

Grimsby Institute Higher Education Building

A Post-Occupancy Evaluation

Final Report

Ryder





THE UNIVERSITY OF

OF THE SOUTH EAST

Introduction

The Higher Education building at Grimsby Institute is a five storey building, comprising general teaching space, a coffee bar, café and vocational kitchen, Learning Centre, media production suites and open IT spaces / break areas. These spaces surround a full height atrium space with ETFE roof. The building is a white reflective, monolithic block with deeply grooved and coloured window reveals.

There are 1300 students using the building.

Post-Occupancy Evaluation Methodology

A mixed method approach was taken to evaluating the effectiveness of the design, and building in operation. This included:

- A desktop review of data
- An interview with senior leadership
- Questionnaires for students
- Questionnaires for teaching and non-teaching staff
- A student workshop with 16 students
- A staff workshop with teaching and support staff
- Informal discussions with kitchen and library staff
- Building performance assessment

The overall findings are reported here, and recommendations made for both Grimsby Institute and the future design of effective higher and further education environments.

Building Design and Use

Overall Design and Layout

- Staff and students like the appearance of the building, describing it as modern and professional.
- The external appearance could have been more iconic and a better reflection of the identity of the higher education offer at Grimsby Institute.
- Internally, more art or display would be appreciated to inject colour and highlight work being done on courses.
- Inspirational quotes on the stairs are liked by some, but others feel they could have an adverse impact.

Teaching Spaces

- Larger seminar rooms are liked, but it is felt smaller rooms are too crowded when used by larger groups.
- Seminar room chairs are very uncomfortable.
- Lecture theatres are popular and liked by students and staff. They are comfortable, look good and it is easy for students to see the board, and staff to see students. They are used for both lectures and seminars.
- ICT suites are a popular provision, but staff feel that the layout could be more effective.
- Practical areas, e.g. labs, are rated positively overall.

Learning and Support Spaces

- Break out areas are well liked by students, and the computers in these areas are particularly popular.
- Students reported that break areas get busy at certain times, particularly 9am to 3.30pm.

- Students report that there is a lack of quiet space. The dedicated room is not quiet. Staff said the previous quiet space on the 4th floor had worked better.
- The Learning Centre is well liked and well used. Again, it is the computers which are used most.
- The group room is also well used, but is often too big for the number of students using it.

Staff Spaces

- Non-academic offices are generally liked as they are spacious, have practical furniture and good daylight.
- Academic staff are less positive about their offices which they feel are too crowded and have limited workstation space. They feel they do not have enough privacy and are distracted by others.
- There appear to be enough meeting rooms, but they are generally too small for meetings held.

Facilities and Amenities

- The café in the atrium is well liked and gets very busy at certain points of the day, but the system for service appears to work efficiently.
- The tables are not felt to be an ideal size. The bench seating is found to be more flexible.
- Staff do not have a dedicated space for breaks but find they are disturbed by students in the café.
- Corner Lounge design is liked, but it is used less than the café. The tables in the Corner Lounge are felt to be too low to be practical.
- The Corner Lounge is a good spaces for events, such as award presentations and careers fairs.

Technology Provision

- Students prefer the fixed computers to laptops, but say they are not always repaired very quickly.
- Students report that there is a shortage of PCs, however this only appears to be at peak times.
- The WiFi signal is poor and this prevents students from using laptops and other devices effectively.
- The floorboxes are not an effective solution as many are in the wrong location and they break easily.

Facilities Management

Access and Security

- The building is easy to get around and open circulation allows people to orientate themselves. But once in rooms, people feel it is not clear what floor they are on.
- The 3rd floor Disability Officers space is effective, but the location could be more accessible.
- The revolving doors are too heavy for one person, and move too fast when lots of people are using them.
- Students feel safe in the building and like being able to access it 24 hours a day.

Cleaning

- The space is reported to be clean and well maintained.

Handover

- The fire alarm plan was based on inaccurate designs and the system had to be reprogrammed.

Maintenance

- Parts for the air source heat pump could not be sourced so it had to be replaced with a gas boiler.
- The ETFE roof was damaged by birds so a protective cover had to be retrofitted.
- Door access panels burnt out and had to be replaced.
- The cladding is not self-cleaning and has to be jet washed bi-annually.
- Roof capping was not securely fitted when constructed.
- An additional handrail was fitted to the floating staircase for health and safety reasons.

Controls Protocol

- Many of the systems had a closed protocol, with expensive service contracts to maintain them, or limited options to source cost-competitive parts.
- The lift system was expensive to maintain and repair.
- The lighting system service contract was particularly bad value for money so light controls are being replaced.

Catering

- The design of the kitchen and equipment is well liked.
- Only half the kitchen is used by the commercial team.

Comfort

Light

- Light levels are generally good.
- Some blinds do not work so glare cannot be controlled.
- Lighting controls are over complicated and not intuitive

Acoustics

- Acoustics are good in teaching spaces.
- The noise of rain on the ETFE roof can be very loud.
- Noise transfers from the atrium to adjacent spaces, including the Learning Centre.

Thermal Comfort

- Spaces are usually a comfortable temperature.
- Some spaces are cold in winter and warm in summer, particularly the break out area on the third floor.

Heating Strategy

- There are considerable temperature variations in the atrium due to significant stratification of the internal air temperatures.
- This is a result of the atrium, underfloor heating, and ETFE roof solar gains.
- The restriction of temperature outside of core hours, and moderate temperature set points, helps ensure heating is effective.

Energy Profile

Energy Benchmarks

- The building generally performs well, compared with benchmarks for similar buildings.

Heating Energy Demand

- The heating energy demand is low compared to benchmarks, although these are over 10 years old.
- Based on similar buildings, the performance is still good.

Electrical Energy Demand

- The performance is almost a benchmark level, which is very positive.
- This is partly due to a sensible level of ICT provision for an education building and efficient ventilation distribution routes.
- The light fitting replacement is preserving energy efficiency.

Energy Management

- The BMS system does not log energy use recorded by sub-meters.
- The centralised lighting controls system has limited impact and value, due to the LED fixtures minimising the lighting energy use.

Impact

Students

- Students reported that the building has a positive impact upon their formal learning, self-directed learning and overall wellbeing.

Academic and Non-Academic Staff

- Staff reported that the building has a positive impact upon them and their work, but on the whole do not feel that it has much impact on their wellbeing.
- Staff reported a very positive impact of the building on students formal and self-directed learning.

Conclusions and Recommendations

- Conclusions from the post-occupancy evaluation are summarised.
- Recommendations are made for Grimsby Institute in relation to changes that could be made to the existing building to make it more effective.
- Recommendations are also made for future design of further education and higher education buildings.

 University Centre
Grimsby

1. Introduction

Introduction

Ryder Architecture designed a five-storey, higher education building on the existing college site, and it is the flagship building for the institute.

The project value was £9m and was completed in 2011, with an area of 7,100 sqm.

Vision

The vision was to create a dedicated building for higher education students, with fit for purpose teaching and learning spaces. Grimsby Institute were keen to encourage people from the local area to stay in Grimsby to study higher education courses. To do this, they wanted to create a space to differentiate the offer from the further education courses they delivered. It was also intended to inspire further education students to consider higher education courses at Grimsby Institute.

The aim of the new building was not to change the way higher education is taught, but to provide enough space and dedicated facilities that supported how the courses are delivered, and how students learn and engage with the institution.

At the time of the evaluation, there were around 1,300 students enrolled on Higher Education courses and using the building.

Design

The design is a white reflective, monolithic block with deeply grooved and coloured window reveals. The white ceramic cladding of the building's façade was specified to reflect the colours and shapes of the adjacent mature trees.

Accommodation

The accommodation comprised general teaching space, a students' union bar (now the Corner Lounge, a Costa Coffee concession), vocational kitchen and servery (now run by a commercial team), a Learning Centre, media and radio production suites and open IT spaces.

The internal accommodation and primary circulation wrap around a central atrium space which is covered by a curved ETFE roof light, allowing natural daylight to penetrate deep into the building.

The design of Grimsby University Centre commenced in 2009 and was completed on site in 2011. The completed project was built in accordance with the client brief, agreed area schedule and budget. The design team worked to ensure best value was delivered in line with the client requirements, at that point in time, and the design was agreed and signed off, prior to construction, by the client and their advisors.

Inevitably, things change, sometimes very quickly in an education environment. Once in use, the new building has an impact on the occupants and facilitates change, hopefully in a positive way. However, it may also need to adapt to the changing circumstances of educational needs and the organisation.

This report objectively records the findings from users, so lessons can be learned both for the Grimsby Institute University Centre, and on projects going forward.

Post Occupancy Evaluation Methodology

An holistic approach was taken to gather qualitative and quantitative data, and provide both breadth and depth.

Students, teaching staff and support staff who work and learn in the Higher Education building completed questionnaires about the space and attended interviews, discussions and workshops. In total, we gathered feedback from 256 people who use the building.

Evaluation activities included:

1) ***Desktop review*** of documentation including design brief, layout plans, energy data, etc.

2) ***Questionnaires*** were designed for both students and staff. In the questionnaire, they were asked about their perceptions of the design, comfort of the environment and overall impact on teaching and learning. We received responses from 65 members of staff, divided between academic and support staff, and 162 students who are both full time and part time students studying a range of courses.

3) An ***Interview*** was conducted with the Group Director of Corporate Services. He provided us with a high level, strategic understanding of the design process and building in use.

4) ***Student Workshop*** was held with a group of 16 students from Health and Social Care.

5) ***Staff Workshop*** was attended by 10 members of staff, both teaching and support staff.

6) ***Building performance assessment*** was conducted by a building scientist to establish how the facility was performing in terms of building fabric and energy use. The assessment included a walk-through of the spaces, a review of the energy data from the meters, Grimsby Institute records, and energy companies. Key design documents were reviewed and informal discussions held with the estates team and designers.

In this report the key findings of the evaluation are detailed under the headings:

- Building Design and Use
- Facilities Management
- Comfort
- Energy Profile
- Impact

From the evaluation, conclusions and recommendations were developed and are incorporated at the end of the report.



2. Building Design and Use

2.1 Overall Design and Layout

Both students and staff rated the external and internal appearance of the building extremely positively.

Students reported that they like the external appearance of the building, that it is a modern and professional style. Staff are also positive about the external appearance of the building. There were a few comments about the simplicity of the design, with a small number of students and staff reporting that it is a little bland, but overall they like it. Questionnaire responses revealed that 67% of students feel positive when they walk into the building.

From a strategic point of view, it is felt that the building externally could be more striking and iconic. It is not felt that the building reflects the identity of higher education at the Grimsby Institute.

Given its location on the main road, it was seen as an opportunity to advertise and celebrate what they do there. However, Grimsby Institute feel that whilst they got a modern and professional looking building, it is not particularly distinctive from the outside and there are not as many views to the inside of the building as they would have liked, to show off the atrium space.

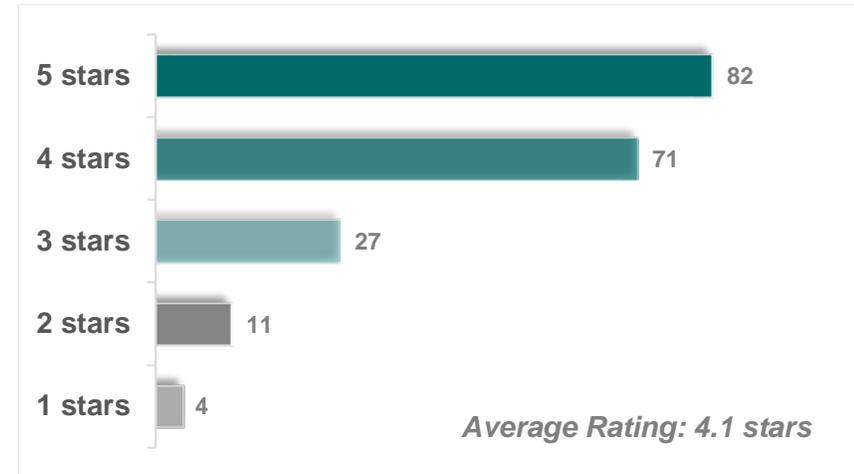
Students reported in workshops that whilst it is nice to have an attractive building, they are more interested in what is on offer internally, and the quality of spaces and facilities.

Internally, the appearance of the building is rated very positively by staff and students. In particular, the atrium is noted as being a great design feature, creating a bright, light and open space at the heart of the building. In workshops, staff and students were very positive about the building overall, and it was mostly attributed to the atrium design.

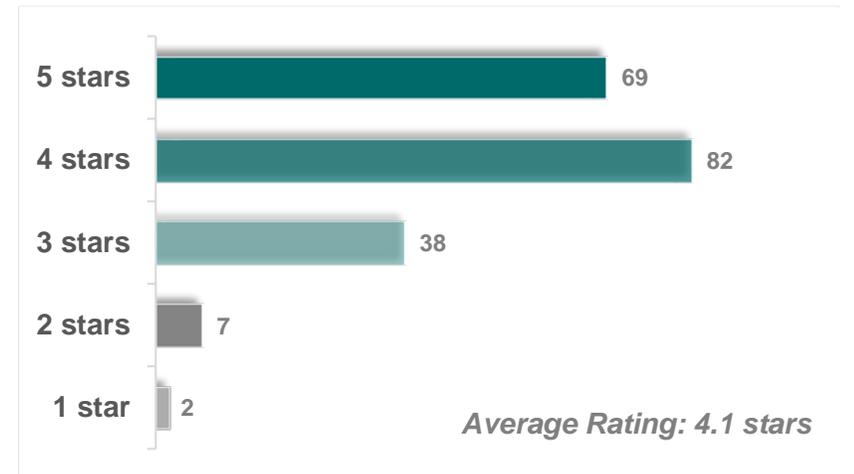
Whilst the overall design of the space is liked, both students and staff reported that they would like more colour or artwork to be incorporated around the atrium, break areas and in learning spaces. It is felt to be a little too clinical. Students, in particular, reported that they would like the design to reflect the work that they do there. They appreciate artwork being displayed, but would also like some representation of other higher education subjects taught in the building. They feel that anyone coming into the building would not know what people are studying there, and that this is a shame.

There were mixed views received about the positivity slogans on the staircase such as “Get fitter and healthier” and “Don’t break your heart, use the stairs”. Some people feel they are positive, but others reported that they are a little patronising, or could make students and staff feel negatively about themselves, particularly if they were disabled and not able to use the stairs.

Students and staff: How would you rate the external appearance of the building?



Students and Staff: How would you rate the internal appearance of the Higher Education building?



2.2 Teaching Spaces

The teaching spaces are rated positively overall in the building, in particular the lecture halls. For the purpose of this report, teaching spaces refer to those in which formal teaching takes place.

In terms of design, the seminar rooms are well liked. The majority are felt to be a good shape, to allow a variety of furniture layouts, and with good levels of light.

However, both students and staff reported that they do not like the smaller seminar rooms (those around 40sqm and below), particularly when there are over 25 students in these spaces. It is reported that these spaces are overcrowded and that there is less flexibility as students cannot change the layout of furniture to suit their needs. Staff also reported that these spaces are not optimal as they are cramped due to the amount of furniture in them. Additionally, they find that they cannot move around the room as easily to work with students, and that they have to stand at an angle to the interactive whiteboard which makes it more difficult to teach, and blocks the view of some students.

The furniture was given a positive rating overall, but it is felt that it could be more flexible. If it was easier to move, and stack, staff feel that they would change the layout of spaces more often, to suit the session they are going to deliver. When students have lectures in the clinical room, they reported that the chairs with a flip-down writing surface are uncomfortable and they would prefer not to have non-practical sessions in these spaces.

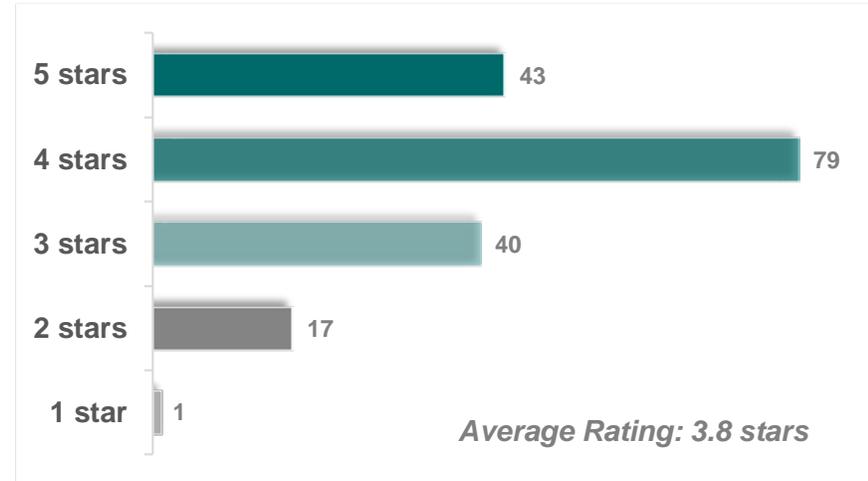
The main issue raised in relation to the furniture was the comfort of the dark grey chairs in seminar rooms and other teaching spaces. Students and staff, in both the questionnaires and workshops, expressed their dissatisfaction with these chairs and reported that they are very uncomfortable, especially after a two-hour lecture. They would ideally like these chairs to be replaced.

Students and staff reported high levels of satisfaction with the lecture theatres in the questionnaires, and this was even more apparent in the workshops. Staff like teaching in the lecture theatres as they feel that they are more comfortable spaces, and are “warmer” than the seminar rooms. The level of natural light is also liked. The design of the furniture is felt to give the space some softer edges, without compromising the practicality which comes from having an orthogonal space. Staff also reported that the design enables them to see all students when they are teaching.

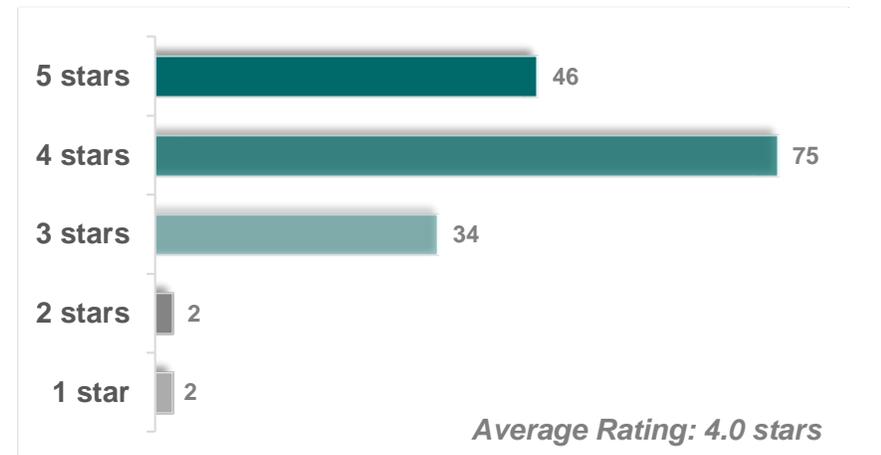
Students like the furniture, which they find comfortable, and said that the tiered seating makes it easier for them all to see the lecturer and screen at the front. They like the bench seating, as they are able to seat more students comfortably.

Students and staff use the lecture theatres for both lectures and seminars, the latter with fewer students, and find that the space is suitable for both uses. They feel that more lecture theatres, of the same design and possibly of different sizes, would have been positive.

Students and staff: How would you rate the seminar rooms?



Students and Staff: How would you rate the lecture theatres?



2.3 Learning and Support Spaces

The practical teaching spaces, including performing arts spaces, art studios and laboratories, were rated positively in the questionnaire by students. Teaching staff were slightly less positive, particularly about the art studio and laboratories. In the workshops, the students and staff were positive about the clinical space for practical sessions, but said that they are not suitable for lectures, which are sometimes scheduled for the space.

The ICT suites were reported to be in high demand. Staff sometimes find that it is difficult to book one of these rooms when they need it, due to demand. Staff reported that the layout could be more effective. The way that the workstations are laid out mean that the space is effectively divided in two, so some students cannot see what they are demonstrating on the board, and they cannot see how students are doing in both halves of the room. However, they feel that it is a useful provision to have.

Students were positive about the ICT suites. They would like more access to the rooms outside of teaching sessions, particularly during the day when they reported that computers in the Learning Centre and breakout spaces are busy.

The learning spaces, outside of the formal teaching spaces, are also rated positively by students and staff.

The breakout spaces, on each floor, are rated positively by students and staff. Observations revealed that they are well used during the day, before 4pm, and that the computer stations, both PCs and Macs, are the most popular.

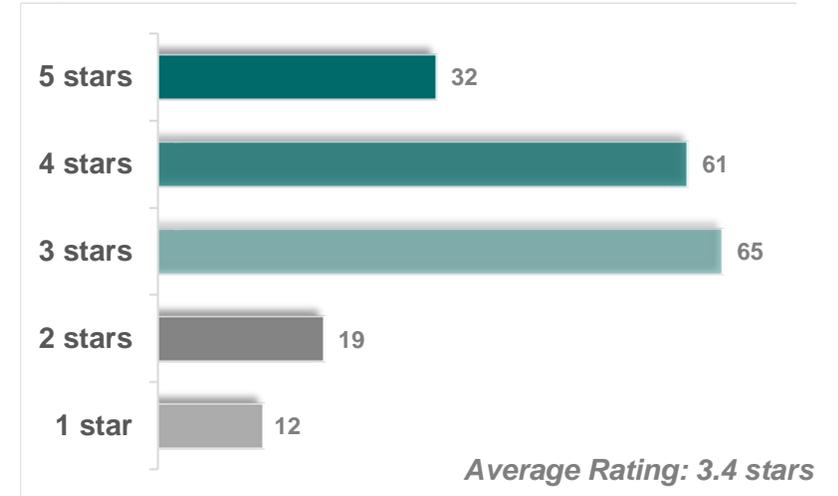
Large groups of students gather in the smaller break areas, on the soft seating, before lectures. Some pairs or small groups of students were observed using the sofas at other times, but they are often empty.

Large benches of desks in break areas are less popular than the PCs and Macs in the same areas. Students said that they would like more furniture in break areas to facilitate group work, preferably groups using a computer.

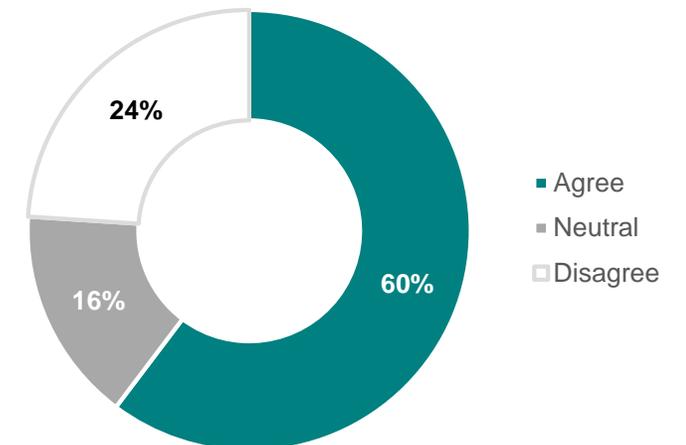
Students reported that the breakout areas are always busy, and that they do not have a preferred area as they just have to find one that is free. Observation studies revealed that there are busy periods during the day, but that by mid-afternoon there are a lot of computers and desks available in each break area.

In the questionnaire, 60% of students reported that they can usually find somewhere quiet to work. However, this means that 40% of students find it difficult to locate quiet space to work. In the workshops, this was reinforced with students requesting more quiet spaces.

Students and Staff: How would you rate the breakout spaces?



Students: Do you agree or disagree that it is easy to find somewhere quiet to work?



2.4 Staff Spaces

A quiet room has recently been reinstated, but staff reported that it is often noisy, and not kept as a quiet space by students. Alternative furniture provision, such as single study booths, with dividers between them, was suggested to encourage individual, focussed and quiet study. Alternatives for semi-private spaces, such as upholstered pods or study booths, had been considered by the Learning Centre staff, to provide more quiet areas for study. Staff reported that the quiet study area, when it was provided on the 4th floor, was very popular and was quiet due to its proximity to offices. It has now been enclosed and is used as a meeting room.

The Learning Centre was rated very positively by students, and they said that they make good use of this space. They reported that the main reason they access the Learning Centre is for the PCs. This was confirmed by Learning Centre staff.

Whilst the layout is liked, students reported that they would like some of the less used areas to become additional computer stations.

Within the Learning Centre is a group room, which is well used. It was felt that it would have been beneficial to have two, or more, smaller spaces that possibly opened up into one larger area. This would have provided more space for groups to meet, and may have reduced the number of groups using the quiet room for discussion. The location of the group room near the staffed reception, and glazed partition walls, means that it is easy for the Learning Centre staff to passively supervise.

Whilst a large number of staff were positive about their office provision, the average rating given to academic offices was 3.1 stars, and for non-academic offices was 3.2 stars.

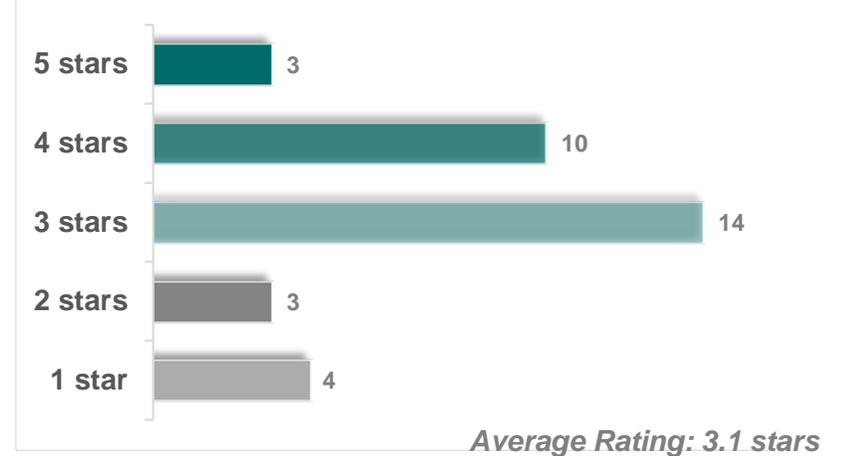
In workshops, non-academic staff were more positive about their office space. They are happy with the size of spaces and amount of light. They like the furniture, including curved desks and comfy chairs. They feel they have enough space to do their jobs effectively.

Academic staff reported that their work bases are too small, and dark. Due to the number of people in their offices, they do not feel that they have enough space, that it is distracting and that there is a lack of privacy.

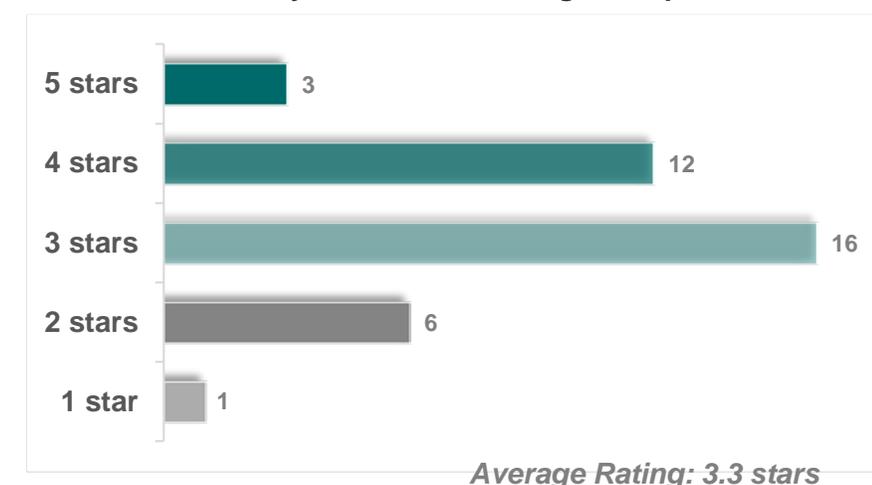
Academic staff said that their workstations are benches, with little room for any papers in addition to their computer, and a lack of leg room. They reported that they do not have enough space to do their work, especially marking. Staff reported that they have limited privacy as they share the office with other teams and a larger number of people than is ideal.

Meeting rooms were given a moderate rating. Staff reported that it is because rooms are the wrong size for meetings held. The 10-12 people meeting rooms are too small for larger meetings, and 3-4 people meeting rooms too small for smaller meetings. The design and furniture in the boardroom is liked, but staff are less positive about furniture and layout of other meeting rooms.

Academic Staff: How would you rate the academic offices?



Staff: How would you rate the meeting room provision?



2.5 Facilities and Amenities

The facilities and amenities were rated positively overall. Both staff and students rate the café provision positively and it is extremely well used. The Corner Lounge, with a Costa coffee concession, was also rated positively, but to a slightly lesser extent than the atrium café.

Students like the café provision, and staff who ran the café reported that they are serving more meals and sandwiches now, than they had since opening.

The main issue that students reported with the café is that it is too busy at peak times. Observation studies revealed that it gets steadily busy from 8.15am through to 9.30am. There is then a quieter period until 10.30am when the café is very busy. It is very busy again from about 11.45am until 1.30pm. Outside of these times, there are always a few tables being used by people having coffee, socialising or working, demonstrating its effectiveness and popularity.

Students and café staff reported that the tables and chairs are not the ideal size. Students usually meet in groups larger than four, so drag chairs over to other tables. It also means that someone eating in the café on their own takes up a whole table, which is an issue when space is at a premium. The bench seating is preferred, as it is felt to be more flexible. Students gathering lots of seats around tables also makes it more difficult for staff to get around the space when delivering food and clearing tables.

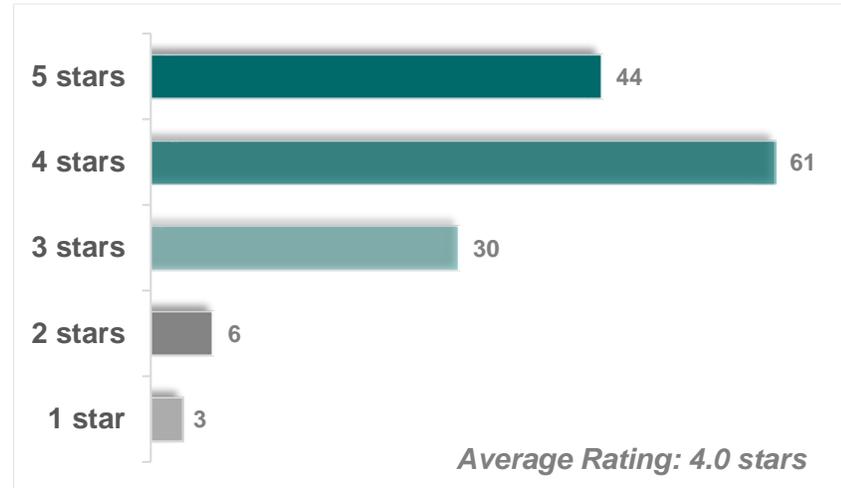
Students reported that the queues can be long and that it can take a long time to get served. Kitchen staff have made some changes, such as delivering food to the tables and installing a second till to process cold and hot food separately. They reported that this has had a positive impact upon service, and made the design work more effectively. Observation studies confirmed that this is the case. However, students reported that the second till is not always open in the morning when it is also busy.

The location and design appears to have had a positive impact upon the range of people using the space. Being so open, and at the heart of the building, means that certain groups of students do not colonise the space, and it is used by all ages and types of students.

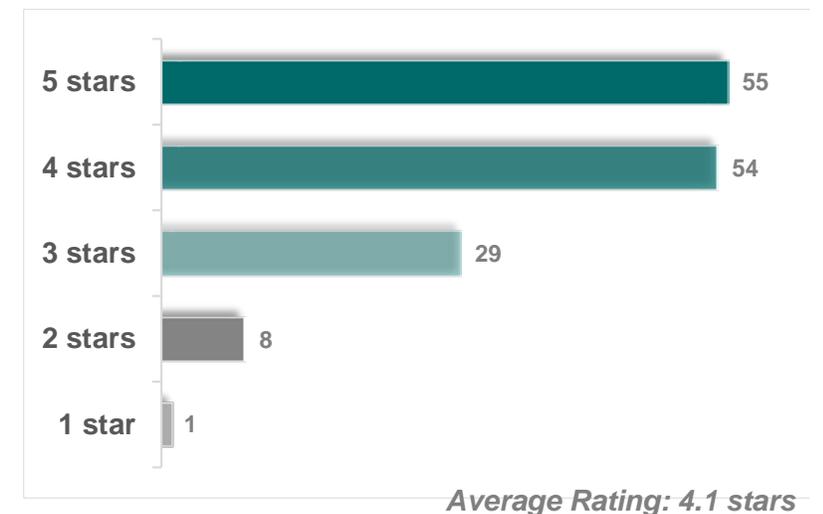
The Corner Lounge is rated highly but is slightly less popular than the atrium. Students suggested that this is mostly because they prefer the food served in the atrium. Bench furniture in this space has been swapped for soft seating and low coffee tables. Students reported that the furniture in the Corner Lounge is comfy, but is starting to look worn. They also feel that some higher tables would encourage them to go in there to work. The lower tables make it difficult to eat food in there, or to make notes or work on a laptop.

Staff reported that they do not use the café or Corner Lounge during their own breaks as they find that they are approached by students too much, so do not get a break from work.

Students: How would you rate the café provision?



Students: How would you rate the Corner Lounge?



2.6 Technology Provision

Students gave technology provision in the Higher Education building a moderately positive rating.

In workshops, students reported that they like the fixed PCs and Macs and that they prefer to work on these, as opposed to laptops. The Learning Centre staff confirmed that they have a stock of laptops, but that they are rarely used as students prefer to use the PCs.

As noted earlier, students reported that there are not always PCs available when they want to use them. From staff reports and observation studies, it appears that the shortage only occurs at peak times of the day, and at certain times of the year, when lots of students have deadlines. Learning Centre staff do log students off if they leave a PC unattended for long periods of time, to allow other students access.

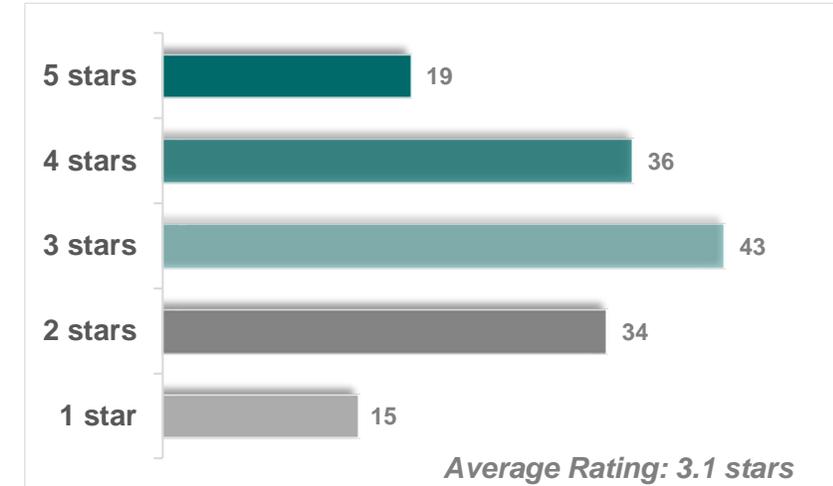
Students are positive about the software provided, but in questionnaires some criticised the speed and age of the computers. Students find that it can sometimes take a while for computers or IT issues to be fixed. This was confirmed by staff in their workshop.

The WiFi provision in the building was rated fairly poorly by both staff and students. They reported that there are areas in the building where there is no WiFi signal at all, and that it is very slow throughout the building. That is one of the main reasons they do not use their own laptops and prefer fixed computers over laptops provided by the Learning Centre.

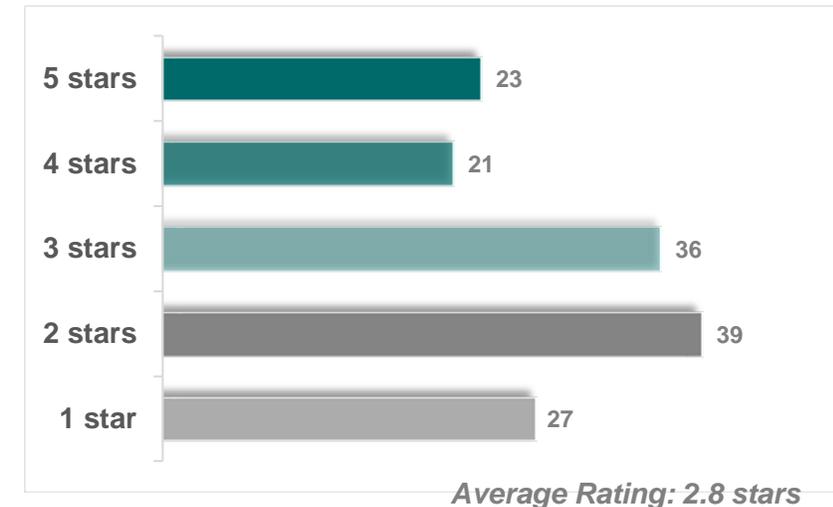
One of the other issues highlighted in relation to technology was the decision to have power supplied via floorboxes as opposed to wall trunking. Whilst the floorboxes were felt to be the most flexible option, in many areas of the building they are in the wrong location. In the Learning Centre there are floorboxes between the bookshelves, where the space is too narrow for a table, so they cannot be used. In other areas, they are too far from desks or workstations so power cables trail across the floor.

In addition, the floorboxes have not proven to be very robust, with parts coming detached easily, and leaving holes in the floor that are trip hazards.

Students: How would you rate technology provision?



Students: How would you rate WiFi provision?



HE Learning Centre

3. Facilities Management

3.1 Access and Security

Access around the building was rated very positively. It is felt that the openness of the environment and signage make it easy for people to orientate themselves within the building. Some of those involved in the evaluation reported that it is not obvious which floor you are on when you are in learning spaces, and that some colour coding or other visual indication would be helpful.

The building is felt to be accessible to all, including those with physical disabilities and those who are visually impaired. There are a small number of height adjustable desks available for wheelchair users.

The room that the Disability Officers are based in is reported to be a good design, with a separate space that can be made in to a comfortable space for one to one conversations. However, its location on the third floor is felt to be less than ideal and makes it less accessible to people, which could discourage them from accessing the provision.

In terms of entering the building, students do not like the revolving doors. They reported that they are too heavy for one person to move, and that they move too fast when it is being used by more than one person. One student said that she had become stuck in the door. Students said that they would have preferred a sliding door.

Students were very positive about how safe they feel in the building. Even when using the building at night, students reported feeling safe as security check their pass to let them in out of hours. They appreciate being able to use the building 24 hours a day. Management feel the design supports them in being able to offer 24 hour access as they can secure teaching areas, whilst allowing students to access the areas they need, including break areas with computers, and the Learning Centre.

3.2 Cleaning

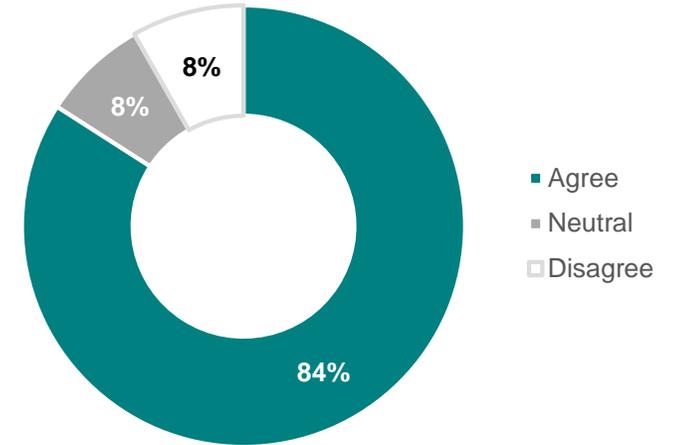
Students and staff are very positive about how clean all areas of the building are, and how well looked after and maintained the building is.

It was reported that the MDF skirtings and railing capping have aged rather quickly, due to the texture of the MDF. It has gathered dirt quickly and is difficult to clean effectively.

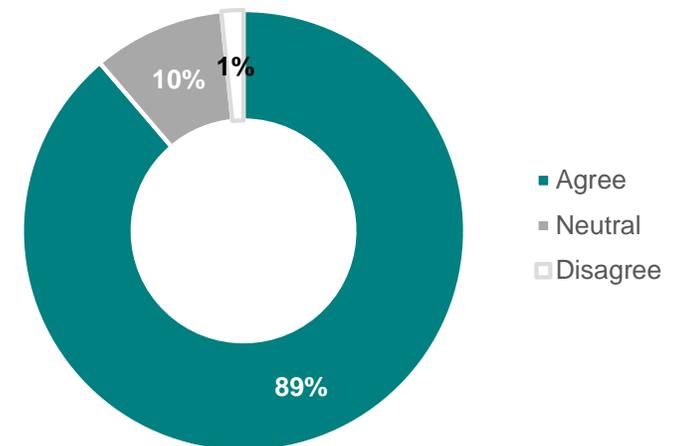
3.3 Handover

The fire alarm system is good, however the room locations were the design room designations, not the final installed design-stage temporary room locations. This meant the fire service could not find the locations of specific faults/alarms, panic alarms and SOS's from refuges. 1,000 device addresses needed to be reprogrammed post-completion.

Students and Staff: Do you agree or disagree that it is easy for everyone to get around the building?



Students and staff: Do you agree or disagree that the Higher Education Centre is clean and well looked after?



3.4 Maintenance

The underfloor heating is limited to the ground floor atrium area and is now served with a gas boiler instead of the air source heat pump originally specified and supplied. The ASHP was a Chinese-made Mitsubishi unit for which the client could not source spare parts. There were no UK or EU suppliers that could service and repair the unit, so it was replaced approximately a year after handover with a gas boiler, as it was easier to repair and manage.

The ETFE roof suffered damage from seagulls and pigeons who pecked holes in the roof, which partially depressurised it and caused it to flatten in windy conditions. The patches cost £1k per patch, when labour and access costs are factored in, though there was some value in multiple patches being carried out in a single repair. However, the patches have not been a permanent fix, as some of the seagulls were pulling at the patches in curiosity. The client had to incur a further £20k upgrade to the roof to install bird protection and prevent further punctures.

The current door access system is closed protocol controls from a single supplier, based in the UK but who acquires parts from China. The boards have physically burned out multiple times, visibly scorched boards were removed and replaced. There is no other supplier these can be purchased from, so the client is locked into paying whatever price the supplier specifies at the time of ordering, and the parts appear to be cheap and poor quality.

The external cladding was sold as “self-cleaning”, however the building needs to be jet-washed every two years to remove green algae that has grown on the north façade, and dirt that has acquired elsewhere. When the supplier was contacted to discuss the cleaning, they confirmed that “self-cleaning” did not actually mean it would not have to be actively cleaned. This is a failure of marketing communication on the part of the supplier.

The roof parapet capping blew off after two years and was hanging from the façade until it could be repaired. This was a detailing / construction issue as there were a minimal number of fixings and the capping was vulnerable to winds getting underneath the sheet metal.

Internally, there are some minor cracks in plasterboard joints where the final finishes are not holding up well. Some of the beading was not overlapped with the plasterboard edges, and other junctions appear not to have been taped properly. That has caused some significant settling cracks in certain locations.

For health and safety reasons, the floating metal staircase required an additional handrail to be installed on the inside of the stair. This was to limit how close users can get to the central pillar, as the internal tread width is narrow and steep.

3.5 Controls Protocol

Controls are commonly categorised into “closed” and “open” protocols, which describe their ability to be accessed, modified and maintained by non-proprietary trades people and technology. Closed protocols requires the equipment be maintained with proprietary equipment and software by specialised engineers, not framework electricians or engineers. Open protocols can be maintained by any engineer or electrician, and more easily integrate with other technologies.

In the case of the Higher Education building, the majority of building controls are closed protocols which has locked Grimsby Institute into paying for expensive service contracts, or having to completely replace systems as they break down or fault. This is because the payback of maintenance call-out charges are higher than the cost of replacing the systems with generic alternatives.

Comey lifts are closed control protocols, and require an expensive service contract to maintain and repair, and limit market options for replacement. The revolving door is also closed control protocol, and the service contract is £2k per repair, in addition to the annual service contract.

One of the faults was causing the leaves to fold as if in fire-alarm mode, which was determined to be a fault with the controller circuit board. This could not be replaced with another supplier’s board and the cost of replacement was £1,800 for a new board.

There are other supplier options which have open protocols, do not have service contracts and have more generic components which can be sourced from multiple suppliers, enabling competitive pricing.

The lighting is a closed protocol, fully-integrated system which is tied back to the central BMS system. Each lamp has a controller, but framework electricians cannot repair or replace the controllers without disrupting the entire system. The supplier gave the framework electricians some training but not enough to repair the system without invalidating the warranty, leaving the Grimsby Institute locked into using the supplier as the sole viable repair contractor.

The lighting supplier has a minimum £500 call out charge for a 4-hour callout, framework contractors have a much lower callout charge, and there is no guarantee the supplier will be able to repair or replace a faulty unit during a single call-out.

The controllers cost £900 per replacement. For an 10W LED fixture with a 3W controller, the cost of supplying electricity to a single unit is approximately £5 per year. Thus, it is more financially viable to completely replace broken lighting units and/or controls with non-proprietary LED lighting and off-the-shelf PIR and daylighting controls, than it is to maintain the fully integrated system, as the payback for a single £1,400 repair is approximately 280 years.

3.6 Procurement Impacts

Both the controls and building services packages were design/build by the installers. There are several risks to this approach, which appear to have materialised within this building.

Firstly, a D&B M&E supplier has little motivation to design material-efficient services, such as minimising duct runs, or designing compact servicing strategies. It is always important to highlight this to clients who choose a D&B procurement method so they can ensure adequate quality oversight of the design, to provide the client with good value for money.

Secondly, many controls suppliers have been transitioning to product-as-service business models rather than supply-only business models. As a result, they sell the equipment at a very low capital cost, using closed protocol controls. This limits use by the end user and locks the owner into expensive service contracts. For the supplier, this enables them to secure long-term revenue from the initial sale. It is a fairly difficult to protect a client from movement to closed-protocol controls during value engineering exercises, as the capital costs of such systems are almost always substantially lower cost than the open-protocol alternatives.

3.7 Catering

The commercial team who run the café are positive about the space that they have, in terms of service, seating and the kitchen area.

The kitchen is too large for them. It was originally designed as a vocational kitchen and it was anticipated that Further Education students from the college would provide the catering for the Higher Education students and staff. As a result, the kitchen is much bigger than would have been designed to cater for the number of students that it does.

However, due to high demand, it was not felt to be a good solution in practice, so a commercial team were brought in to run the café. They only use half of the kitchen space. The rest is rarely utilised.

Staff feel that all the equipment that they require is provided within the kitchen and are very happy with the design overall. Staff feel that a larger dishwasher, or one with a faster cycle, would help them cope with the amount of tableware and cooking utensils used. The kitchen sinks that staff use for washing up are a little low for staff and put a strain on their backs.

Staff also report that storage is limited. They have enough for their needs, but if the amount of food they serve is to increase, or the full capacity of the kitchen was being used, they would need more storage.



4. Comfort

4.1 Light

The light levels overall are reported to be comfortable. However, there are a small number of areas which are felt to be lacking in daylight, such as staff offices and the smaller seminar rooms.

The large windows can lead to glare, and where there are functioning blinds, it can be controlled. However, staff reported that in some lecture theatres there are no blinds and in other spaces the blinds do not work, i.e. the blinds in the Learning Centre.

Users reported some issues with lighting control. In some spaces the lighting is movement sensor controlled. If people are not very active when working, the lights can go out. Users then have to get up and walk to the switch to turn the lights back on.

In teaching spaces, the lighting controls have overlapping zone controls, meaning that the same bank of lights may be controlled by two separate switches. In a lecture theatre, for example, there are three rows of lights and three switches. But rather than each switch controlling each row of lights separately, one switch controls the back row of lights, while one switch controls the front row and the other switch controls the front row AND the middle row. The middle row cannot be controlled independently. Users find it unnecessarily complicated and counter-intuitive.

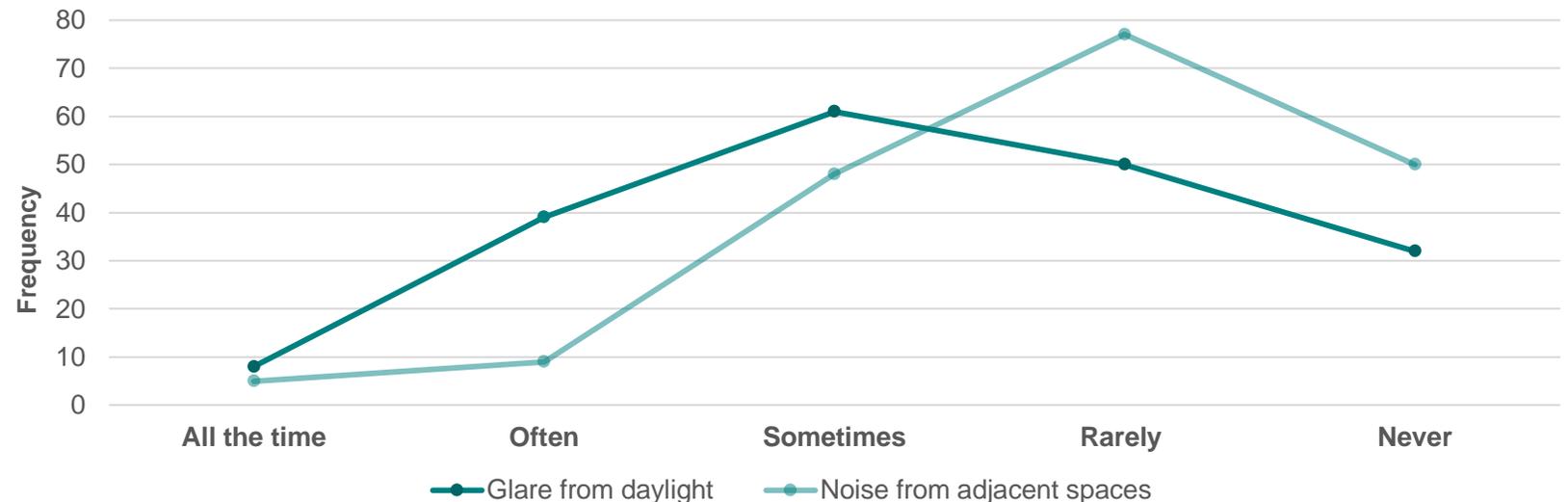
4.2 Acoustics

Overall, staff and students report that noise from outside does not really permeate the building, and that there are rarely issues with noise transfer between teaching spaces. In teaching spaces, acoustics are reported to be good. Students can clearly hear lecturers, even in the larger spaces.

There were two issues highlighted in relation to noise. The first issue reported is the noise generated by the ETFE roof when it rains. Staff and students report that it is so loud they cannot concentrate in the atrium or open spaces adjacent to the atrium, and that there is nothing they can do to reduce the impact of the noise.

The second issue is the noise from the atrium permeating adjacent spaces, particularly the Learning Centre which opens directly onto the atrium. Furthermore, the Learning Centre is open across all three floors of the building that it occupies. The mezzanine floor in particular is reported to be a noisy space as people use it as a thoroughfare to get from one side of the building to the other. The combination of these factors means that no open areas of the Learning Centre work as designated quiet areas.

Students and staff: How often do you experience the following?



4.3 Thermal Comfort

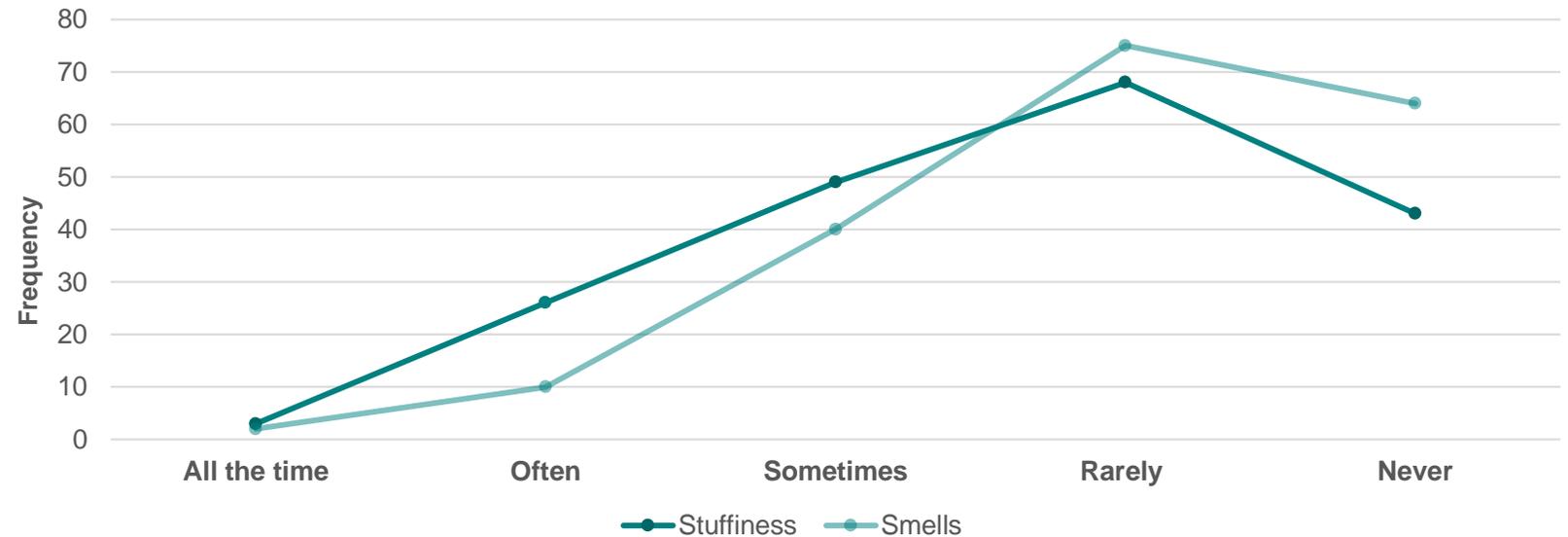
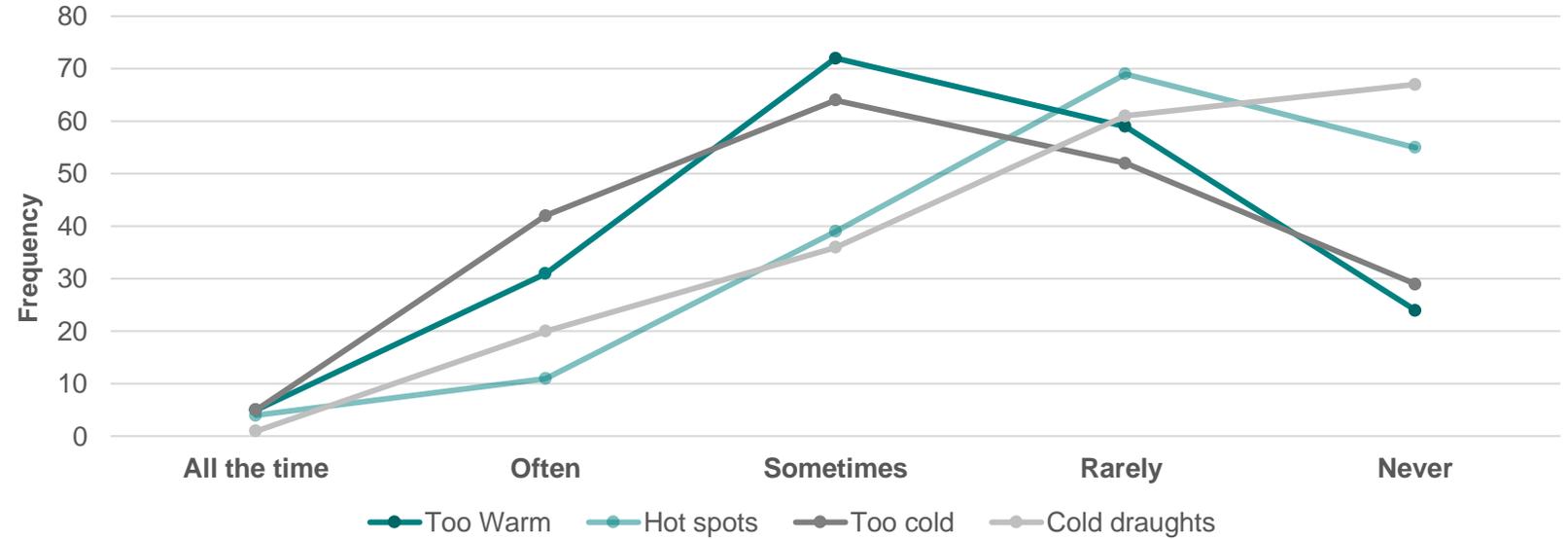
Overall, students and staff feel that the building is a comfortable temperature. The majority reported that the space being too warm or too cold only happens sometimes or rarely. Whilst there are no hot spots or cold draughts reported, there are areas that can become too cold or too warm, depending on the weather.

The break out area on the third floor is liked as it is a bright space. However, it's location adjacent to the atrium and the ETFE roof means that it is very cold in winter months and very warm in summer months. People also reported that the building becomes noticeably cooler in the evenings or at weekends.

Staff in the kitchen reported that, due to the large windows, the space is cold in winter and warm in summer. To prevent these fluctuations in temperature, the staff pull the blinds down. However, this means that they do not have as much natural light in the space, which they miss.

Students and staff report that there are rarely issues with unpleasant smells in the building, or stuffiness. They are happy with the ventilation and air freshness in the building, despite it being mechanically rather than naturally ventilated.

Students and staff: How often do you experience the following?



4.4 Heating Strategy

The building is serviced with a gas-fired, pre-heat air supply system with heat recovery and active cooling. It is effectively an MVHR system, plus cooling, using 5AHUs mounted on the top floor of the building.

The building has no operable windows and relies solely on active air handling for ventilation, and most heating and comfort cooling demands, with the exception of underfloor heating in the atrium space and ASHP supplying heat to the Corner Lounge on the ground floor.

There are considerable temperature control issues with the open-plan spaces adjacent to the atrium. This is due to significant stratification of the internal air temperatures as a result of the atrium, underfloor heating, and ETFE roof. The third floor spaces can exceed 35°C in summer, which causes issues in the open breakout spaces.

There is no solar control on the ETFE roof, leading to significant solar gains across the full length and width of the atrium, which combines with the warm air rising up the atrium from the lower floors. The extract at the top of the atrium is only a small portion of the visible grilles on two of the four façades, as the other grilles are part of the fire control strategy for emergency smoke extract.

Atriums are quite complex thermodynamic building features which require quite careful balancing of heat loads, control and ventilation to ensure comfortable conditions throughout the atrium-adjacent spaces.

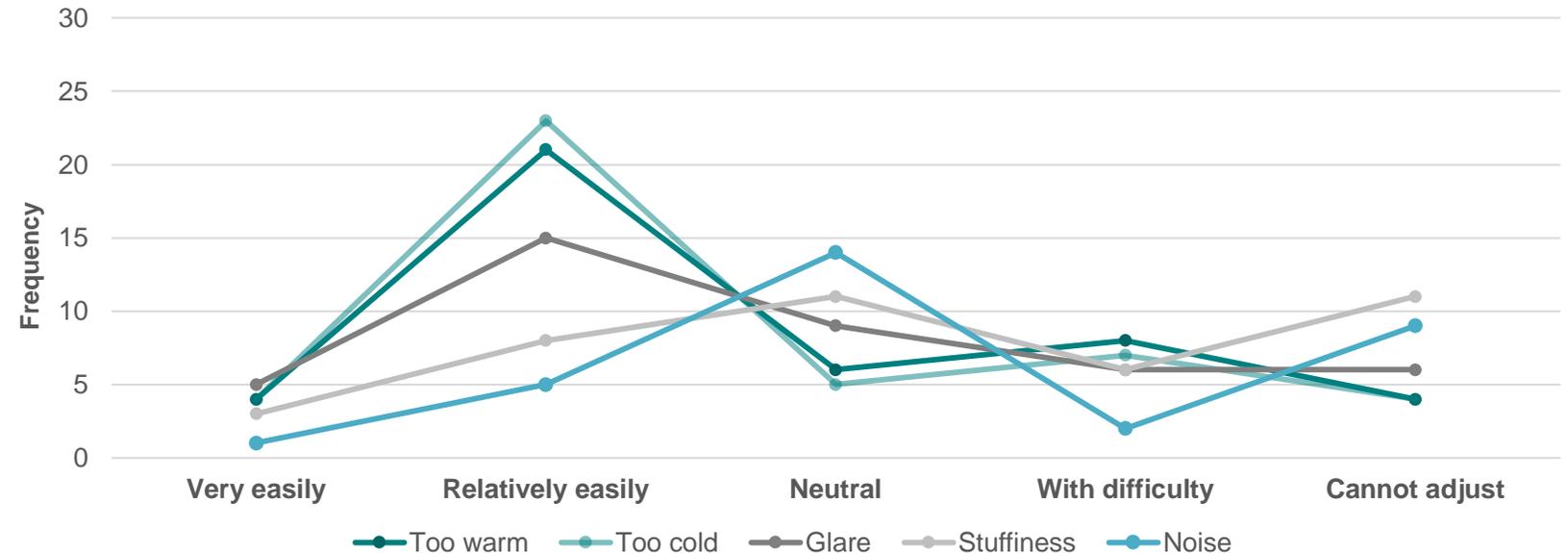
In the case of this atrium, the ETFE roof leads to a substantial solar gain load to the building. In the case of summer conditions, the roof creates a greenhouse effect in the upper floors with only four or five extract vents at the top level to provide comfort cooling extraction, and this has proved inadequate.

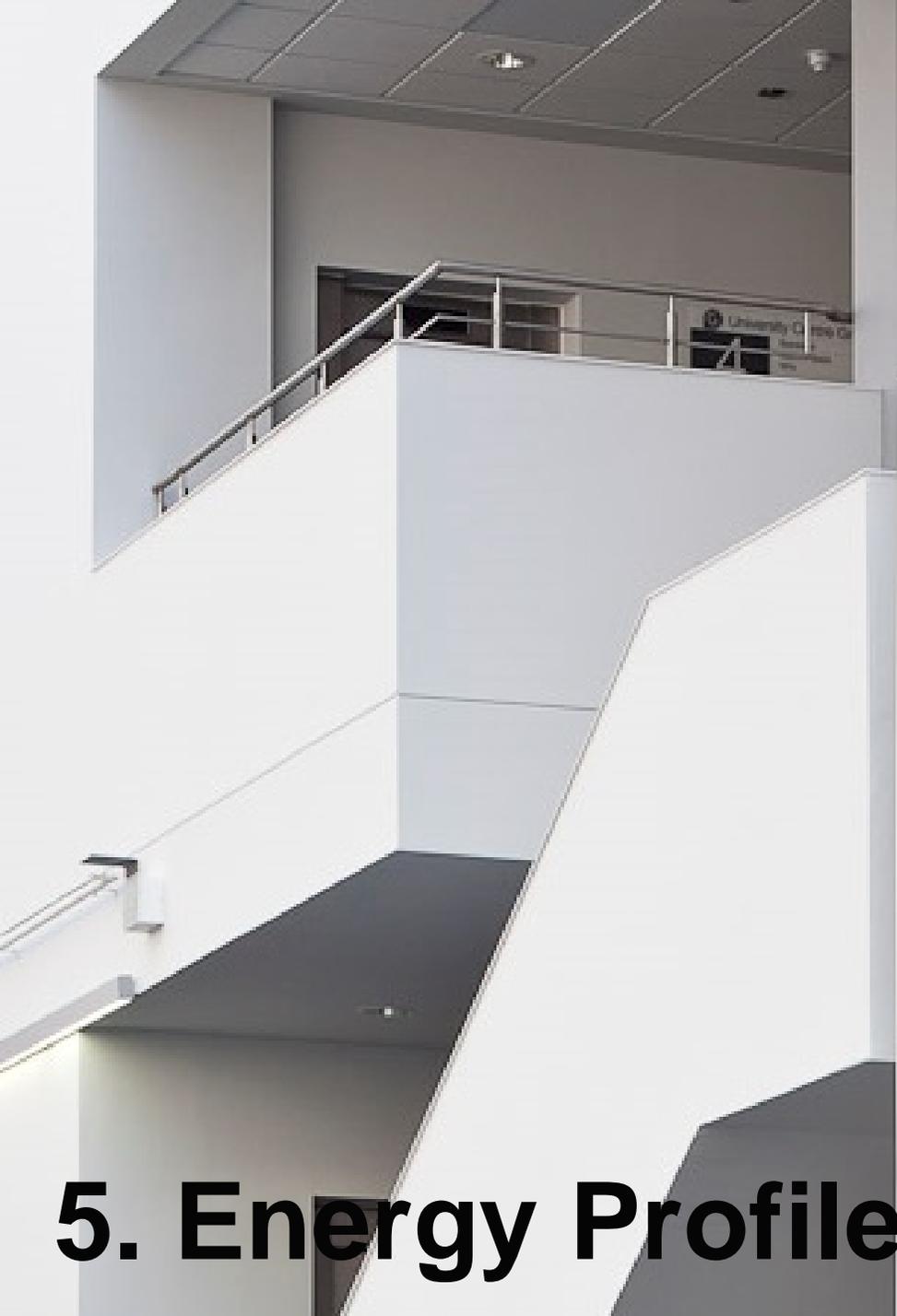
The building is open 24 hours a day, 7 days a week, however Grimsby Institute heats and conditions the building quite sensibly, and restricts the hours of servicing to core hours, 7am-4:30pm, on weekdays only, with the services largely powered down at holidays.

Building users are advised to wear coats and jumpers out of hours, if they are cold. The building is reported to hold its temperature fairly well out of hours. This is a very sensible approach to operating a building, with this type of occupancy, to minimise extraneous energy use.

The set points with the key spaces also seem to be sensible, with the library set at 19°C and most of the teaching spaces set at 18°C. The atrium space has a higher set point of 21.5°C to compensate for the vertical heat loss.

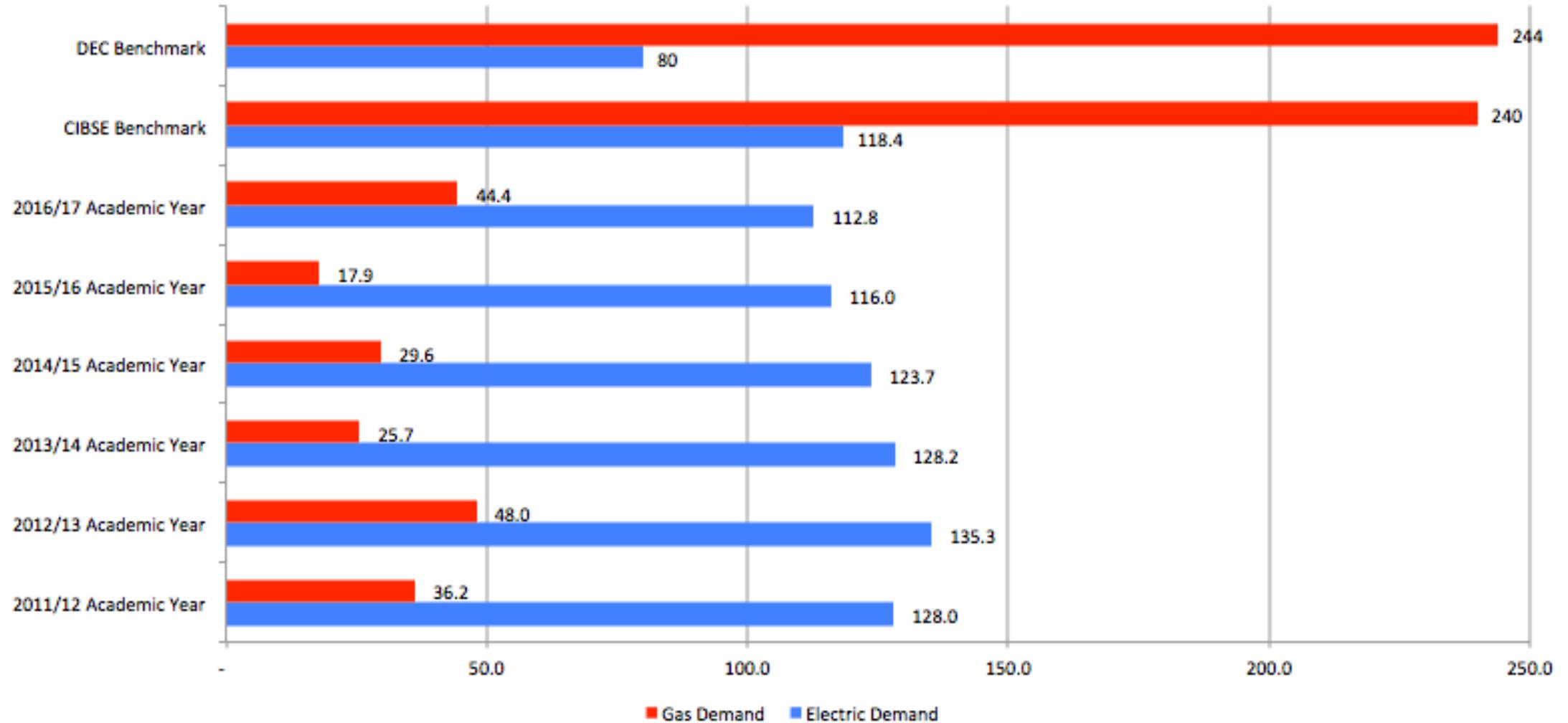
Staff: How easy do you find it to make adjustments when you have issues with the following?





5. Energy Profile

5.1 Energy Benchmarks



5.2 Heat Energy Demand

The heat energy demand of the building is exceptionally low compared with the published benchmark values. This is due in part to benchmark values being somewhat historic given that it is 10 years since their publication, and they are based on data which is even older. Buildings have generally become significantly more airtight, and better insulated, in the past 10 years.

However, even with incremental improvements to building fabric in the UK, the Higher Education building at Grimsby Institute is still performing very well.

This can partly be attributed to the choice of servicing, using a flywheel MVHR system versus natural ventilation or VAV. It is also partly due to the control and management of the building such as restricting the hours of operation of the heating and ventilation and asking students and staff to be prepared to wear a jumper if they are using the building out of core hours. This is a management opportunity which is often missed with University buildings that similarly have 24/7 access.

The building compliance report notes the final airtightness to be measured at $7.91\text{m}^3/(\text{h}\cdot\text{m}^2)\text{@}50\text{Pa}$. To get maximum efficiency out of the MVHR, an airtightness of less than 5 is normally recommended, however the performance of the building is generally quite good regardless.

5.3 Electrical Energy Demand

The electric energy demand almost achieves the benchmark. This is positive as electrical energy demand is the most difficult to control and predict in modern buildings due to the high amount of unregulated energy demands (servers, ICT, small power, etc.). Furthermore, the energy use has been progressively decreasing as the operation of the building has refined itself through learning controls, and responsive management changes since opening several years ago.

The building has a sensible amount of ICT for a higher education building, without creating unnecessary complexity through excessive technology.

The ventilation layouts provided in the design documents appear to have some inefficient distribution, which would increase the total fan power required for the ventilation system, though it is unclear whether the design matches the final installation, due to the installer ceasing to trade before completing as-built documents. The final installation may indeed be more efficient than the drawings indicate.

The current lighting is relatively efficient, being a combination of high efficiency fluorescents and LEDs. There were some notable areas where the zoning of the light controls were counter-intuitive, such as where some rows of lights were controlled by multiple switches in a single lecture hall.

Whilst the lighting is being changed when failures occur, so the client can de-tether themselves from the expensive service contract of the centralised control system, this does not appear to be impacting the overall energy use of the building as lighting is getting progressively more efficient. Furthermore, the nature of the replacements, one PIR occupancy sensor and daylight sensor for each bank of replacement lighting, may in fact reduce the overall parasitic load of the controls system on the electrical demand. This will further reduce both the operational costs and electrical demand, as well as the maintenance and management costs.

The catering demand is relatively small, due to the fairly modest amount of cooking undertaken to run the café.

5.4 Energy Management

The BMS was not set up to log energy data from sub-meters, so no breakdown of sub-uses could be easily determined. However, the majority of BMS data logging tends to be incorrect, so this should not be considered a critical loss of data due to specification, as it is unlikely a data-logging BMS setup would have produced reliable data.

It was noted the DEC incorrectly designated the building as naturally ventilated, when it does not have any operable windows.



6. Impact

6.1 Students

Students reported a positive impact of the building on their learning, and their wellbeing.

71% of students who responded to the questionnaire reported that the design of the building has a positive, or very positive, impact upon their concentration in lectures.

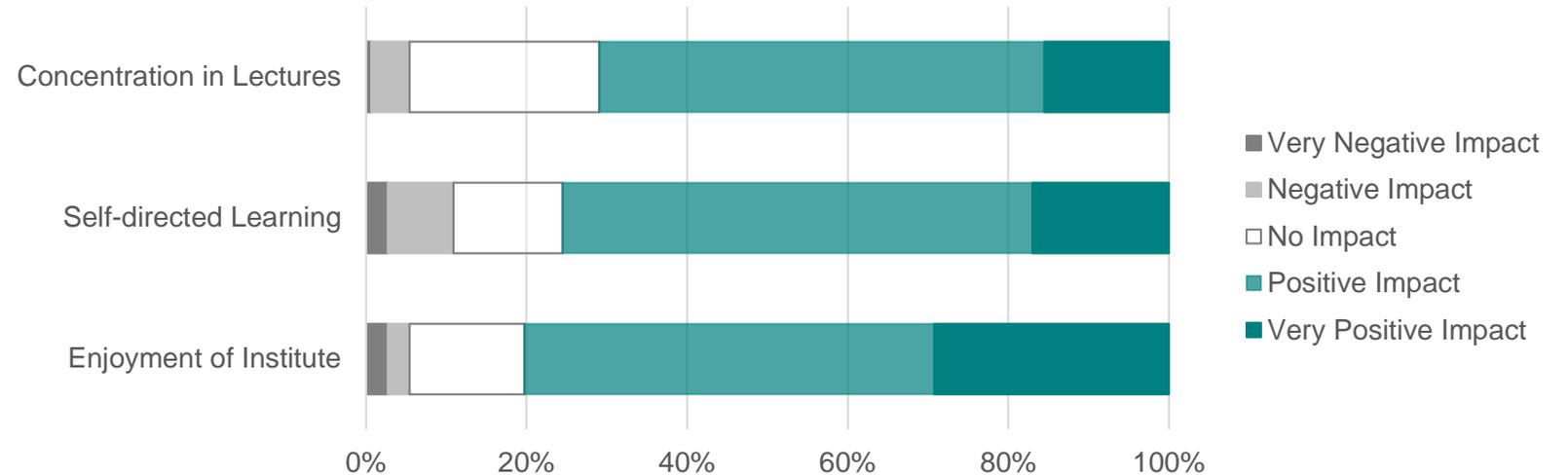
Although some issues with teaching spaces were noted, students feel that the formal teaching spaces, especially lecture theatres, are conducive to learning and help them to concentrate.

Students are also very positive about the impact of the building on self-directed learning, with 76% of students reporting that the building has a positive or very positive impact on their ability to undertake self-directed learning.

Students are very positive about the break out spaces and Learning Centre. Their main issue is that they would like these spaces, particularly the PCs, to be more available. They also feel that a quiet space, which was kept quiet, would help with their self-directed study.

In terms of wellbeing, students are particularly positive about the impact of the building on how much they enjoy coming to Grimsby Institute. 80% of students reported that the building has a positive, or very positive impact upon their enjoyment of being in the Higher Education building.

Students: What is the impact of the design of the Higher Education building?



Students on the whole like the building, and enjoy spending time there. Over half of students said that they often stay in the building to do work, and over half also said that they remain in the building to socialise with friends before, between or after lectures.

Highest use of the building tends to be between 8am and 4pm, but students really appreciate the ability to be able to use the facilities within the building at times that suit them, because it is open 24 hours a day, 7 days a week.

The building is reported to make people feel safe, and that it is easily accessible. Both of these factors affect wellbeing. The majority of students reported that the building helps to create a sense of community and that they feel good walking into the building in a morning.

6.2 Academic and Non-Academic Staff

Academic and non-academic staff reported being positive about the impact of the building, particularly on the student experience.

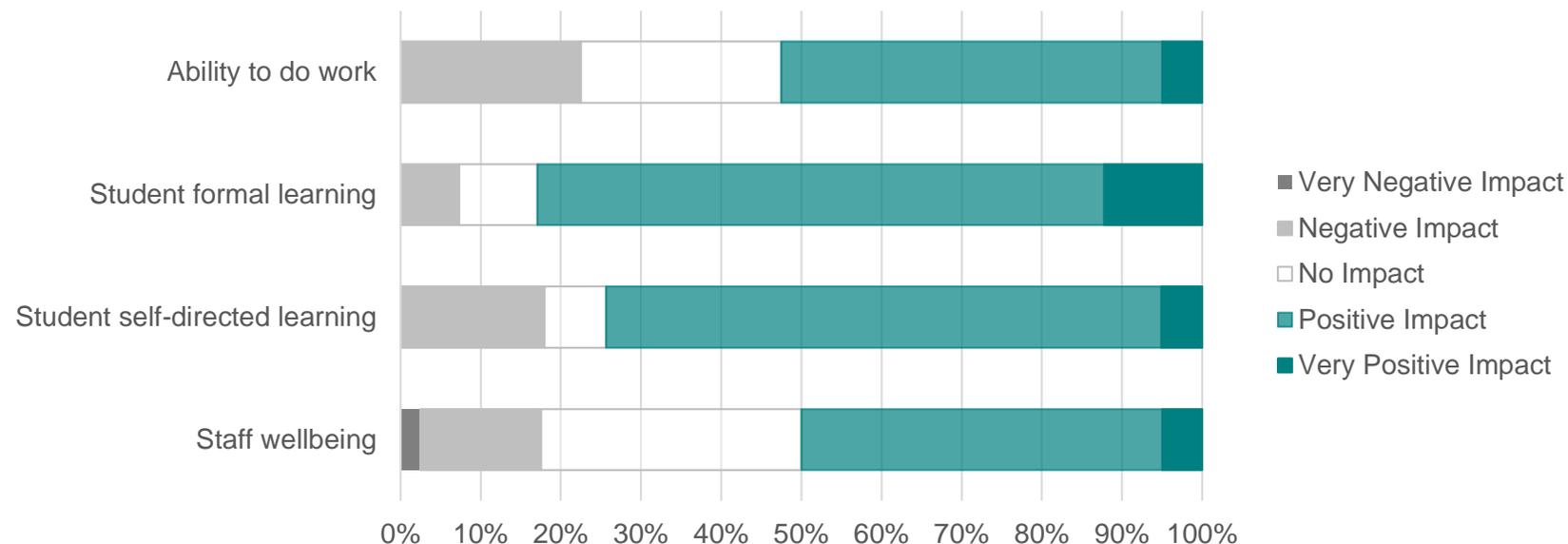
Over 80% of staff reported that they think the building has a positive impact upon student's formal learning. They feel that the facilities meet their needs and that teaching spaces support learning. The main issue reported by staff is availability of appropriate spaces, but they are positive about the spaces themselves. Like the students, they particularly like the lecture theatres and feel that they have a very positive impact upon learning due to their design.

Staff are also positive about the impact of the building on learning outside of lectures or formal taught sessions, with 74% of staff questionnaire respondents saying the building facilitates self-directed learning.

Staff feel that the break out spaces are positive places for students to learn and that there is a lot of space around the building for students to use. It is only certain times of the day, or the year, that there is a shortage of space. Staff also reported that quiet areas do exist, but the way students use them means that they are not quiet.

Staff are very positive about the sense of community facilitated by the building, and 65% of staff said that they enjoy working or teaching in the building.

Staff: What is the impact of the design of the Higher Education building?



Staff are slightly less optimistic about the impact of the building on their ability to complete their job, but over half of staff still reported a positive impact. The main reason for the building not supporting their way of working can be attributed to the issues reported with space, distractions and a lack of privacy in staff offices. Overall, staff like the teaching spaces.

Around half the staff from the evaluation reported that the building has a positive impact upon their own wellbeing. Only a small number of staff reported a negative impact upon their wellbeing, which can be attributed to some of the issues raised

A large proportion, 33%, did not feel that the building had any impact, and that other factors relating to their job are more influential. Often when a building or space is working effectively, people do not recognise a positive impact because it is more difficult to appreciate than a negative impact.



7. Conclusions and Recommendations

7.1 Conclusions

The Higher Education building at Grimsby Institute is well liked by academic staff, non-academic staff and students. They rated almost all aspects of the building and facilities positively.

Both students and staff report that the building has a positive impact upon their learning, work and wellbeing.

Students and staff are positive about the way the building looks, although it was not felt to reflect the identity of the Higher Education offer at Grimsby Institute.

Formal teaching spaces are well liked, especially lecture theatres, but some seminar rooms are too small.

The break out spaces and Learning Centre are both well liked, and the PCs are particularly popular. But students feel that computers are not always available and that there is limited quiet space to work.

Non-academic staff like their office provision due to the size, daylight and furniture. Academic staff reported that their offices are too crowded and that their desk area is too small.

The Café in the atrium is well liked and it gets busy at peak times. Students move chairs around as the groups eating were bigger or smaller than the 4 person tables. The Corner Lounge is liked, but used less due to the different food offer and tables being too low.

Technology is liked and fixed computers are popular. The WiFi coverage is not rated positively. Floorboxes are also felt to have been ineffective in practice.

Users find the building accessible but the revolving doors to enter the building are not liked. Students feel safe in the building and like 24hour access.

The building is felt to be clean and well looked after. There are some maintenance issues highlighted such as systems having to be replaced when parts cannot be sourced, damage to the ETFE roof, and “self-cleaning” cladding having to be actively cleaned. A handrail was fitted to the feature floating staircase for health and safety reasons.

The controls protocol is an issue as most systems are proprietary (closed protocol), requiring specialist engineers to work on them and specialist parts for repairs.

The kitchen design was rated positively. However, only half of the kitchen is being used.

The light levels were generally reported to be good but lighting controls are felt to be less than optimal.

Acoustics are good in teaching spaces, but there are issues with noise from the ETFE roof and noise transference from the atrium space, particularly into the Learning Centre.

Overall, the temperature is felt to be comfortable. Some spaces, particularly the break area on the third floor, get cold in winter and warm in summer due to the atrium design and solar gain via ETFE roof.

The heat energy demand is low compared to benchmarks. The restriction of the temperature out of hours and relatively low set points are effective.

The electrical energy use is close to industry benchmarks, which is very positive. Mostly due to appropriate amount of ICT and efficient systems and efficient light fittings being installed.

7.2 Recommendations for Grimsby Institute

These are things that Grimsby Institute could consider, or are considering, to tackle the small number of issues identified with the building and operation. We are aware that they are already actioning some of these recommendations.

Building Design and Use

1. The overall appearance of the building is well liked, but students and staff report that they would like more colour internally, preferably artwork or displays that highlight and celebrate the work done on Higher Education courses.
2. Review approach to booking of rooms to ensure that larger groups of students are not allocated a smaller seminar room, and to limit the number of lectures taking place in practical or clinical rooms.
3. Consider options to change the layout of the ICT rooms to allow staff to see all students' screens and make it easier for students to see the whiteboard.
4. Consider the replacement of seminar chairs, which are very unpopular with students, possibly through a rolling replacement programme.
5. Review opportunities to incorporate more PCs in break areas and the Learning Centre, or allowing access to select ICT suites at peak times of the day and year.
6. Consider opportunity to provide quiet space in an area that is easy for staff to monitor and / or contains furniture which promotes individual work, such as study booths.

7. Review allocation of academic offices and whether they could be sub-divided to reduce issues with distractions and privacy.

8. Think about changing some of the furniture in the café to incorporate more bench seating, in place of some of the chairs and tables, to increase efficiency, and incorporate some higher tables in the Corner Lounge.

9. Determine whether WiFi signal could be improved to enable greater use of laptops and students own devices.

10. Ascertain whether floorboxes could be relocated to make them more accessible, particularly in the Learning Centre.

Facilities Management

1. Consider providing some indication within teaching spaces of the floor they are on, such as colour coding.
2. Review location of Disability Office, and whether there is a more accessible location for it within the building.
3. Review service contracts, and opportunity to replace systems or fittings, where the contract is not good value for money.
4. Ensure new systems installed have open protocols as opposed to closed protocols to allow for easier maintenance.
5. Review use of kitchen and whether the half not being utilised could be repurposed and review dishwashing provision (sinks and dishwasher) to determine if it could be more effective.

Comfort

1. Determine whether lighting controls can be made more user friendly, with switches that intuitively link to banks of lights and motion sensors which turn lights back on, rather than people having to physically go to the switch on the wall.

Energy Profile

1. The current operation of the heating system is generally working well and efficiently, so no major changes are recommended.
2. Continue to review and monitor heating and electrical energy demands to ensure the building is operating efficiently in relation to appropriate benchmarks.

7.3 Recommendations for Future Design

Future design recommendations are made, not for the Higher Education building at Grimsby Institute, but to inform future designs of further and higher education environments, including those at Grimsby Institute. Recommendations have been based on aspects of the Grimsby Institute project which contributed to its success, and areas where some lessons were learnt.

Building Design and Use

1. Consider how well the building reflects the identity of the institution, both internally and externally.
2. Provide opportunities for the display of art or work within and around the building.
3. Design teaching spaces that are orthogonal to allow for optimum flexibility as it is easier to reconfigure furniture in square or rectangular spaces.
4. Fully understand the combination of teaching spaces required and incorporate spaces that are the right mix of sizes and styles. Note that the lecture theatre space was the most preferred teaching space in the building we evaluated.
5. When specifying furniture, ensure that it is comfortable for people sitting on it for long periods of time.
6. Ensure the layout of spaces enable lecturers to see all students, and that all students can see the board, especially when there are physical barriers such as in an ICT suite.

7. Ensure that break out spaces are flexible to allow for different uses and furniture layouts. Then group tables, individual tables and PCs can be increased or decreased as required, on a short, medium and long term basis.

8. When providing quiet spaces, ensure that the furniture encourages individual, focussed working and that the space can be passively supervised by staff so it remains quiet.

9. Consider how a sense of openness can be provided within a Learning Centre, without the space actually being open as this can lead to higher noise levels than desired and no opportunity to designate quiet areas within the space.

10. Keep circulation spaces and informal learning spaces separate. Consider whether spaces will be used as thoroughfares due to their location, and the impact that this will have on people trying to study there.

11. Understand how staff will use their workbases, and that they often need to facilitate staff preparing for lectures and marking, as well as departmental discussions and space for staff to take a break. Segregated break and work areas may be more effective, or smaller staff offices.

12. Work with the client to determine the mix and size of meeting rooms required to facilitate meetings that they have.

13. In café areas, provide a mix of seating. Bench seating can be efficient as it can accommodate a range of group sizes, from a person on their own through to large groups of students. Tables and chairs and soft seating are also positive to facilitate conversation and encourage people to use the space for meetings beyond lunch and break times.

14. Review how WiFi signal can be maximised by a design.

15. Work with the client to establish their needs for power and data and find the most appropriate and flexible solution. Floorboxes had not been found to be effective in this building.

Facilities Management

1. Ensure the layout of the building is easy to read, and that it is easy for people of all abilities to access.

2. Where 24 hour access is to be provided, consider how this can be supported by the design so areas can be secured and users of the building feel safe out of hours.

3. Revolving doors are often unpopular, especially if there are lots of people accessing and exiting the building at the same time. Consider other options that will be more user friendly but also allow the internal temperature to be maintained.

4. When specifying systems and FF&E consider how repairs can be made and where parts will need to be sourced from so that the client can develop an accurate building management plan and realistic lifecycle costs.

5. ETFE roofs can be damaged by birds, so protection should be specified, particularly if the building is in an area where there are lots of birds, especially seagulls.

6. When finishes are specified as “self-cleaning” or similar, ensure that the client is aware of what this means in reality so they can plan effectively for maintenance.

7. Consult with clients about their financial capacity to manage closed protocol systems and pay for service contracts. If this is likely to be a problem, try to eliminate their inclusion through the contract specifications or preconditions.

8. Ensure that any performance specification or client brief which requires open-protocol controls names acceptable manufacturers/suppliers (i.e. Siemens, Schneider, etc.).

9. Explore the catering offer in detail with the client, and understand how this will be provided. Look at different options that might be implemented in the future and how the kitchen and servery space can easily be adapted to suit changing need.

10. Beware of false economies with regard to value engineering variations that have lower capital cost but prohibitive operational costs.

Comfort

1. Ensure there is adequate daylight in all spaces, including smaller teaching spaces and offices.

2. Specify robust blinds, that are easy to operate, so lecturers can eliminate glare on screens. The blinds will be moved regularly, so need to be robust.

3. Review controls strategies for lighting to ensure it is intuitive and user friendly. Lights that switch off due to a lack of movement should not require someone to get up and physically switch the light back on.

4. Understand the noise generated in spaces by rain on an ETFE roof, and take account of this when specifying ETFE.

5. Consider the adjacency of spaces and do not have a quiet space, such as Learning Centre, opening directly on to a noisy space, such as a café in an atrium.

6. When designing a large atrium space within a building, fully understand the impact this will have on thermal comfort and the control of the temperature within the space.

7. Understand the potential solar gain from an ETFE roof, and how it may affect spaces in the building.

Energy

1. Ensure that zone controls are intuitive to support users in operating the space efficiently.

2. Remember that advanced controls have decreasing economies and impact when the appliances themselves have very good energy efficiency (i.e. LED lighting), so efficient fixtures do not necessarily need elaborate controls.

3. The flywheel MVHR system works relatively well to save heat energy, but always ensure the airtightness of the building is matched with the ventilation strategy.

4. Buildings with 24/7 access should not necessarily need 24/7 servicing. Restricting servicing to core hours is generally well tolerated by users and saves considerable energy.

5. Ensure that D&B M&E designs are adequately overseen to ensure efficient layouts, compact servicing and good value for money.

6. Double-check EPC and DEC assessments to ensure that the correct building strategy is noted on the certificates, and the benchmarking is correctly assessed.

Acknowledgements

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