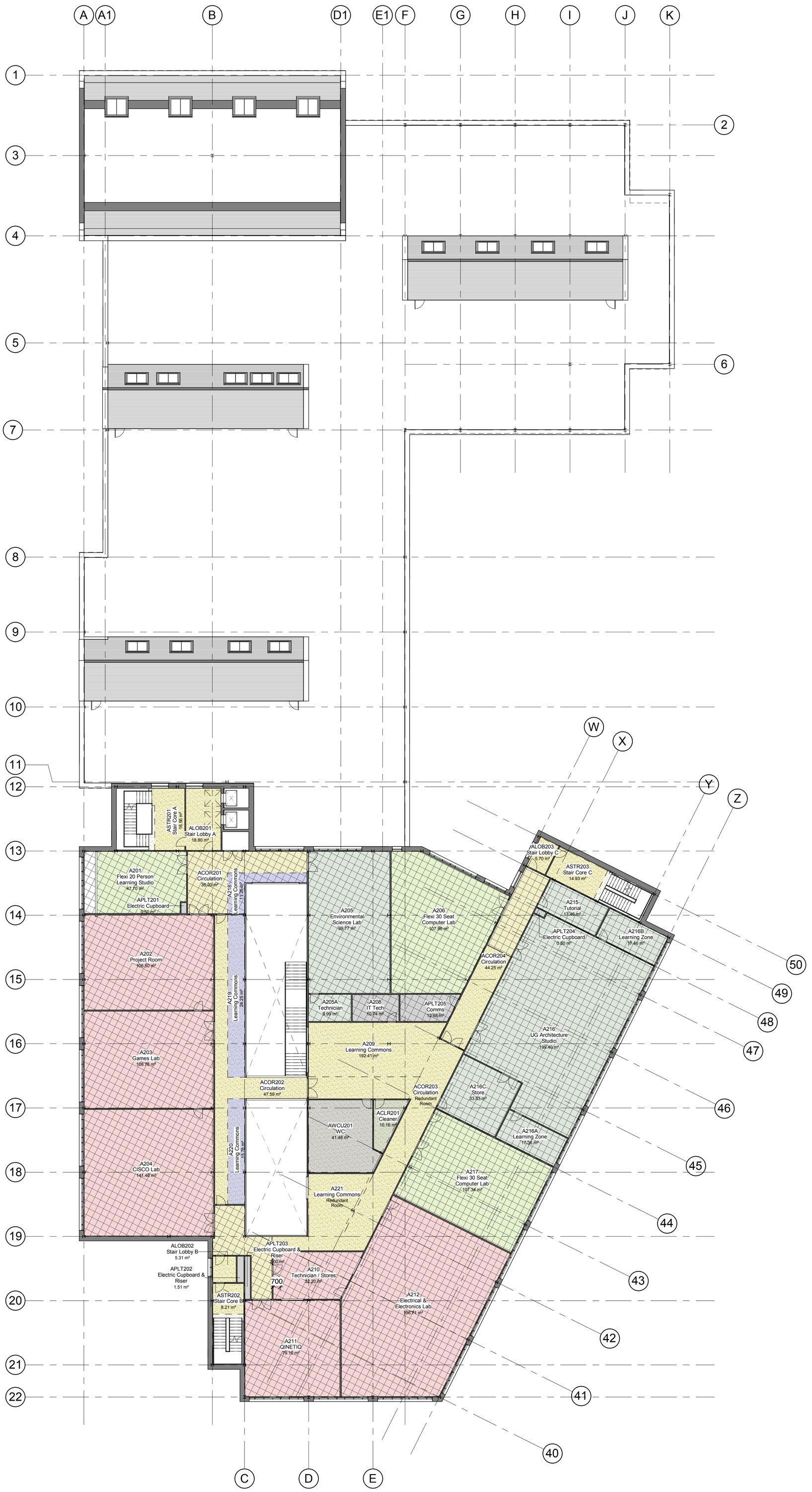
SCALE
1 : 200 @ A1

PROJECT | ORIGINATOR | ZONE | LEVEL | TYPE | ROLE | CLASS | NUMBER
UWTSD_01-STL-01-01-DR-A-ZZ-02003

REVISION
P2

Responsibility is not accepted for errors made by others in scaling from this drawing.
All construction information should be taken from figured dimensions only.

0mm 50mm 100mm



Proposed Second Floor Plan
1 : 200

Colour Schedule

- Architecture
- Building Support
- Circulation
- Computing
- Core
- Flexi
- Learning Commons
- Void

S1	P2	12/02/16	RIBA Stage 3 Control Estimate. Building model updated to include amended layout and client requirements. Further co-ordination with ESHA elevations completed.
S2	P1	03/02/16	General revision to align with VE/comments from KD
S0	P0.7	21/01/16	Work in progress issue
S0	P0.5	18/01/16	Work in progress issue
S0	P0.3	15/01/16	Work in Progress issue for ICT integration
S0	P0.2	12/01/16	Work in progress issue. Drawing number amended to conform with BS
S0	P0.1	04/01/16	Minor Revision CAT 8 Removed

STATUS	REV	DATE	DESCRIPTION

CONSULTANT

Stride Treglown

REVISED BY Aled Jones
CHECKED BY Ian Standen

© Stride Treglown Limited 2015

stridetreglown.com

CLIENT NAME
University of Wales Trinity Saint David

ORIGINATOR NO
70266_01

PROJECT
UWTSD FACE and Tech
University of Wales Trinity Saint David
Swansea
SA1

DRAWING TITLE
Proposed Second Floor Plan

SUITABILITY STATUS
S1 Co-ordination

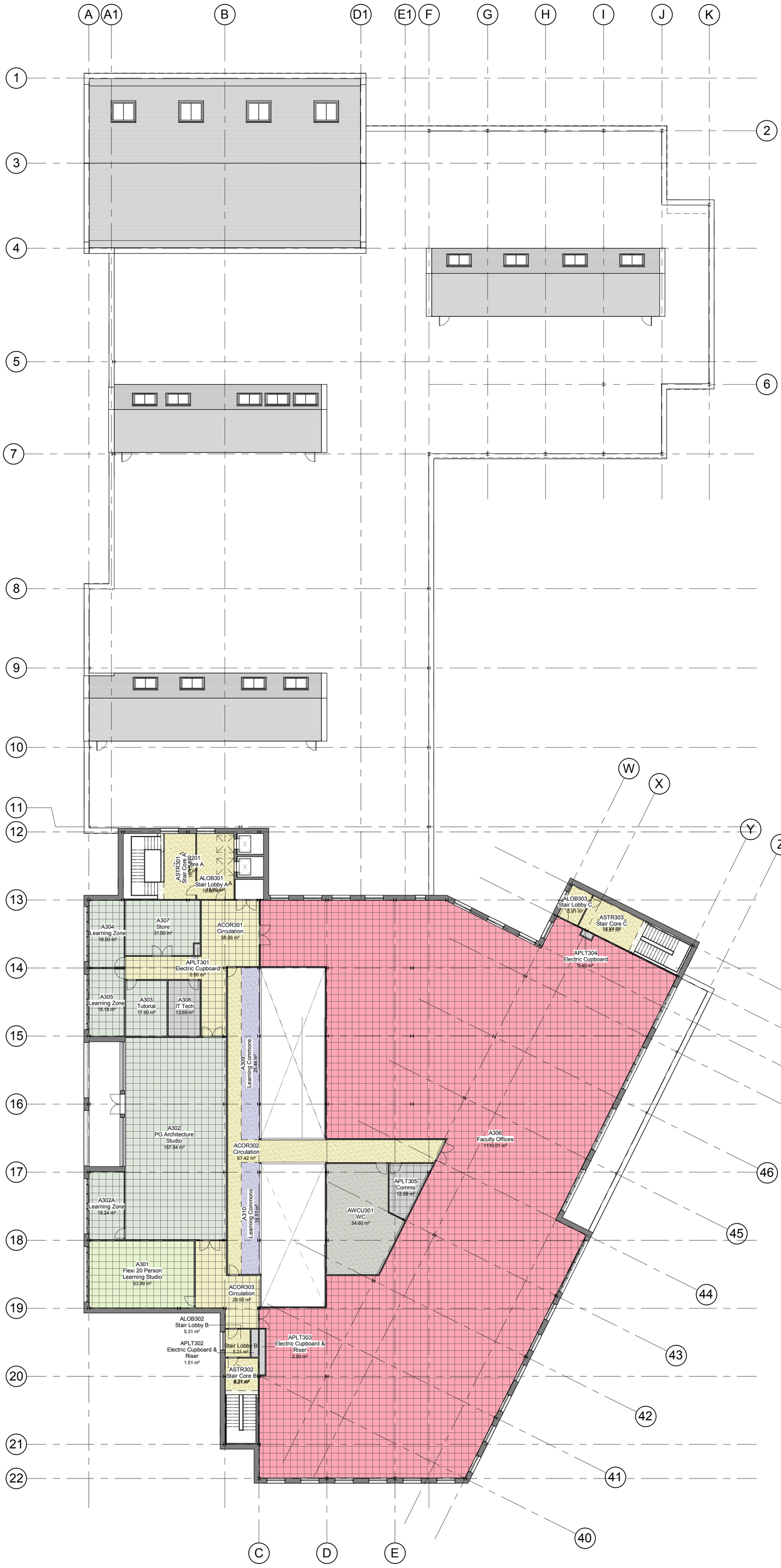
SCALE
1 : 200 @ A1

PROJECT | ORIGINATOR | ZONE | LEVEL | TYPE | ROLE | CLASS | NUMBER
UWTSD_01-STL-01-02-DR-A-ZZ-02004

REVISION
P2

Responsibility is not accepted for errors made by others in scaling from this drawing.
All construction information should be taken from figured dimensions only.

0mm 50mm 100mm



Proposed Third Floor Plan
1 : 200

Colour Schedule

- Architecture
- Circulation
- Core
- Faculty
- Flexi
- Learning Commons
- Void

S1	P2	12/02/16	RIBA Stage 3 Control Estimate. Building model updated to include amended layout and client requirements. Further co-ordination with ESHA elevations completed.
S2	P1	03/02/16	General revision to align with VE/comments from KD
S0	P0.7	21/01/16	Work in progress issue
S0	P0.5	18/01/16	Work in progress issue
S0	P0.3	15/01/16	Work in Progress issue for ICT integration
S0	P0.2	12/01/16	Work in progress issue. Drawing number amended to conform with BS
S0	P0.1	04/01/16	Minor Revision CAT 8 Removed

STATUS	REV	DATE	DESCRIPTION

CONSULTANT

Stride Treglown

REVISED BY Aled Jones
CHECKED BY Ian Standen

© Stride Treglown Limited 2015

stridetreglown.com

CLIENT NAME
University of Wales Trinity Saint David

ORIGINATOR NO
70266_01

PROJECT
UWTSD FACE and Tech
University of Wales Trinity Saint David
Swansea
SA1

DRAWING TITLE
Proposed Third Floor Plan

SUITABILITY STATUS
S1 Co-ordination

SCALE
1 : 200 @ A1

PROJECT | ORIGINATOR | ZONE | LEVEL | TYPE | ROLE | CLASS | NUMBER
UWTSD_01-STL-01-03-DR-A-ZZ-02005

REVISION
P2

SPACES THAT WORK

DRAFT

Test fit space plans

UWTSD Library

Reduced Scheme (revised)

Mixed use building

SPACES THAT WORK



Building Supply

	Grd Fl	1st Fl	2nd Fl	Total
GIA	**920**	**804**	**920**	**2644**
Cores	118	90	90	**298**
NIA	802	714	830	**2346**
Circulation	202	139	114	**455**
NUA	600	575	716	**1891**

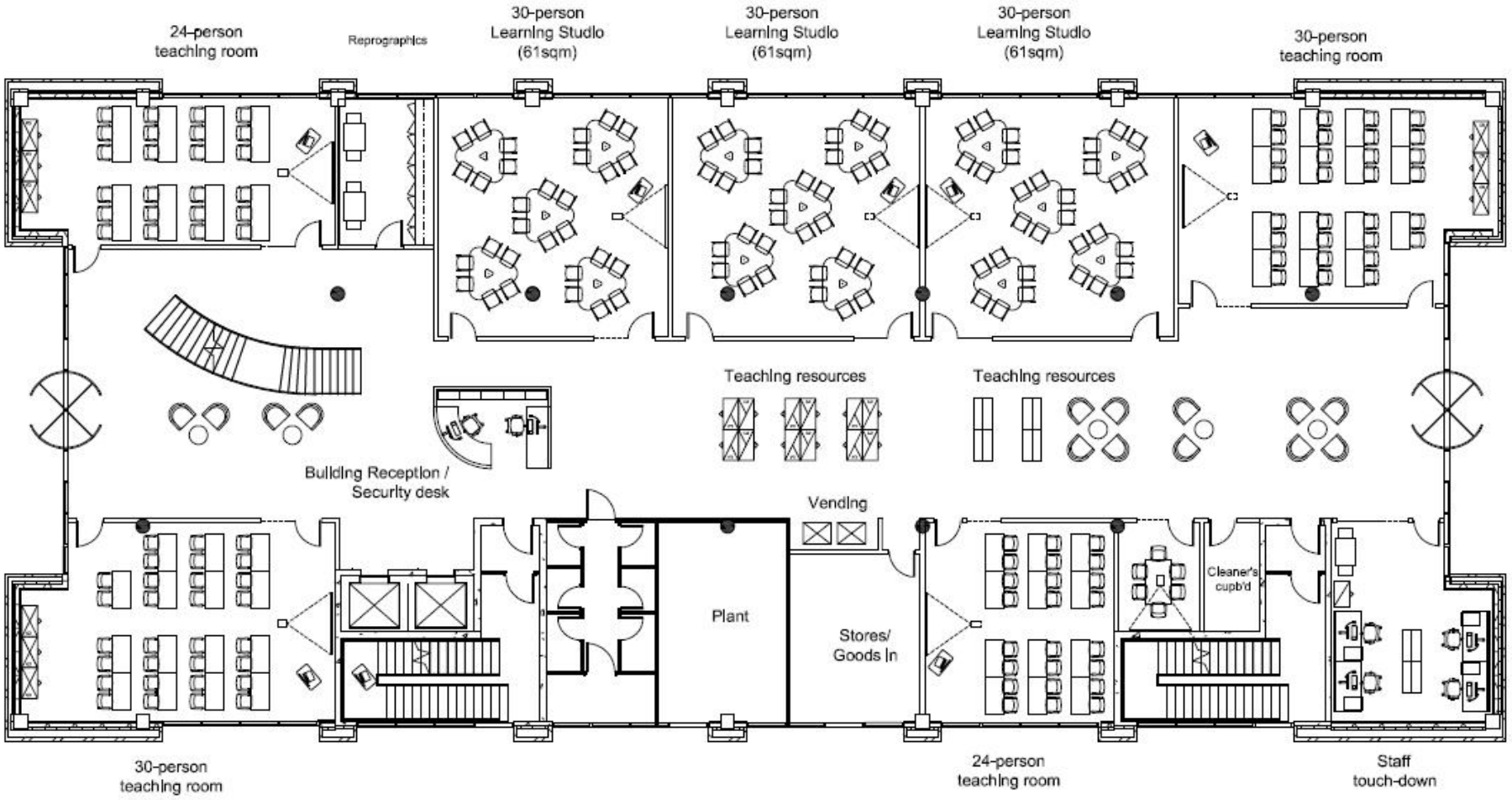
Second Floor: Library

First Floor: Library

Ground Floor: Teaching Rooms

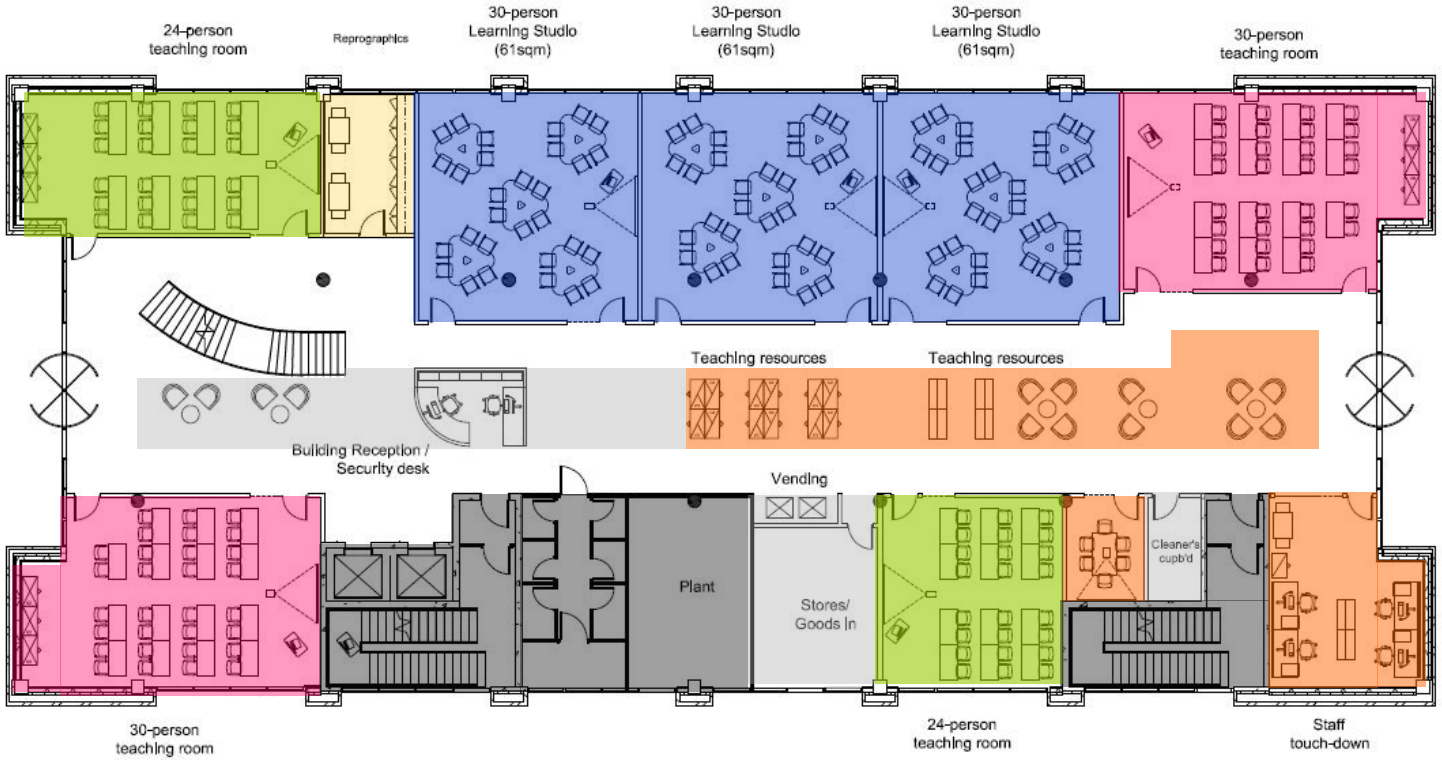
Ground Floor: Teaching Rooms

SPACES THAT WORK



Ground Floor

SPACES THAT WORK

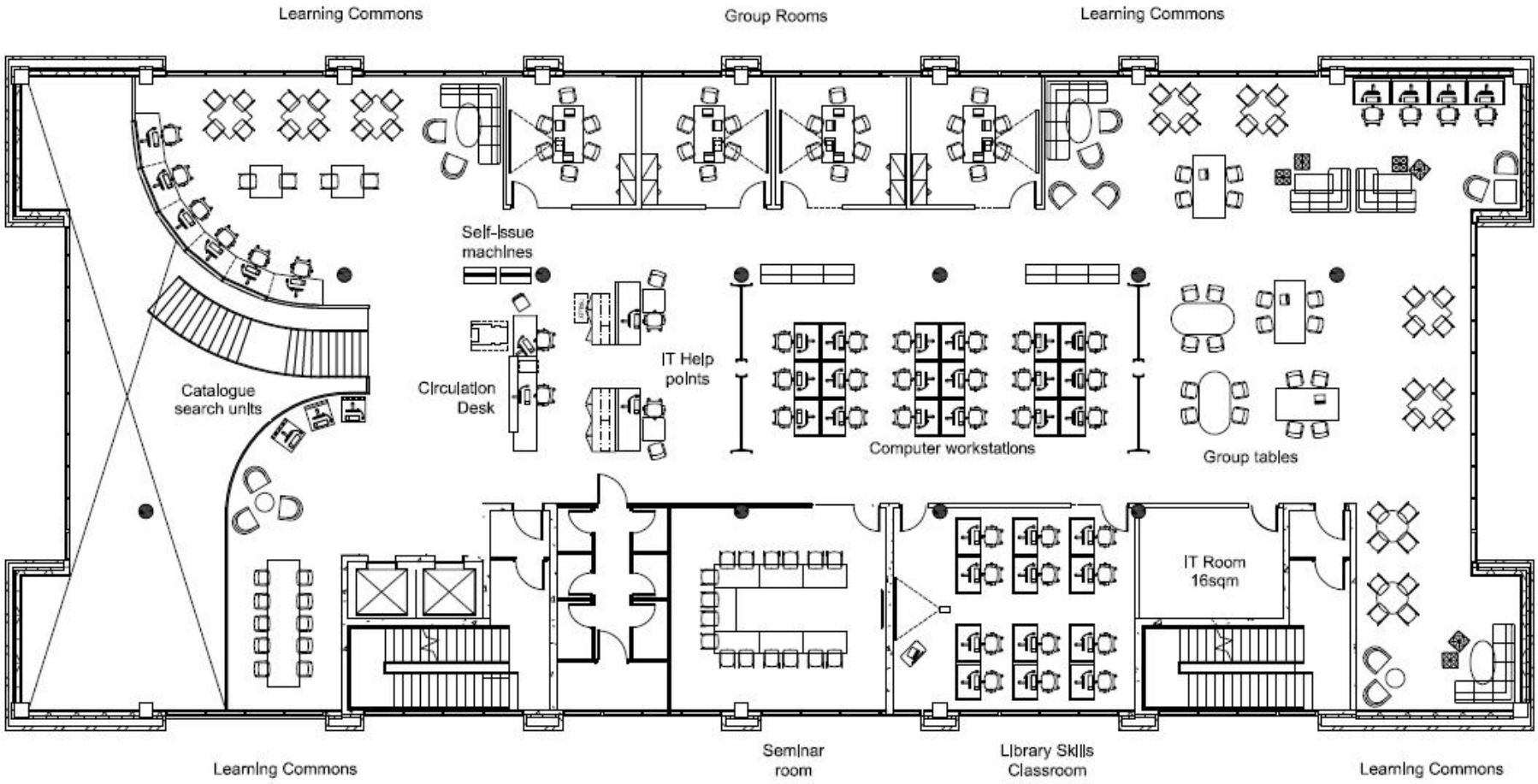


- Front of House settings
- 24-seat Classroom
- 30-seat Classroom
- 30-seat Learning Studio
- Staff touchdown & support settings / teaching resources
- Building support settings
- Building core

Total reader seats: 214
Total informal /other seats: 10
Grand Total: 224

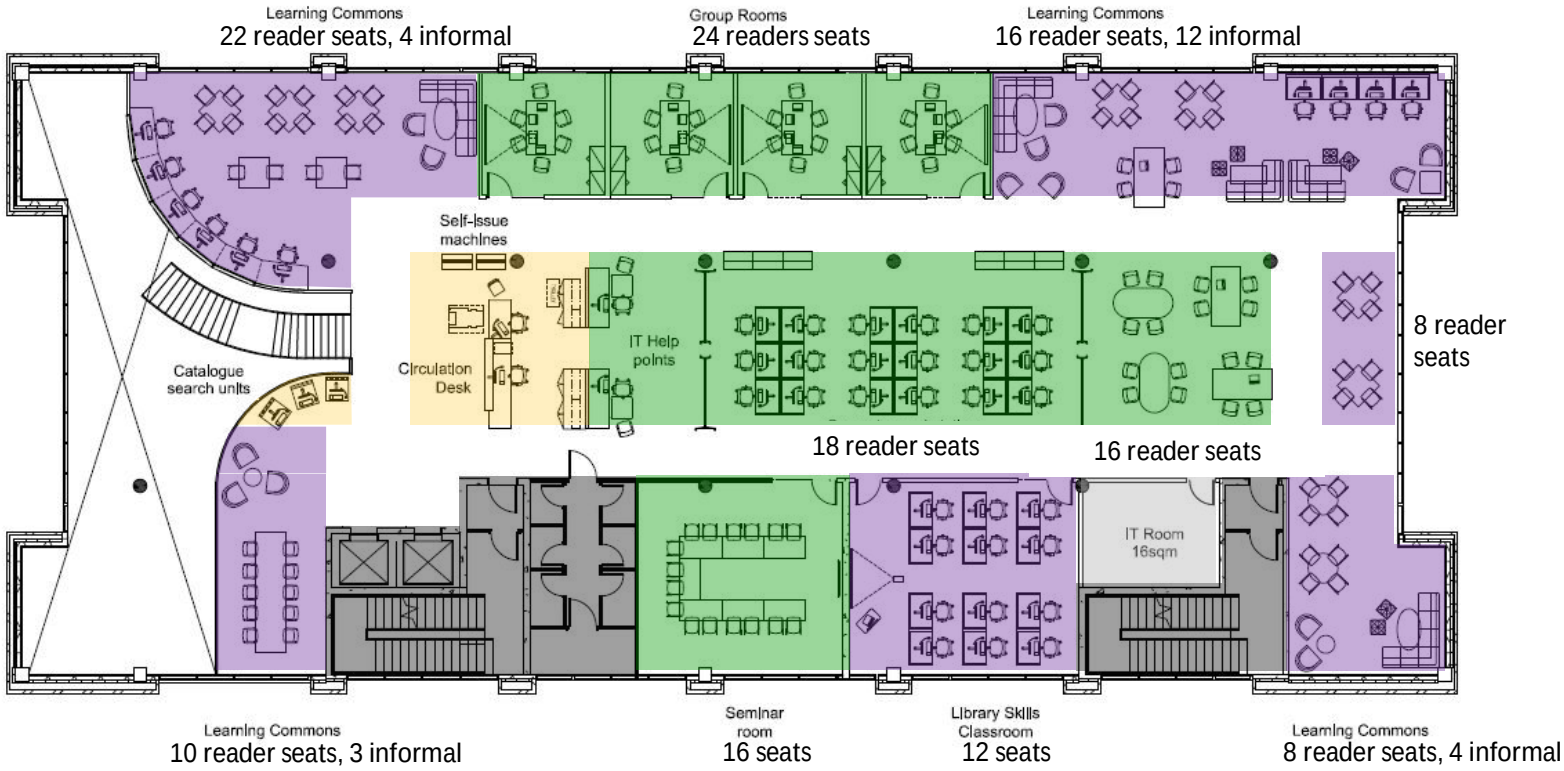
First floor: Library Learning Commons

SPACES THAT WORK



First floor

SPACES THAT WORK

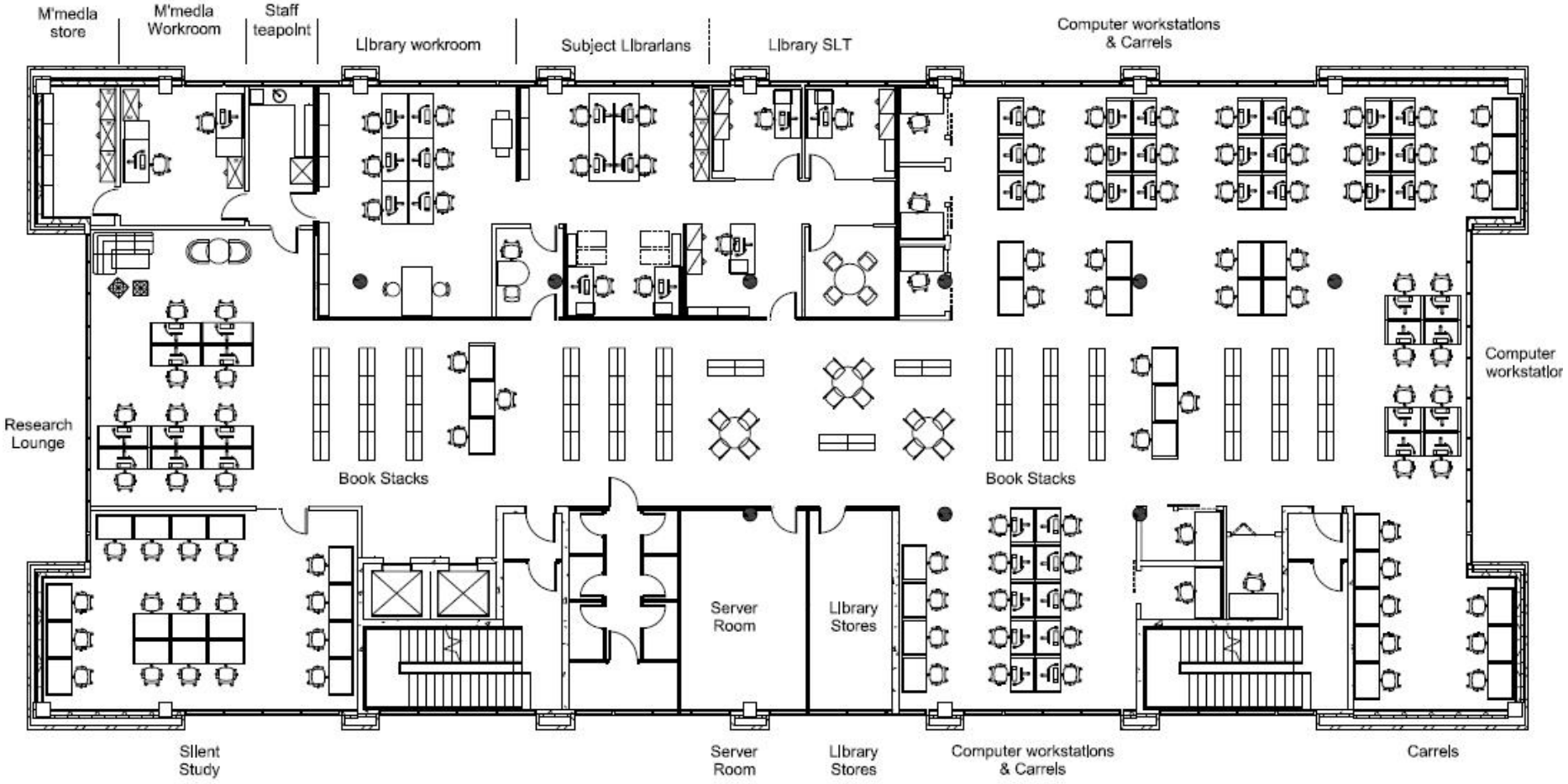


- Skills Hub (staff spaces)
- Book Stacks & seating
- Front of House settings
- Digital Research Centre settings
- Undergraduate Centre (Learning Commons)
- Building support settings
- Building core

Total reader seats: 122
Total informal /other seats: 41
Grand Total: 163
(Computer stations: 28)

SPACES THAT WORK

Second Floor: Library book stacks, open access computers & reading areas

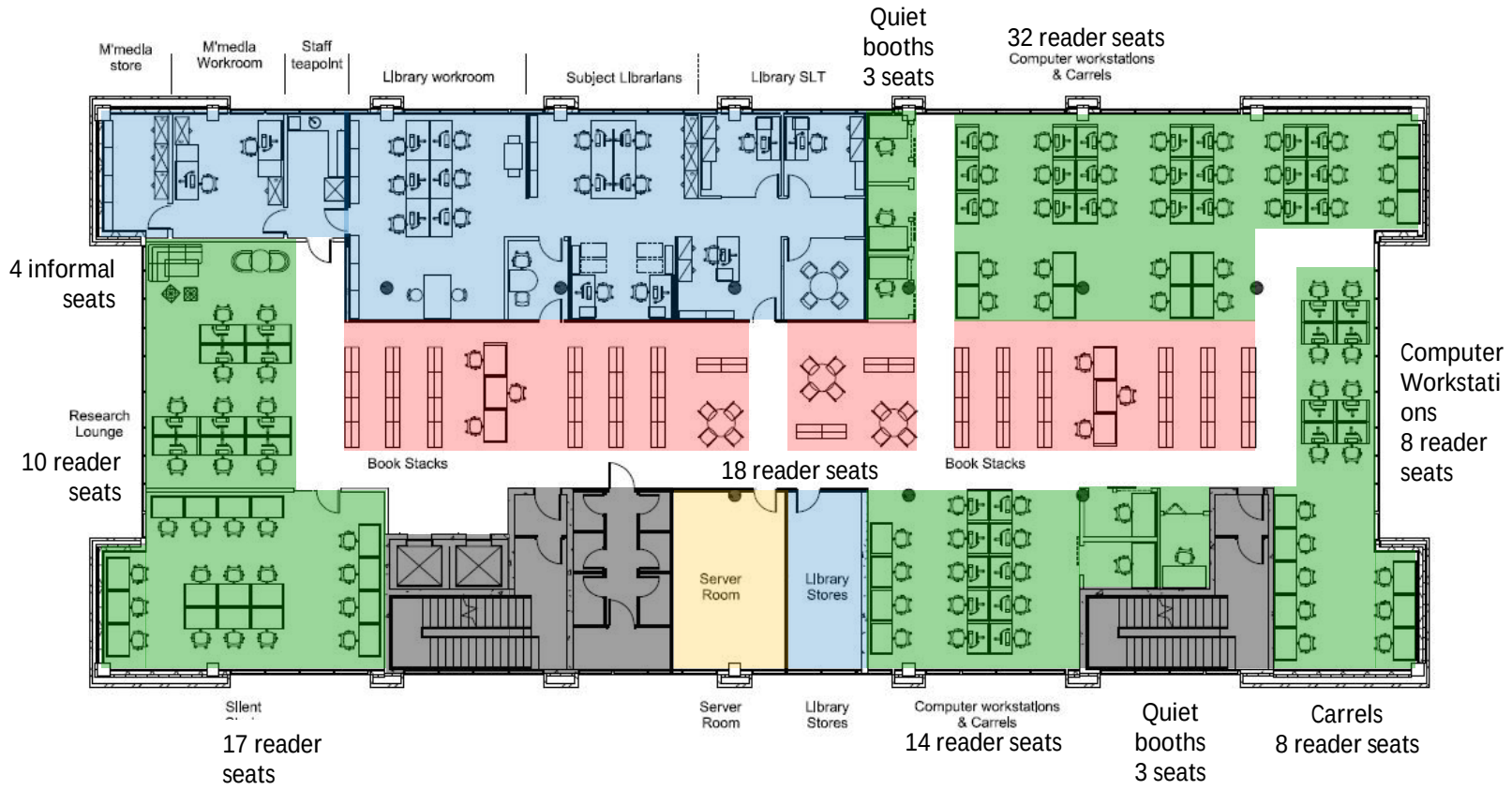


Book stacks sufficient to accommodate existing Mount Pleasant core collection
- low use journals/ books stored off site

UWTSD Library

Second Floor

SPACES THAT WORK



- Skills Hub (staff spaces)
- Book Stacks & seating
- Front of House settings
- Digital Research Centre settings
- Undergraduate Centre (Learning Commons)
- Building support settings
- Building core

Total reader seats: 113
Total informal /other seats: 4
Grand Total: 117
(Computer stations: 49)

Book stacks: 562 lin. m. (104 units)

Summary – Building Supply

SPACES THAT WORK

Revised Scheme: Library - 2 Floors, Teaching - 1 Floor

	Grd Fl	1st Fl	2nd Fl	Total
GIA	**920**	**804**	**920**	**2644**
Cores	118	90	90	**298**
NIA	802	714	830	**2346**
Circulation	202	139	114	**455**
NUA	600	575	716	**1891**

Summary

SPACES THAT WORK

Building Space Use	Grd Fl.	1st Fl.	2nd Fl.	Total
Teaching Rooms	409	-	-	**409**
Lecturer touchdown & support	102	-	-	**102**
Library Skills Hub	-	-	203	**203**
University book stacks	-	-	133	**133**
Front of house settings	13	45	-	**58**
Digital Research Centre	-	256	353	**609**
Undergraduate Centre/ Learning Commons	-	267	-	**267**
Building Support	76	7	27	**110**
(sqm) **Total NUA**	**600**	**575**	**716**	**1891**

Library seating

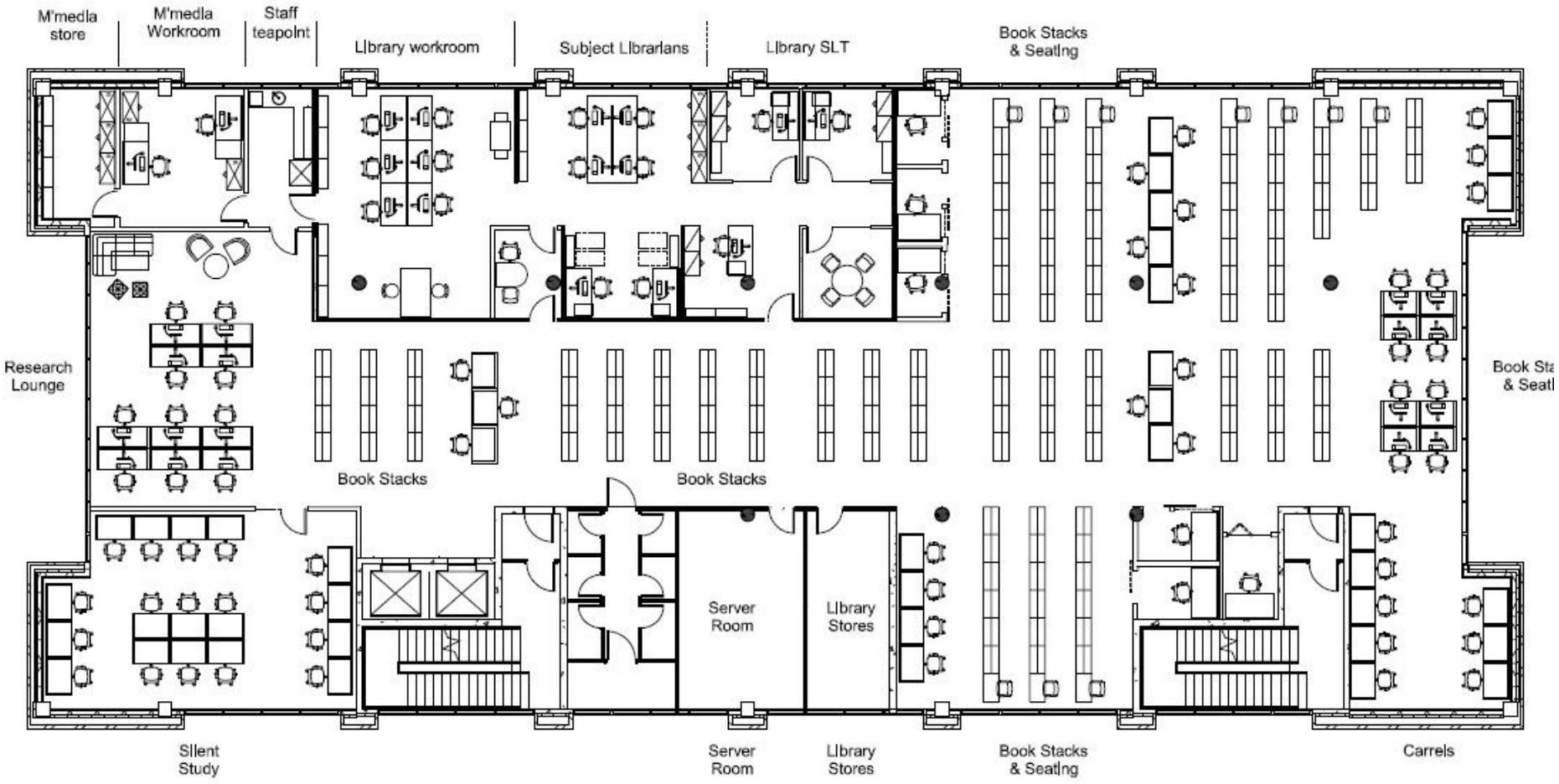
	1st Fl.	2nd Fl.	Total
Computer stations	28	49	77
Carrels & quiet booths	94	64	158
Informal and other seats	41	4	45
	163	**117**	**280**

Summary of existing library provision

	Study places	Computers	Core stacks Lin. M.	Low use stacks Lin. M.
Mount Pleasant	124	38	492	889

Second Floor option 2 (Increased book stacks)

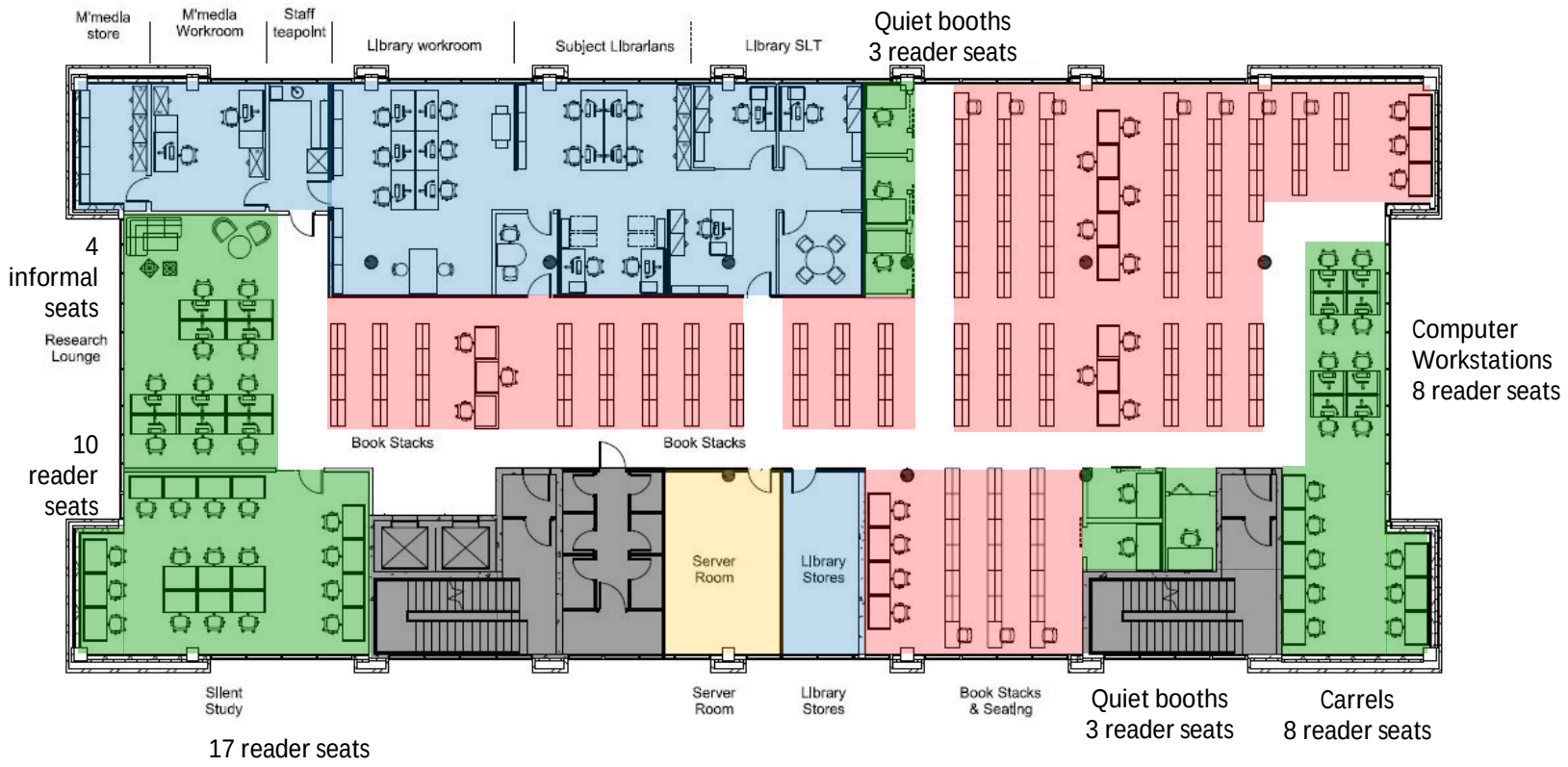
SPACES THAT WORK



Book stacks sufficient to accommodate compressed Mount Pleasant and Townhill core collection - 50% of collections including low use journals/ books stored off site

Second Floor option 2 (Increased book stacks)

SPACES THAT WORK



- Skills Hub (staff spaces)
- Book Stacks & seating
- Front of House settings
- Digital Research Centre settings
- Undergraduate Centre (Learning Commons)
- Building support settings
- Building core

Total reader seats: 78
Book stacks: 1415 lin. m. (262 units)

Library Seating option 2

SPACES THAT WORK

	1st floor	2nd floor	Total
Computer stations	28	18	46
Carrels and quiet booths	94	56	150
Informal and other seats	41	4	45
	163	**78**	**241**

Additional study settings and computers provided in FACE learning commons
FACE = 144 study seats including 60 computers

TOTAL PROVISION = 385 study seats including 106 computers

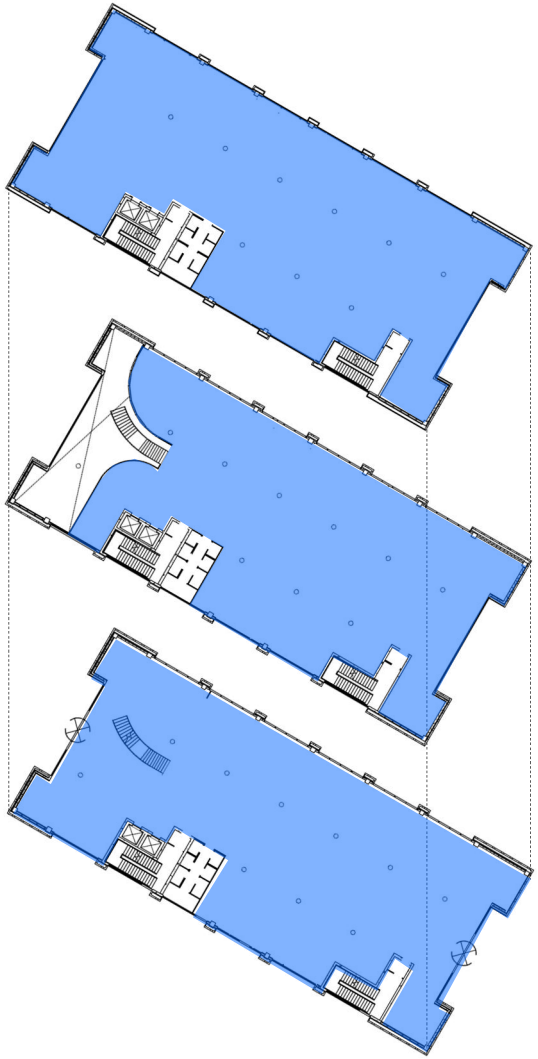
Book stacks = 1,415 lin. meters.- a 37% reduction in core collection required

Summary of existing library provision

	Study places	Computers	Core stacks Lin. M.	Low use stacks Lin. M.
Mount Pleasant	124	38	492	889
Townhill	118	60	1764	920
Subtotal	***242***	***98***	***2256***	***1809***
Swansea Business campus	216	50	657	0
Total	***458***	***148***	***2913***	***1809***

Single-use building

SPACES THAT WORK



Second Floor: Library

First Floor: Library

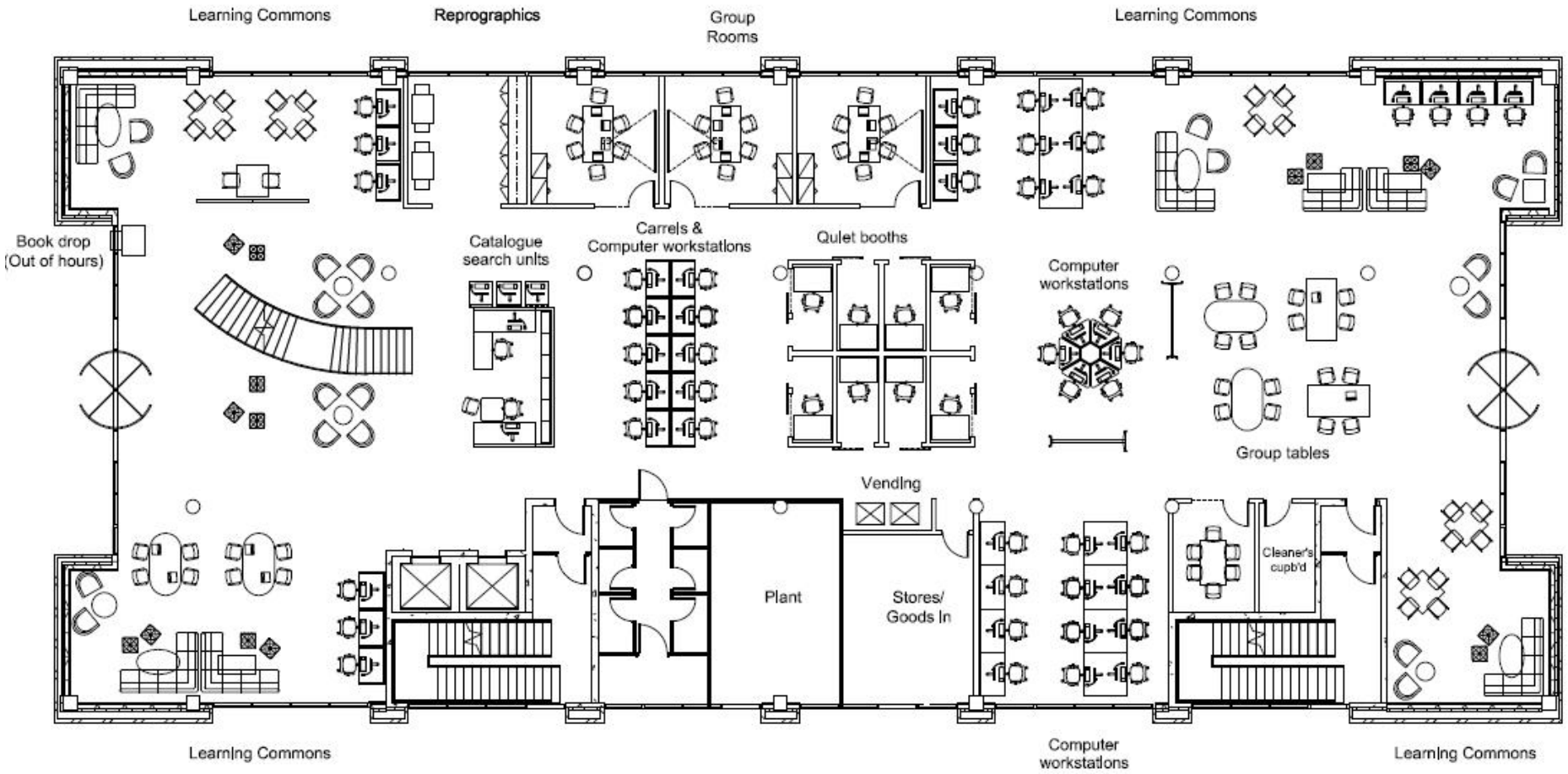
Ground Floor: Library

Building Supply

	Grd Fl	1st Fl	2nd Fl	Total
GIA	**920**	**804**	**920**	**2644**
Cores	118	90	90	**298**
NIA	802	714	830	**2346**
Circulation	202	139	114	**455**
NUA	600	575	716	**1891**

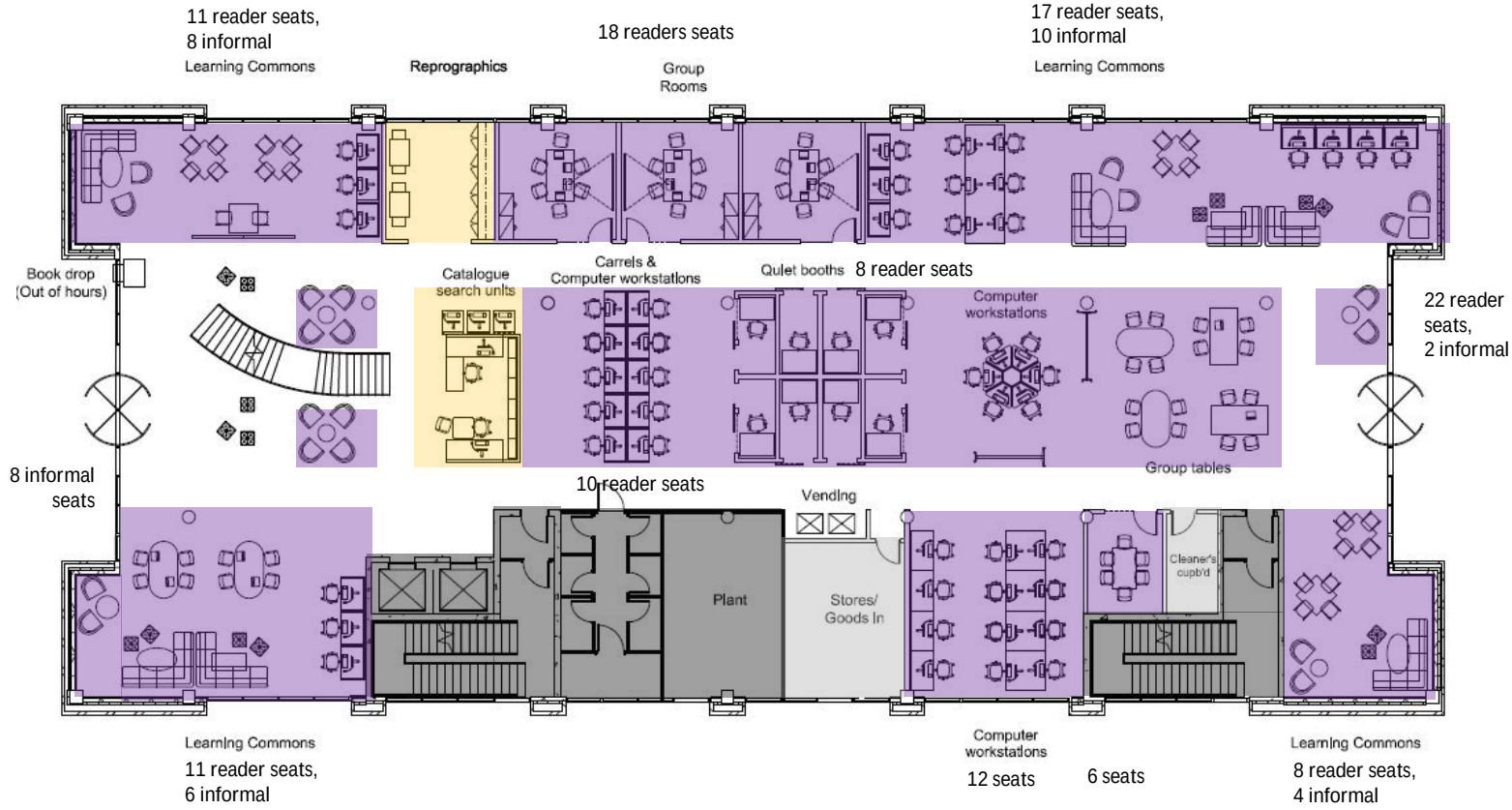
Ground Floor: Library

SPACES THAT WORK



Ground Floor: Library

SPACES THAT WORK

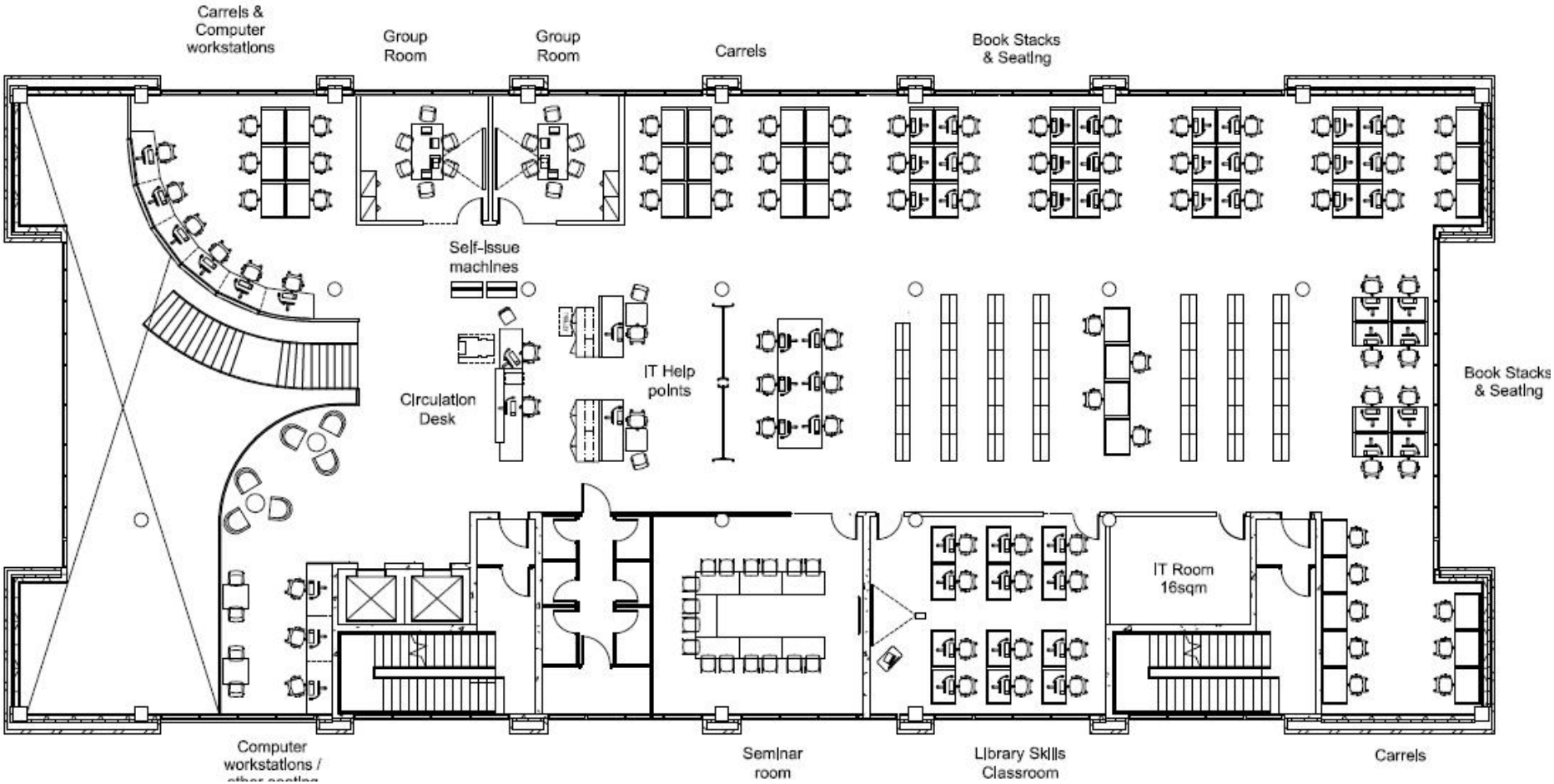


- Skills Hub (staff spaces)
- Book Stacks & seating
- Front of House settings
- Digital Research Centre settings
- Undergraduate Centre (Learning Commons)
- Building support settings
- Building core

Total reader seats: 117
Total informal /other seats: 44
Grand Total: 161
(Computer stations: 41)

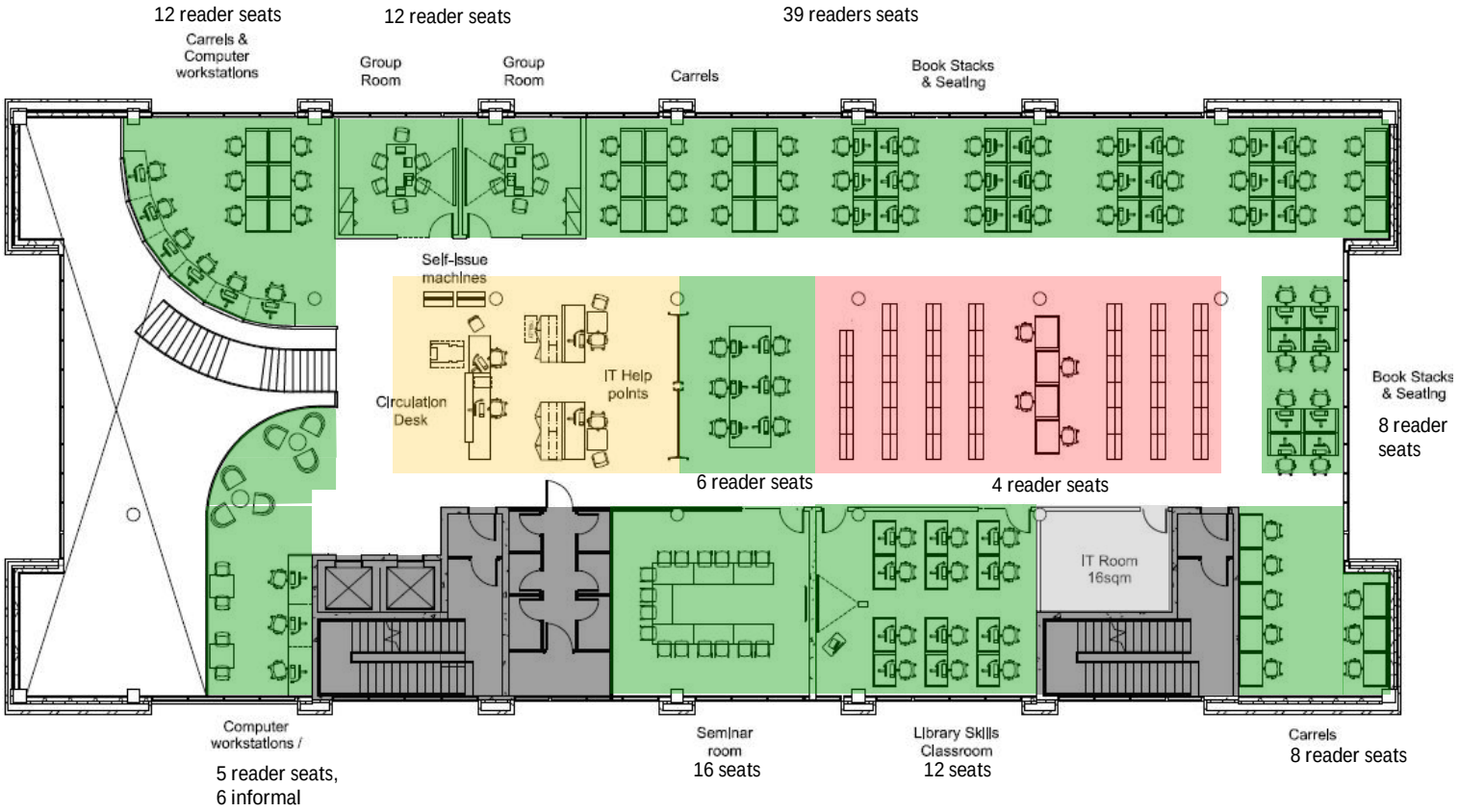
First Floor: Library

SPACES THAT WORK



First Floor: Library

SPACES THAT WORK



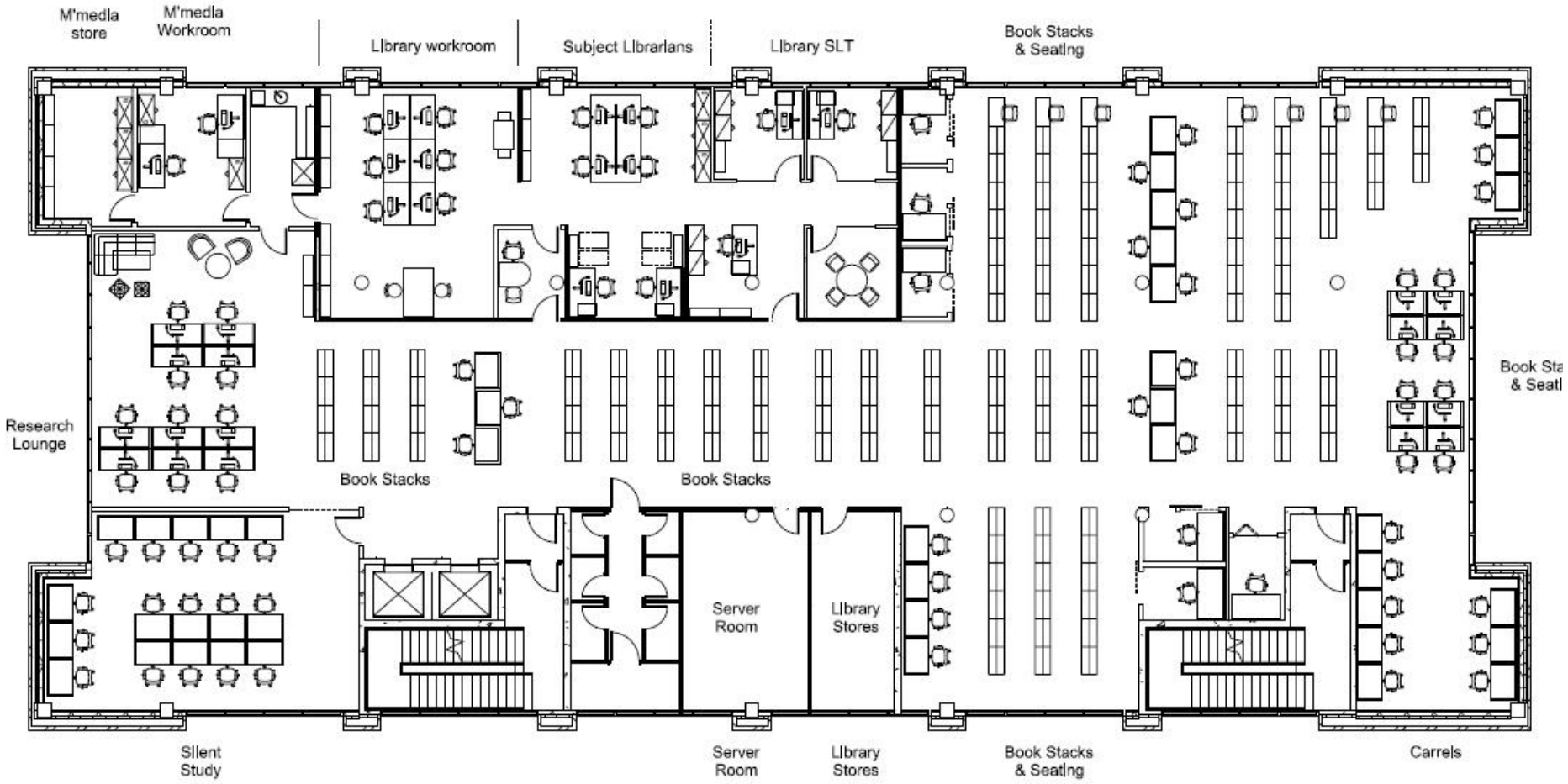
- Skills Hub (staff spaces)
- Book Stacks & seating
- Front of House settings
- Digital Research Centre settings
- Undergraduate Centre (Learning Commons)
- Building support settings
- Building core

Total reader seats: 94
Total informal /other seats: 34
Grand Total: 128
(Computer stations: 47)

Book stacks: 443 lin. m. (82 units)

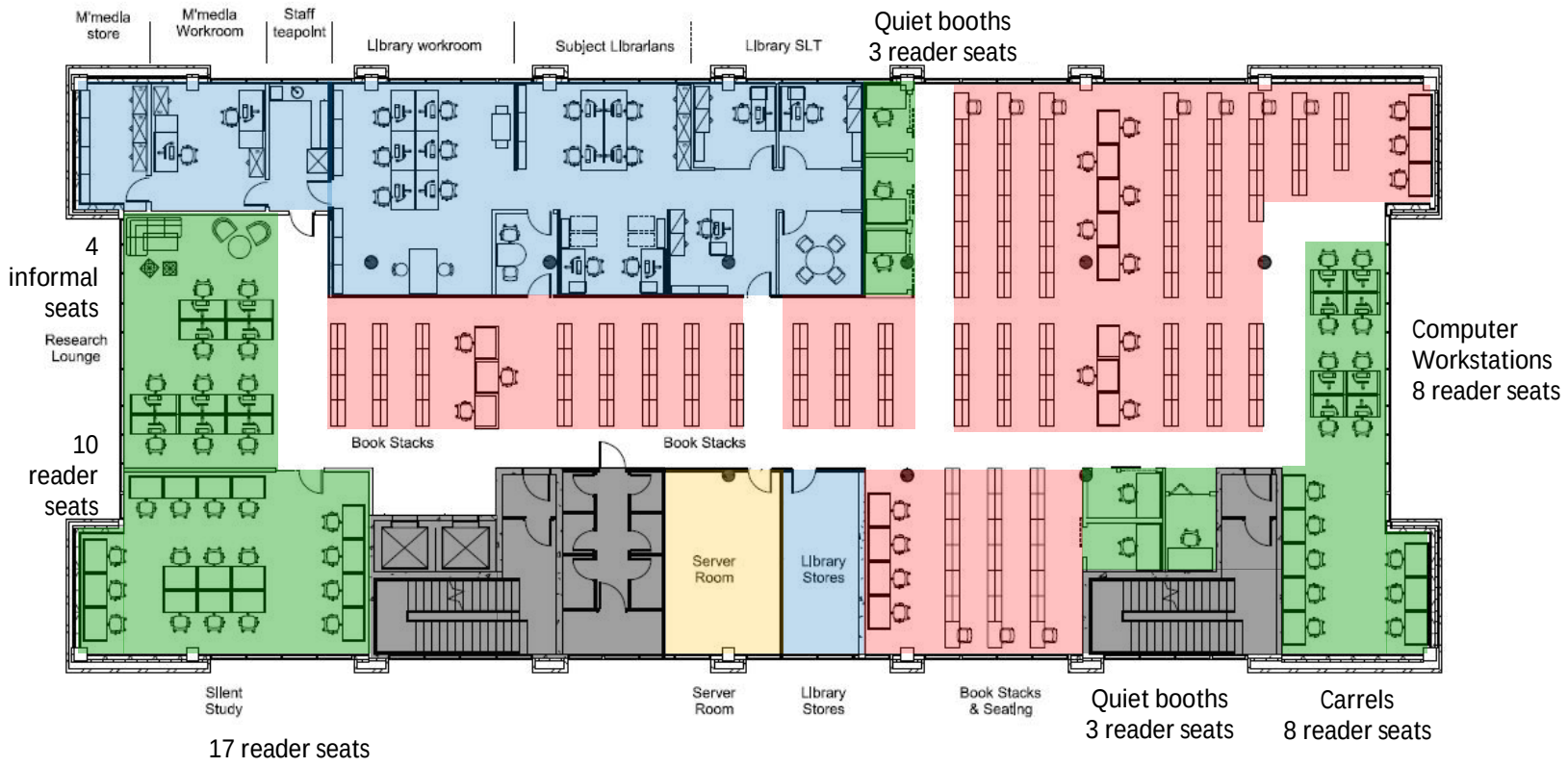
Second Floor: Library

SPACES THAT WORK



Second Floor: Library

SPACES THAT WORK



- Skills Hub (staff spaces)
- Book Stacks & seating
- Front of House settings
- Digital Research Centre settings
- Undergraduate Centre (Learning Commons)
- Building support settings
- Building core

Computer stations: 18
Total informal /other seats: 60
Grand Total: 78

Book stacks: 1415 lin. m. (262 units)

Library Seating – 3 floor full library

SPACES THAT WORK

	1st Fl.	2nd Fl.	3rd Fl.	Total
Computer stations	41	47	18	106
Carrels & quiet booths	76	47	60	183
Informal and other seats	44	34	0	78
	161	**128**	**78**	**367**

Additional study settings and computers provided
in FACE and Business precinct learning commons
FACE = 144 study seats including 60 computers
Business/ Education = 220 study seats including 20 computers

TOTAL PROVISION = 731 study seats including 186 computers
= 18.6% of student population.
Book stacks = 1,858 lin. meters.- a 33% reduction in core collection required

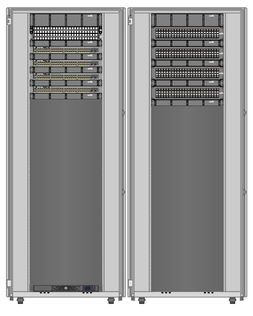
Summary of existing library provision

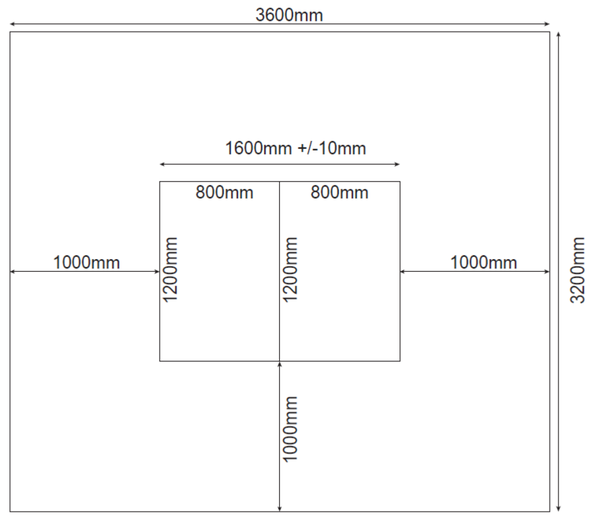
	Study places	Computers	Core stacks Lin. M.	Low use stacks Lin. M.
Mount Pleasant	124	38	492	889
Townhill	118	60	1764	920
Subtotal	***242***	***98***	***2256***	***1809***
Swansea Business campus	216	50	657	0
Total	***458***	***148***	***2913***	***1809***

3rd Floor Library

Data Points	165				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	4				
48 Port C2960X-48FPD-L	4				
APC SUA1000RMI1U Smart-UPS 1000VA	1				
1u Cable Management	9				
2u Cable Management	2				

Rack 3A Rack 3B

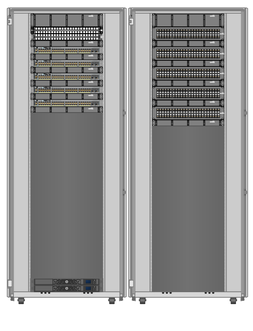


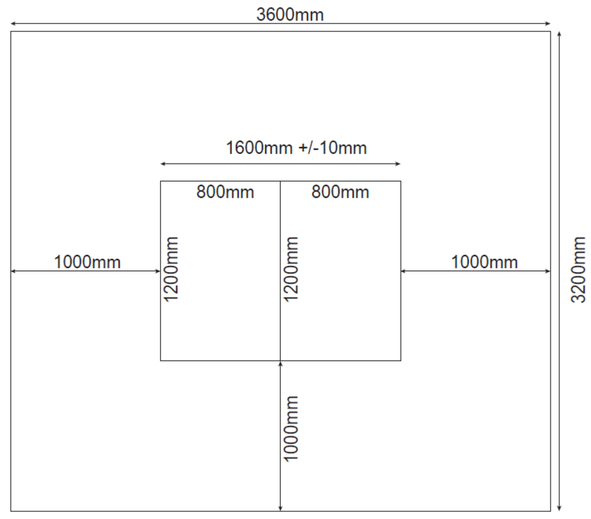


2nd Floor Library

2nd floor option 1	Qty				
Data Points	231				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	5				
48 Port C2960X-48FPD-L	5				
APC SUA1000RMI1U Smart-UPS 1000VA	2				
1u Cable Management	11				
2u Cable Management	2				

Rack 2A Rack 2B

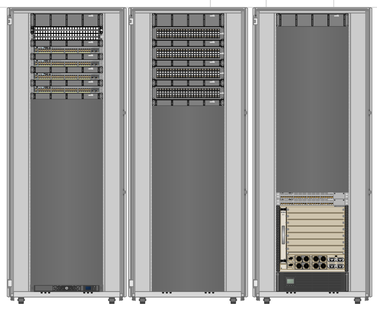




1st Floor Library

1st floor option 1	Qty				
Data Points	187				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	4				
48 Port C2960X-48FPD-L	4				
APC SUA1000RMI1U Smart-UPS 1000VA	1				
1u Cable Management	9				
2u Cable Management	2				
Cisco 3850 Distribution Switches	2				
Cisco 6807 Core	1				

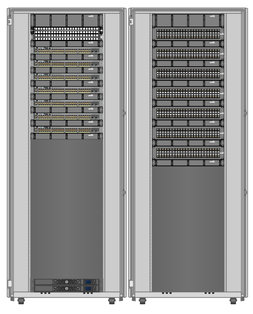
Rack 1A Rack 1B Core & Distribution

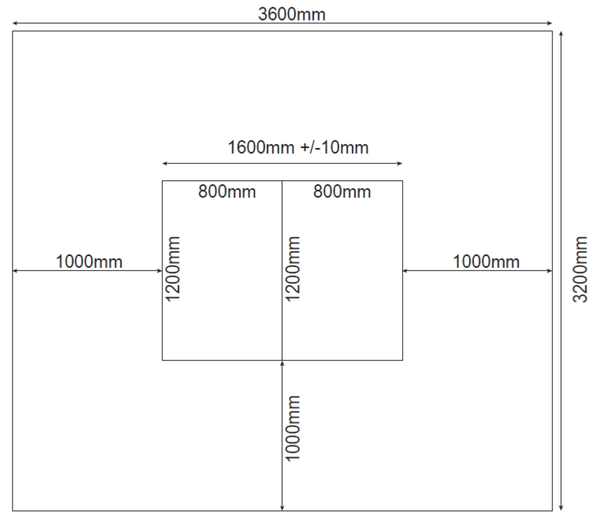


Ground Floor Library

Ground floor option 1	Qty				
Data Points	312				
24 Port Fibre Patch Panel	2				
48 Port Patch Panels (2u)	7				
48 Port C2960X-48FPD-L	7				
APC SUA1000RMI1U Smart-UPS 1000VA	2				
1u Cable Management	11				
2u Cable Management	2				

Rack GA Rack GB





A1

C4

EXISTING STREET LIGHTING TO REMAIN

DRY DOCK

BUILDING MOUNTED LIGHTING ON THIS ELEVATION. CONSISTING OF UP/DOWN LIGHTING, RECESSED FLOOR UP LIGHTING AND RECESSED WALL MOUNTED DOWN LIGHTING.

CYCLE STORE

BUILDING MOUNTED LIGHTING ON THIS ELEVATION, CONSISTING OF UP/DOWN LIGHTING, RECESSED FLOOR UP LIGHTING AND RECESSED WALL MOUNTED DOWN LIGHTING.

F

TIDAL BASIN

W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\X\WA0155-X-00-00-001.dwg

NOTES

X-G1



BUILDING MOUNTED LIGHTING









Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.201

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life

3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
SITE PLAN
EXTERNAL SERVICES

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

Acad Model

Revision
P1

Drawing No.
WA0155-X-00-00-001

A1

TECHNIUM BUILDING
ROUTE 2

TECHNIUM BUILDING
ROUTE 1

INTER - BUILDING CONNECTIVITY
ROUTE 1
UNDERGROUND BT 90mm PVC DUCT
FOR FIBRE CONNECTIVITY BETWEEN
THE LIBRARY BUILDING AND
TECHNIUM BUILDING

INTER - BUILDING CONNECTIVITY
ROUTE 2
UNDERGROUND BT 90mm PVC DUCT FOR FIBRE CONNECTIVITY
BETWEEN THE LIBRARY BUILDING AND TECHNIUM BUILDING

BT - EXTERNAL BUILDING CONNECTIVITY
PBSA 2
THIS IS NO REQUIREMENT FOR CONTRACTOR, BT WILL
MANAGE THIS DUCT AS PART OF THE BT INSTALLATION
PROCESS

C4

BT - EXTERNAL BUILDING CONNECTIVITY
PBSA 1
THIS IS NO REQUIREMENT FOR CONTRACTO
BT WILL MANAGE THIS DUCT AS PART OF TH
BT INSTALLATION PROCESS

INTER - BUILDING CONNECTIVITY
ROUTE 2
UNDERGROUND BT 90mm PVC DUCT FOR FIBRE
CONNECTIVITY BETWEEN THE LIBRARY AND FACE/TECH
BUILDING

JOINTING CHAMBER

DRY DOCK

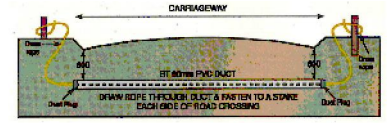
INTER - BUILDING CONNECTIVITY
ROUTE 1
UNDERGROUND BT 90mm PVC DUCT
FOR FIBRE CONNECTIVITY
BETWEEN THE LIBRARY AND
FACE/TECH BUILDING

TIDAL BASIN

F

W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3X\WA0155-X-00-00-002.dwg

NOTES



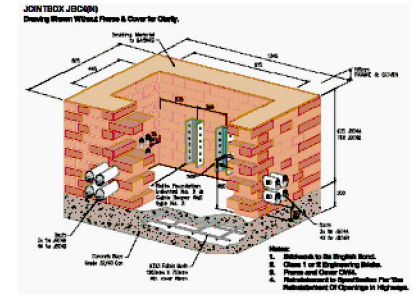


Figure 5 Typical Jointbox JBC4(H)

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.201

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
SITE PLAN EXTERNAL SERVICES
BT DUCT LAYING,
INTER - BUILDING CONNECTIVITY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

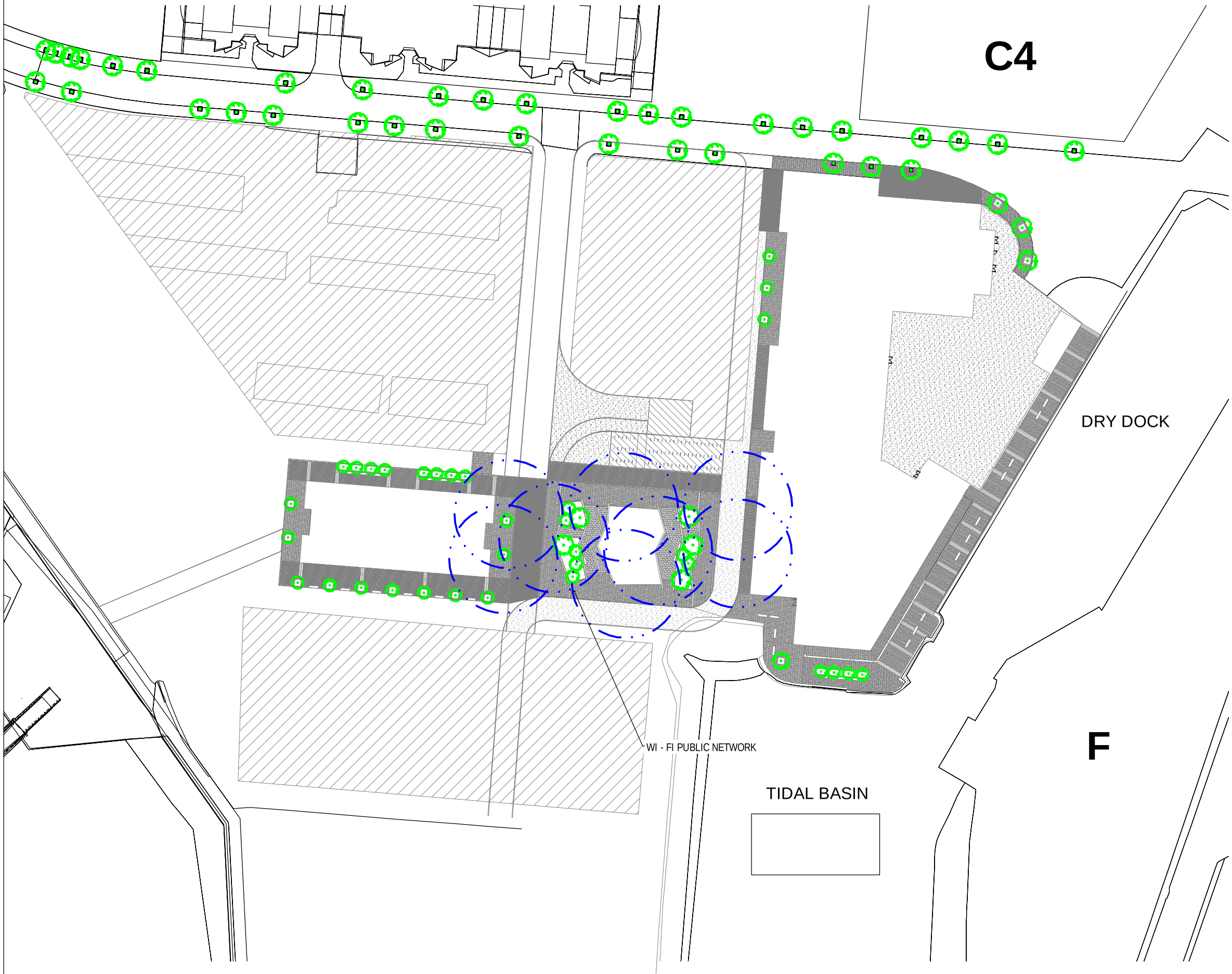
Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

Acad Model

Drawing No.
WA0155-X-00-00-002

Revision
P1

A1



NOTES

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.201

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
SITE PLAN EXTERNAL SERVICES
WI-FI NETWORK

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

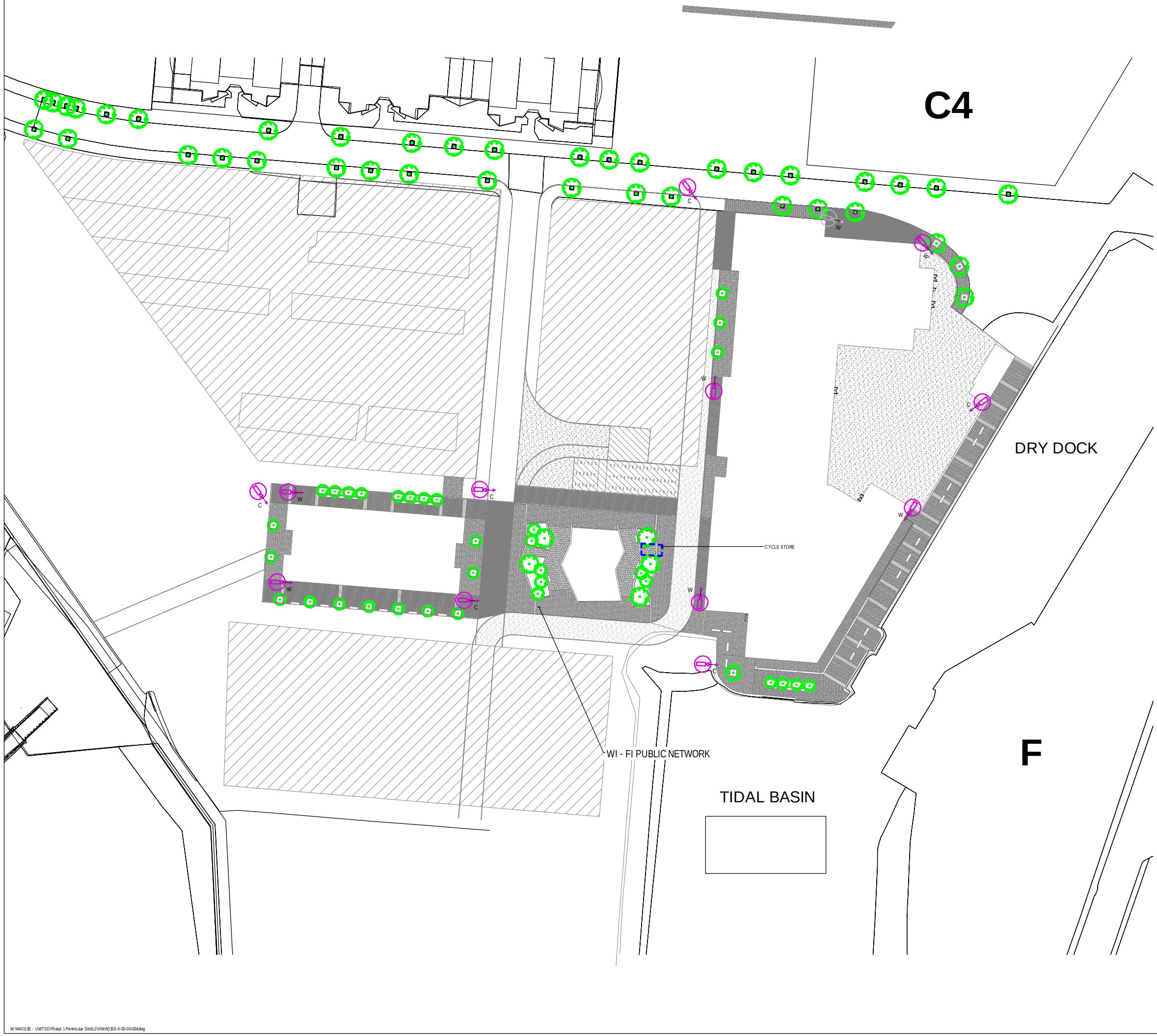
Acad Model

Revision
P1

Drawing No.
WA0155-X-00-00-003

W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\X\WA0155 X-00-00-003.dwg

A1



NOTES

W EXTERNAL CCTV CAMERA WALL MOUNTED

C EXTERNAL CCTV CAMERA COLUMN MOUNTED 4m HIGH COLUMN

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t +44 (0)2920 003760
e cardiff@tbanda.com
w www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
SITE PLAN EXTERNAL SERVICES
SECURITY CCTV

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

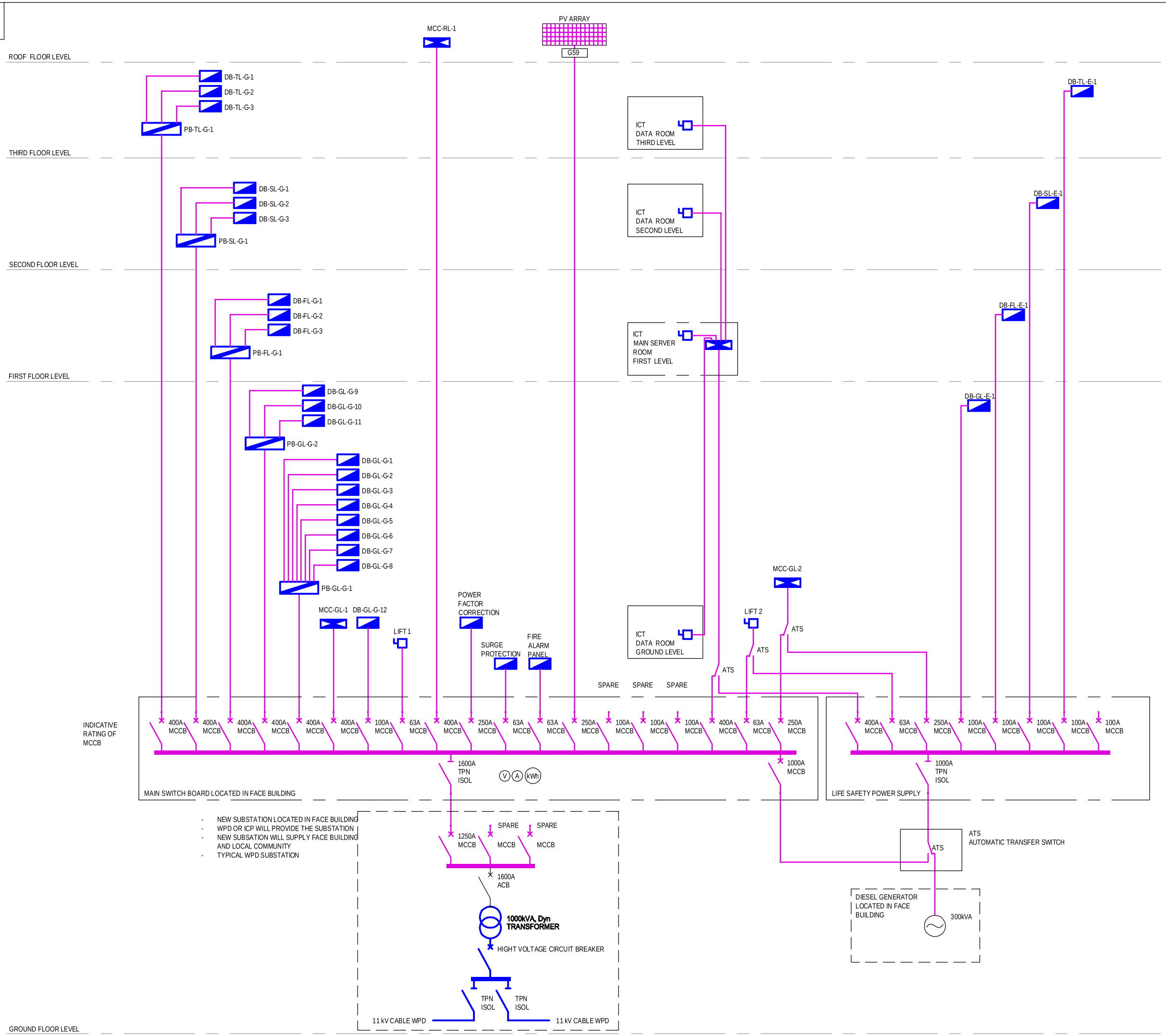
Acad Model

Drawing No.
WA0155-X-00-00-004

Revision
P1

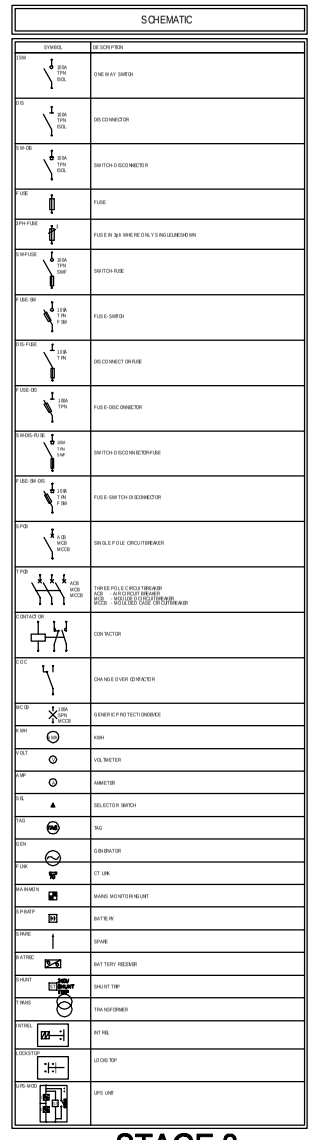
W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\XWA0155-X-00-00-004.dwg

A3



NOTES

1) AUTOMATIC CHANG OVER SHALL BE PROVIDED BY PLC CONTROL C/W MECHANICAL INTERLOCKS TO PREVENT PARALLELING OF SUPPLIES
2) REFER TO SECTION 7 & 9 OF MEP REPORT



STAGE 3

rev	dcc	description	dwn	chkd	date
					- -

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
LOW VOLTAGE DISTRIBUTION STRATEGY

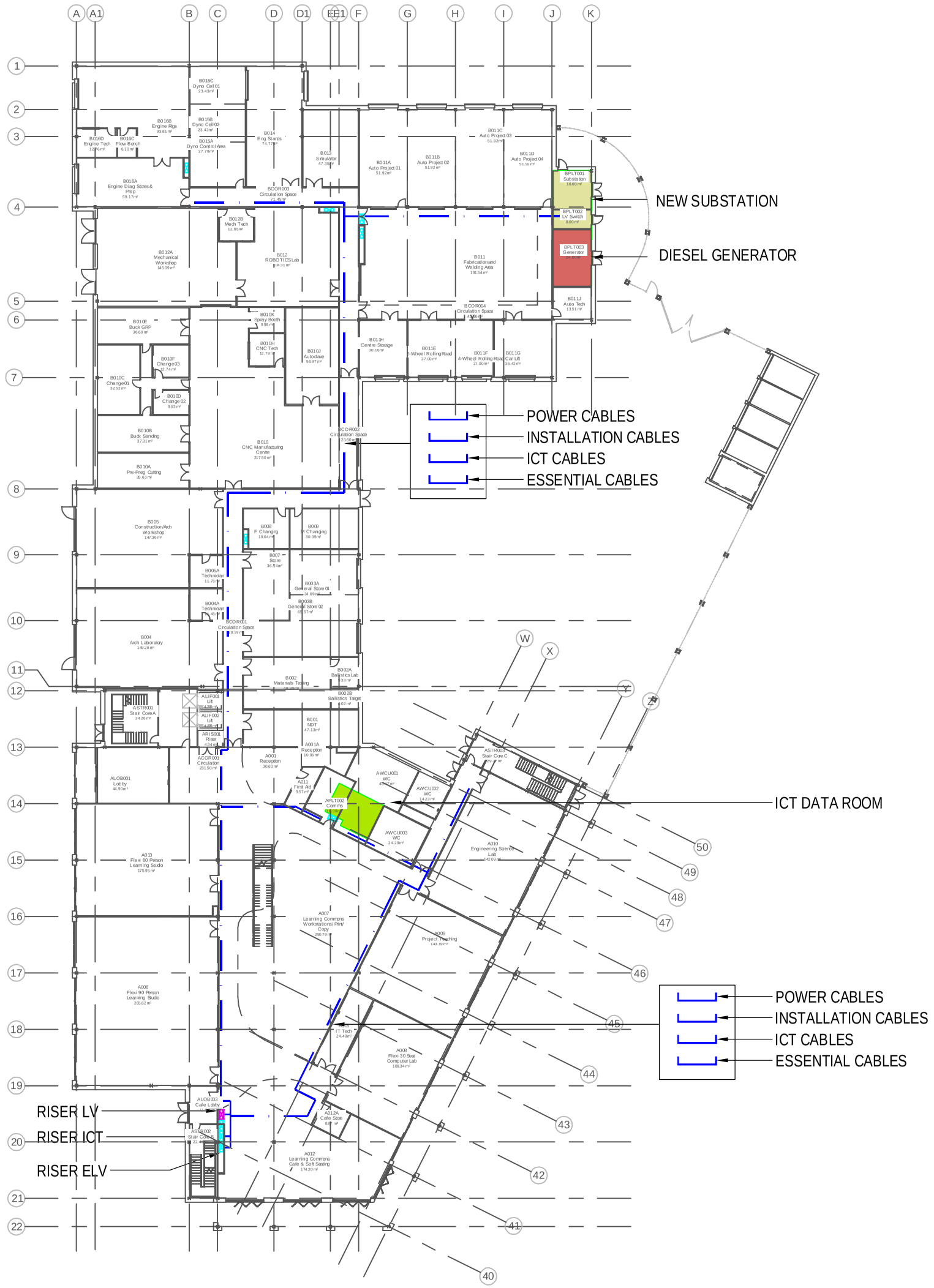
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	BP	05/01/2016	CL	N/A

drawing no.
WA0155-E-60-LM-101 | P0

A3



NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
ELECTRICAL SERVICES &
INFORMATION AND COMMUNICATION
TECHNOLOGY,
ELECTRICAL CONTAINMENT
GROUND FLOOR

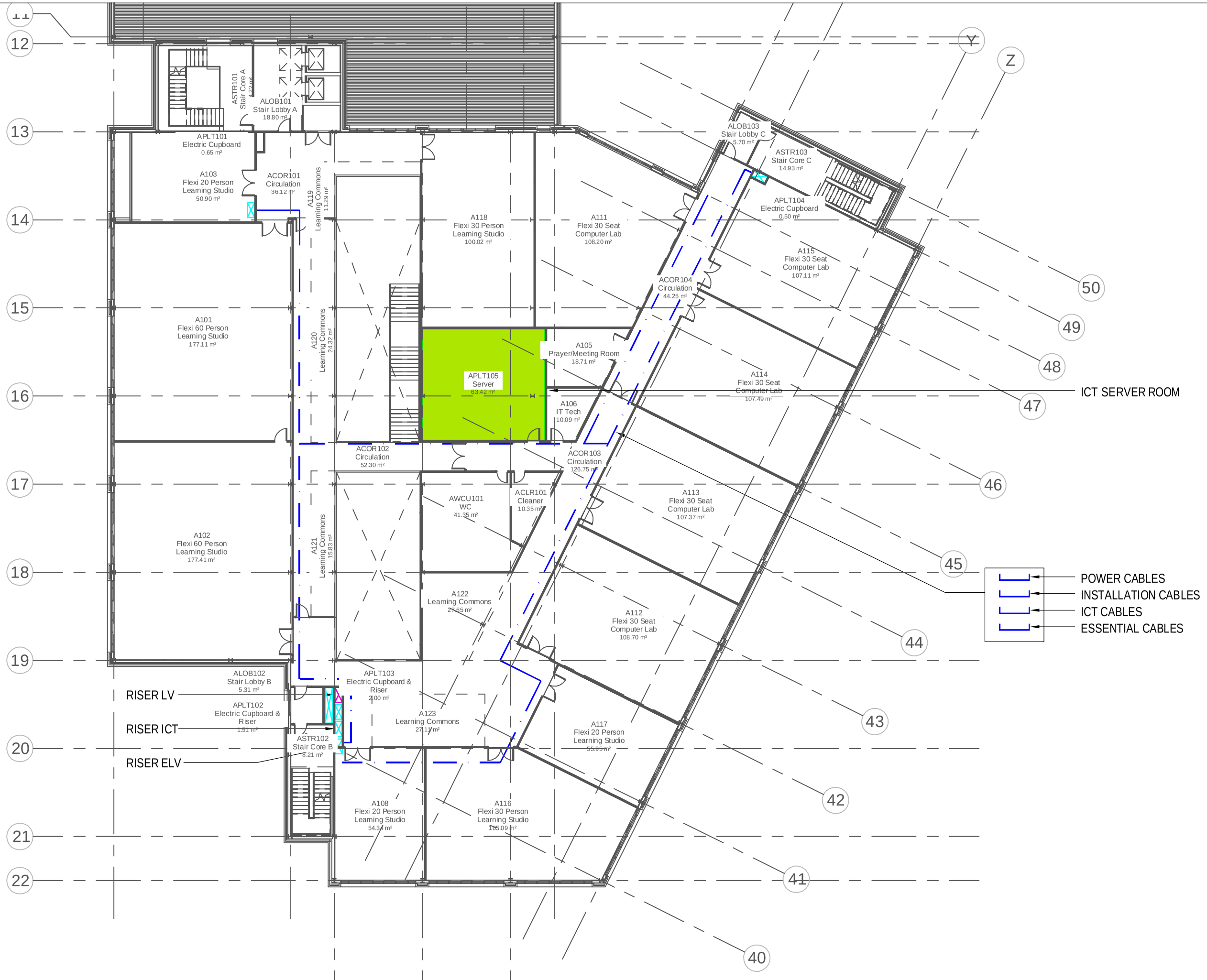
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:500@A3

drawing no.
WA0155-E-61-00-101 P2

A3



NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
ELECTRICAL SERVICES &
INFORMATION AND COMMUNICATION
TECHNOLOGY
ELECTRICAL CONTAINMENT
FIRST FLOOR

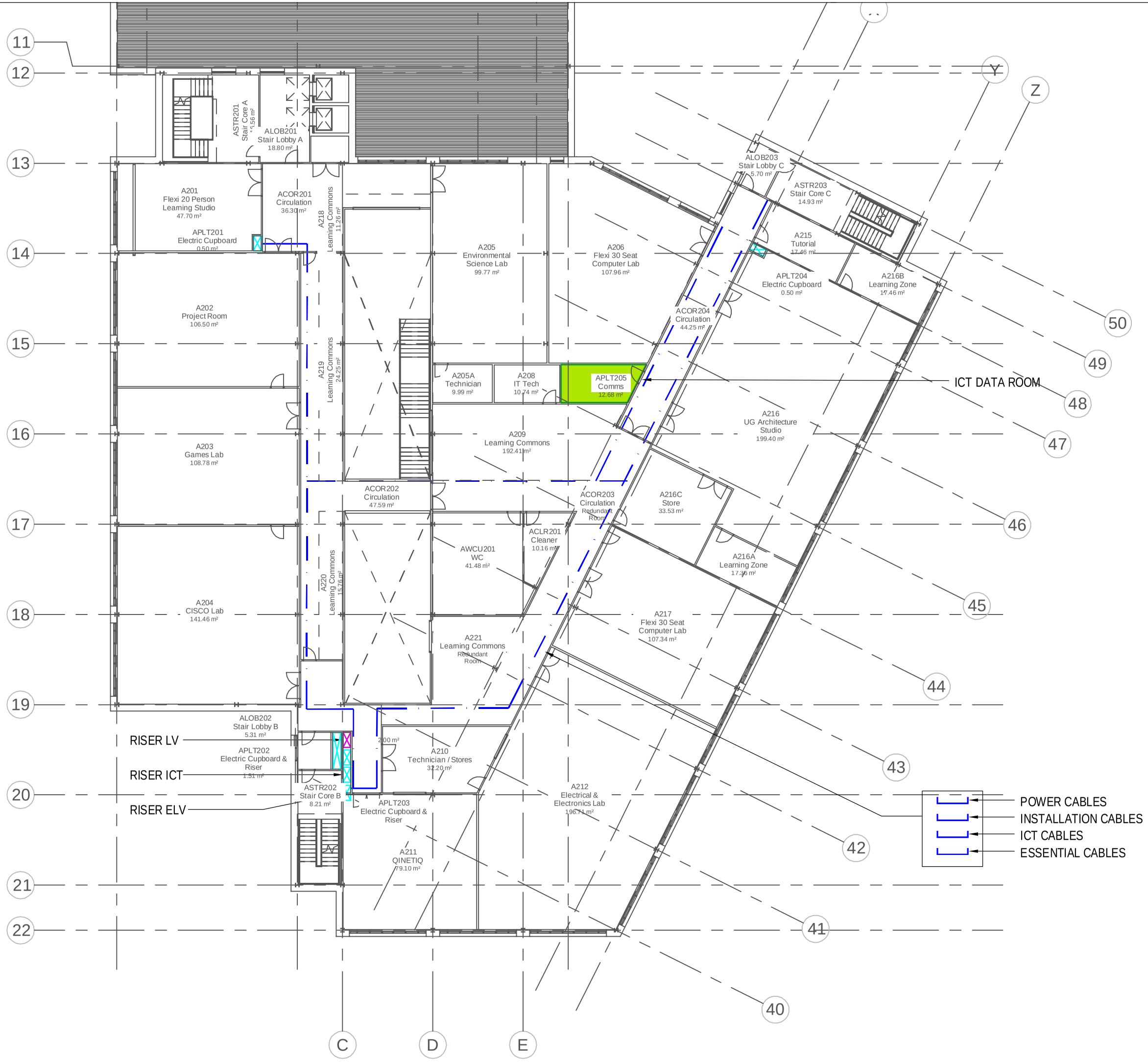
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:250@A:

drawing no.
WA0155-E-61-01-101 P2

A3



NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
ELECTRICAL SERVICES &
INFORMATION AND COMMUNICATION
TECHNOLOGY
ELECTRICAL CONTAINMENT
SECOND FLOOR

client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:250@A:

drawing no.
WA0155-E-61-02-101 | P2

A3



NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
ELECTRICAL SERVICES &
INFORMATION AND COMMUNICATION
TECHNOLOGY,
ELECTRICAL CONTAINMENT
THIRD FLOOR

client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:250@A:

drawing no.
WA0155-E-61-03-101 P2

A3



NOTES

NOTES

ROOM DATA SHEET PROVIDE NUMBER OF OCCUPANTS PER ROOM , NUMBER OF POWER SOCKETS AND DATA OUTLETS, INCLUDING EXACTLY TYPE OF DISTRIBUTION

LEGEND

- ICT RISER (500 x 200mm) FROM SUSPENDED CEILING VOID TO FLOOR LEVEL
- UNDER FLOOR TRUNKING - 3 COMPARTMENTS FOR POWER CABLES , DATA CABLES AND FUTURE EXTENSION
- FLOOR BOX, 4 COMPARTMENTS FOR: 4 POWER OUTLET, 4 DATA OUTLET FOR CAT 6 &7 CABLES, AND ONE SPARE FOR FUTURE EXTENSION
- FLEXI LEARNING SPACE: UNDER FLOOR DATA OUTLETS INCLUDING FLOOR BOXES AS TYPICAL ARRANGEMENT WILL BE ADOPTED
- WORKSHOP TYPE AREAS DADO TRUNKING, WALL MOUNTED DATA OUTLETS INCLUDING PENDANT DATA OUTLETS AS TYPICAL ARRANGEMENT WILL BE ADOPTED

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
INFORMATION AND COMMUNICATIONS TECHNOLOGY
DATA CONTAINMENT
GROUND FLOOR

client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:500@A3

drawing no.
WA0155-E-65-00-101 P2

A3



NOTES

NOTES

ROOM DATA SHEET PROVIDE NUMBER OF OCCUPANTS PER ROOM , NUMBER OF POWER SOCKETS AND DATA OUTLETS, INCLUDING EXACTLY TYPE OF DISTRIBUTION

LEGEND

- ICT RISER (500 x 200mm) FROM SUSPENDED CEILING VOID TO FLOOR LEVEL
- UNDER FLOOR TRUNKING - 3 COMPARTMENTS FOR POWER CABLES , DATA CABLES AND FUTURE EXTENSION
- FLOOR BOX, 4 COMPARTMENTS FOR: 4 POWER OUTLET, 4 D OUTLET FOR CAT 6 &7 CABLES, AND ONE SPARE FOR FUTUI EXTENSION
- FLEXI LEARNING SPACE: UNDER FLOOR DATA OUTLETS INCLUDING FLOOR BOXES A TYPICAL ARRANGEMENT WILL BE ADOPTED
- WORKSHOP TYPE AREAS DADO TRUNKING, WALL MOUNTED DATA OUTLETS INCLUDIN PENDANT DATA OUTLETS AS TYPICAL ARRANGEMENT WILL ADOPTED

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
INFORMATION AND COMMUNICATIONS TECHNOLOGY
DATA CONTAINMENT
FIRST FLOOR

client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:250@A:

drawing no.
WA0155-E-65-01-101 P2

A3



NOTES

NOTES

ROOM DATA SHEET PROVIDE NUMBER OF OCCUPANTS PER ROOM , NUMBER OF POWER SOCKETS AND DATA OUTLETS, INCLUDING EXACTLY TYPE OF DISTRIBUTION

LEGEND

- ICT RISER (500 x 200mm) FROM SUSPENDED CEILING VOID TO FLOOR LEVEL
- UNDER FLOOR TRUNKING - 3 COMPARTMENTS FOR POWER CABLES , DATA CABLES AND FUTURE EXTENSION
- FLOOR BOX, 4 COMPARTMENTS FOR: 4 POWER OUTLET, 4 DATA OUTLET FOR CAT 6 &7 CABLES, AND ONE SPARE FOR FUTURE EXTENSION
- FLEXI LEARNING SPACE: UNDER FLOOR DATA OUTLETS INCLUDING FLOOR BOXES AS TYPICAL ARRANGEMENT WILL BE ADOPTED
- WORKSHOP TYPE AREAS DADO TRUNKING, WALL MOUNTED DATA OUTLETS INCLUDING PENDANT DATA OUTLETS AS TYPICAL ARRANGEMENT WILL BE ADOPTED

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
INFORMATION AND COMMUNICATION TECHNOLOGY
DATA CONTAINMENT
SECOND FLOOR

client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:250@A:

drawing no.
WA0155-E-65-02-101 P2

A3



NOTES

NOTES

ROOM DATA SHEET PROVIDE NUMBER OF OCCUPANTS PER ROOM , NUMBER OF POWER SOCKETS AND DATA OUTLETS, INCLUDING EXACTLY TYPE OF DISTRIBUTION

LEGEND

- ICT RISER (500 x 200mm) FROM SUSPENDED CEILING VOID TO FLOOR LEVEL
- UNDER FLOOR TRUNKING - 3 COMPARTMENTS FOR POWER CABLES , DATA CABLES AND FUTURE EXTENSION
- FLOOR BOX, 4 COMPARTMENTS FOR: 4 POWER OUTLET, 4 DATA OUTLET FOR CAT 6 &7 CABLES, AND ONE SPARE FOR FUTURE EXTENSION
- FLEXI LEARNING SPACE: UNDER FLOOR DATA OUTLETS INCLUDING FLOOR BOXES AS TYPICAL ARRANGEMENT WILL BE ADOPTED
- WORKSHOP TYPE AREAS DADO TRUNKING, WALL MOUNTED DATA OUTLETS INCLUDING PENDANT DATA OUTLETS AS TYPICAL ARRANGEMENT WILL BE ADOPTED

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
INFORMATION AND COMMUNICATION TECHNOLOGY
DATA CONTAINMENT
THIRD FLOOR

client
UNIVERSITY OF WALES TRINITY SAINT DAVID

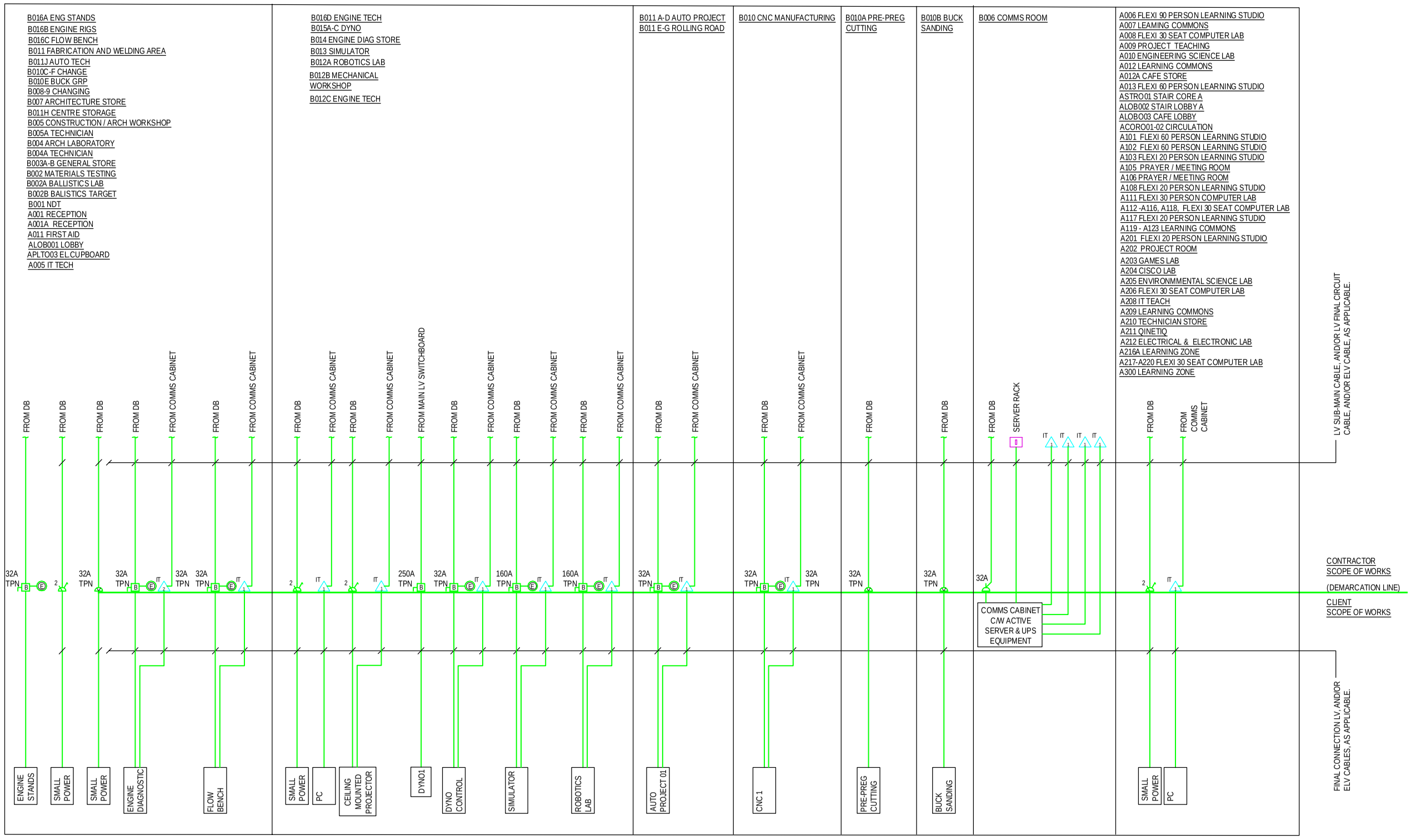
architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:250@A3

drawing no.
WA0155-E-65-03-101 P2

A1

1



THE ABOVE SCHEMATIC IS INTENDED TO INDICATE THE TYPICAL DEMARCATION OF WORKS TO BE UNDERTAKEN BY THE CONTRACTOR AND THOSE WORKS REQUIRED AS PART OF THE UNIVERSITY FIT-OUT WORKS, THE IDENTIFICATION OF EQUIPMENT SETS, THE PRINCIPLES FOR THE DEMARCATION , AND DOES NOT REPRESENT THE PRECISE QUANTITY OF EQUIPMENT WHICH SHOULD BE OBTAINED FROM THE ROOM DATA SHEETS.

THE ROOM DATA SHEETS ARE BASED UPON ON INFORMATION RECEIVED FROM THE UNIVERSITY ON 24-02-2016.

NOTES

NOTES

1. THIS DRAWING IS INDICATIVE ONLY, AND SHALL BE READ IN CONJUNCTION WITH THE ELECTRICAL + MECHANICAL SERVICES SPECIFICATIONS AND IN CONJUNCTION WITH THE MAIN CONTRACT DOCUMENTS.
2. THE CONTRACTOR SHALL PRODUCE CO-ORDINATED INSTALLATION WORKING DRAWINGS AND BUILDERS WORK DRAWINGS IN COMPLIANCE WITH THE SPECIFICATION REQUIREMENTS.
3. THE CONTRACTOR SHALL LIAISE AND CO-ORDINATE WITH ALL OTHER TRADES AND SPECIALISTS.
4. SIZE ARE INDICATIVE

DRAWING SPECIFIC NOTES

1. THE SERVICES ITEMS AS INDICATED ABOVE THE "DEMARCATION LINE" SHALL BE SUPPLIED + INSTALLED BY THE CONTRACTOR AS PART OF THE PROJECT SCOPE OF WORKS.
2. THE SERVICES ITEMS AS INDICATED BELOW THE "DEMARCATION" LINE SHALL BE SUPPLIED + INSTALLED BY THE CLIENT.
3. 1 NUMBER COMPRESSED AIR CONNECTION ONLY INDICATED ON SCHEMATIC FOR EACH CONCERNED AREA OF APPLICATION FOR CLARITY PURPOSES.

A 400V, 3 PHASE, 50Hz ISOLATOR, OF THE NUMBER OF POLES AND RATING AS INDICATED.
B 400V, 3 PHASE, 50Hz ISOLATOR, OF THE NUMBER OF POLES AND RATING AS INDICATED.
COMMANDO SOCKET OUTLET, OF RATING AND NUMBER OF PHASES AS INDICATED.
32A 32AMP, 1 PHASE SOCKET OUTLET, COMMANDO PATTERN
2 13AMP, TWIN SWITCHED SOCKET OUTLET.
N SWITCHED FUSED CONNECTION UNIT WITH INDICATOR LAMP
IT TWIN MODULE IT OUTLET.
E EMERGENCY KNOCK-OFF BUTTON.
TRANSFORMER UNIT
R TRANSFORMER RECTIFIER UNIT
COMPRESSED AIR ISOLATION VALVE
CA COMPRESSED AIR OUTLET
* CLIENT HAS ADVISED THAT THESE ARE NOW NOT REQUIRED.

FOR INFORMATION

rev	dcc	description	dwn	chkd	date

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T: 029 2000 3768
E: WA@TBandA.com
I: www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1

title
FACE BUILDING
DEMARCATION OF RESPONSIBILITY

client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	BP	06/01/2016	AB	NTS

drawing no.
WA0155-X-80-LM-001

revision

A3



REFER TO UNIVERSITY DRAWINGS FOR QUANTITY OF RACKS IN EACH SERVER ROOM AND DATA ROOMS

NOTES

THIS DRAWING TO BE READ IN CONUCTION WITH SECTION 11 AND APPENDIX OF STAGE 3 REPORT

PRELIMINARY

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
FACE BUILDING
TYPICAL ICT ARRANGEMENT

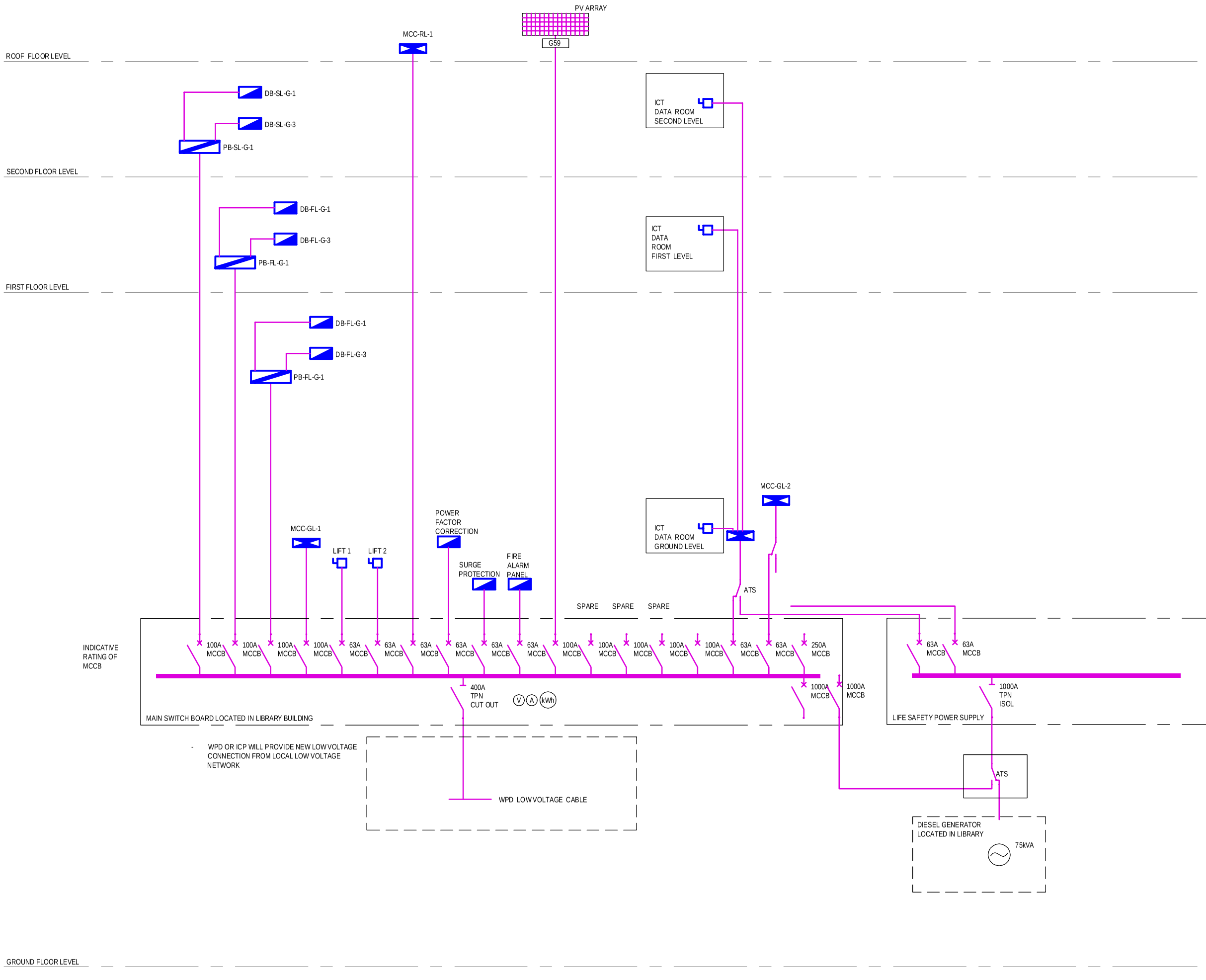
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	BP	30/09/2015	AB	N/A

drawing no.
WA0155-P1-F-E-65-LM-SK1 | P0

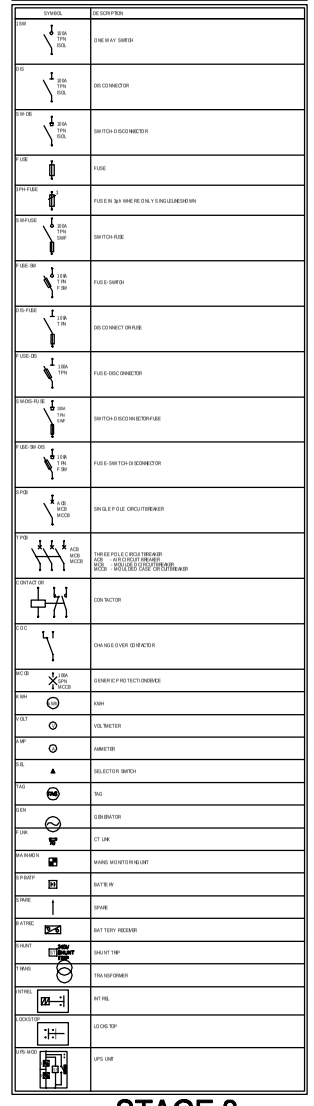
A3



NOTES

1) AUTOMATIC CHANG OVER SHALL BE PROVIDED BY PLC CONTROL C/W MECHANICAL INTERLOCKS TO PREVENT PARALLELING OF SUPPLIES
2) REFER TO SECTION 7 & 9 OF MEP REPORT

SCHEMATIC



STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - LIBRARY BUILDING

title
LOW VOLTAGE DISTRIBUTION STRATEGY

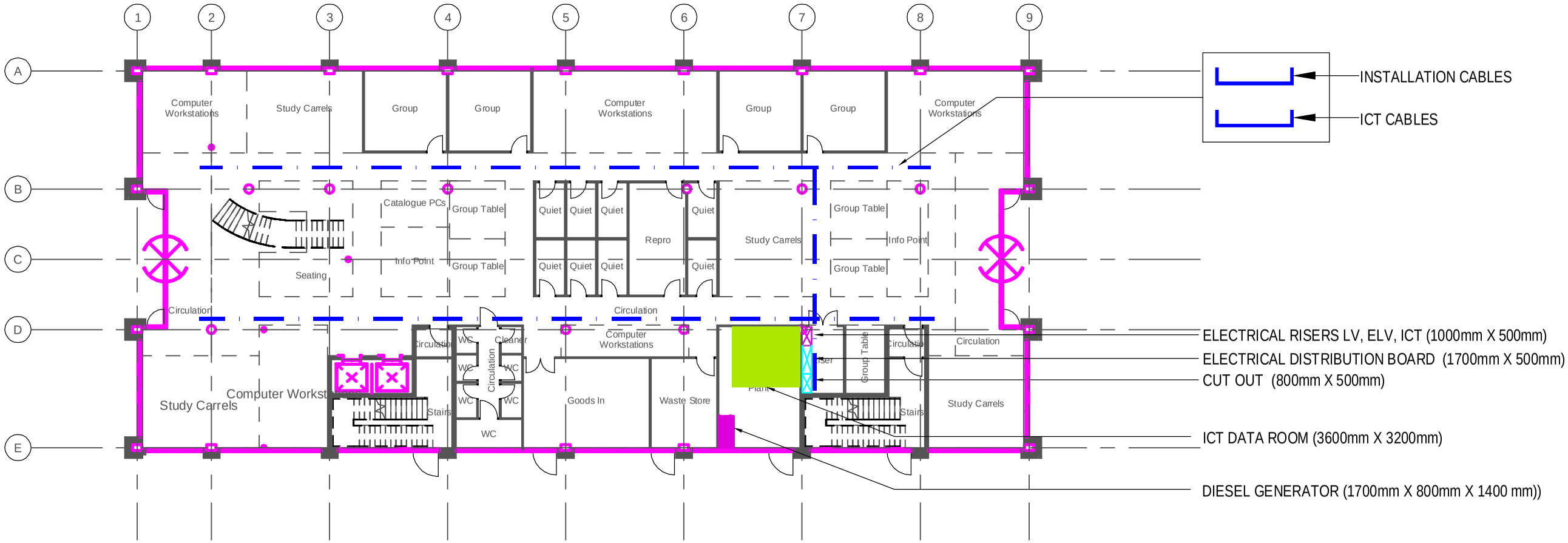
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	BP	05/01/2016	CL	N/A

drawing no.
WA0155-E-60-LM-201 | P0

A3



NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958

3 Park Place
Cardiff
CF10 3DP

T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - LIBRARY BUILDING

title
ELECTRICAL SERVICES &
INFORMATION AND COMMUNICATION
TECHNOLOGY,
ELECTRICAL CONTAINMENT
GROUND FLOOR

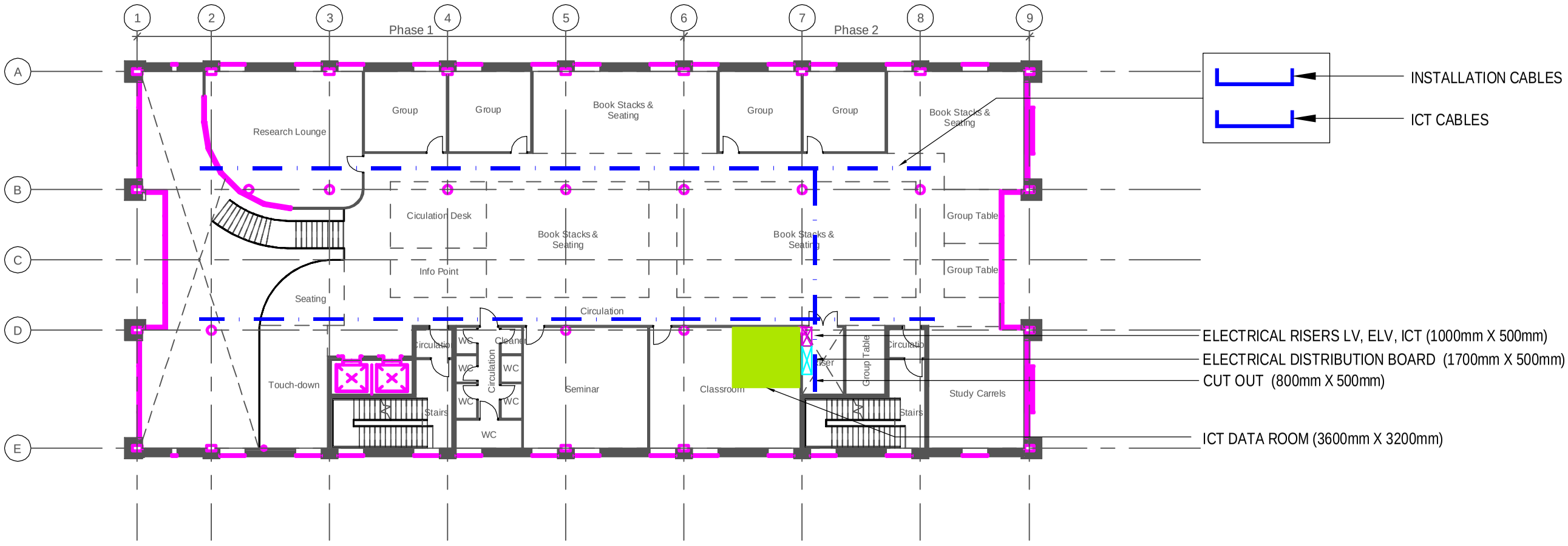
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	BP	30/09/2015	CL	1:250@A3

drawing no.
WA0155-E-61-00-201 | P1

A3



NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958

3 Park Place
Cardiff
CF10 3DP

T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - LIBRARY BUILDING

title
ELECTRICAL SERVICES &
INFORMATION AND COMMUNICATION
TECHNOLOGY
ELECTRICAL CONTAINMENT
FIRST FLOOR

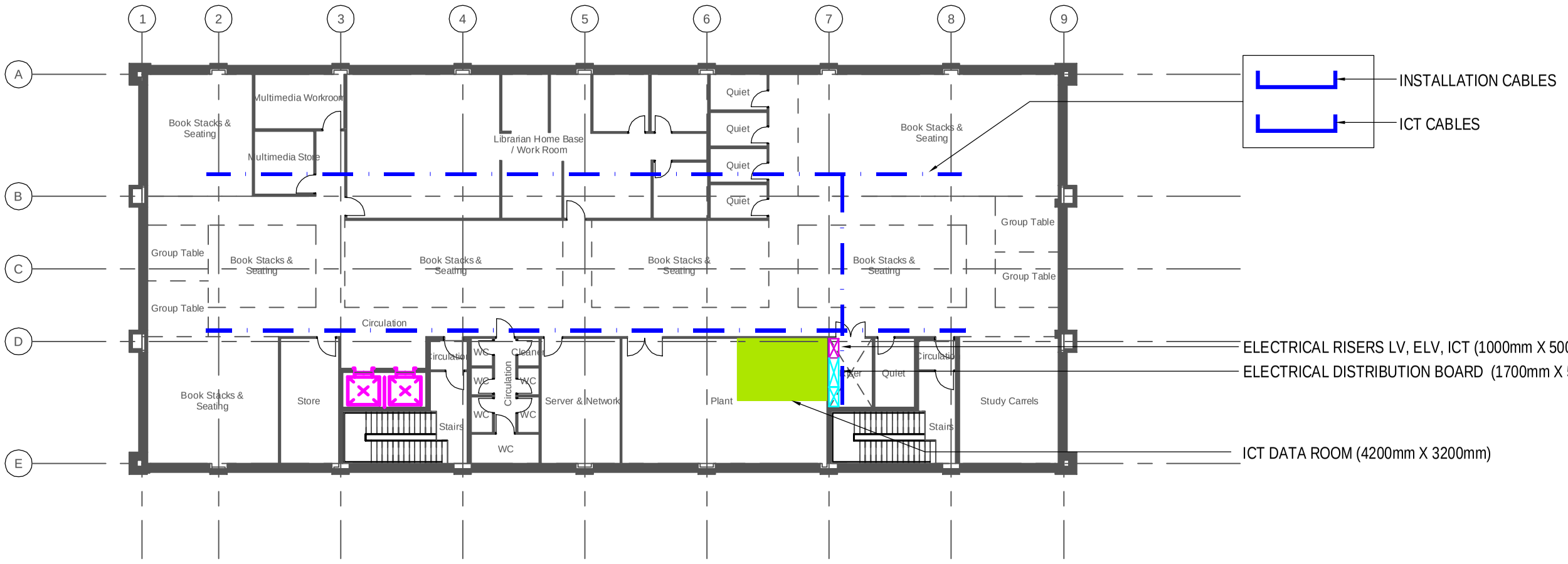
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	BP	30/09/2015	CL	1:250@A:

drawing no.
WA0155-E-61-01-201 | P2

A3



NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958
3 Park Place
Cardiff
CF10 3DP
T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - LIBRARY BUILDING

title
ELECTRICAL SERVICES &
INFORMATION AND COMMUNICATION TECHNOLOGY
ELECTRICAL CONTAINMENT
SECOND FLOOR

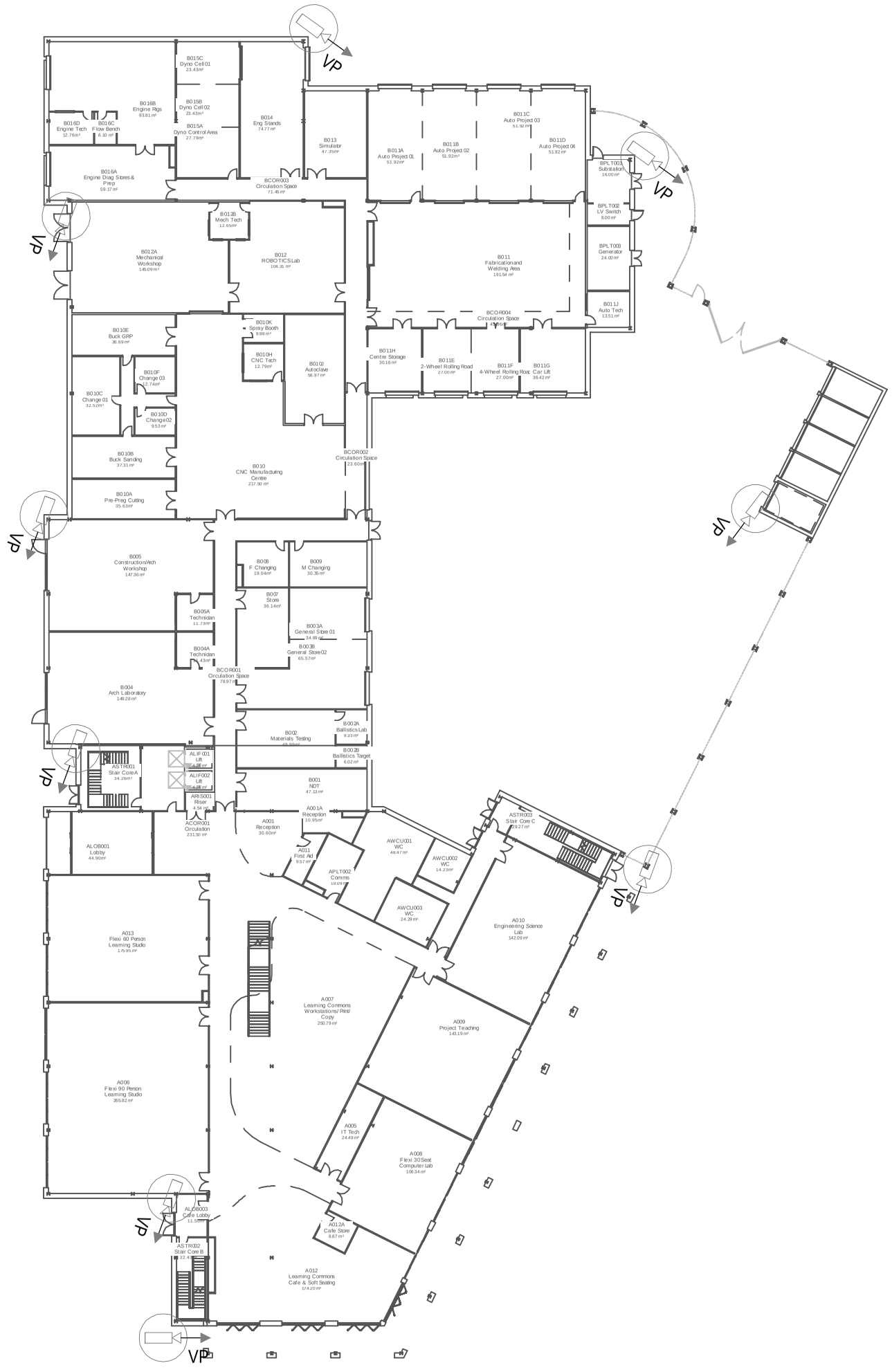
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	30/09/2015	CL	1:250@A:

drawing no.
WA0155-E-61-02-201 | P2

A3



VP EXTERNAL CCTV CAMERA

NOTES

STAGE 3

rev	dcc	description	dwn	chkd	date
					. .

TROUP BYWATERS + ANDERS
Bringing Buildings to Life since 1958

3 Park Place
Cardiff
CF10 3DP

T : 029 2000 3760
E : WA@TBandA.com
I : www.TBandA.com

project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

title
SECURITY SYSTEM
CCTV CAMERAS
GROUND FLOOR

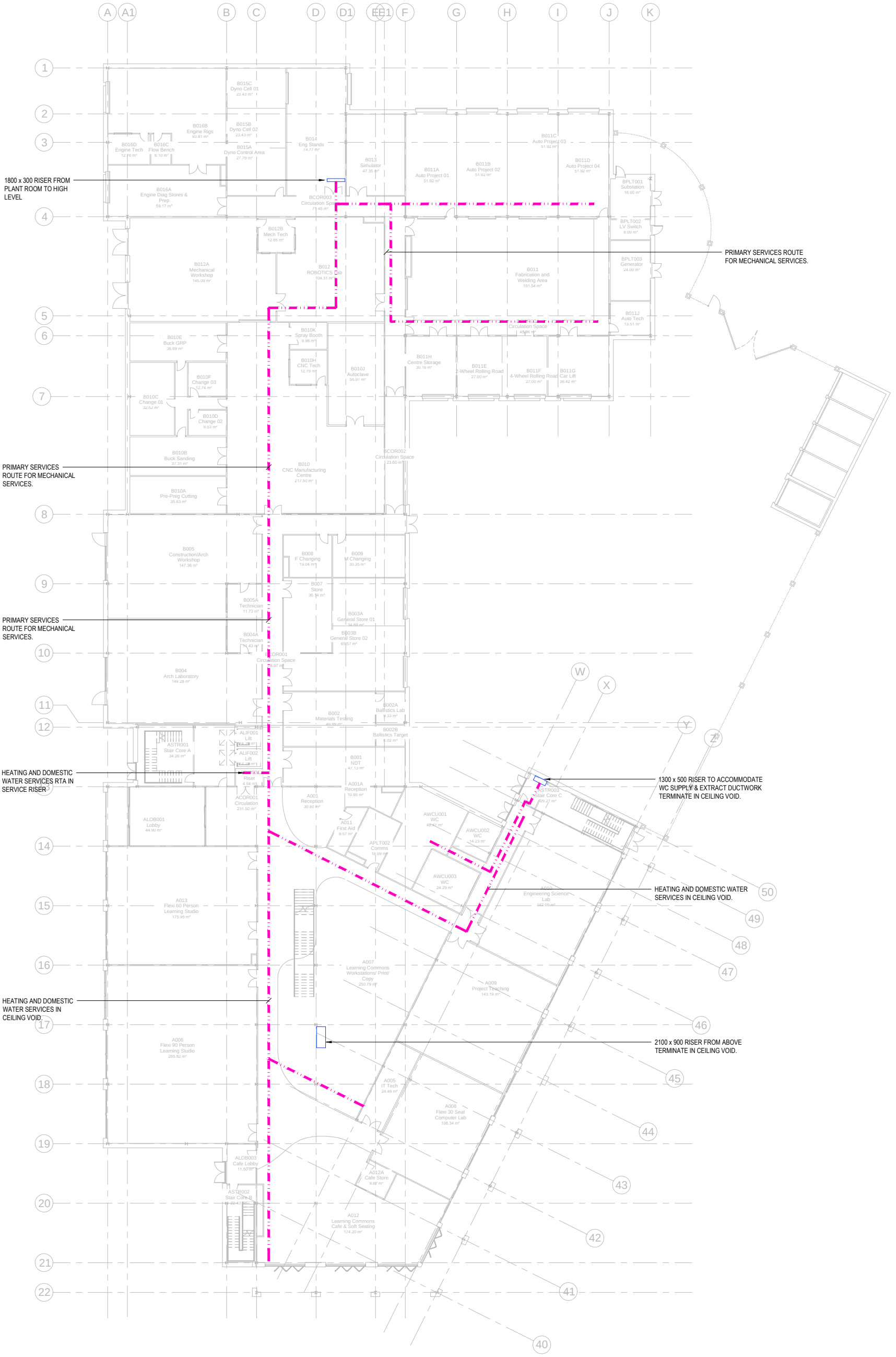
client
UNIVERSITY OF WALES TRINITY SAINT DAVID

architect
STRIDE TREGLOWN ARCHITECTS

project no	drawn by	date	checked	scale
WA0155	DP	06/03/2016	CL	1:500@A:

drawing no.
WA0155-E-96-00-101 | P0

A1



W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\M\WA0155-M-50-00-101.dwg

NOTES

.

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
GROUND FLOOR
MECHANICAL SERVICES
DISTRIBUTION & RISER STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVID

Architect
STRIDE TREGLOWN ARCHITECTS

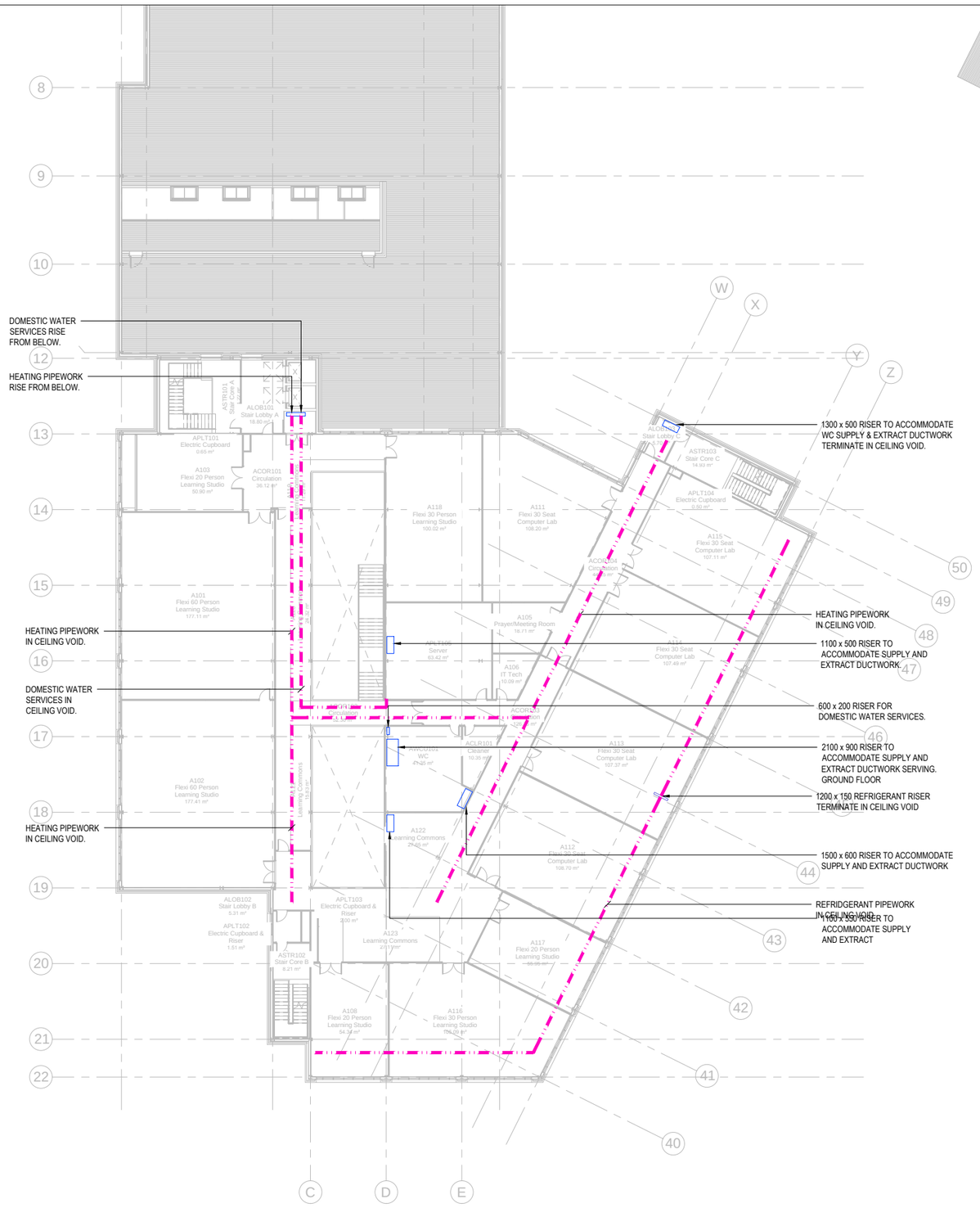
Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2015	IP	1:200@A1

Acad Model

Drawing No.
WA0155-M-50-00-101

Revision
P1

A1



NOTES

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
FIRST FLOOR
MECHANICAL SERVICES
DISTRIBUTION & RISER STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

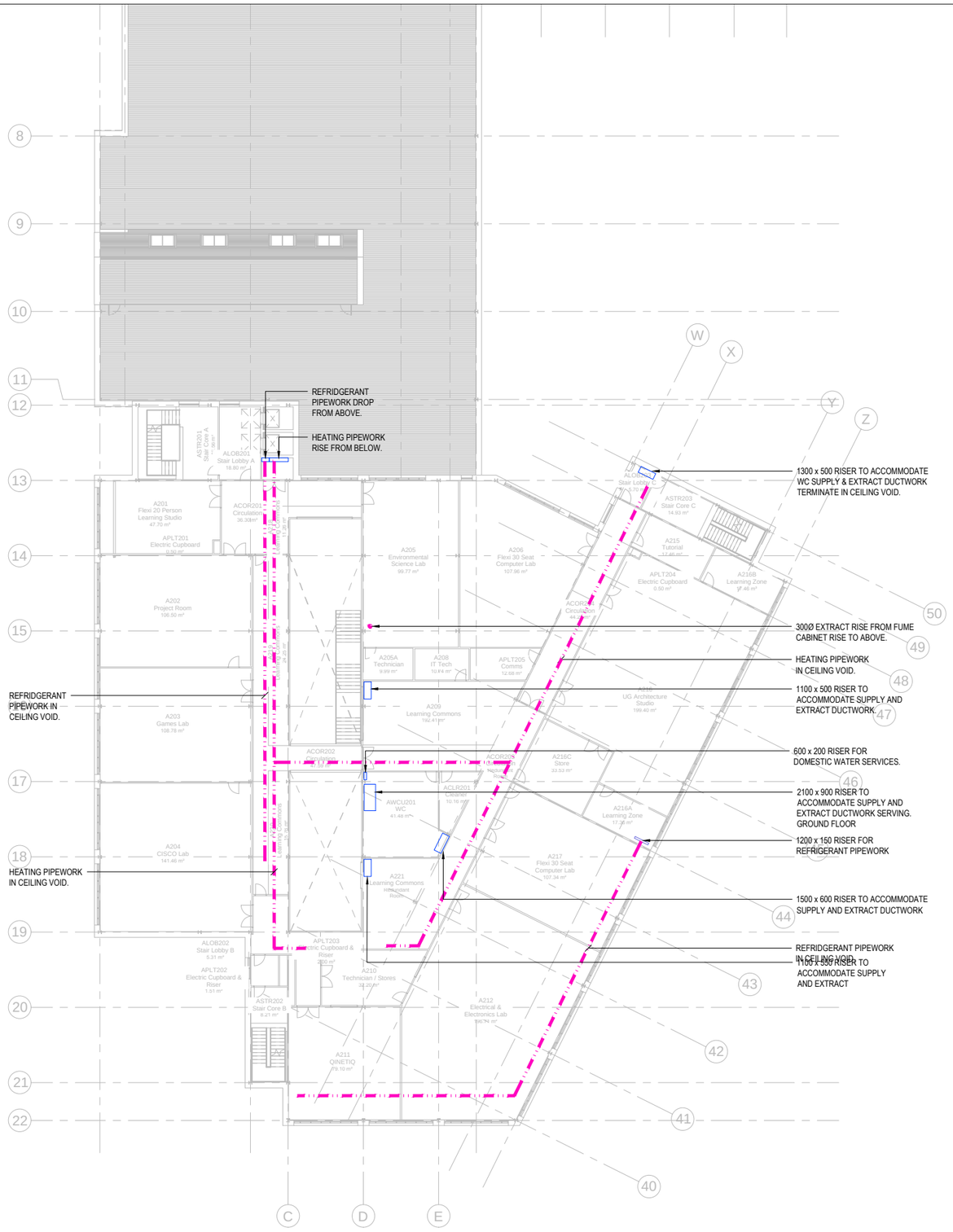
Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

Acad Model

Revision
P1

Drawing No.
WA0155-M-50-01-101

A1



W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\MI\WA0155-M-50-02-101.dwg

NOTES

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
SECOND FLOOR
MECHANICAL SERVICES
DISTRIBUTION & RISER STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

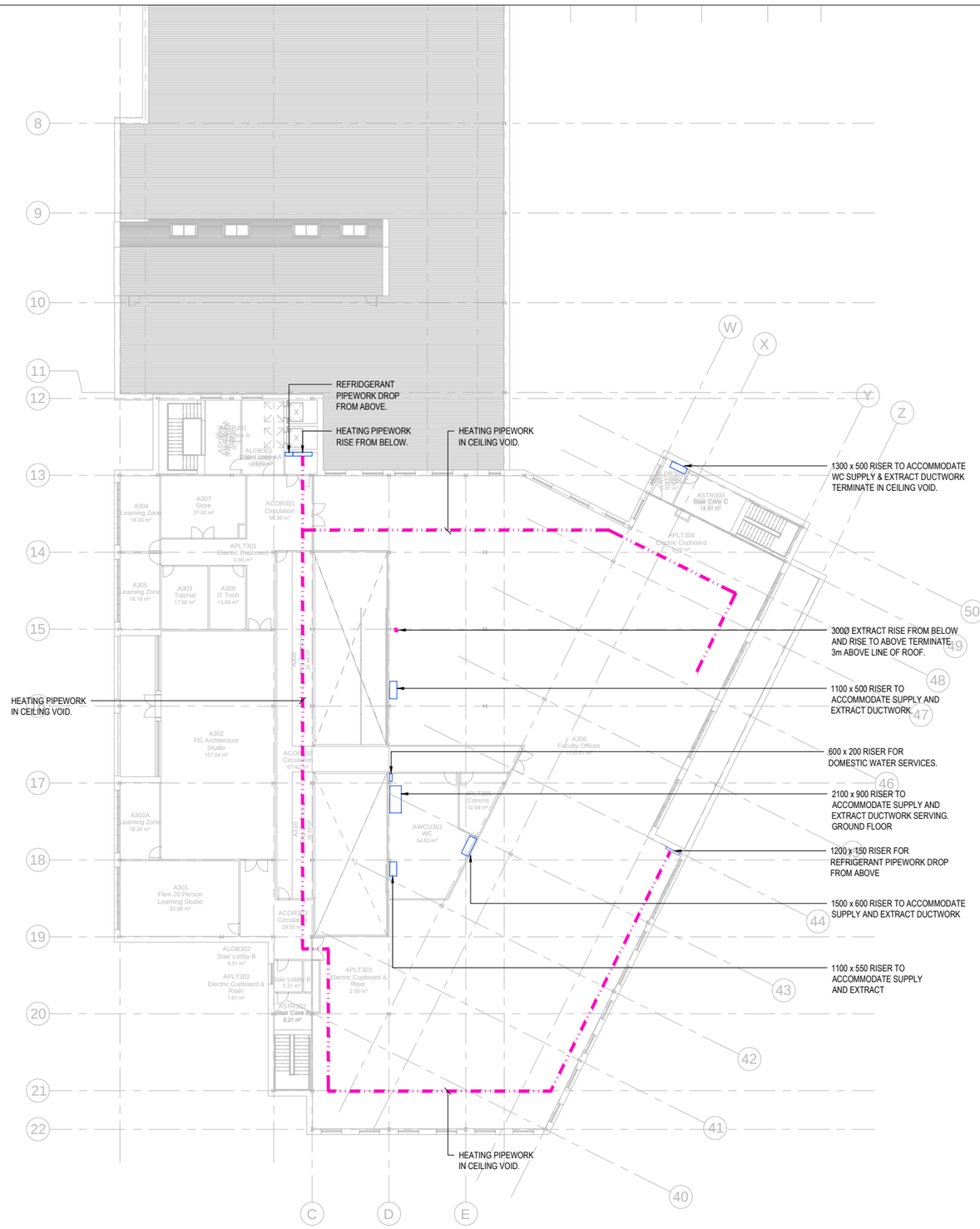
Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

Acad Model

Revision
P1

Drawing No.
WA0155-M-50-02-101

A1



W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\MI\WA0155-M-50-03-101.dwg

NOTES

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
THIRD FLOOR
MECHANICAL SERVICES
DISTRIBUTION & RISER STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

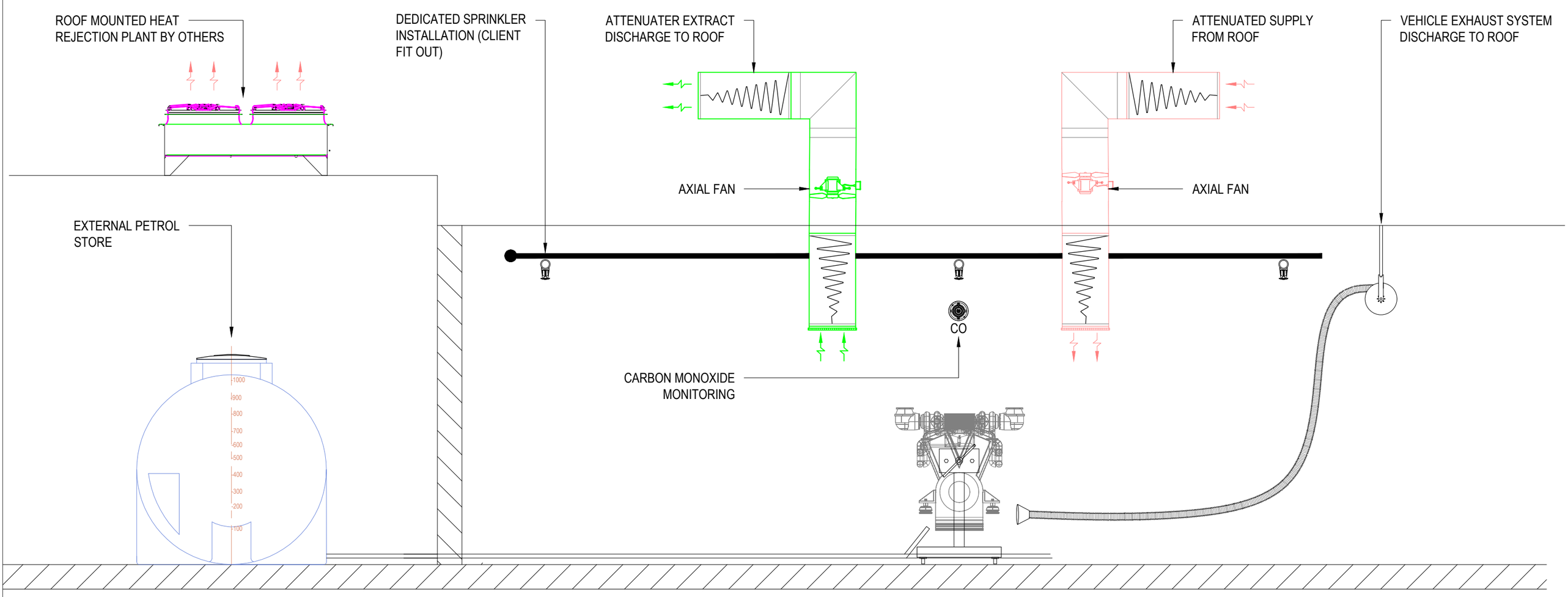
Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

Acad Model

Revision
P1

Drawing No.
WA0155-M-50-03-101



STAGE 3

					. .
Revision	Dcc	Description	Drwn By	Checked	Date

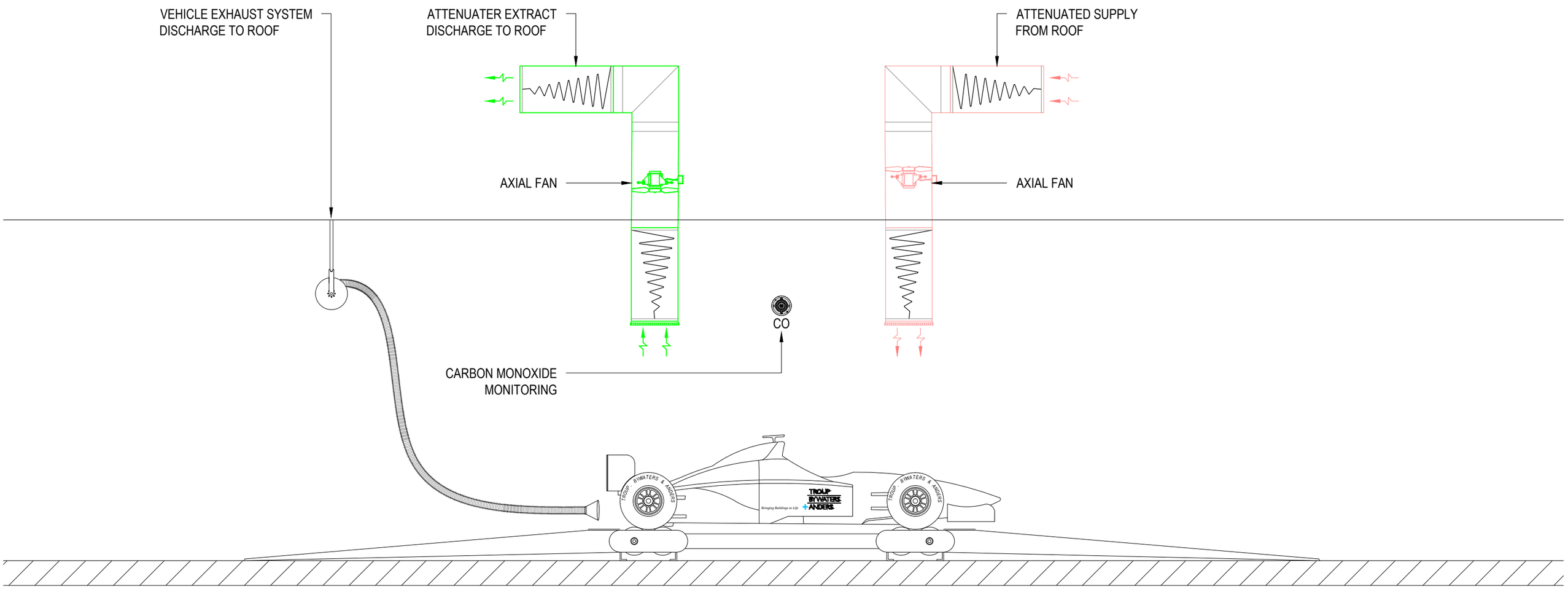
TROUP BYWATERS + ANDERS

Bringing Buildings to Life

Project	UNIVERSITY OF WALES TRINITY SAINT DAVIDS PHASE 1 - FACE BUILDING
Title	SCHEMATIC OF TYPICAL DYNO AREA

Drawn By	Date	Checked	Scale
CJH	11.01.2016	IP	N.T.S.
Project No	Drawing No.		
WA0155	WA0155-M-50-LM-101		

W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\M\WA0155-M-50-LM-101.dwg



STAGE 3

					. .
Revision	Dcc	Description	Drwn By	Checked	Date

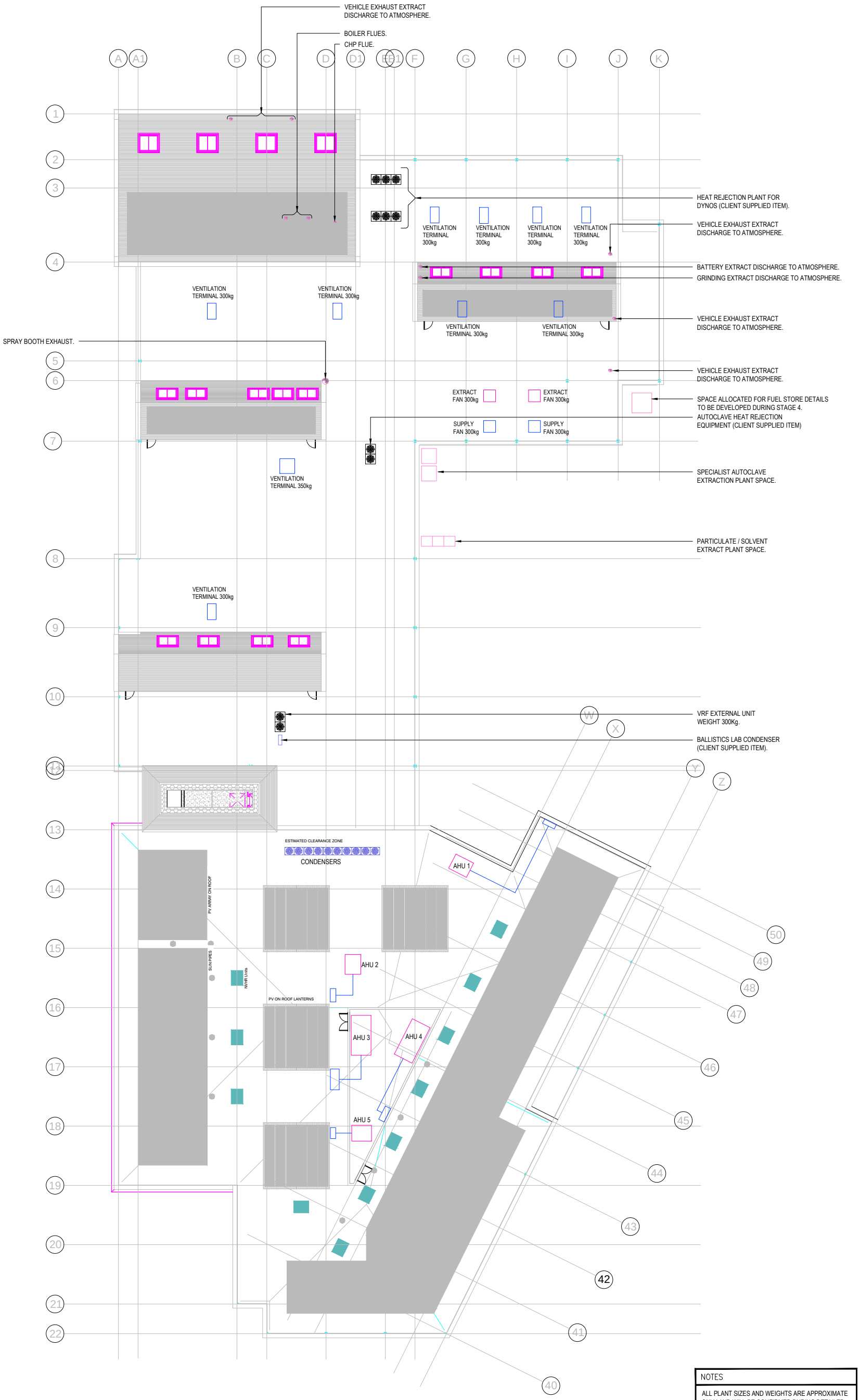
TROUP BYWATERS + ANDERS

Bringing Buildings to Life

Project	UNIVERSITY OF WALES TRINITY SAINT DAVIDS PHASE 1 - FACE BUILDING	Drawn By	Date	Checked	Scale
Title	SCHEMATIC OF TYPICAL ROLLING ROAD INSTALLATION	CJH	11.01.2016	IP	N.T.S.
		Project No	Drawing No.		
		WA0155	WA0155-M-50-LM-002		

W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\M\WA0155-M-50-LM-102.dwg

A1



NOTES

ALL PLANT SIZES AND WEIGHTS ARE APPROXIMATE ONLY AND WILL BE CONFIRMED DURING DETAILED DESIGN. (STAGE 4)

W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\M\WA0155-M-50-RR-001.dwg

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
ROOF LEVEL
MECHANICAL SERVICES
DISTRIBUTION & RISER STRATEGY

NOTES

.

Rev	Dcc	Description	Dwn	Chkd	Date
P01		UPDATED TO LATEST ARCHITECTURAL PLANS	IP	AB	26.02.2016

Client
UNIVERSITY OF WALES TRINITY SAINT DAVID

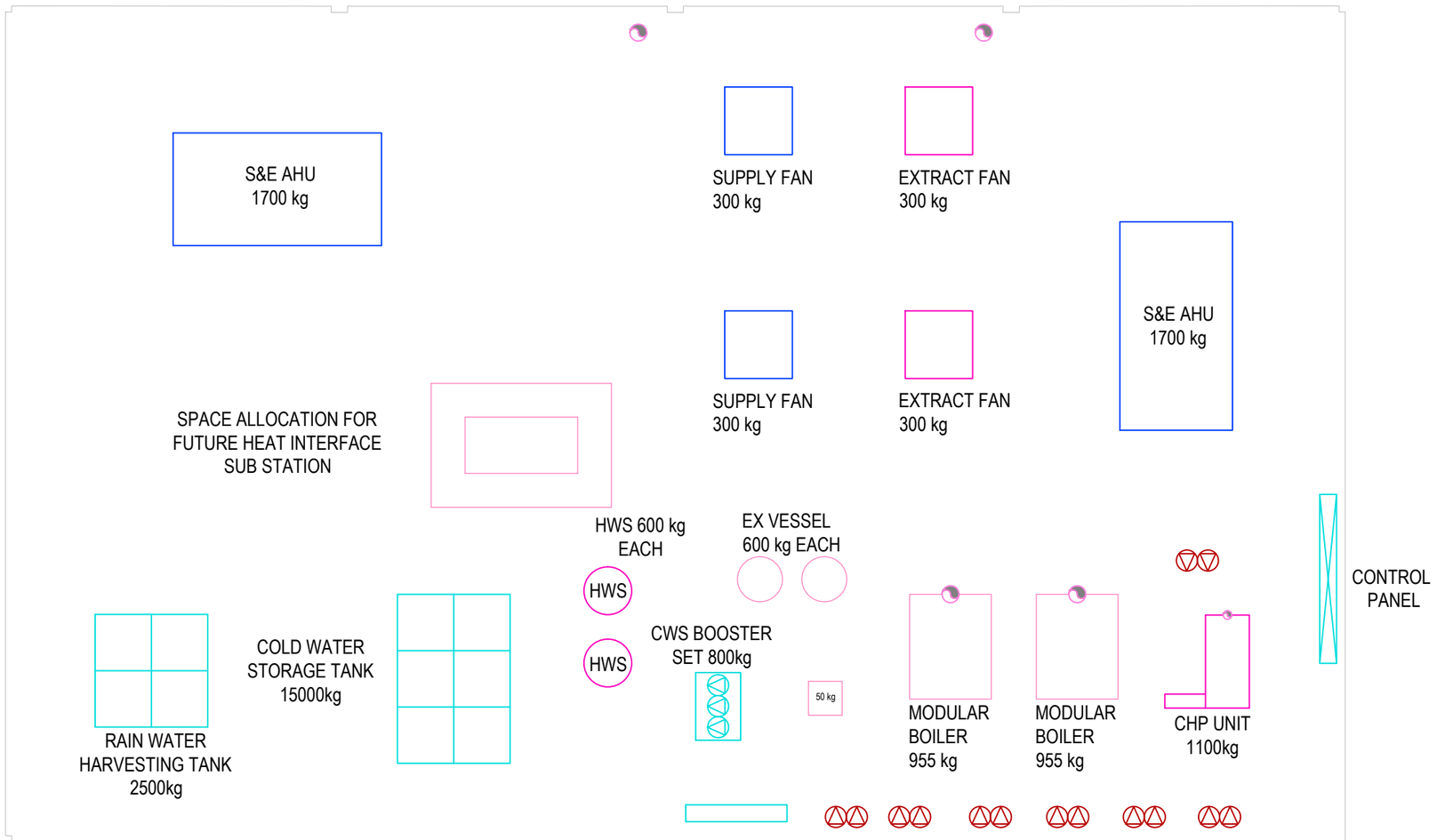
Architect
STRIDE TREGLOWN ARCHITECTS

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2015	IP	1:200@A1

Acad Model

Drawing No.
WA0155-M-50-RR-001

Revision
P01



STAGE 3

Revision	Dcc	Description	Drwn By	Checked	Date

TROUP BYWATERS + ANDERS

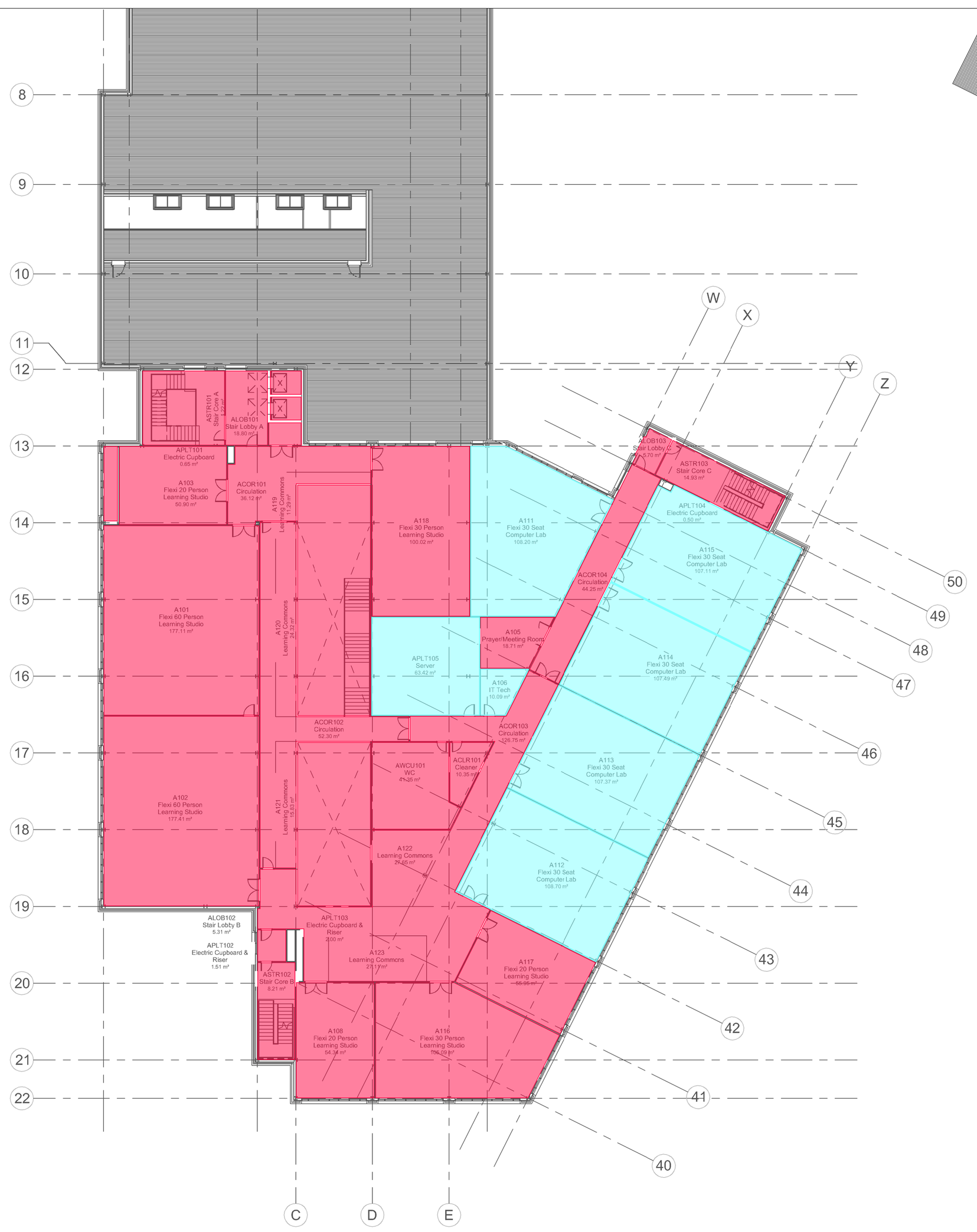
Bringing Buildings to Life

Project	UNIVERSITY OF WALES TRINITY ST DAVIDS - PHASE 1- FACE BUILDING
Title	FIRST FLOOR PLANT ARRANGEMENT

Drawn By	Date	Checked	Scale
CJH	25.01.2016	IP	1:100@A3
Project No	Drawing No.		
WA0155	WA0155-M-51-01-001		

W:\WA0155 - UWTSD Phase 1 Peninsular Site\L3\M\WA0155-M-51-01-001.dwg

A1



C:\Users\a.broad\Documents\WA0155 - UWTSD\Stage 3 report\mech\WA0155-M-56-01-101.dwg

NOTES

LEGEND

1. RADIATORS
2. RADIANT PANELS
3. UNDERFLOOR HEATING
4. COMFORT COOLING

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
FIRST FLOOR
HEATING STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

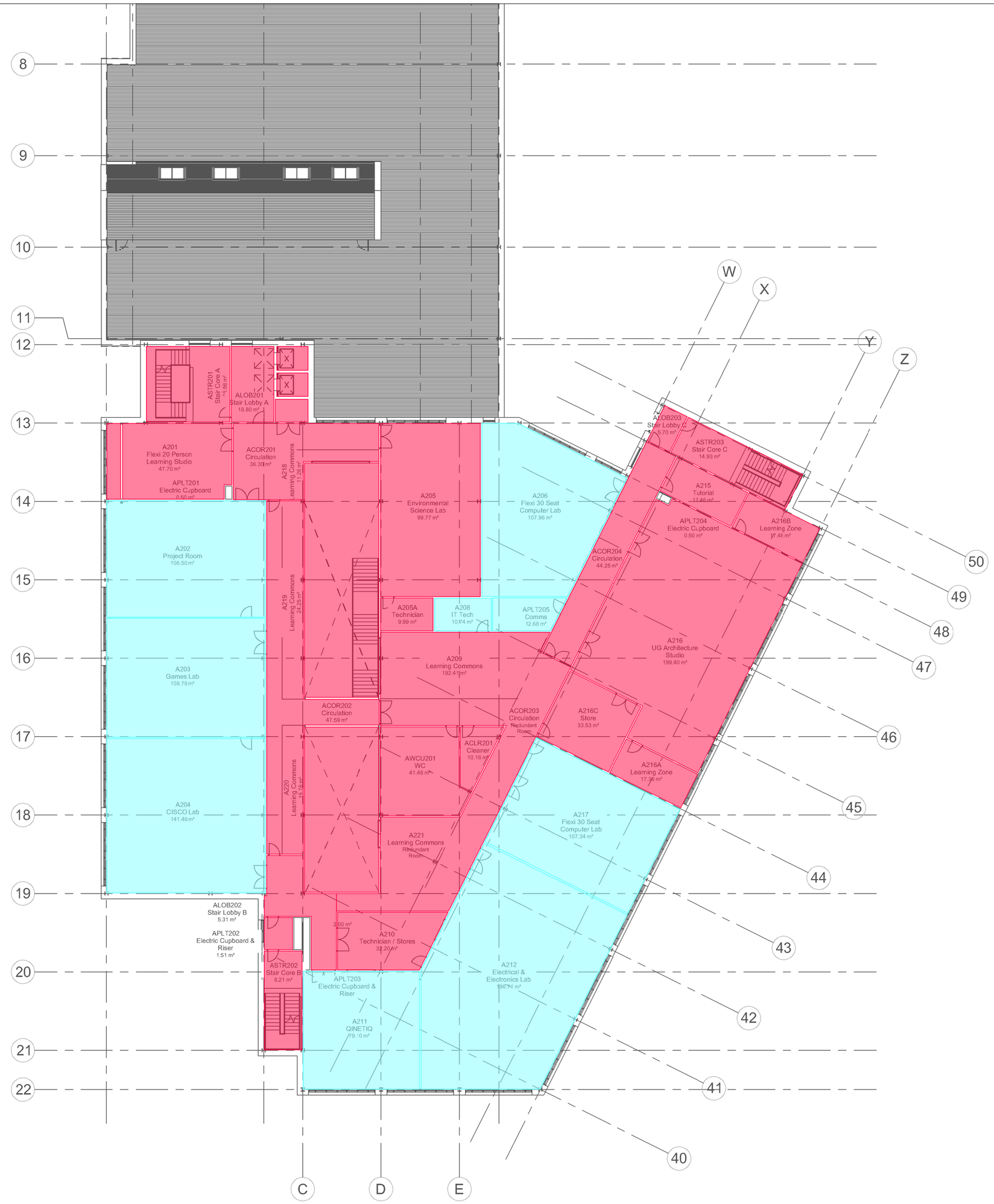
Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

Acad Model

Drawing No.
WA0155-M-56-01-101

Revision
P1

A1



NOTES

LEGEND

1. RADIATORS
2. RADIANT PANELS
3. UNDERFLOOR HEATING
4. COMFORT COOLING

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
SECOND FLOOR
HEATING STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	N.T.S.

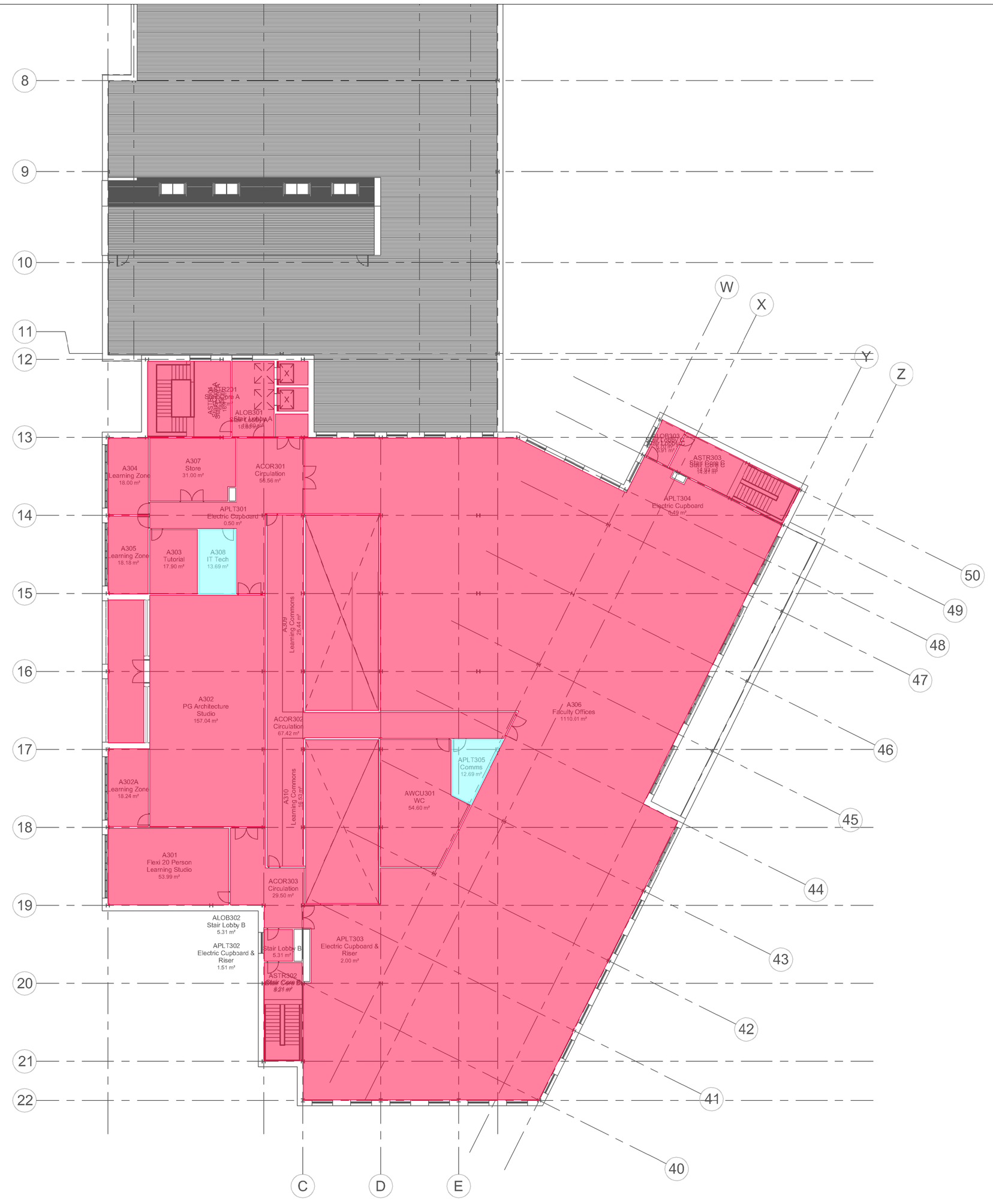
Acad Model

Drawing No.
WA0155-M-56-02-101

Revision
P1

C:\Users\a.broad\Documents\WA0155 - UWTSD\Stage 3 report\mech\WA0155-M-56-02-101.dwg

A1



NOTES

LEGEND

1. RADIATORS
2. RADIANT PANELS
3. UNDERFLOOR HEATING
4. COMFORT COOLING

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
THIRD FLOOR
HEATING STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

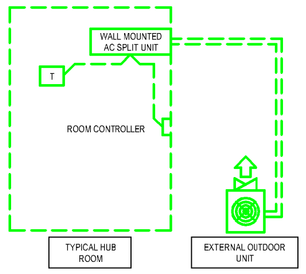
Acad Model

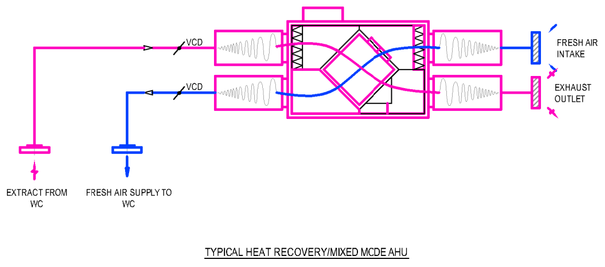
Drawing No.
WA0155-M-56-03-101

Revision
P1

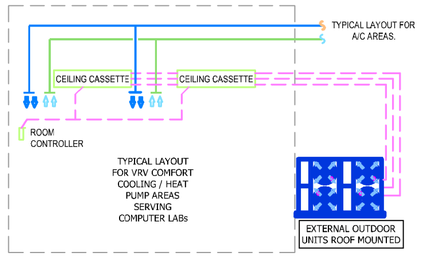
C:\Users\a.broad\Documents\WA0155 - UWTSD\stage 3 report\mech\WA0155-M-56-03-101.dwg

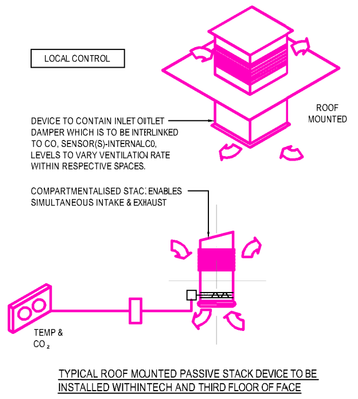
A1



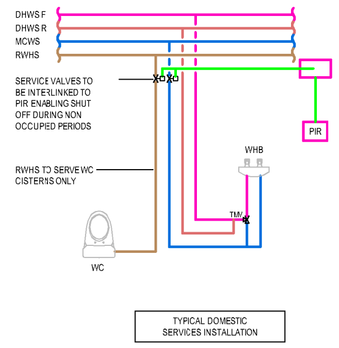


TYPICAL HEAT RECOVERY/MIXED MODE AHU

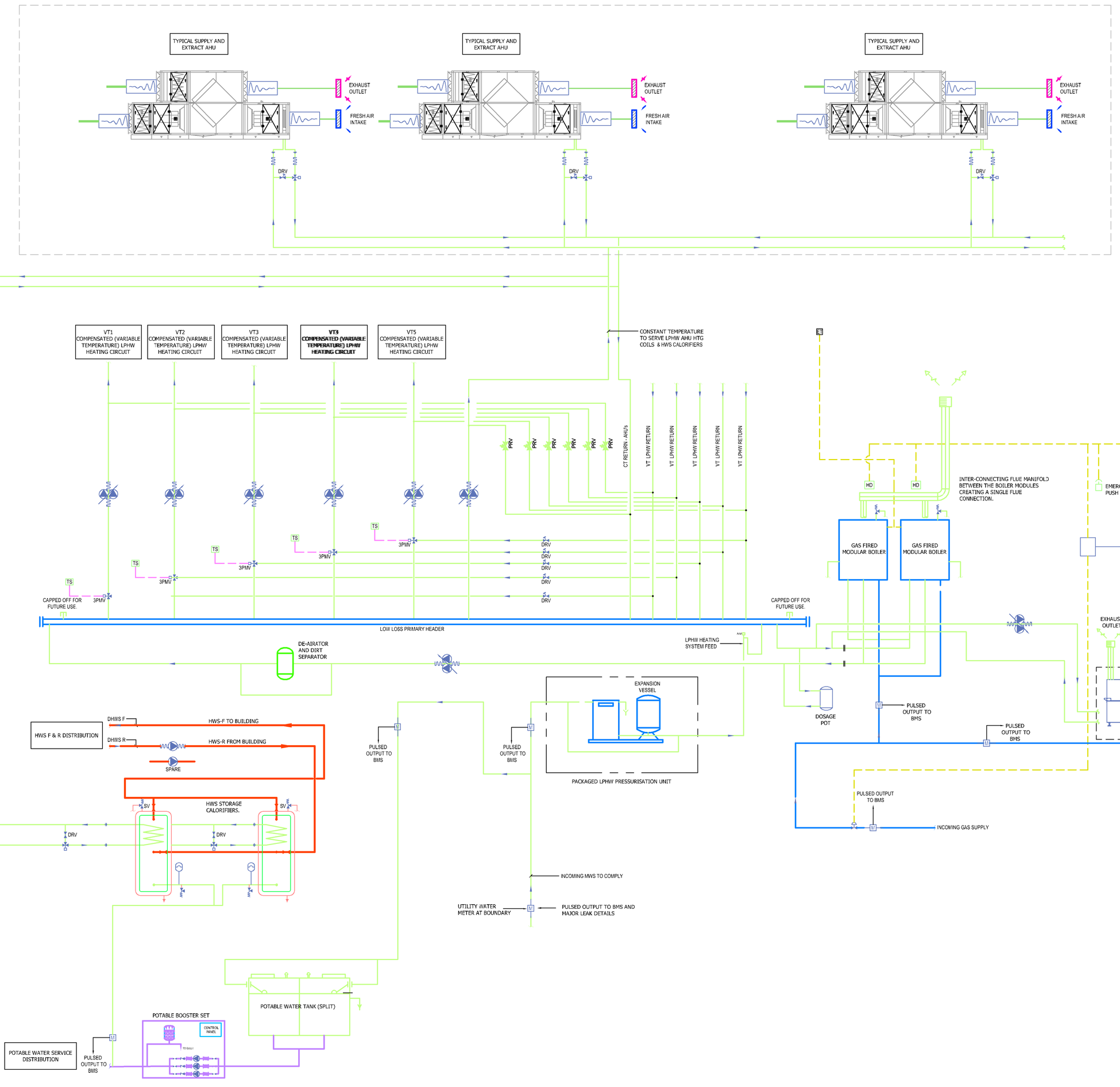




TYPICAL ROOF MOUNTED PASSIVE STACK DEVICE TO BE INSTALLED WITHINTECH AND THIRD FLOOR OF FACE



TYPICAL DOMESTIC SERVICES INSTALLATION



C:\Users\la.broad\Documents\WA0155 - UWTSD\Stage 3 report\mech\WA0155-M-56-L.JM-001.dwg

NOTES

LEGEND

Rev	Dcc	Description	Dwn	Chkd	Date
-	-	-	-	-	. - .

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
PROPOSED MECHANICAL SCHEMATIC

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	IP	28.01.2016	AB	N.T.S.

Acad Model

Drawing No.
WA0155-M-56-LM-001

Revision
P0

A1



STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life

3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
GROUND FLOOR
VENTILATION STRATEGY

C:\Users\a.broad\Documents\WA0155 - UWTSD\stage 3 report\mech\WA0155-M-57-00-101.dwg

NOTES

LEGEND

1. NATURAL VENTILATION (NVHR)
2. MECHANICAL VENTILATION
3. MIXED MODE - MVHR
4. TOILET EXTRACT

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

Client
UNIVERSITY OF WALES TRINITY SAINT DAVID

Architect
STRIDE TREGLOWN ARCHITECTS

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2015	IP	1:200@A1

Acad Model

Revision
P1

Drawing No.
WA0155-M-57-00-101

A1



NOTES

LEGEND

1. NATURAL VENTILATION (NVHR)
2. MECHANICAL VENTILATION
3. MIXED MODE - MVHR
4. TOILET EXTRACT

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
FIRST FLOOR
VENTILATION STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	1:200@A1

Acad Model

Drawing No.
WA0155-M-57-01-101

Revision
P1

C:\Users\a.broad\Documents\WA0155 - UWTSD\Stage 3 report\mech\WA0155-M-57-01-101.dwg

A1



C:\Users\a.broad\Documents\WA0155 - UWTSD\Stage 3 report\mech\WA0155-M-57-0\2-101.dwg

NOTES

LEGEND

1. NATURAL VENTILATION (NVHR)
2. MECHANICAL VENTILATION
3. MIXED MODE - MVHR
4. TOILET EXTRACT

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life
3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
SECOND FLOOR
MECHANICAL SYSTEMS

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

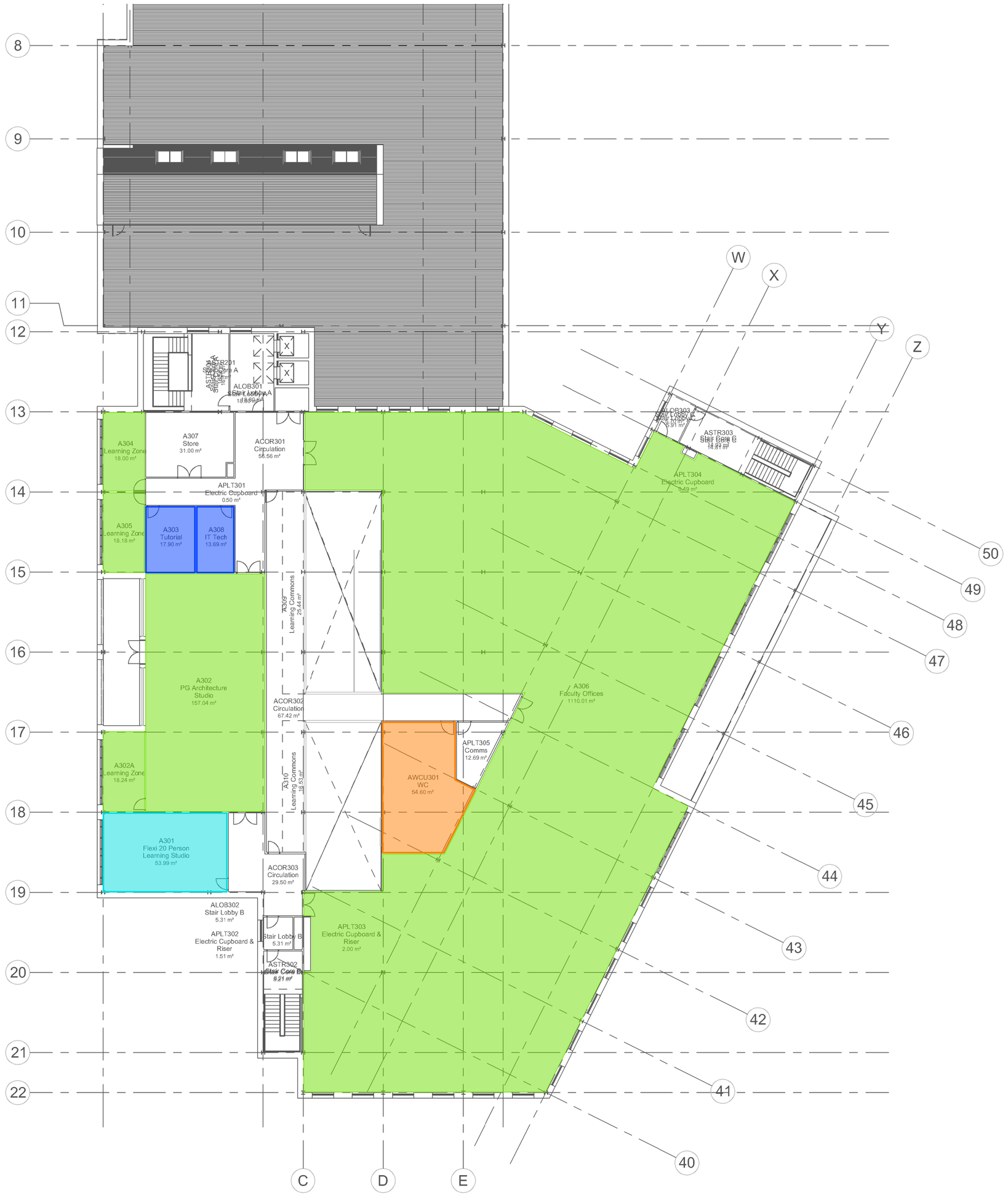
Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	N.T.S.

Acad Model

Revision
P1

Drawing No.
WA0155-M-57-02-101

A1



NOTES

LEGEND

1. NATURAL VENTILATION (NVHR)
2. MECHANICAL VENTILATION
3. MIXED MODE - MVHR
4. TOILET EXTRACT

Rev	Dcc	Description	Dwn	Chkd	Date
P1	-	LATEST ARCHITECTS LAYOUT ADDED	PK	IP	24.02.2016

STAGE 3

TROUP BYWATERS + ANDERS
Bringing Buildings to Life

3 Park Place
Cardiff CF10 3DP
t: +44 (0)2920 003760
e: cardiff@tbanda.com
w: www.tbanda.com

Project
UNIVERSITY OF WALES
TRINITY SAINT DAVID
PHASE 1 - FACE BUILDING

Title
THIRDFLOOR
VENTILATION STRATEGY

Client
UNIVERSITY OF WALES TRINITY SAINT DAVIDS

Architect
STRIDE TREGLOWN ARCHITECT

Project No.	Drawn By	Date	Checked	Scale
WA0155	CJH	08.01.2016	IP	N.T.S.

Acad Model

Revision
P1

Drawing No.
WA0155-M-57-03-101

C:\Users\a.broad\Documents\WA0155 - UWTSD\Stage 3 report\mech\WA0155-M-57-03-101.dwg

TROUP
BYWATERS
+ ANDERS

3 Park Place Cardiff CF10 3DP www.TBandA.com