

POST OCCUPANCY EVALUATION REPORT

AEROSPACE TECHNOLOGY CENTRE



MARCH 2015

FINAL



1. Introduction

QTC Projects were appointed to carry out the Post Occupancy Evaluation following the submission of a tender for services dated 25 March 2014 to the Senior Capital Projects Officer, University Estate Office.

2. Scope of the Review

Evaluation Technique

The evaluation was conducted at Project Review stage (1 – 2 years after handover) and has been undertaken in line with the criteria and guidance contained in the HEFCE/AUDE publication, 'Guide to Post Occupancy Evaluation'.

Analysis

Analysis broadly followed the University's brief for undertaking the evaluation and consisted of reviewing all written information received concerning the building together with information collated from the questionnaires and workshop. Particular areas reviewed were:

- Purpose and scope of project (brief)
- Some aspects of the building procurement process
- Building user feedback
- Cost management and control
- Construction and project management
- Functional and technical performance
- Sustainability - Assessment against BREEAM criteria
 - Review of energy efficiency measures incorporated into the design

The review of construction is limited in this evaluation due to the main contractor going into administration.

Questionnaires

Questionnaires were developed to obtain information and feedback from four specific groups:

- a) User (On-line survey)
 - a representative sample of 17 users of the building (approx 30% of total Occupants) being evaluated consisting of Academic/Admin staff and PGR students

A sample of the user questionnaire is shown in Appendix 1
- b) Consultant Design Team
 - Architect
 - Project Manager/Quantity Surveyor
 - Building Services Consultant
 - Structural Engineer

c) Estate Office – Development/Operations & Facilities

Interviews

Interviews were held with the following:

- a) Institute of Aerospace Technology Programme Manager – Rachel Brereton
Engineering Faculty Technical Manager– Paul Antcliff
Engineering Faculty Infrastructure Manager – Charlie Hallam
- b) Estate Office
- Richard Wigginton – Senior Capital Projects Officer
- c) William Saunders Architects – Chris Houldsworth
- d) Turner and Townsend Project Manager – Anthony Blackburn
- e) Turner and Townsend QS – Martyn Cooper

Workshop

A half day workshop was held on 11 March 2015 (a list of attendees is shown in Appendix 2).

The format for the workshop was a presentation by QTC Projects acting as facilitator which included feedback from the user satisfaction questionnaires. The workshop helped to highlight the key issues that had been raised in the questionnaires and interviews which were then discussed and debated.

The information from the workshop provided important comment which has been incorporated into this report.



3. Building Data

Name	Aerospace Technology Centre
Size	1,934m ² (Gross Internal Area)
No of Storeys	2 storeys
Occupants	Institute for Aerospace Technology, Faculty of Engineering
Types of space	Offices (single and shared) Specialist Workshop/Lab area Meeting/seminar rooms Ancillary space
Construction Period	65 weeks
Start on site	15 August 2011
Contract Completion	14 May 2012
Practical Completion	5 September 2012

Net Construction Costs

At Start of Construction	£3,330,000
Final adjusted contract sum	£3,406,000 (figure includes retention used for addressing defects following main contractor entering into administration)

<u>Funding</u>	University, ERDF
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Consultant Team

Project Manager	Turner and Townsend, Nottingham
Architects	William Saunders, Newark
Cost Managers/QS	Turner and Townsend, Nottingham
Services Engineer	B3 Consulting Engineers, Altrincham
Structural Engineers	Curtins, Nottingham

<u>Contractor</u>	Baggaley Construction, Nottingham (in receivership)
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<u>Building Contract</u>	JCT Design & Build 2005 (Rev 2009)
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4. Project Background and Description

The building is located on the Jubilee campus and provides a dedicated research and knowledge transfer centre for the Institute for Aerospace Technology. The Centre operates as a 'Research Hotel' and with the Institute working with its industrial partners, provides facilities for delivering application-focused research on a large and complex scale.

As part of the design competition the University issued a design brief in January 2010 which identified the site for development which had to be in line with the University Campus Development Plan formally adopted by Nottingham City Council in December 2004 and updated in the Development Framework issued in February 2006.



The building (18) has been aligned on a north-south axis and forms a closure to the open space between the Energy Technologies Building (16) and Institute of Mental Health Building (17).

The final design and finished building sits well within a mix of contemporary architecture which makes up the University Campus and it respects the original master planning principles. The two storey building which is a simple curved form reflecting the aeronautical theme of the building's function, houses a double height workshop/Laboratory together with office accommodation, seminar and meeting rooms.

There are subtle references to the earlier buildings constructed on Triumph Road in the selection of type and colour of the cladding to the west elevation of the building which also incorporates solar shading in the form of vertical perforated aluminium fins. The south end of the building has a fully glazed frontage at first floor level with solar shading. The curved east elevation is clad in zinc and merges with the roof as a continuous 'roll'. The entrance is located on the south east corner and is protected by a curved canopy.

The main contract works commenced on site in August 2011 and were completed in September the following year.

The building has achieved an 'Excellent' rating in line with the Building Research Establishment's environmental assessment methodology (BREEAM).

A full list of project milestones is shown in Table 1.

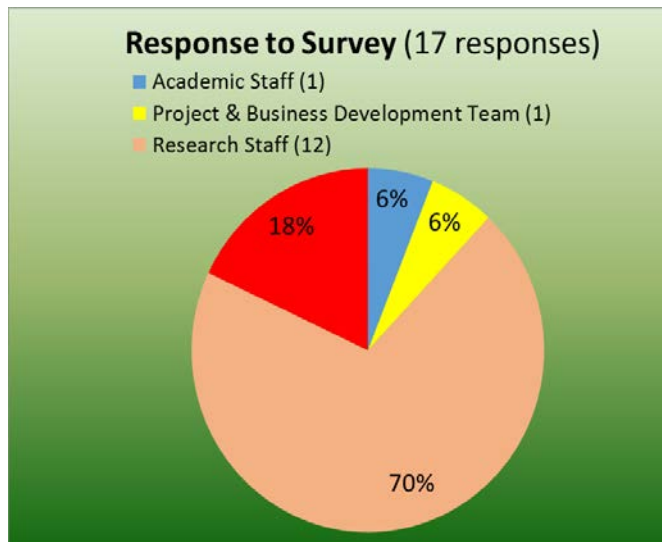
Table 1 Project Milestones

Design Brief issued	January 2010
Design Team appointment	27 May 2010
Stage C cost plan	4 November 2010
Planning Application submitted	1 December 2010
Stage D cost plan	19 Jan/3 March 2011
Main construction tender invitation	15 February 2011
Planning Approval	25 March 2011
Tender Report	31 May 2011
Main contractor appointed	15 June 2011
Start on site	15 August 2011
Contract completion date	27 February 2012
Contract completion date (adjusted)	14 May 2012
Practical Completion	5 September 2012
Official Opening	26 October 2012

5. User Satisfaction

Building user satisfaction has been assessed from the responses to the on-line questionnaires received and analysis of the comments made. The results are shown in a series of bar charts covering the following areas:

- Satisfaction with specific room types, ie workshop/Lab, shared and single offices, seminar/meeting rooms, ancillary space and overall impression of the building
- Security
- Accessibility
- Cleanliness
- Internal room temperature
- Distraction from noise
- Lighting conditions, natural and artificial
- Data connectivity at the workspace/Wi-Fi
- AV equipment in meeting rooms

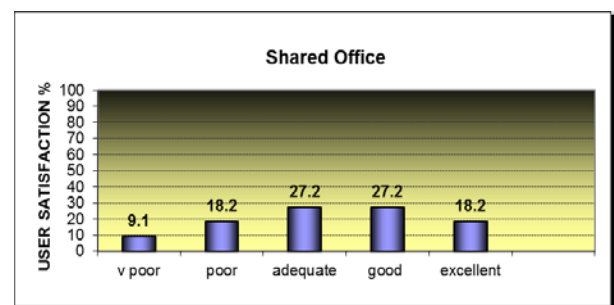
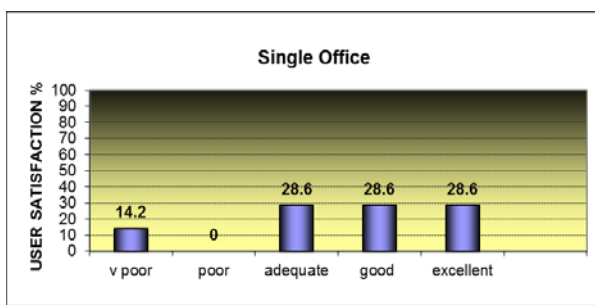


Overall, 17 responses were received from a representative group comprising Academic/Admin staff, Research staff and PGR students. This is approximately 30% of occupants of the building which is a reasonable response.

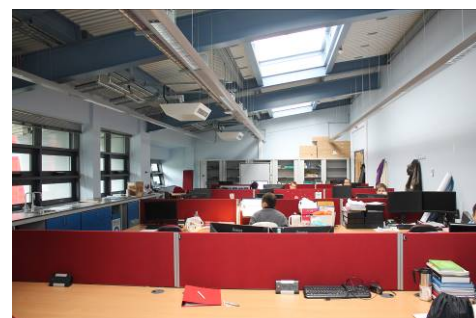
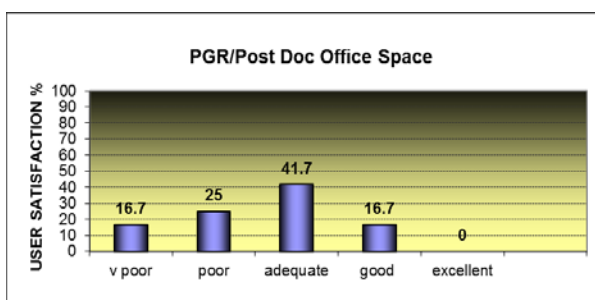
Users were asked to give a response on their overall impression of the building and this has shown a reasonable level of satisfaction.

75% of respondents rated the building adequate, good or excellent.

Single and shared offices are located on the first floor via the main staircase and lift. Most respondents occupying single offices were satisfied, with 86% rating them adequate, good or excellent. In the shared/open plan areas the level of satisfaction is reduced to 73% (adequate, good or excellent rating).

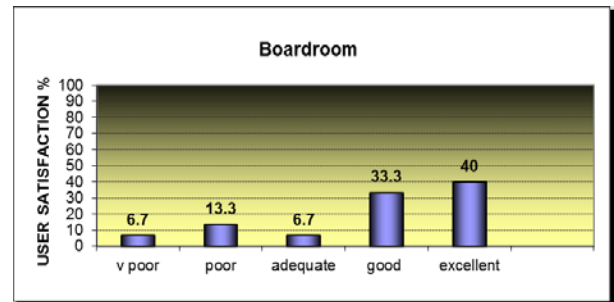
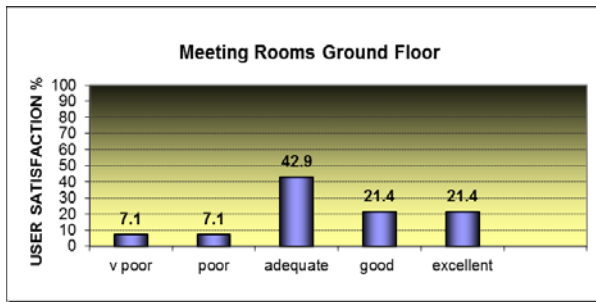


The PGR/Post Doc Office space attracts the most dissatisfaction. It should be noted that this room (B13) was originally intended to be used as a laboratory. As a shared office it has attracted some comments due to temperature conditions and natural lighting. Despite this, 58% of respondents found the working space to be satisfactory.

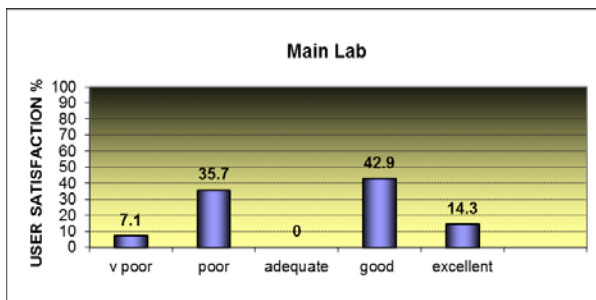


Room B13

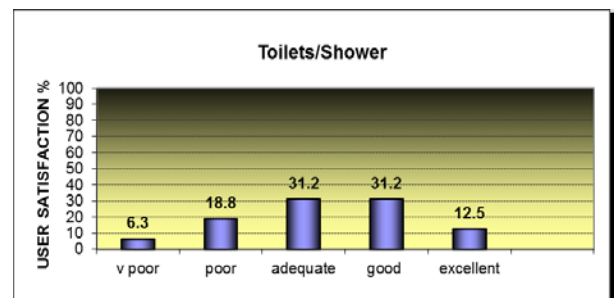
There is a meeting room on the ground floor which is well used as reflected in the level of satisfaction with this space. The Boardroom also received fairly high levels of satisfaction (80%) from the building users despite some comments relating to temperature control.



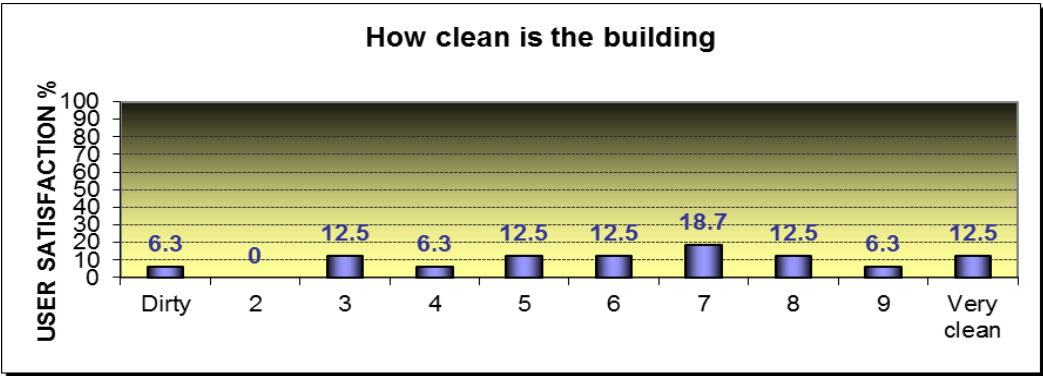
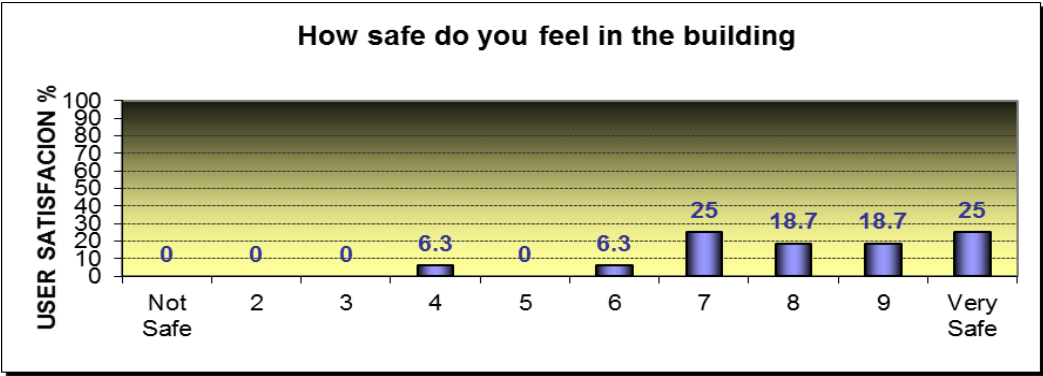
The double height Workshop/Lab space is the main area of activity in the building providing flexible accommodation for research activities. The score on how satisfied respondents were with the space varied with some regarding it as good/excellent whereas others felt the Lab is poor. There is little written comment to explain the polarised scores other than reference to poor ventilation controls as some have commented that the space gets very warm in summer. However positive comments were made about the lighting. At the workshop, the User Representative felt there were no major issues with this space.



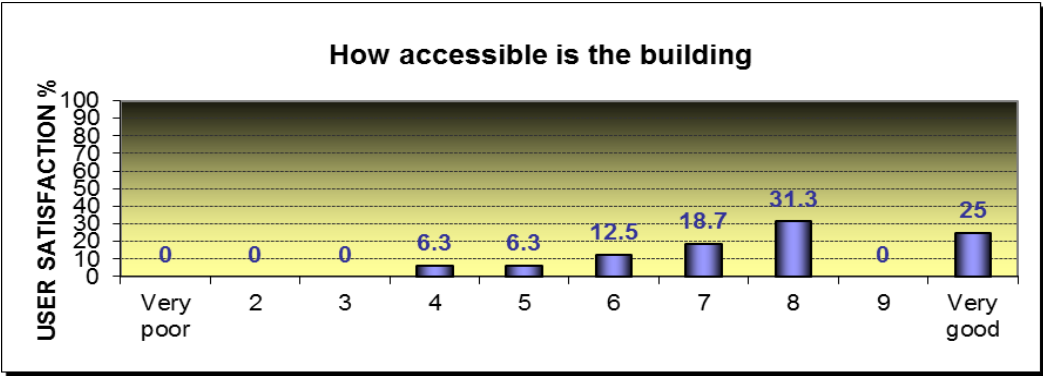
Generally, respondents were positive about the first floor kitchen. References to kitchen cleanliness are more to do with tidiness and therefore a management issue. There was a broad range of responses on the toilet/shower areas, adverse comments being related to cleanliness.



Looking at the charts for building amenity and comfort, most users felt safe in the building.

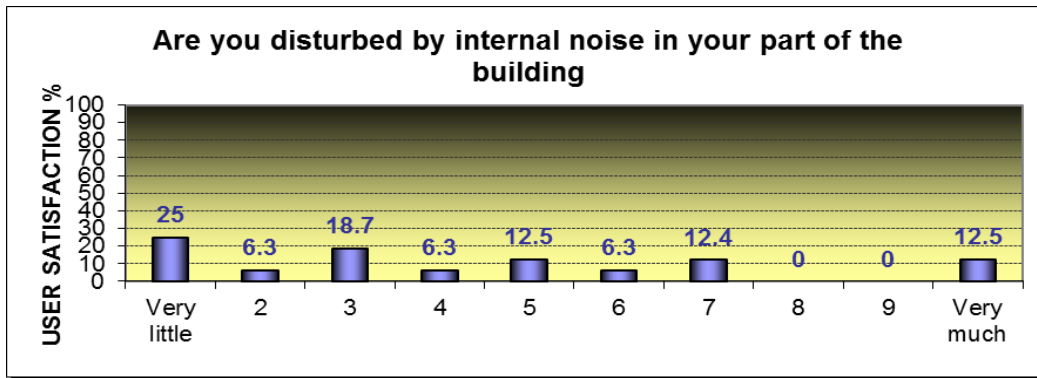


Overall, users are content with the cleanliness of the building apart from the ground floor toilets.



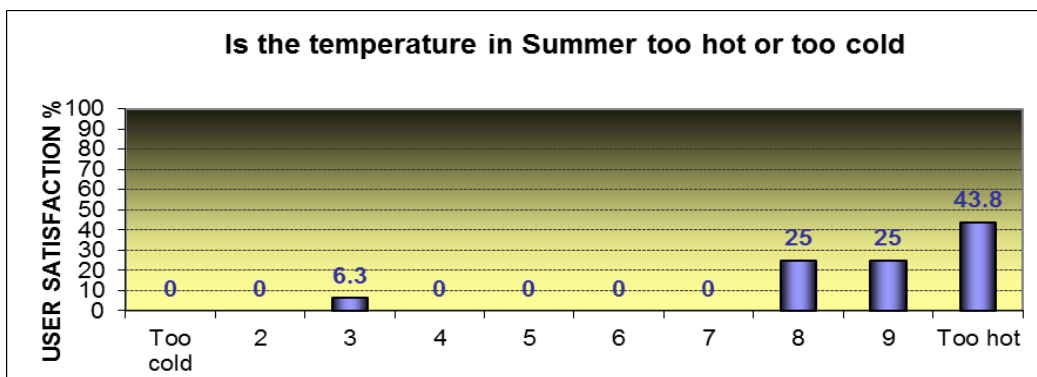
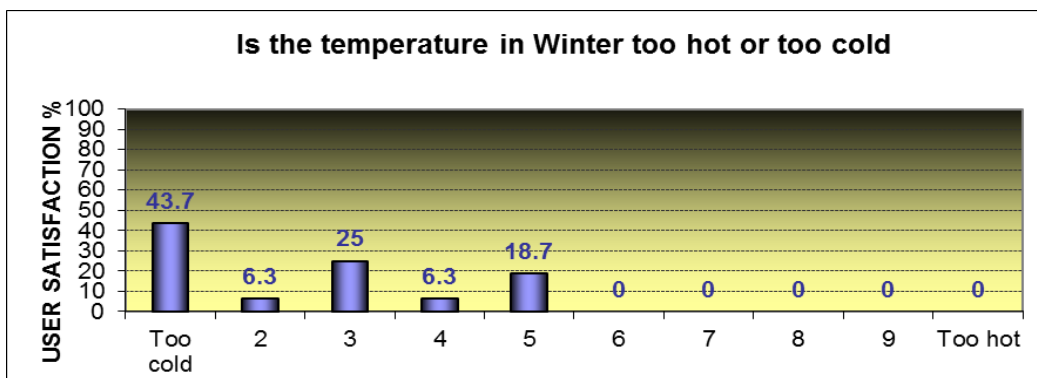
There were fairly positive responses on accessibility.

The response to the disturbance from noise question presented scores almost across the full range but apart from the staff who work in the technicians' workshop who commented on noise from the outside compressor, no major issues were raised.

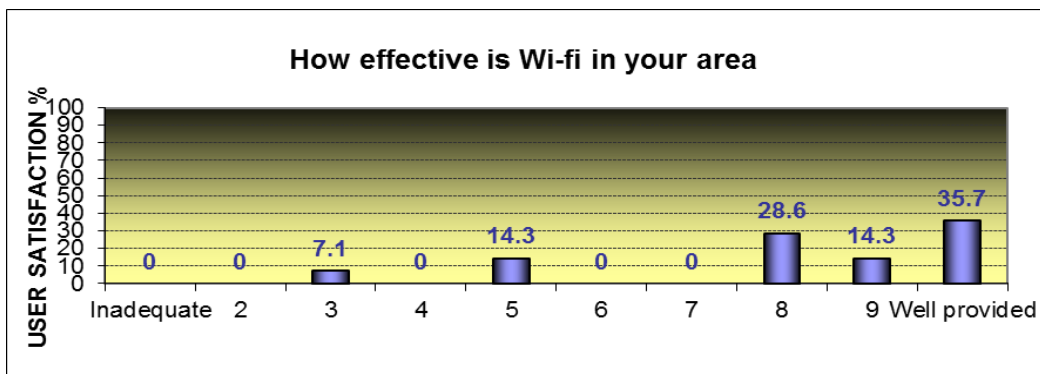
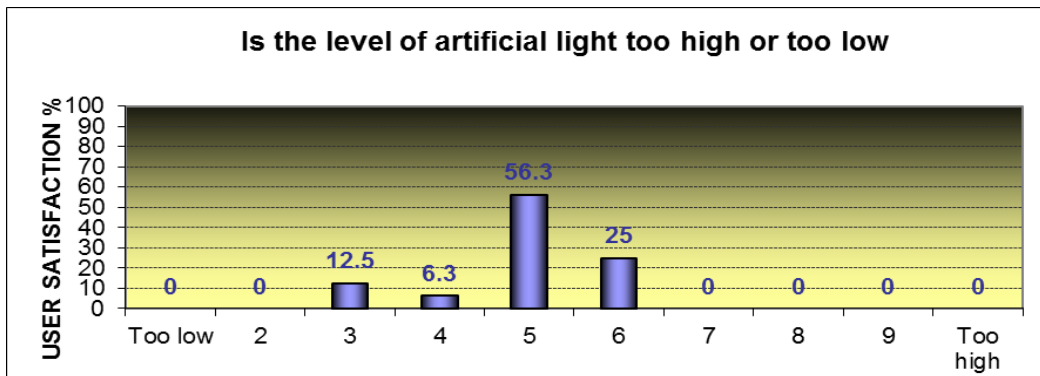
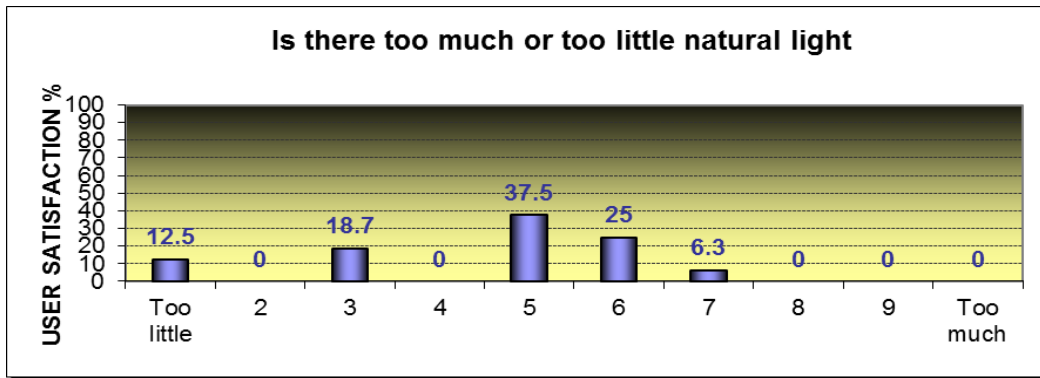


Regarding temperatures in the building, the charts show some interesting results both for winter and summer. In winter respondents are indicating that 82% are too cold whilst in summer 95% are too hot.

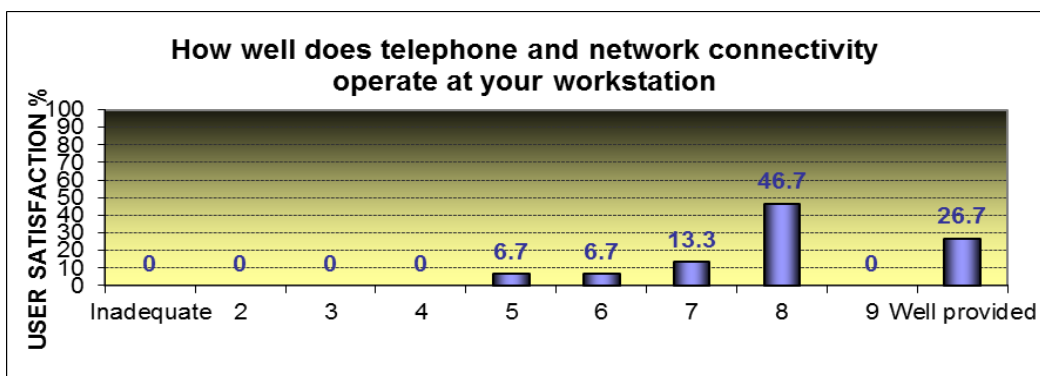
The temperature control is an ongoing issue and in part reflects problems caused by the main contractor going into administration. Further works have been carried out post contract to the heating and cooling systems and control of solar gain. For example, the Board Room has been fitted with comfort cooling.

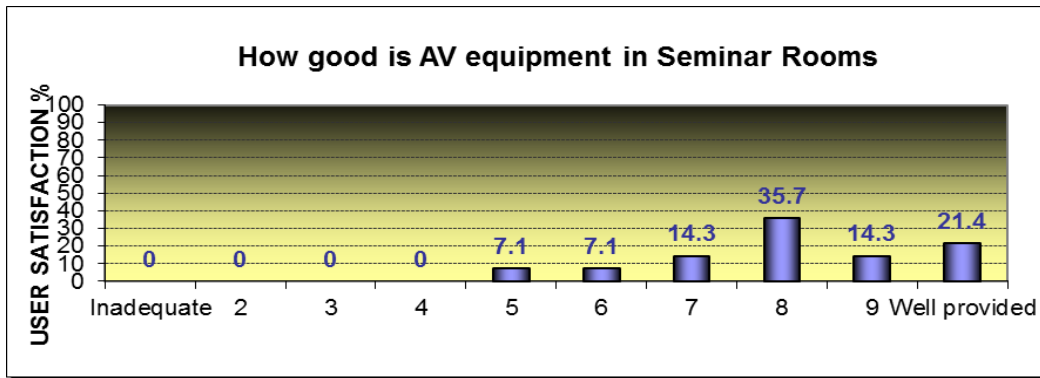


Comments on lighting relate mainly to the operation of the lighting controls and movement sensors in B11 and B13. This is a common issue with lighting in office areas but it should be noted that the levels of controls incorporated into the building are a requirement to satisfy Building Regulations and achieve the BREEAM accreditation.



The scores on how good the ICT is at the workplace were fairly positive (Wi-Fi on this campus has now been improved). Respondents also felt that telephone and network connectivity was good along with the level of AV equipment in the seminar rooms.





Resulting from the questionnaire responses, interviews and various discussions, a number of issues have been highlighted and were presented at the POE workshop for further discussion/debate. The issues have been grouped under the following headings and considered in more detail in this report:

- User Issues
- Design Issues
- Construction Issues
- Facilities and Operations
- Project Management
- Procurement and Cost Management
- Sustainability

6. User Issues

A number of user issues and comments were raised during the interviews and from the questionnaire returns which were discussed at the workshop. These are listed below and commentary given.

Temperature

Action has been taken to address the issues of temperature control and the building getting too warm in winter to some parts of the building, namely:

Boardroom

- Completion of the installation of comfort cooling which can also provide additional heating in winter
- Consideration is also being given to applying solar film to windows on the gable where blinds have not been fitted

Heating Cycle

- Boiler temperature increased to improve heating during winter (Note: the systems had to be re-balanced/re-commissioned following issues with the main contractor going into administration)

Despite these improvements, the level of negative comments from occupants indicates that there is still a problem in some areas. At the workshop this was acknowledged by Operations and Facilities and monitoring of room temperatures is continuing and further adjustment of the Building Management System may be needed. The addition of further blinds is also being considered.

Lighting

Comments from users concerning the lighting relate to the automatic movement/daylight sensors and further adjustment may be needed. In the PGR/Post Doc office B13, it was noted at the workshop that as this was originally designed as a laboratory space, the lighting sensors may be incorrectly located for an office environment. This needs further investigation.

Automatic windows

Since the initial occupation of the building and in response to user comments, manual override switches have been fitted to the automatic windows which can operate the windows during standard office working hours.

The ongoing comments concerning the window operation may be due to a lack of understanding by the users of how and when the windows operate to purge heat. Further advice/explanation may be needed.

Recommendations

- i) Carry out further assessment of the heating and cooling in the building and make adjustments/modifications where necessary*
- ii) Consider installing additional window blinds*
- iii) Consider providing further advice/guidance to building users on the automatic window operation*

7. Design Issues

A number of comments relating to design were raised during the interviews and from the questionnaire returns which were discussed at the workshop. These are listed as follows and commentary given:

Design Brief

The University issued a design brief at the competition stage. This was adequately detailed and provided sufficient information on which to prepare preliminary designs. The Design Team considered there was good communication through the University's Estate Office via the Senior Capital Projects Officer.

User Consultation

There was no clearly defined user for the main spaces in the building and the Architect and Consultant Project Manager relied on meetings with the Associate Dean for Research, Infrastructure Manager and Engineering Workshop Manager from the Faculty of Engineering to assist with the initial design development.

There were no major issues with this approach although the Architects felt that earlier involvement of the Faculty technical advisers may have helped with the early project definition.

Planning Stage

The siting of the project was in line with the approved Masterplan and Development Framework and the design solution was sympathetic to adjacent buildings. Although there were no issues with obtaining planning approval, there were numerous conditions attached with some proving difficult to discharge. For example, the need to satisfy the City Council on flood risk due to close proximity to residential neighbours.

The acoustic assessment requested by the planners to determine noise levels from plant and equipment also proved difficult as the research activities within the building were not clearly defined at planning stage.

Structural Design

There were no issues with the structural design. The Structural Engineer has commented that Client requirements were sufficiently clear. Although end users were unknown at the time of construction, the structural layout and requirements were clear, and any changes had little effect on the design of the structure.

8. Construction Issues

It should be noted that at the end of the building contract, the main contractor went into administration. It has therefore not been possible to record any comments from the main contractor in this report.

Contractor Performance

Initially the contractor performed well and had a good site team but was let down by some of the subcontractors, particularly the electrical subcontractor. The contractor should also have engaged and appointed subcontractors at an earlier stage which may have avoided late or rushed detailing and consequent changes (eg. Plant space was increased when the M & E subcontractor became involved).

Towards the end of the construction contract, the main contractor's performance deteriorated probably due to their financial position. After Practical Completion and the main contractor going into administration, the decision of one subcontractor to unlawfully remove services and components caused further problems relating to time and cost.

Site Conditions

The site was logistically challenging in that two other building projects (Institute of Mental Health Building and Energy Technologies Building) were under construction adjacent to the ATC site. Interdependency of services and access into the sites added to the challenge. There were also issues with the discovery of a basement plantroom on the site and the presence of asbestos. Other ground issues such as the location of an existing HV cable also caused some delays.

Programme

It was felt that the length of programme set out by the main contractor at tender stage was a reasonable period bearing in mind the size and nature of the building to be constructed. The contractor also had the opportunity to extend the programme produced at tender stage but declined to do so.

Early problems with utilities and ground issues resulted in an eleven week extension of time but despite this, the contractor still took a further sixteen weeks beyond the revised completion date to finish the works.

Quality

The quality of the finishes both internally and externally are good and to a standard expected by the University.

Commissioning/Handover

There were no major issues with commissioning apart from the delays due to removal of some services/components mentioned earlier which lead to further re-balancing/re-commissioning. Also the commissioning of the incoming gas supply was late.

As a result of the delays, the user client had to take occupation of the building whilst some completion items were still being undertaken.

Outstanding Defects

There were a number post-completion snags that had to be dealt with and due to the main contractor's demise, the University employed a third party to deal with these and the replacement of services/components that had been removed.

Health and Safety

There were no health and safety issues raised, the contractor conducting site operations in a satisfactory manner.

Recommendations

i) Where possible ensure that the main contractor appoints the mechanical and electrical subcontractors at an early stage to aid design development and avoid late/rushed changes at a later date.

9. Operations and Facilities Issues

Involvement of Maintenance Team

On this project, maintenance staff were involved in the project to some extent and it is noted that on later projects a more structured approach has been applied and this should continue on all future projects.

Building Materials/Services Specification

There were no major issues concerning the specification of building materials and mechanical and electrical services. Comments were made regarding the location of the daylight and movement sensors controlling the artificial lighting which may need further investigation in the PGR/Post Doc office.

Fault Reporting

There were no issues regarding fault reporting through the Estate Office helpdesk. Building users understood the process and were satisfied with the arrangements.

Operations & Maintenance Manuals

The Operations and Maintenance manuals were produced by consultants who have prepared sets of documents for a number of University capital projects and there is now a consistency in their production and content.

Cleaning

The only comments regarding cleanliness of the building related to the toilets and this should be reviewed in order to determine whether the cleaning regime to these areas needs to be adjusted.

Security

There were no issues raised relating to security.

Recommendations

- i) Continue to improve the communication with the Operations and Facilities Team*
- ii) Check the location of the lighting sensors in the PGR/Post Doc office*
- iii) Review the cleaning regime to the toilet areas*

10. Project Management

Communication worked reasonably well on this project. The consultant design team, Quantity Surveyor and main contractor all had positive comments to make regarding the Estate Office and the accessibility of the University's Project Officer.

As with all University capital projects, this project was overseen and monitored by a Project Management Group (PMG) which included representation from the Faculty of Engineering. Once the final scheme was selected by the University, the project was delivered successfully through the normal PMG process.

There were very few client changes on this project with changes being dealt with through a well-structured change control process. The main changes were the installation of a car charging point and walkway on the roof.

The consultant Project Manager produced a detailed Project Execution Plan which sets out clearly the scope and broad objectives for the project, communication protocol and change control procedures.

Risk management was a key part of the project monitoring process and was handled well with a risk register being produced at an early stage and monitored by the PMG.

11. Procurement and Cost Management

Procurement

The Architects on this project acted as lead design consultant, being appointed following the outcome of a design competition.

This has proved to be a worthwhile and beneficial process as it enables the client to consider a range of design initiatives and different approaches to interpretation of the brief. The Architect also selected the Structural and Building Services Engineers to make up the overall design team. The consultant Project Manager and Quantity Surveyor were appointed separately which took place after the Design Team appointments.

The Architects and Structural Engineers were novated to the contractor at stage D+ with the Building Services Engineers being retained on the client side to provide a monitoring role and quality control service. It is considered that stage D+ or stage E is the most appropriate point in the design process at which to novate as more design certainty has been achieved by this stage.

The main contractor appointment followed standard University procedures. Following a pre-qualification exercise, five contractors were invited to tender for the proposed works and four tenders were received.

The appointment of the preferred contractor took place following a detailed assessment of tenders with the process and recommendations being set out in a detailed tender report approved by PMG.

The form of contract used was the JCT Design and Build contract 2005 (revised 2009). This form of contract works well particularly since the contract clauses remain unamended and thus requiring less negotiation. In this form it is considered to provide good value in balancing cost and quality.

Cost Management

Costs were managed well on this project. Regular cost plans and cost checks were prepared prior to construction and as the pre-tender net construction budget was above the accepted tender sum, no value engineering/cost saving exercises were needed following receipt of tenders. Some client additions were made at this stage and the gross budget was adjusted to allow for the increase in the vat rate.

Once construction commenced, regular cost reports were produced. PMG was kept regularly informed through the monthly cost reports and was able to monitor expenditure effectively and direct as required.

The final account has now been established which reflects figures that would have been agreed if the contractor had not gone into administration.

12. Sustainability

The design brief for this project stipulated a BREEAM target of 'Excellent' which conforms to the requirement of the University's Carbon Management Plan and this has been achieved.

It is a requirement of the Nottingham City Council Planning Guidelines that 10% of all energy used (interpreted through CO₂ emissions) in new developments over 1000m² be obtained from low carbon emission or renewable energy sources.

The design intent was that following an appraisal of possible options this would be achieved through the provision of a ground source heat pump powered by energy generated by photovoltaic roof mounted panels. The design calculations assessed that this would achieve a 10.3% contribution to total energy consumption.

Energy Consumption and generation figures have been obtained from the University's Estate Office for the period 1 August 2013 to 31 July 2014 and comparison made with the design targets. These are shown in the table below:

	kWh/annum (Design Target)	kWh/annum (Actual)
Generation		
GSHP	53,720	30,970
PV's	16,279	13,906
Consumption		
Electricity	145,900*	313,758
Gas	437,701	320,691
Water		156m ³

* Excludes consumption from small power

It is not possible to make a true comparison with actual generation/consumption figures as target figures do not include energy used by electrical equipment and appliances. However if a pro rata figure is deducted from the actual electricity consumption figures then the renewable energy sources are achieving the 10% target.

A number of energy efficiency and sustainability measures have been incorporated into the building, namely:

- Ground Source Heat Pump
- Photovoltaic panels
- Passive ventilation and night time cooling
- Sensor controlled lighting including daylight sensors
- Solar shading/high spec glazing
- High efficiency gas fired boilers

Recommendations

i) Continue to record energy consumption and compare with design targets for the building

13. Conclusion

This building has successfully delivered on the design brief and produced a quality building. There are some issues that need addressing and these are shown in the list of recommendations but overall, a flexible building has been produced that will provide the facilities needed for research activities undertaken by the Institute for Aerospace Technology and their partners.

14. Summary of Recommendations

Action

User Issues

- | | |
|---|---------------------------|
| i) Carry out further assessment of the heating and cooling in the building and make adjustments/modifications where necessary | Operations and Facilities |
| ii) Consider installing additional window blinds | Operations and Facilities |
| iii) Consider providing further advice/guidance to building users on the automatic window operation | Operations and Facilities |

Construction Issues

- | | |
|--|-------------|
| i) Where possible ensure that the main contractor appoints the mechanical and electrical subcontractors at an early stage to aid design development and avoid late/rushed changes at a later date. | Development |
|--|-------------|

Operations and Facilities Issues

- | | |
|--|--|
| i) Continue to improve the communication with the Facilities and Operations Team | Development
Operations and Facilities |
| ii) Check the location of the lighting sensors in the PGR/Post Doc office | Operations and Facilities |
| iii) Review the cleaning regime to the toilet areas | Operations and Facilities |

Sustainability

- | | |
|---|----------------|
| i) Continue to record energy consumption and compare with design targets for the building | Sustainability |
|---|----------------|

APPENDIX 1

Sample Questionnaire

POST OCCUPANCY EVALUATION

BUILDING USER SATISFACTION QUESTIONNAIRE (On-line survey method used)

BUILDING: AEROSPACE TECHNOLOGY CENTRE

Occupation (Please tick most relevant or state in 'other')

Academic Staff

Project and Business Development Team

Research Staff

PGR Student

An evaluation of your building is being conducted to assess how well it performs for those who occupy it. This information will be used to assess areas that might need improvement and provide feedback that can be used for the benefit of similar future buildings.

Please complete the following questions relating to the above project by ticking the appropriate boxes and adding comments where requested.

1 – Satisfaction with types of space in building

Please rate the overall quality of the following areas:

(Please tick)

A: Single Office	1 V Poor	2	3	4	5 Excellent	N/A
B: Shared Office	1 V Poor	2	3	4	5 Excellent	N/A
C: PGR/Post Doc Office	1 V Poor	2	3	4	5 Excellent	N/A
D: Main Lab	1 V Poor	2	3	4	5 Excellent	N/A
E: Boardroom	1 V Poor	2	3	4	5 Excellent	N/A
F: Meeting Room Ground Floor	1 V Poor	2	3	4	5 Excellent	N/A
G: Kitchen	1 V Poor	2	3	4	5 Excellent	N/A
H: Toilets/Shower	1 V Poor	2	3	4	5 Excellent	N/A
I: Overall Impression	1 V Poor	2	3	4	5 Excellent	N/A

2 - Security

2.1 How safe do you feel in the building? (*Please tick*)

Unsafe									Very safe
1	2	3	4	5	6	7	8	9	10

3 - Accessibility

3.1 How accessible is the building?

Dirty									Clean
1	2	3	4	5	6	7	8	9	10

4 - Cleanliness

3.1 How clean is the building?

Dirty									Clean
1	2	3	4	5	6	7	8	9	10

5 - Temperature

5.1 Is the temperature in winter too cold or too hot?

Too cold									Too hot
1	2	3	4	5	6	7	8	9	10

5.2 Is the temperature in summer too cold or too hot?

Too cold									Too hot
1	2	3	4	5	6	7	8	9	10

6 - Noise

6.1 Do you suffer distraction caused by noise in your part of the building?

Very significant									Not significant
1	2	3	4	5	6	7	8	9	10

7 - Light

7.1 Is there too much or too little natural light?

Too little									Too much
1	2	3	4	5	6	7	8	9	10

7.2 Is the level of artificial light too high or too low?

Too low

Too high

1	2	3	4	5	6	7	8	9	10
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8 – Telephone/Network Connectivity/Av Equipment

8.1 How well does telephone and network connectivity operate at your workstation?

Inadequate

Well provided

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

8.2 Is the AV equipment in the teaching/meeting rooms adequate?


Inadequate

Well provided

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

9 - Comments

If you have any additional comments that you would like to make about any aspect of the building and your working environment please note them here.



Thank you for completing the questionnaire.



Appendix 2
AEROSPACE TECHNOLOGY CENTRE
Post Occupancy Evaluation Workshop
Held on Wednesday 11 March 2015

List of Attendees

User Representatives

Michael Winfield	Senior Technical Manager, Engineering
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Estate Office

Richard Wigginton	Senior Capital Projects Officer
Adrian Mawdesley	Space Resource Manager
Chris Dickinson	General Manager Maintenance
Gary Byard	Security Supervisor
Martin Wooley	Assistant Senior Engineer

Design Team

Karen Whysall	William Saunders – Architects
Paul Fieldhouse	William Saunders – Architects
Anthony Blackburn	Turner and Townsend – Project Manager
Martyn Cooper	Turner and Townsend - QS

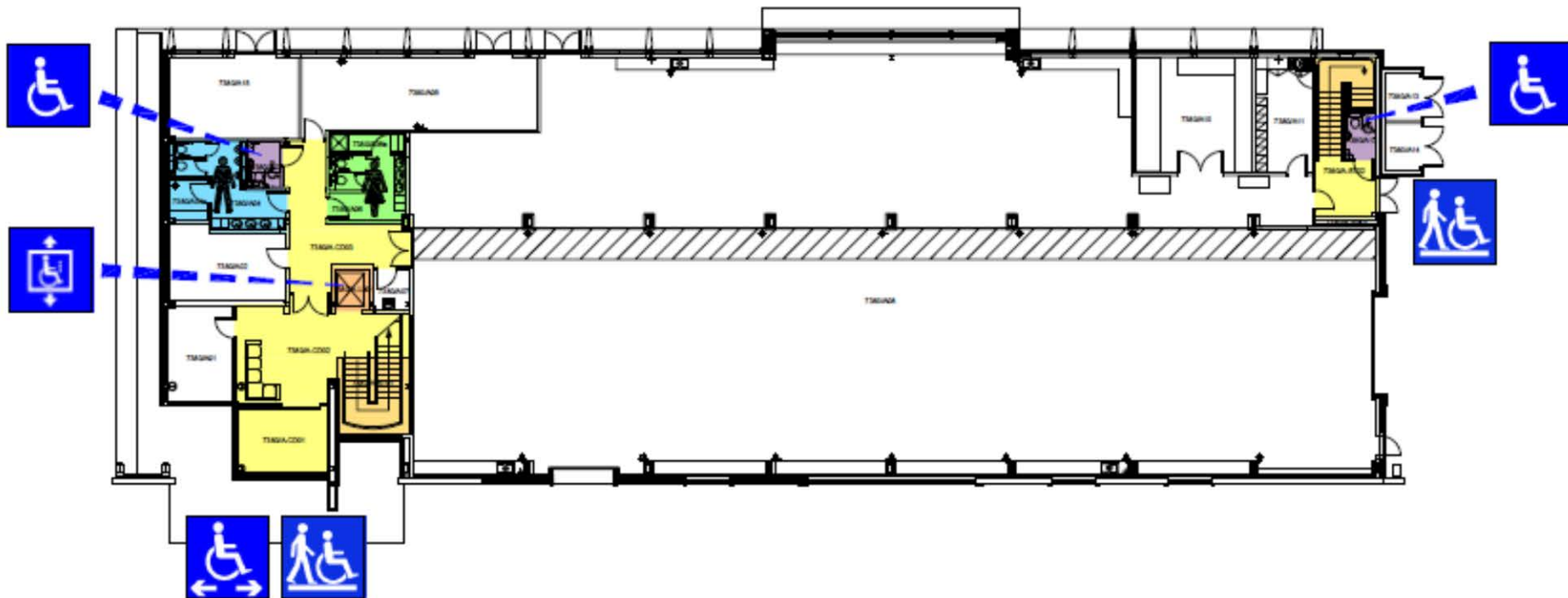
Apologies

Cliff Hogan George	Domestic Services Operations Manager
Mark Bonsall	Estate Office – Senior Engineer
Barry Chadwick	Operations & Facilities Director
Chris Houldsworth	William Saunders – Architects
Peter Daniels	B3 Consulting Engineers

APPENDIX 3

Floor Plans

Aerospace Technology Centre - A Floor Plan



Aerospace Technology Centre - B Floor Plan

