UNIVERSITY OF LEICESTER

ENGINEERING BUILDING
CONSERVATION MANAGEMENT PLAN

v1.0 MARCH 2022

ARUP

ENGINEERING BUILDING
CONSERVATION MANAGEMENT PLAN

March 2022

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1. The Engineering Building in 2017

1 INTRODUCTION

"An engineering laboratory is not a static thing: its purpose and contents change, often at an alarming rate, with the passage of time. Anything which limits adaptability for the future is as far as possible to be avoided."

Professor Edward Parkes, August 1959

1.1 THIS DOCUMENT

This document sets out an agreed plan for conserving the Engineering Building at the University of Leicester (figure 1).

The building is included on the National Heritage List for England at Grade II* and is therefore considered to be "particularly important" and of "more than special interest"[1]. The University of Leicester has a legal obligation to conserve and maintain it.

The broad objective of this plan is to help facilitate this: to allow the building to flourish in the future whilst protecting the things that make it special.

Achieving this will involve finding ways to balance the impact of new technology, with all the potential benefits it can bring – both in terms of building performance and academic study – with the sensitive preservation of a building which tells an important story about Britain, its engineering and its architecture in the early 1960s.

1.2 AUTHORSHIP & FUNDING

The CMP has been prepared by Thomas Pearson and Emily Sutton at Arup. It has been reviewed by Russell Cole at Arup.

References and credits for photographs, drawings, etc. are provided at the back of the document.

1.3 BASIC STRUCTURE

The history of the Engineering Building from its origins to the present day, biographies of its architects, and an assessment of the building's historical and cultural significance are provided in chapters 2-5. Chapter 6 presents a summary of the many challenges facing both the building and the department today. Several different institutions and groups, including the wider architectural community, are invested in the building's future; their opinions, obligations and objectives have been collated in chapter 7. Finally, chapter 8 draws together a set of policies agreed by the University and the statutory stakeholders. These are actions to be carried out by the University as and when funding permits.

This plan is not intended to be an academic study. Many excellent books cover the building in considerable detail. Several have been referenced as part of this work and are listed as appropriate in the bibliography.

1.4 METHODOLOGY

Conservation management plans (CMPs) have been recognised in recent years as important tools to assist the safeguarding of historic buildings. The methodology of CMPs, now relatively well established, involves defining the following:

- the building's origins and history, including changes made since its construction;
- its overall heritage significance, in this case using Historic England guidelines;
- areas and elements of greater or lesser significance within the whole;
- the most likely challenges and opportunities relevant to the future use of the building;
- the requirements and aspirations of a wide range of stakeholders, from owners and maintenance staff through to heritage organisations and the local council;
- a clear set of agreed policies, to which all parties have committed to upholding.

1.5 DECISION-MAKING

1.5.1 Following an agreed process

An important feature of this CMP is a decision diagram at the back (section 8.4) which may be used by the University of Leicester to determine if listed building consent will be required for a particular intervention. It allows the university some freedom to make changes as required, within a framework agreed with wider stakeholders, and avoid the need to seek statutory approval.

Key tests must be applied to a proposed intervention, following engagement with the University's nominated Conservation Advisor (see below) in the first instance, to establish whether a formal listed building consent application will be required.

If it is, this document may be used to demonstrate the University's understanding of the building in place of a separate heritage statement. Additional detail and supporting information will also be required which relates to a specific item or area, depending on the nature of the application.

1.5.2 Conservation Advisor

The University of Leicester has nominated Thomas Pearson of Arup as its Conservation Advisor. Thomas leads a team of heritage specialists under the directorship of Russell Cole.

1.6 IMPLEMENTATION

The University of Leicester has committed to upholding the policies of this document, as far as is reasonably practicable, during the future development of both the building and the campus around it.

It is acknowledged by all departments of the University of Leicester, and by the statutory stakeholders Leicester City Council, Historic England and the Twentieth Century Society, that this document may be referred to as an example of core policy. It may be cited as such in, and in response to, applications for planning and/or listed building consent.

The University of Leicester commits to reviewing the assessment and findings of this plan, issued in 2022, no later than 2025. Thereafter it will be reassessed on a quinquennial (five-yearly) basis.

Formal approval for the CMP has been recveived from the following parties.

Name	Role
Professor Sarah Davies S.J. Davies.	Pro-Vice Chancellor, University of Leicester Head of the College of Science & Engineering, University of Leicester
Professor Stephen Garrett Stephen Garrett	Head of School, School of Engineering, University of Leicester
Richard Thomas	Director of Asset Management, University of Leicester
Anne Provan Anne Provan	Conservation Team Leader, Leicester City Council
Catherine Croft Catherine Croft	Director, Twentieth Century Society

Historic England has been consulted several times throughout the preparation of the plan and has submitted some formal comments, as detailed in section 7.4.

2 BACKGROUND TO THE BUILDING

2.1 LEICESTER

The city of Leicester is one of the oldest in England. After developing as the Roman settlement of Ratae Corieltauvorum, clustered around where the Fosse Way (a road between Lincoln and Exeter) crossed the River Soar, Leicester grew to be a productive manufacturing town. Under Saxon occupation it became a bishopric, and although it lost this title after its capture by Vikings in the ninth century it became, for a time, the seat of one of the Five Burghs of the Danelaw. Leicester was recorded in the Domesday Book of 1086 as a city, although this legal status was removed in the eleventh century and only granted again in 1919.

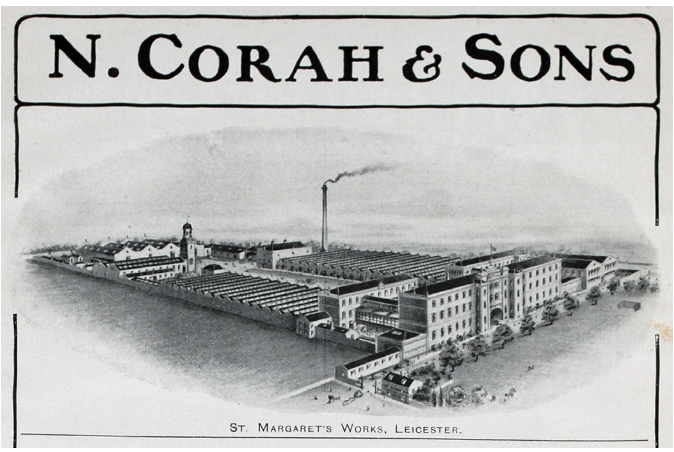
The medieval period saw the town grow into a prosperous regional centre, with an economy based originally around the wool trade. Its status increased gradually through the Tudor and Stuart years, and by the Georgian period Leicester was becoming the main centre for hosiery manufacture in Britain. Nineteenth-century industrialisation, particularly in the manufacturing of clothing, textiles and footwear, brought a massive growth in population and transformed the architecture of the town.

The Victorians developed the centre of Leicester into a bustling civic space, with large buildings of varied and occasionally flamboyant character. Industrial buildings were erected close to the town centre, often relatively domestic in scale and detailing, before larger mills were built further out – particularly along the Grand Union Canal and the Soar.

Enormous factories built by clothing firms like Corah & Sons (2) were emblematic of the scale of production underway. Large parts of these buildings had low, open ground-floor workshops lit from above through north-facing skylights, and tall chimneys were a necessary feature to lift the fumes from coal-fired boilers high above street level. Red brick was employed almost universally.

Swathes of terraced housing were constructed to provide housing close to these industrial buildings. Meanwhile, the town's surrounding rural landscape was built upon with villas for wealthier families. The late Victorian and Edwardian period, from around 1870 to 1914, produced a legacy of fine suburban dwellings in the eclectic Queen Anne and Domestic Revival styles (3). These styles combined forms and motifs from older English buildings, mixing delicate vernacular forms with the hard edges of Gothic architecture. Asymmetry and robust massing were primary characteristics, along with steep roofs, dormers, dramatic gables and elaborate chimneys. Red brick was the primary exterior material for walls.

The Engineering Building at the University of Leicester is a direct descendant of these two branches of Leicester's architectural development – the picturesque Gothic of the suburbs and the practical, top-lit spaces of the factories – although it draws from a wide variety of other influences, as described in section 3.3.



2. The Corah factory at St. Margaret's Works (built from 1866)

3. Domestic Revival in the suburbs

2.2 THE SITE

The Leicester, Leicestershire and Rutland University College was established in 1921, occupying the grounds of a former asylum (designed by William Parsons, 1837; extended 1842) donated by local businessman Thomas Fielding Johnson to create a 'living memorial' to the dead and wounded of the First World War. It became University College Leicester in 1927; in 1957 it was granted university status with the right to award its own degrees.

The masterplan for a nine-acre campus was prepared by Leslie Martin, chief architect to London County Council, who was widely respected as designer of the Royal Festival Hall in London. By 1959 almost all of the campus grounds had been assigned to buildings for the various departments, many of which were constructed (to designs by Martin) as low-rise, low-key modernist blocks in buff brick.

Martin's plan did not originally allow for a new building for Engineering. After the Senate and Council of the college approved the creation of a Department of Engineering in June 1956 they offered it the Lancaster Boys' School, which was due to be vacated. By 1959 the university had acknowledged the need for purpose-built accommodation; the school would therefore be demolished to make way for a new building.

The school site was relatively small. It was also awkwardly constrained by the angled boundary of Victoria Park to the north-east and older buildings on three other sides, giving a chamfered rectangular shape aligned to a north-east to south-west axis. The tapered edge created by the park, along with the 45° offset from true north, were to be particularly influential to the design of the building which stands there now.

See (4) overleaf.

2.3 THE BRIEF

Leslie Martin, who was something of a benefactor to young architects throughout his career, recommended James Stirling and James Gowan to the university's building committee as architects for the new department building. After providing some information on their earlier work the practice was formally appointed on 31 July 1959.[2]

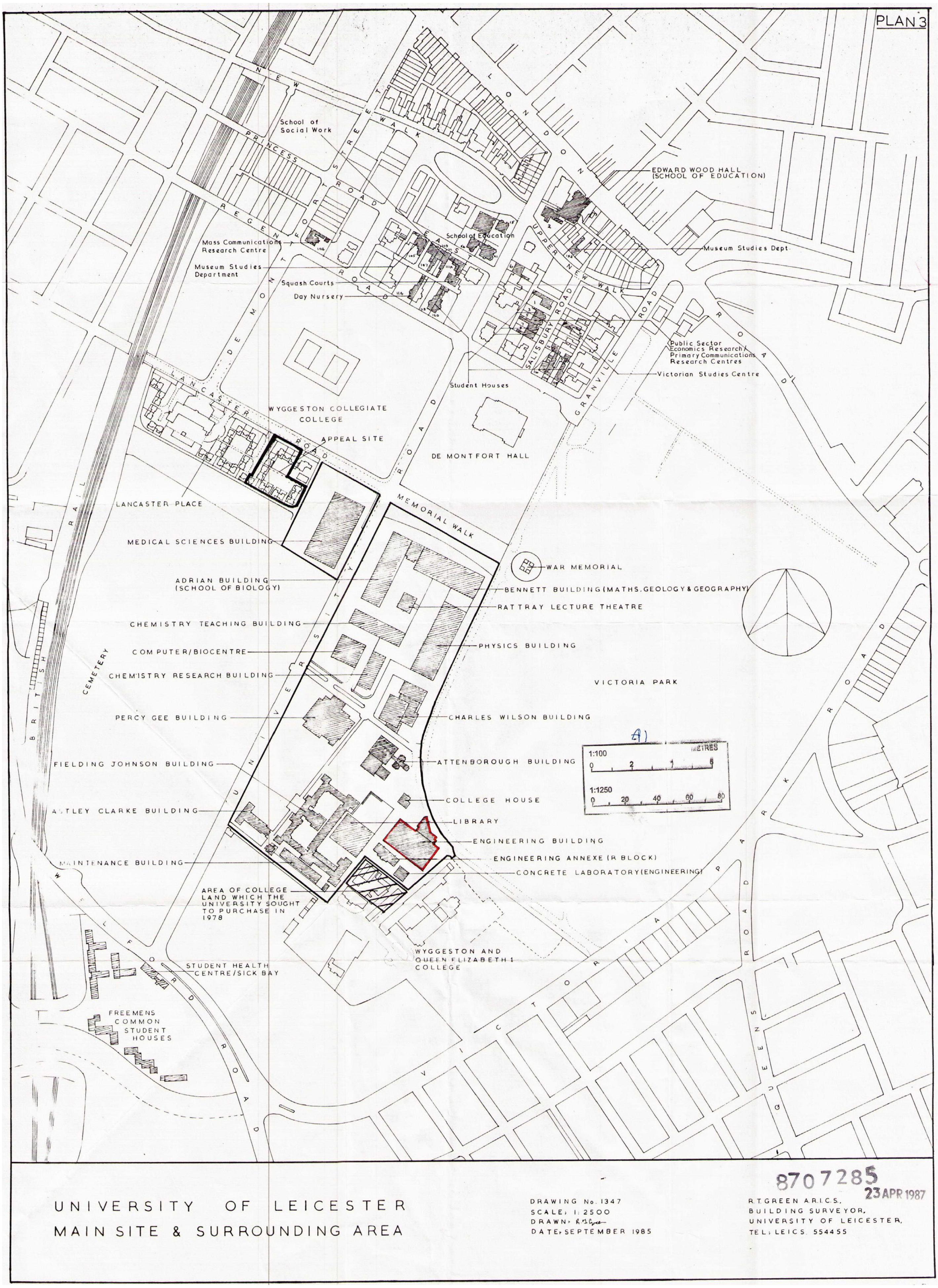
Two briefing documents were written in the summer of 1959 by the new head of department Edward Parkes to describe his requirements.

"There is only one essential concept which should be before the architects," wrote Parkes, "and that is 'flexibility'. An engineering laboratory is not a static thing: its purpose and contents change, often at an alarming rate, with the passage of time. Anything which limits adaptability for the future is as far as possible to be avoided."[3]

To cater for an undergraduate population of 200, plus staff, the department would need a range of large laboratories, each with different specifications for clear spans and headroom; a large tank of water "at a considerable height above the laboratory (say 100 ft)"; two lecture theatres with raked seating; an entrance hall "suitably disposed so that it can be used for exhibitions of photographs, models, etc."; and small rooms for various use, some of which "might be given a pleasant aspect by being put on the Victoria Park end of the site."[4]

Parkes' aspiration for the building was for it to be a community of engineering scholars in which different disciplines would share a common, flexible workshop space. Teaching sessions and group work in laboratories were to play an unusually prominent role in academic life. Formal lectures, although still important, would be less central to the syllabus.

See (5) overleaf.



4. Site plan (from later repair works in 1987)

2

Leicester University Engineering Laboratory

First Brief for Architects, 16th August, 1959.

1. Introduction

Following discussions with the architects in London, Cambridge and Leicester, the following notes are offered as a basis for their preliminary planning. When it has been determined to what extent the requirements listed here can be met, and in what way, more detailed suggestions will be made.

There is only one essential concept which should be before the architects, and that is "flexibility". An engineering laboratory is not a static thing: its purpose and contents change, often at an alarming rate, with the passage oftime. Anything which limits adaptability for the future is as far as possible to be avoided.

These notes are based upon a population of 200 undergraduates, 10 research students, 20 adademic staff and 40 assistants, but it is assumed that the drawing office, draughtsmen and 10 academic staff can be accommodated in existing buildings.

2. Large Laboratories

Teaching and research will, as far as possible, be done in the same laboratories. Details of each laboratory are given below, but the following points are common to all. 20ft. clear spans are required. Large doors and easy access to a road are necessary for the movement of bulky apparatus. Top lighting is preferred. Adequate AC and DC electrical services are needed.

(a) Heat Laboratory. 5000 sq.ft. 20ft. headroom. There will be a condenser pit (say 8ft deep by 800 sq.ft.). Provision must be made for supplies of cooling water and its discharge (when hot), and for exhaust from engines. Steam supplies from (b) must be provided. There must be adequate ventilation and the problem of noise from moving machinery must be considered.

5. Professor Parkes' "first brief to architects", August 1959 (continued overleaf)

This laboratory must be on the ground floor and the floor itself must be dust free and capable of being readily removed for the provision of local foundations.

(b) Boiler House. 2000 sq.ft. 30 ft. headroom. This is intended to raise steam for (a) and for undergraduate instruction. It is not intended for heating the building. Fuel storage is included in the area. The boiler capacity is intended to provide 5000lb/hr at 180 psi saturated, but it will rarely be used continuously at this rating. This is equivalent to about 800 lb. coal/hr., but the boiler may be oil fired. Suitable water supply and flue stack must be provided for the maximum rating. The boiler house must be at ground level.

(c) Hydraulics Laboratory. 2500 sq.ft. 20ft. headroom. A 12000 gal. water tank must be provided to serve this laboratory. The head should be at least 40ft. and preferably more. Beneath the floor there should be a 40,000 gal. reservoir with means of return to the tank. The floor should permit easy discharge to the reservoir. Provision must be made for occasional draining and refilling of the whole system. This laboratory also must be at ground level.

(d) Structures Laboratory. 5000 sq.ft. 20 ft. headroom over 3500 sq.ft. 30 ft. headroom over 1500 sq.ft. Must be on ground floor and floor must be dust free and capable of local removal for foundations. Part of the floor area (say 600 sq.ft.) may be strong grid. Special electrical services may be required in this laboratory for heating tests (say 100 KVA). It is important that this laboratory should be reasonably draught free.

(e) Electrical Laboratory 5000 sq.ft. 20 ft. headroom. Woodblock floor. This laboratory need not be at ground level although it should preferably be so. Adequate electrical supplies must be provided for both machinery and electronic purposes (10v. steppings AC and DC) and the laboratory should be adjacent to (f).

(f) Battery Room. 500 sq.ft. 10 ft. headroom. The important points here are ease of access to batteries, acid resistant floor and adequate ventilation.

(g) Aerodynamics Laboratory. 2500 sq.ft. 20ft. headroom. This need not be on ground level although it should preferably be so. Exhaust from tunnels should be considered, and this laboratory is likely to be very noisy.

3. Small Laboratories

Gas, water and electricity suppies are needed to all of these laboratories, which need not be on ground level.

(h) Metallurgical Laboratory. 1200 sq.ft. contains gas and electric ovens and will need flue egress. Lighting unimportant as most apparatus is self lit.

(j) Stress analysis Laboratory. 1200 sq.ft. For strain gauging and photoelasticity. Side lighting with possibility of blacking out 300 sq.ft. completely.

(k) Soil mechanics Laboratory. 1200 sq.ft. Side or top lighting.

(l) Mechanics Laboratory. 1200 sq.ft. Side or top lighting.

4. Workshop and Stores

The workshop will require 1500 sq.ft. 20 ft. high at ground level with another 1500 sq.ft. which need not be at ground level. Some internal division will be necessary and good lighting is important. Next to the workshop there should be a store of 1200 sq.ft.(x 20ft.high) with access to a road.

5. Lecture Theatres

Two raked lecture theatres are required. Suggested capacities are 120 and 180. The larger one should have provision for projection. Writing benches should be at least foolscap (13 inches) width.

6. Periodicals Room

500 sq.ft. For current and unbound periodicals

7. Committee Rooms

Two rooms of 400 sq.ft. each which could be used committees, colloquia, etc.

8. Survey Store

300 sq.ft. Ground level with external door near Victoria Park of site. It would be helpful if there was a lawn near the door, for setting up instruments. Lighting unimportant.

9. Small Rooms

It is assumed that no small rooms need be provided for junior laboratory assistants and that offices for senior laboratory assistants will be made within the laboratories or workshops concerned.

We shall, however, need the following :

(m) Photographers Room. 250 sq.ft. Half of this should be a dark room.

(n) Clerical and Computing Rooms. Two, each 250 sq.ft.

(p) Head of Department. This room should have adequate table space for a small group to look at drawings, etc., say 200 sq.ft. connecting with secretary's room of 150 sq.ft.

(q) 15 rooms of 120 sq.ft. each to contain either one member of staff or two research students.

10. Entrance Hall

The entrance hall of the building might be suitably disposed so that it can be used for exhibitions of photographs, models, etc.

11. Other Space

No discussion has been given here of lavatory or cloakroom accommodation, building heating, circulation, or non-engineering requirements of Mr Martin.

12. Proximities

(a) must be next to (b). (c) and (d) may be made into one laboratory, but they may be quite separate. (e) must be next to (f). (j) should be near to (m). (j) and (l) should be reasonably

free of noise and vibration. (n),(p), and (q) should be close together and as quiet as possible.

13. Likely Future Expansion

The most likely laboratories to expand rapidly are (e) and (g). More staff rooms would also probably be needed in a future expansion but these need not necessarily be adjacent to (n), (p) and (q).

2.4 CLIENT & DESIGN TEAM

The client and designers were young by today's standards: in the summer of 1959 Edward Parkes was 33, as was James Stirling and the consultant structural engineer Frank Newby. James Gowan was 35.

2.4.1 Edward Parkes

b. 19 May 1926
d. 25 September 2019

Parkes read mechanical engineering at St. John's College, Cambridge, and worked there until his appointment as Professor of Engineering at the new University of Leicester in the 1950s. He was soon asked to provide an architectural brief for a department building (5).

Speaking to Mark Girouard for his biography of James Stirling, Parkes indicated that he gave the young architects creative freedom for his new department building.

> "They said – though obviously they were going to ignore it, whatever I said – 'Don't you have any idea what it should look like?' And I said 'No, that is your business. I am concerned that it should do its job, but how you achieve that result is up to you'."[5]

Mark Crinson, however, writes that "Parkes' contribution to the authorship of the building from the beginning was crucial. He applauded the use of the cramped site and admired the exterior, but had critical comments about the location of certain labs and stores and about the symbolism of the chimneys... Parkes' interventions were not just towards utilitarian ends; he had a strong sense of the appropriate image he wanted his building to present to the world."[6]

Crinson credits Parkes with the raking buttresses to the rear of the building, and quotes him in a letter where he comments on the architects' proposed pair of chimneys in November 1959:

> "Perhaps to you they symbolise engineering, but free-standing chimneys are not a common feature of modern engineering works, and I particularly wish to avoid giving the rest of the university the idea that the 'dark satanic mills' have come amongst them."[7]

Berman notes that Parkes' reputation of being "somewhat radical", and that being the same age as his design team "may have aided the client-architect relationship during the development of the design and construction."[8] Parkes clearly enjoyed working with Gowan, at least: he subsequently commissioned him to design his holiday home in St. Davids, Pembrokeshire (18).

Parkes served as Vice-Chancellor of City University, London, from 1974 to 1978, and of the University of Leeds from 1983 to 1991. He was awarded a Fellowship from the Royal Academy of Engineering in 1982 and was knighted in 1983.

2.4.2 James Gowan

b. 18 October 1923, Glasgow
d. 12 June 2015, London

James Gowan first studied architecture at the Glasgow School of Art, where he gained a "diluted" and "benign" education of Beaux-Arts ideals: mass, proportion and line.[9] His studies were interrupted by the Second World War, during which he served in the Royal Air Force as a radar technician in Palestine.

When he enrolled at Kingston School of Architecture in 1946 he was inspired, as many others were at the time, by the possibilities of building a new world. The writings of Le Corbusier were an important influence, particularly on the architecture of ships and industry, although he was sceptical of his peers' unquestioning use of Corbusian details. Gowan was also drawn to De Stijl and early-C20 Dutch architecture.

At Kingston, which Gowan described as like "a Bauhaus version of a puritan grammar school", the emphasis was on radical modernism – although Gowan thought it was lacking in taught design method.

Gowan's first full-time job, from 1950-52, was for Powell & Moya, where he was primarily involved with Churchill Gardens in Pimlico, London (6) – a project which the partners had won, incredibly, at the ages of 23 and 24. Gowan left the practice for the Stevenage New Town Corporation, where he worked principally on prototypes for light industrial buildings.

In 1954 Gowan joined the practice of Lyons Israel Ellis, a down-to-earth, highly professional practice producing work which was "free from the picturesqueness and whimsy that typified modern architecture in Britain in the wake of the 1951 Festival of Britain."[10] It was here that Gowan met James Stirling.

2.4.3 James Stirling

b. 22 April 1926, Glasgow
d. 25 June 1992, London

James Stirling moved from Glasgow to Liverpool as a young child. He attended Liverpool Art School from 1942, although his studies were also disrupted by the Second World War: he served as a paratrooper and was twice wounded behind German lines around the D-Day landings. After the war Stirling returned to Liverpool, which was a rich source of inspiration with its many distinctive dock and warehouse buildings, and entered the Liverpool School of Architecture under the "charismatic theoretical input" of Colin Rowe.[11] As Elain Harwood notes, Rowe "provided an insight into the continuing classicism within modern architecture and informed [Stirling's] understanding of Le Corbusier and (later) Louis Kahn."[12]

After spending a year studying for a planning qualification, Stirling worked briefly for James Cubitt & Partners and Gollins Melvin Ward before joining Lyons Israel Ellis. During this period he designed several notable competition schemes, including Poole College of Further Education and an Arts & Administration Building for the University of Sheffield (7).

Stirling was well acquainted with artists from the Pop Art movement and the Independent Group at the ICA. He was part of the group, including the engineer Frank Newby, which put on the influential *This is Tomorrow* exhibition at Whitechapel Gallery in 1956.

2.5 Stirling & Gowan in partnership

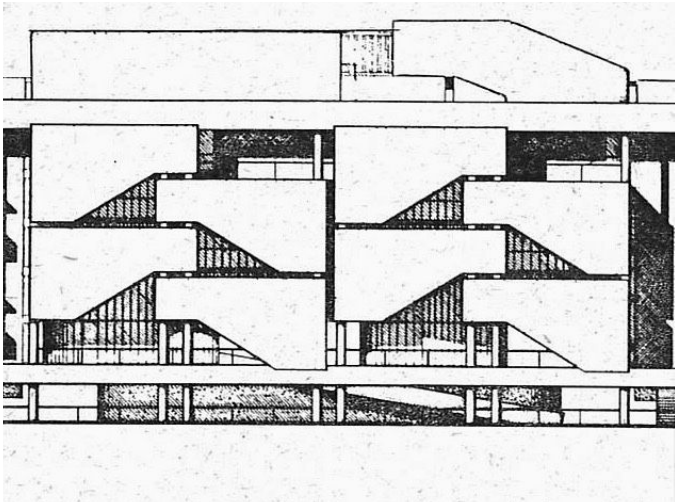
Stirling asked Gowan formally to collaborate with him after winning a commission for flats at Ham Common in London (10). The partnership was formed in 1956. Gowan brought the design of a house in East Cowes on the Isle of Wight which the two architects developed together.

Houses in Buckinghamshire and Kensington and a range of housing study designs followed, before a sequence of projects which were formative for both partners:

- a group of council houses in Preston, strikingly harmonious (for its time) with the surrounding Victorian terraces (11);
- an assembly hall, now listed at Grade II, for Brunswick Park School in Camberwell, set like an angular keep on a grassy motte (12 & 13);
- a castle-like old people's home in Blackheath (14);
- a shortlisted competition entry for Churchill College, Cambridge, where various buildings were set within a square wall like a Roman garrison (15).

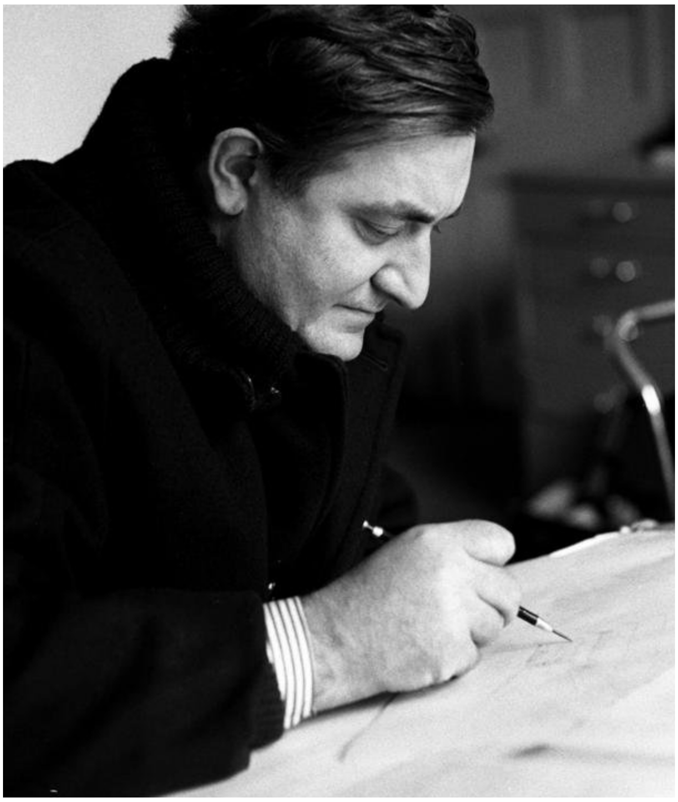
After Churchill College came the commission at Leicester (16). In all of these buildings, with varying degrees of success, the partners attempted to offset their stark architectural modernism with different historical references – many of which were distinctly off-beat for the fashions of the time.

6. *Powell & Moya: Churchill Gardens, Pimlico, London (1946-62; Grade II)*



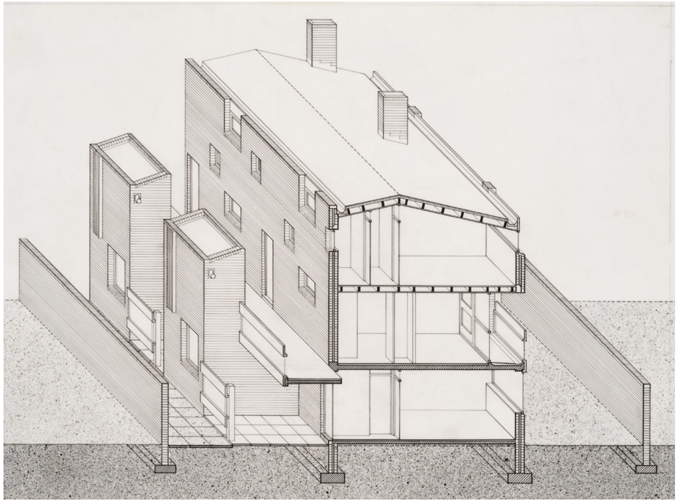
7. *James Stirling: Arts & Administration Building, Sheffield (unbuilt; detail)*

8. *James Gowan*



9. *James Stirling*

10. Flats at Ham Common, London (1958)

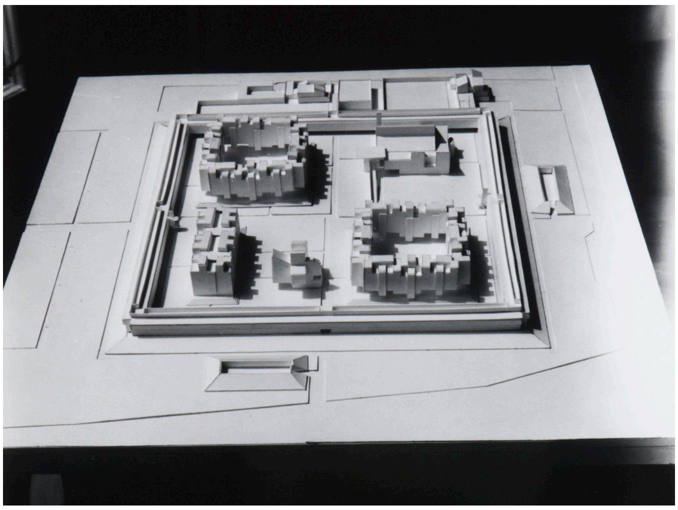


11. Council housing in Preston (1962)

12. Brunswick Park School, London (1961)

13. Brunswick Park School, London (1961)

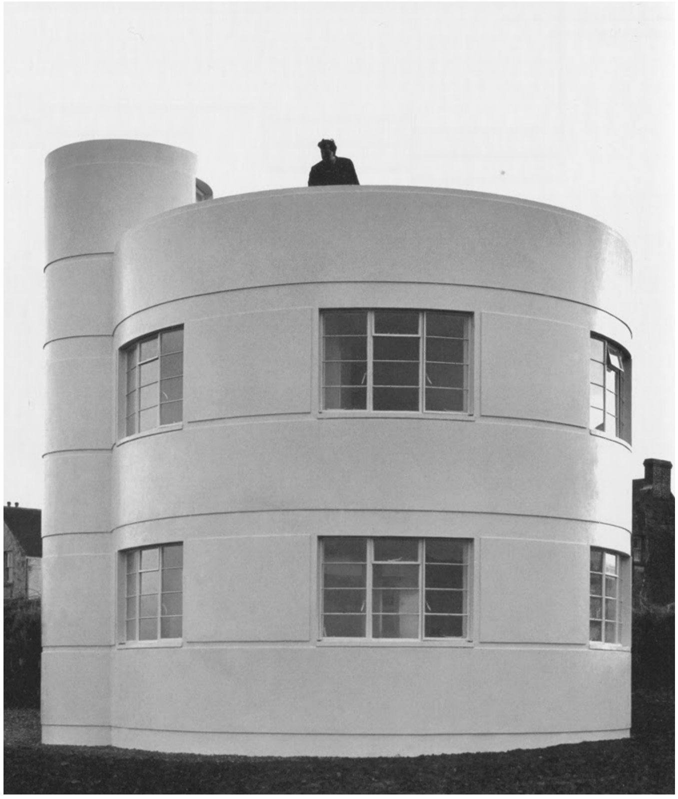
14. Old People's Home, Blackheath, London (1964)



15. Churchill College, Cambridge (1959, unbuilt)

16. Engineering Building, Leicester (1963; Grade II)*

17. Engineering Building with College House in foreground and terraces behind



18. James Gowan: Round House in St. David's, Pembrokeshire (c.1965, Grade II), designed for Professor Parkes after the successful completion of the Engineering Building

19. James Gowan: Schreiber House, Hampstead (1964; Grade II)

20. James Gowan: Schreiber House, Hampstead (1964; Grade II)

21. James Gowan: housing at East Hanningfield, Essex (1978)

2.5.1 Stirling and Gowan after Leicester

The huge success of the Engineering Building was followed by a commission for a new Faculty of History building at Cambridge, for which Stirling was keen to re-use the same architectural vocabulary. Gowan, however, was unwilling to reuse an aesthetic approach generated from the specific conditions at Leicester on a very different building type in a very different setting. This disagreement caused an irreconcilable split in their partnership, which was officially dissolved in November 1963.

Gowan retained from the practice a commission for the Schreiber House in Hampstead (19 & 20), housing blocks in Greenwich and Edgware, and warehouses in Dalston. His practice continued with a "strong if limited formal agenda… guided by the idea that relatively simple exteriors could house interiors of great variety and elaboration."[13] Gowan designed various buildings, mostly housing (21). He became a well-respected teacher at the Architectural Association and various other universities.

His natural reticence and relatively low-key post-Leicester career allowed the more ebullient Stirling to take the principal credit for their shared work. Many people presume that the Engineering Building was Stirling's design, when in fact Gowan prepared much of the design while his partner was away teaching in America.

According to Girouard:

> "Gowan was bitter because he felt that Jim took too much of the credit, then and later, and bitter about money. Jim was a hard bargainer... Gowan still says that 'Jim [Stirling] would take the shirt off your back'. For a good time they were not on speaking terms. At a party not long after the break Gowan came into the room, saw that Jim was there, and walked straight out again."[14]

Stirling, on the other hand, went on to become an architect of international importance. He employed Leicester's 'engineering style' on university buildings in Cambridge (22) and Oxford (23) and went on to design a series of colourful urban-scale projects, increasingly post-modernist in character, including world-famous buildings such as the Neue Staatsgalerie in Stuttgart (24) and 1 Poultry in London (25).

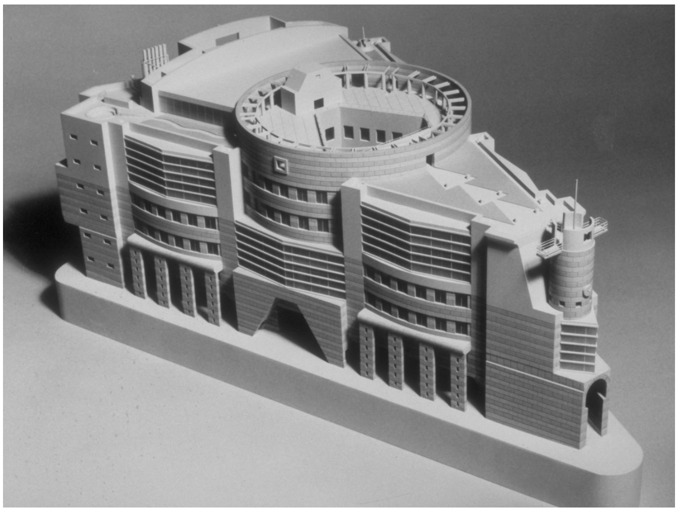
Stirling's buildings tend to feature complex sequences of spaces, often processional in character. Throughout his career he employed an eclectic, cerebral and often playful historicism, drawing from a broad range of historical motifs to create buildings which allude to several traditional typologies at the same time (26). His best buildings generate a rare tension: they are both contextually sensitive and stylistically provocative. They are conceptually rich but often notorious for their technical failings.

Twelve days after being knighted in the Queen's Birthday Honours in 1992, Stirling was taken ill with a hernia. He died unexpectedly from acute bronchial pneumonia following accidental mistakes in a routine operation. Stirling's passing was a huge shock to the architectural world; his influence was acknowledged in 1996 with the naming of the RIBA's Stirling Prize for excellence in architecture.

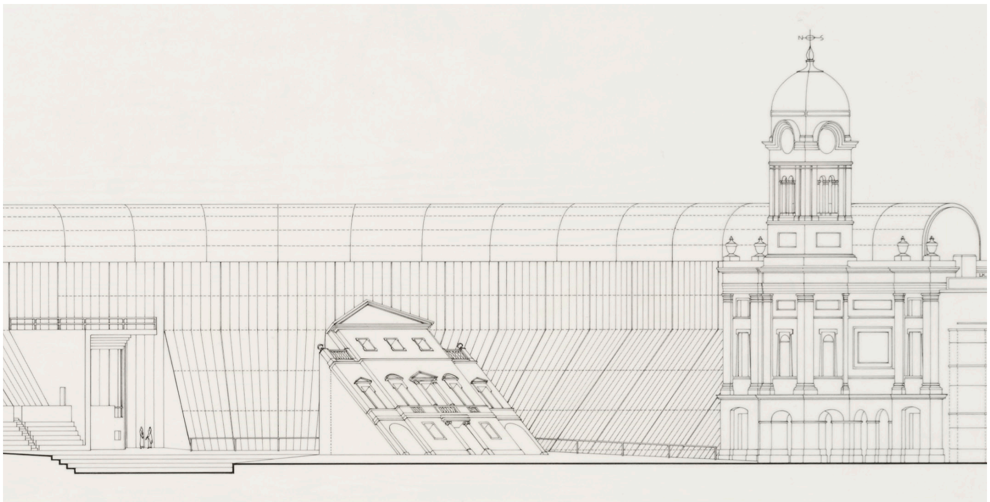
22. *James Stirling: Faculty of History, Cambridge (1968; Grade II*)*

23. *James Stirling: Florey Building, Oxford (1972; Grade II*)*

24. *James Stirling: Neue Staatsgalerie, Stuttgart (1984)*



25. *Stirling, Wilford & Partners: 1 Poultry, London (1997; Grade II*)*



26. *James Stirling: Derby Civic Centre (1970; unbuilt)*

2.5.2 Frank Newby

b. 26 March 1926, Barnsley
d. 10 May 2001, London

Frank Newby studied mechanical sciences at Trinity College, Cambridge, from 1943-47, and after finishing his national service in 1949 he joined the practice of Felix Samuely in London. Soon after this Newby worked on the structure of the famous Skylon (27), designed by Powell and Moya during Gowan's time in their practice.

After a year's travelling scholarship in America, gaining experience at several modernist design practices including those of Eero Saarinen and Ray and Charles Eames, Newby returned to Samuely in 1953 and became a partner in 1956.

Felix Samuely died in 1959, and at the age of just 32 Newby took his place as head of the firm. After designing the structure for Stirling and Gowan's roof at Brunswick Park School he joined them on the Engineering Building project.

Girouard notes that:

> "Newby saw his job to be to 'give architects the feel that they can design what they want and that they don't have to worry too much about the structure. I give them the confidence to design – that's the role of the structural engineer.' When he first became involved at Leicester, in 1960, the main form of the building had already been fixed. He made the structure work."[15]

Newby contributed various important visual elements, including the chamfered edges of the office tower and the 45° crank to the workshop rooflights – both hugely important to the building's overall axonometric logic – and enabled the sophisticated structural balancing act between the lecture theatres and the towers.

Newby later supported Stirling on his projects in Cambridge and Oxford. Other buildings include the American Embassy in London (1960), the Snowdon Aviary at London Zoo (1964) (28), Clifton Cathedral (1973) and the Burrell Collection in Glasgow (1982).

Newby was awarded the gold medal from the Institution of Structural Engineers in 1985.

2.5.3 Other architects

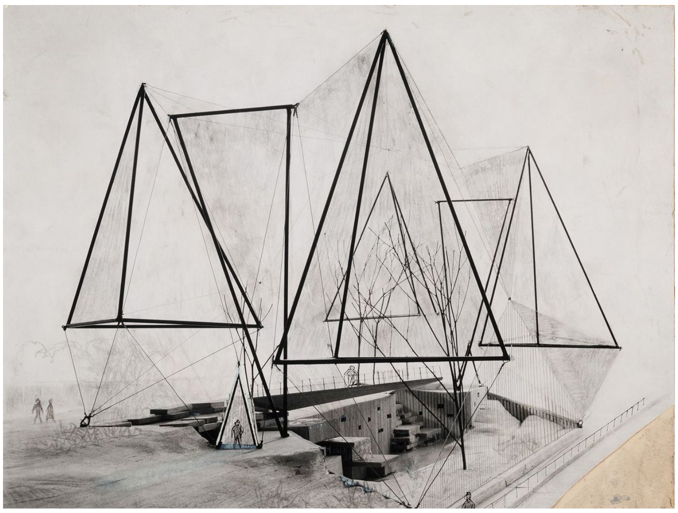
David Walmsby worked full-time for the practice until mid-1960. His replacement, Michael Wilford, was employed full-time in August 1960 to help develop the design and prepare working drawings. Wilford sat on a desk between the two partners and shuttled drawings between them, keeping a low profile during more heated design discussions. He later became Stirling's partner and carried on his practice after his unexpected death.

Other assistants include Kit Evans, who made early models of the Engineering Building, Quinlan Terry, who was one of Gowan's students, Julian Harrap, and Malcolm Higgs.

2.5.4 Wilson, Lovatt & Sons

Wilson, Lovatt & Sons, the main contractor, was based in Wolverhampton and later London. Originally founded in 1858, the company expanded rapidly with post-war reconstruction work and built extensively throughout the country before folding in the 1970s.

27. Powell & Moya: Skylon, Festival of Britain, London (1951)



28. Model for Snowdon Aviary, London Zoo (1965; Grade II)*

3
THE DESIGN

3.1 ARRANGEMENT

3.1.1 Basic arrangement

The basic configuration of the building was brought together in the first few months by James Gowan. He recalled that an early iteration of the scheme was "more like a conventional engineering building… a narrow block of single banked offices at the front, sheds at the back… not a sparky building, but probably a better one if you are sensible about it." Clearly unsatisfied, "the vice-chancellor kept saying 'Have you thought of having a tall building facing the park?'… Eventually I decided, well, if that is what they want."[16]

By the end of 1959, following negotiations with Parkes and the university's building committee, the design was essentially resolved. Two conjoined towers were placed on top of cantilevering lecture theatres: one, fully glazed, contained offices; the other housed research laboratories. A lower, wider workshop block was positioned to the rear, occupying around nine tenths of the site. A ten-foot module was used throughout to define structural spans and proportions on both plan and elevation (31-34).

By the spring of 1960 Stirling was back in London and the two partners had divided the detailing between them, with Stirling concentrating on the tower complex and Gowan on the workshops and 'S-Block' (as it is now known). This division of labour reflects the split nature of the building itself. Essentially it consists of two parts which perform in very different ways: the tower block is a tight stack of smaller-scale accommodation, with vertical movement between relatively static spaces, whereas the workshop areas are open and horizontal in nature, designed to be filled with activity and energy.

Speaking on film in 1964, Gowan described the "schizophrenic quality" of the building's design, with the flexibility of the "big shed" set against the "much tighter mass" of the tower ensemble where "recognisable, inflexible elements like lecture theatres [and] tutorial rooms" are expressed as "fixed, rigid forms which are really quite incapable of being changed in the future."[17]

The basic arrangement was approved by the university in May 1960. Detailed design ran on into early 1961. Work began on site in December 1960 and construction ran from February 1961 to October 1963. The construction contract was let for £447,500.

3.1.2 Workshops and S-Block

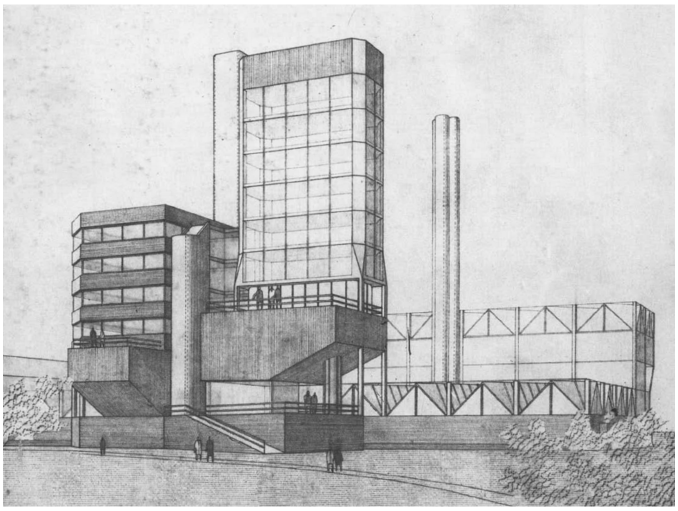
Above a solid red-brick podium the workshops and S-Block are entirely clad with translucent glazing. The two roofs feature ridge-and-furrow rooflight glazing, originally using standard aluminium patent-glazing bars.

Since the optimised orientation of the building on its relatively constrained plot was aligned south-west to north-east, achieving Parkes' request for even top light with north-facing rooflights meant rotating the roof ridges by 45 degrees. Where the ridges met the podium this presented a geometrical conundrum, which in early design sketches (29 & 30) was clearly still unresolved. Gowan admitted that it was "a terrible effort".[18]

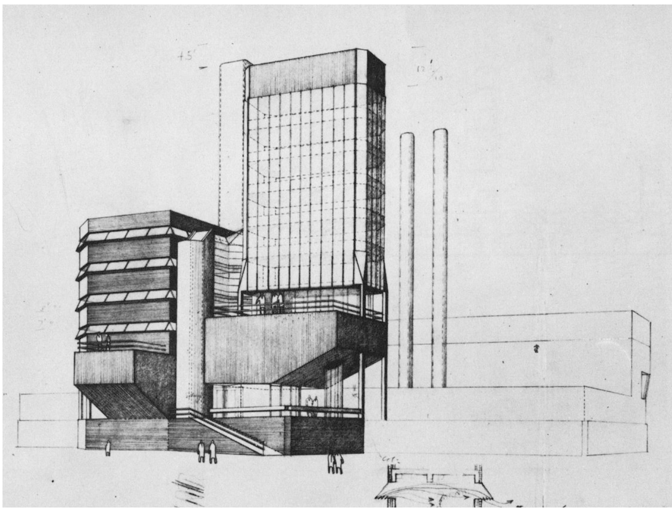
It was Frank Newby who proposed that the glazing should be fixed directly onto steel trusses aligned to the same 45° angle, rather than Stirling and Gowan's preference for exposed beams above the roof running along the main grid-lines. Gowan resolved the awkward ends of the skylight ridges into a series of three-dimensional prismatic gables.

The large double-height volumes on the ground and third floors were, in effect, flexible light-industrial spaces. They were designed to hold large engines and other machinery, which could be moved around on a series of gantry cranes, and were tall enough to accommodate very large machinery and equipment – particularly in the three-storey structural lab which ran upwards into S-Block. Heavy apparatus could be brought in through doors in the brick podium, or hoisted up to the overhanging third floor from vehicles parked on the service road below.

The middle storeys of the S-Block housed activities such as electronics and aerodynamics, which would not require such heavy servicing and large equipment. Beneath them was a boiler house (used for experiments rather than heating) connected to a tall chimney rising up through the workshop roof, a transformer station, and other maintenance areas.



29. Design sketch



30. Design sketch

3.1.3 Towers

The tower ensemble includes several other kinds of accommodation – two lecture theatres, research laboratories, offices and a water tank – arranged into two interconnected vertical compositions.

The lecture theatres, trusting their inclined soffits at right angles to each other (what Gowan called a "cubist idea"[19]), act as massive blank counterweights, stabilising and anchoring the paired towers. They impart a rich colour and texture in contrast to the crisply folded white surfaces of the workshop roof. Their flat roofs serve as terraces and viewing platforms above the line of trees in the park.

The shorter tower features four floors of research laboratories stacked above the smaller lecture theatre, banded horizontally with brick cladding and distinctive inverted hopper windows. The laboratories are significantly offset from the lecture theatre on plan: this creates space for a soffit through which equipment may be hoisted up from the ground floor, through large hatches in the floor of each of the rooms.

The taller tower features the larger lecture theatre, also serving as a monumental entrance arch and canopy, with fully-glazed offices and a water tank (as cornice) above. The office block is expressed as a separate structure to the lecture theatre, in this case apparently straddling it with four haunched columns. Between the solid mass of the lecture theatre and the glass tower above is a smaller glazed enclosure, now the MacLellan Room, which is marked on the original drawings as being a library and labelled on a photograph from 1963 (showing chairs and tables but no reading material) as the 'periodical room'.

Arranging the different built volumes in this way typifies Stirling and Gowan's remarkable control of heaviness and lightness, solidity and transparency. Elements which are in reality structurally conjoined appear independent. Other examples of this include the vertical facetted ribbon of glazing (31e) running between the two towers, separating the different volumes conceptually whilst enclosing and lighting the circulation spaces between them; and a spiral latecomers' staircase, held in a tube of glass, which appears to puncture the solid underside of the larger lecture theatre (32f, 37, 38).

The chamfered corners of the towers respond to the 45° angle of the site and the rooflights and staggered gables of the workshop and S-Block roofs, adding to a distinctive diagonal counter-geometry which runs throughout the design. This geometry can be credited, in part, and acknowledging Newby's contribution noted in 2.5.2, to the architects' admiration for axonometric drawing and its unusually prominent place in their design process.

3.1.4 Podium and plinth

The diagonal park edge was accentuated in the design to create a dramatic raking 'prow' to the building, running tangentially to the path at the edge of the campus. The triangular area it creates in the podium houses toilets and cloakrooms (on a huge scale, in the case of the male facilities, as discussed in section 6.4) on the ground floor. This part of the site, with its spectacular entrance ramp, is a key transition element between the essentially vertical geometries of the tower group and the horizontal emphasis of the workshops.

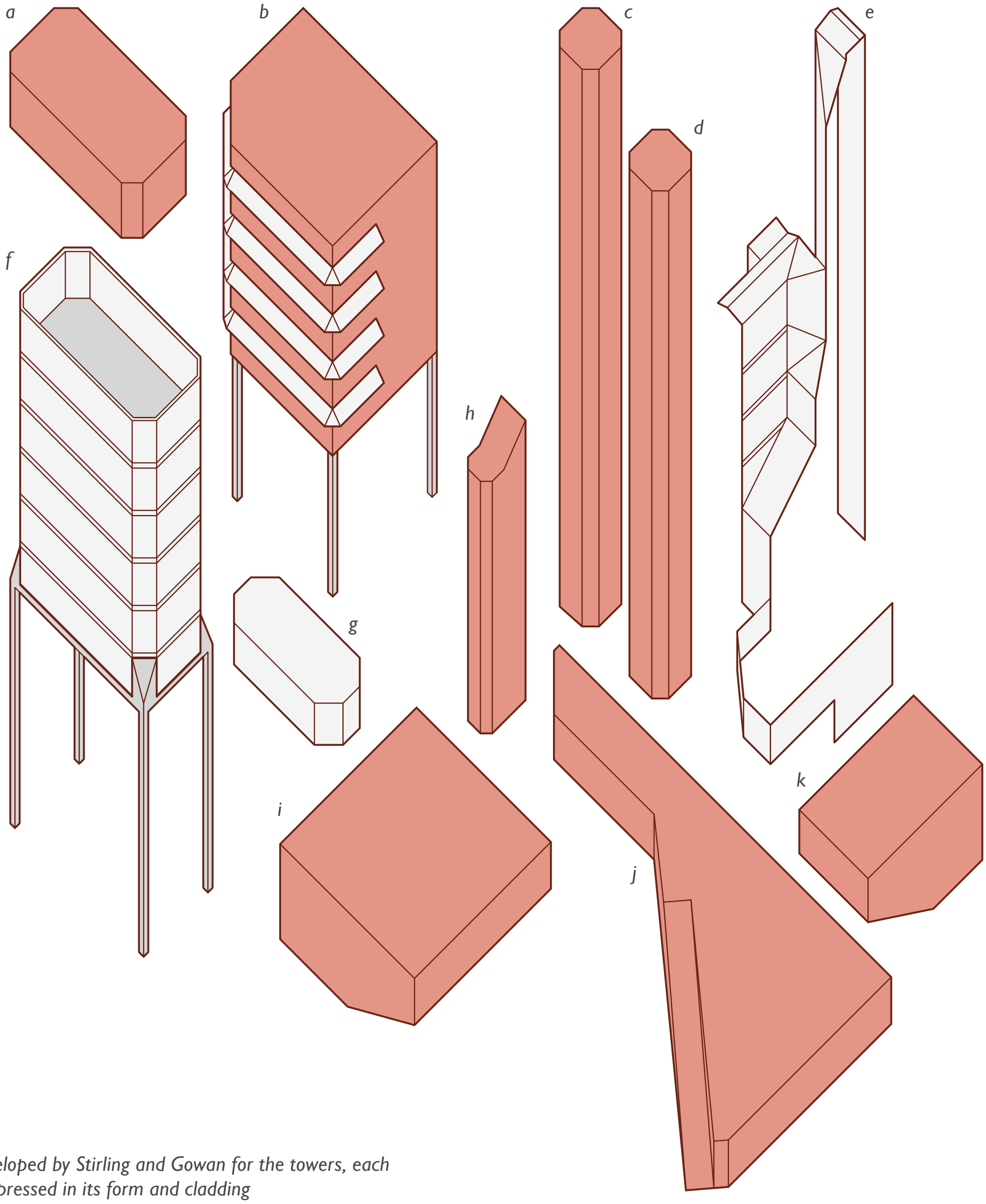
The podium is separated from the brick plinth of the workshop block by double-height glazed screens which form the two principal entry points to the building: the main entrance sheltered under the raking 'belly' of the larger lecture theatre and a second ground-floor entrance on the opposite side of the foyer beneath the research laboratories. A third entrance is reached by climbing the ramp to a door on the first floor; the flat roof of the prow, also reached via the ramp, is edged with a large square-section concrete balustrade-cum-bench. This was intended as a terrace for the students to use on sunny days.

A large snorkel-like extract vent at the tip of the prow denotes the location of the toilets below: a tongue-in-cheek nautical reference similar to others made by Stirling throughout his career.

3.1.5 Circulation spaces

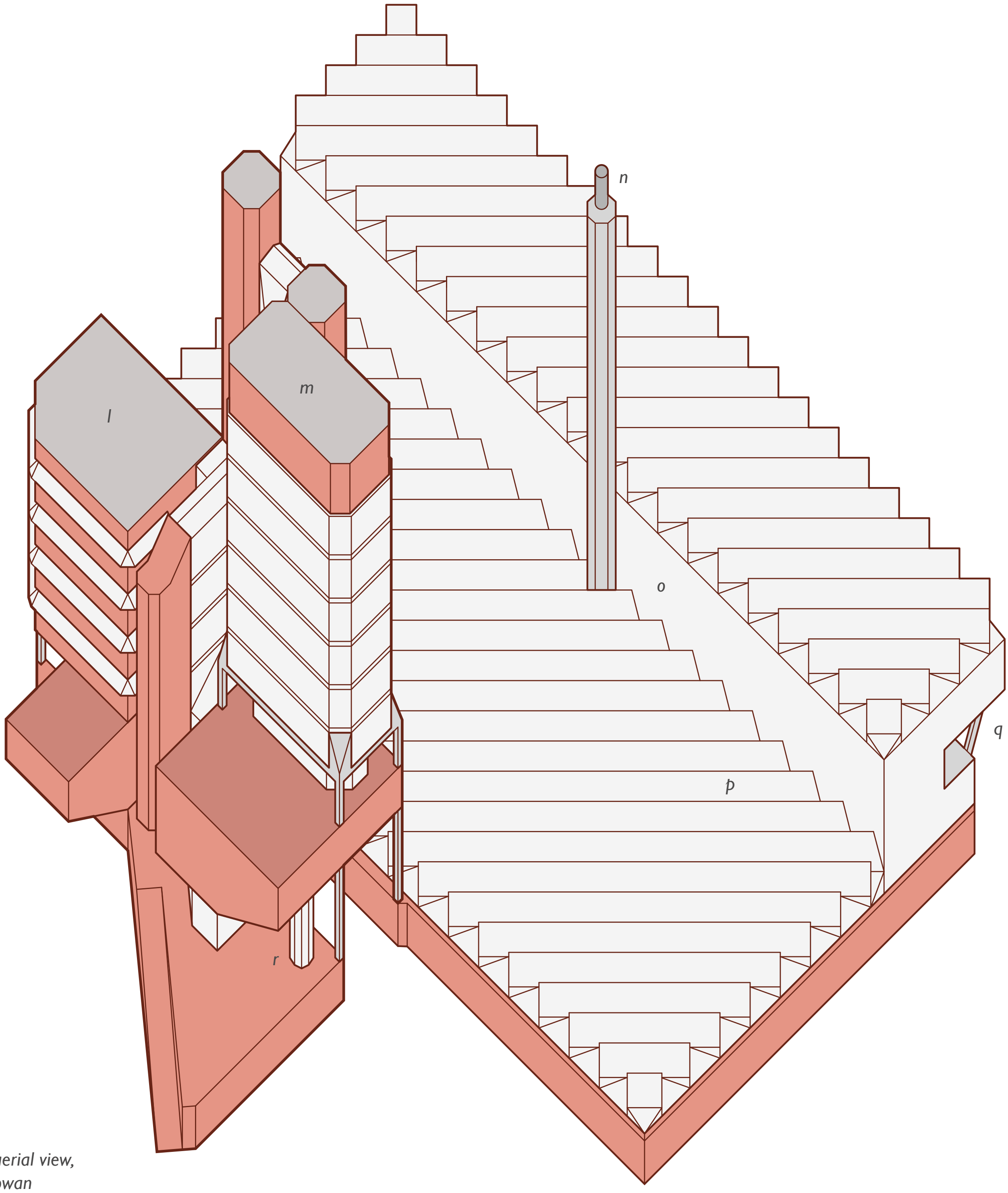
The circulation spaces linking the towers at each floor are similarly stimulating spaces, animated not only by the regular movement of students and staff but also by voids in the floor which create multi-layered viewpoints up and down the building (35). As footfall from staff and students decreases up the building, the floor area given to circulation diminishes significantly and the facetted vertical ribbon of glazing tapers inwards.

Pipes running alongside the staircases (36) play an important role in the diagrammatic reading of the building: this time as a practical engineering experiment. They connect the water tank to the ground floor workshops: a constant reminder to students and staff that the building is set up as a piece of engineering equipment in its own right.



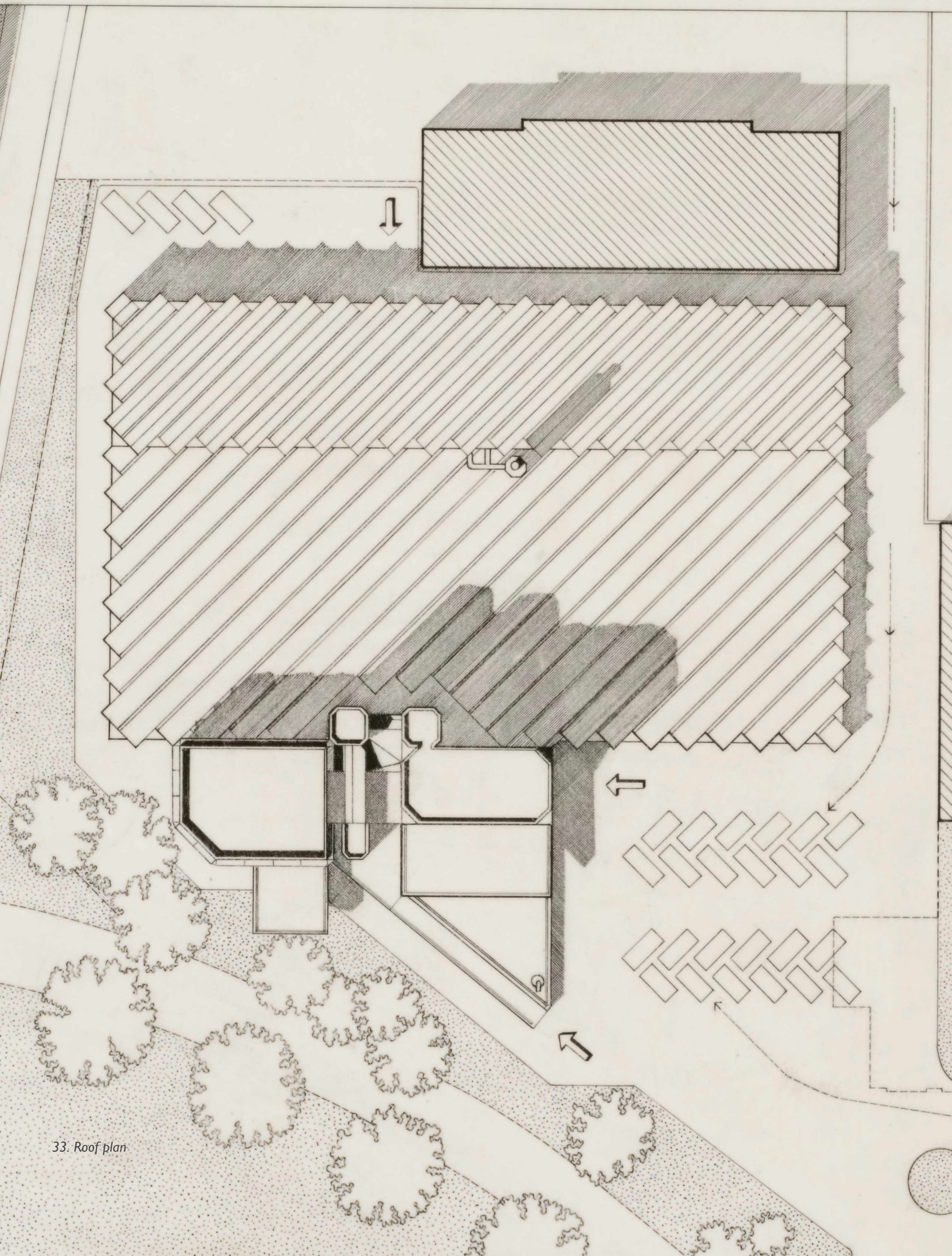
31. The distinct elements developed by Stirling and Gowan for the towers, each having a different function expressed in its form and cladding

a. Water tank (tiled)
b. Research laboratories (brick with strip windows and concrete columns)
c. Core for lift shaft (tiled)
d. Core for staircase (tiled)
e. Circulation spaces (glazed)
f. Offices (glazed with concrete columns)
g. Library, now MacLellan Room (glazed)
h. Core for staircase (tiled)
i. Large lecture theatre, now Lecture Theatre 2 (tiled)
j. Podium with cloakrooms and entrance routes, including ramp (brick with tiled terrace)
k. Small lecture theatre, now Lecture Theatre 1 (tiled)

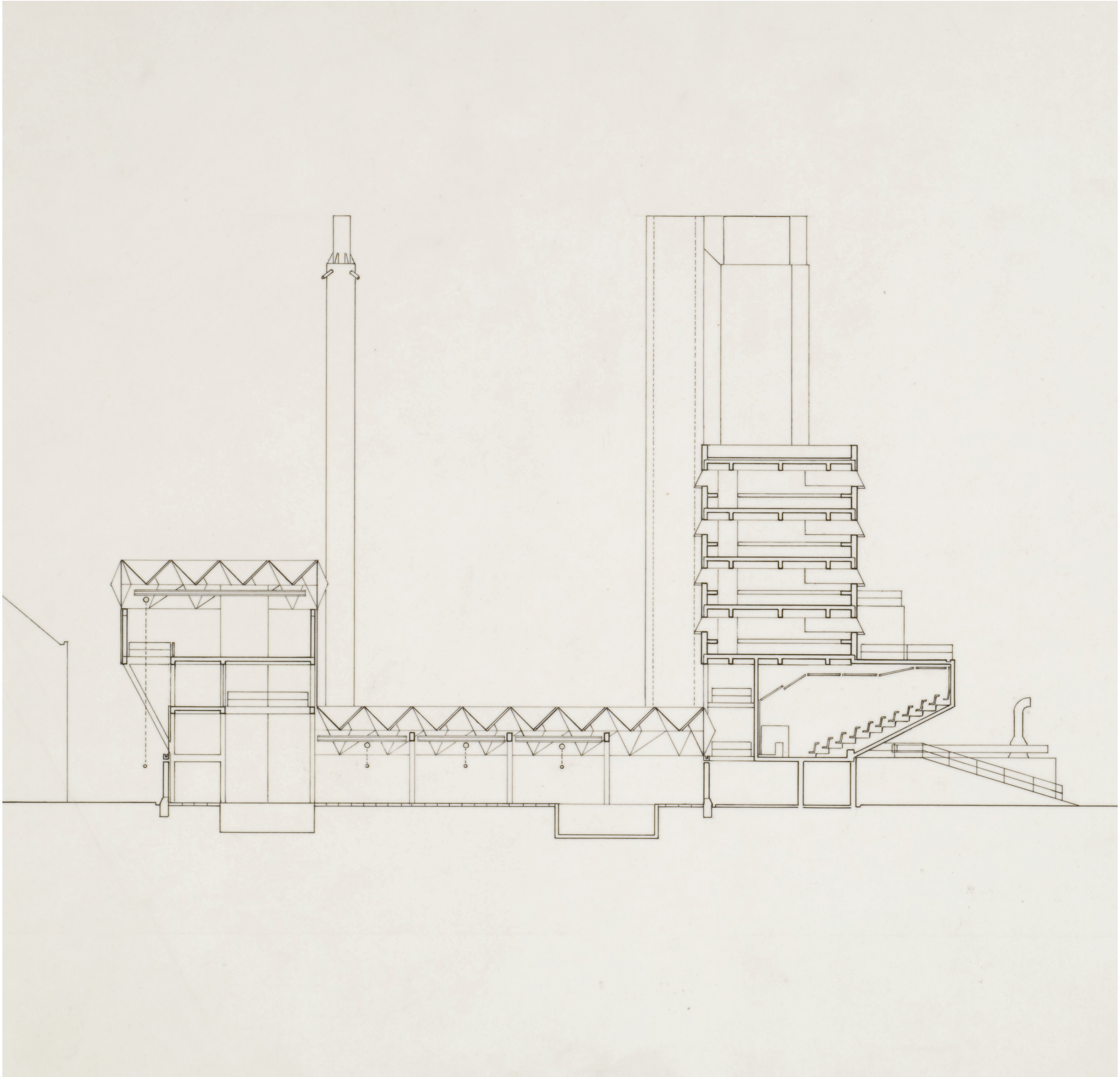


32. Axonometric aerial view, after Stirling & Gowan

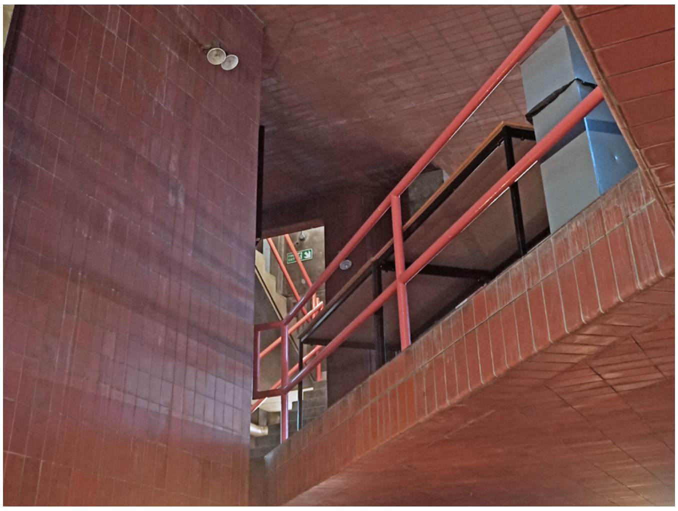
l. Research laboratory tower
m. Office tower
n. Chimney (concrete)
o. S-Block (glazed above brick plinth)
p. Workshop block (glazed above brick plinth)
q. Cantilever over service road, with raking buttresses
r. Latecomers' staircase



33. Roof plan



34. Section through workshops and research laboratory tower



35. Cutaways in lobby floor slabs

36. Large pipes in the main tower staircase

37. View of latecomers' staircase, main lecture theatre soffit and workshop glazing from podium

38. View of main entrance and office tower

39. Service road to rear, with third floor laboratories projecting overhead

40. Tiled and brick surfaces converge at the top of the entrance ramp

41. Brick plinth around ground floor of workshops and S-Block

42. Tiled and brick cladding to the tower ensemble

43. Tiling and industrial lighting in tower circulation space

44. Concrete haunch of office tower column, with 1980s glazing

3.2 MATERIALS

Materials are used on the building to define volumes housing conceptually consistent activity. Overall the palette is limited and used with a firm sense of restraint: brick and tile for wearing surfaces both inside and out; exposed concrete for beams, columns and buttresses, the purest structural elements; glass for light, although not always for visibility or views.[20]

3.2.1 Tiles and bricks

Fully aware that tiling the underside of concrete slabs was unfamiliar to British contractors, Stirling and Gowan consulted with the Building Research Station to ensure that they chose the right substrate (ribbed horizontally using rubber mats on the formwork) and tile surface (ribbed vertically). The architects selected a Dutch tile, the Russl Tiglia: an extruded quarry tile with a keyed back. This tile matched the colour of the Class A engineering bricks sourced from Accrington in England.

Fast-setting cement was used between tile and substrate, producing what Wilford called "a complete lock between the two surfaces" with fine joints less that ¼-inch wide.[21] The architects also commissioned some artificial-ageing tests on mock-up samples to test performance in wet, hot and freezing conditions.

The tiles were laid vertically as an obviously thin, brittle veneer, whereas the engineering bricks were laid in a stretcher bond pattern with recessed joints, accentuating their supposed (but not entirely genuine) load-bearing behaviour. John Jacobus, writing in the Architectural Review, noted this pairing of "real-unreal materials".[22]

The brick cladding to the research laboratories was constructed of an outer leaf of stretcher bond brickwork supported on a galvanised steel angle bolted to the concrete slab. The bottom fourteen courses on each floor were tied back to a concrete upstand beam. The remaining thirteen or fourteen courses above formed the outer leaf of a cavity wall, with an inner leaf laid above the concrete upstand presenting a raw brick finish to the room interior.[23]

The visual consistency of the rusticated brick podium and plinth (41) was sufficiently important for the architects to obscure several doors with slips to match (just visible on 40).

3.2.2 Concrete

One of the few requests from Parkes regarding the aesthetics of the building was that the architects should avoid the use of exposed concrete surfaces.[24] Its use is limited to only the most elemental structural 'bones': externally, slender piers supporting the towers (haunched on the office tower, 44) and the raking buttresses over the service road (39); internally, a portal-framed structure beneath the workshop roof (45) and the paired Y-shaped beams which tie the piers together in the ceiling of the MacLellan Room.

3.2.3 Glass and aluminium

The decision to use low-cost, off-the-shelf patent glazing (the 'Hercules' system by Pillar Patent Glazing Ltd.) for the workshops and S-Block was taken early in the design process.[25]

Patent glazing is a simple system of relatively small glass panels, framed on their vertical edges, which had been in regular use on light industrial buildings since its invention in the late nineteenth century. Rudimentary details for aluminium glazing bars, joints and flashings offered opportunities for creating complex forms without great cost. Reviewing the building in 1964, Reyner Banham praised the roughness of the framework, describing it (favourably) as "rock-bottom cheap industrial stuff… just nuts, bolts, bars cut to length on site, and raggedy flashings left 'as found'".[26]

One extravagance that the architects allowed themselves was a translucent glass product known as 'plyglass', a material of Belgian origin which came into use in England in the late 1950s. Plyglass consisted of two sheets of clear float glass sealed together around their edges, holding a loose 'tissue' of white fibreglass between them (47). This was applied to the workshop roofs and the vertical elevations of the S-Block to give a diffuse, uniform light in the internal spaces. It also allowed the prismatic arrangement around the perimeter of the roofs to glow at night (37, 38).

The south-facing rooflights were also glazed with plyglass, but they included an almost-opaque metallic coating in an attempt to limit solar gain. This colour of this coating was tuned to look the same as the north-facing panes in the daylight, thus preserving the apparent consistency of the glass "stretched rather line polythene" across the whole block: another real-unreal material pairing.[27]

A debate over the glazing on the office tower ran for some time between the partners and became unusually heated. Stirling was keen to use much larger plate glass sheets to give a more refined 'front office' appearance, in contrast to the factory aesthetic behind, whereas Gowan argued that there should be no such distinction; that the whole ensemble should be consistent; and besides, the budget could not sustain the more expensive glass. Gowan had his way and the cheaper patent glazing was applied everywhere.[28] Figures 29 and 30 illustrate this change.

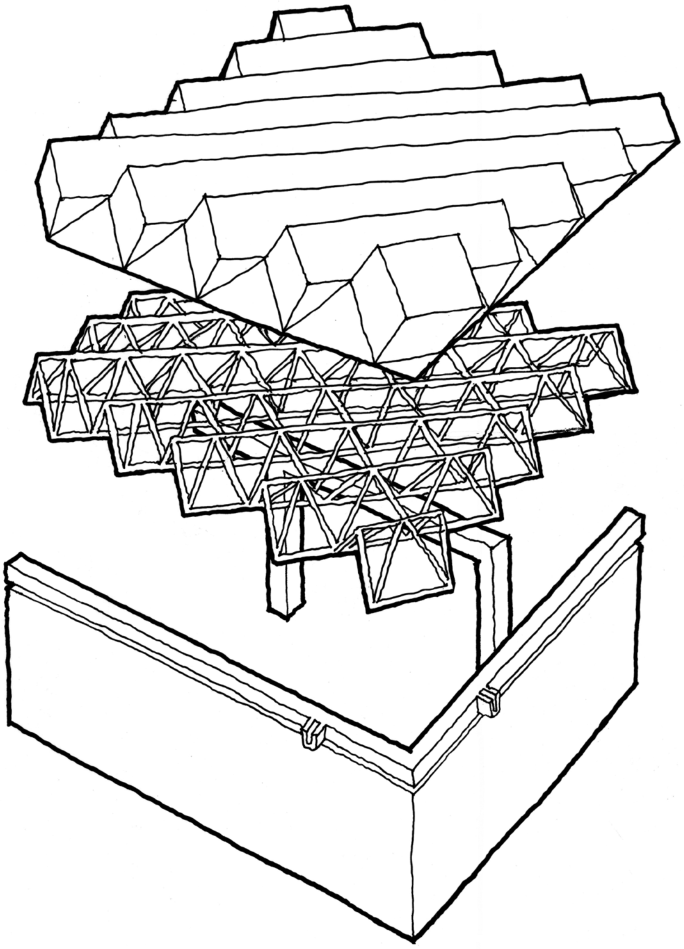
3.2.4 Interiors

The external finishes of the building's principal volumes run from outside to inside: tiles and bricks are dominant in all of the circulation spaces. These materials give a hard-wearing quality to the interior spaces, complemented by tubular steel handrails, exposed plumbing and industrial wall-mounted lamps (35, 43).

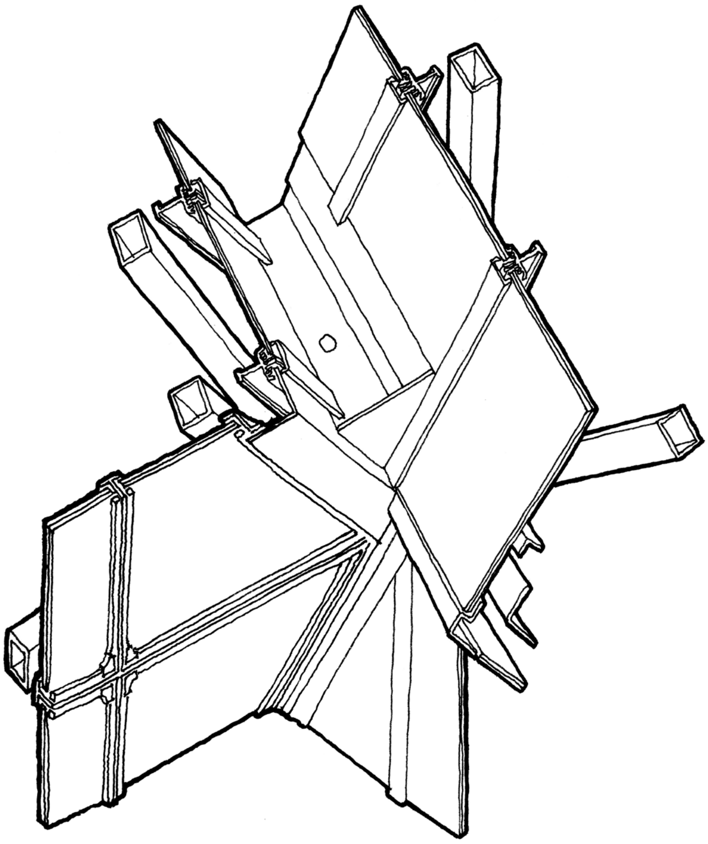
As with the exterior of the building, exposed concrete is limited – although the two tower stairwells remain fair-faced with obvious panel joints and round marks left by the shuttering ties.

By contrast, the lecture theatres feature bespoke upholstered benches and acoustic linings of curved fibrous plaster panels: a "soft inside", as Stirling described it (53).[29]

The plyglass cladding of the workshops and S-Block produce what an early architect visitor, Raymond Andrews, noted as "an excellent quality of internal light that is better than anything suggested in the [Building Research Station] pamphlet on factory lighting".[30] The diffusing properties of the translucent plyglass do create excellent conditions for manual working – with students deprived the distraction of any views out of the workshop – although solar gain and heat loss through the glazing were sources of concern for the building's occupants from the outset.



45. *Cutaway exploded view of workshop construction: glass on aluminium framing, fixed to steel trusses on concrete structure; brick plinth wall with concrete edge beam acting as gutter with spouts*



46. *Cutaway view of original gutter end node arrangement at roof perimeter: five glass planes converge on a single point, with flashings made up in folded aluminium and lead sheets; patent glazing bars supporting rooflights, pre-fabricated frames with T- and Z-shaped aluminium elements for gable; no insulation*

47. *'Plyglass' detail*

48. *Gutter end node in 2012, with 1980s restraint clip*

49. Workshops and S-Block (day)

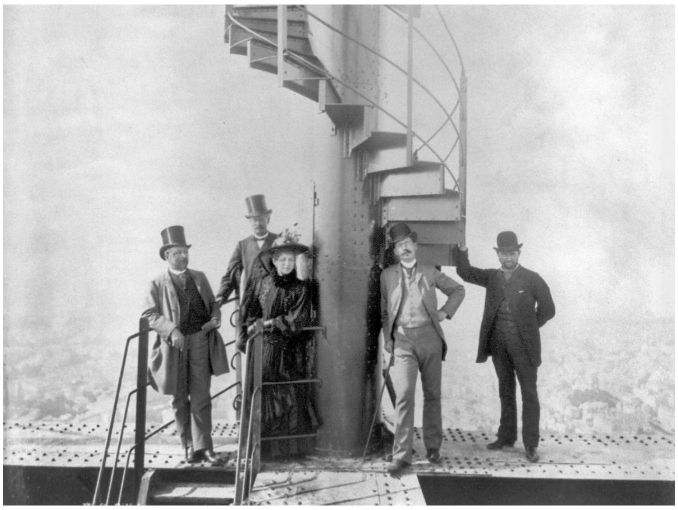
50. Workshops and S-Block (night)

51. Open-plan laboratory space on third floor of S-Block

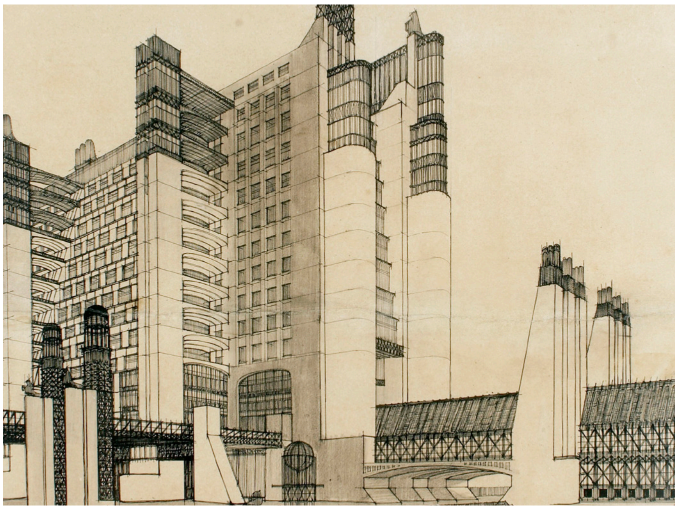
52. *Landing between the towers*

53. *Interior of small lecture theatre*

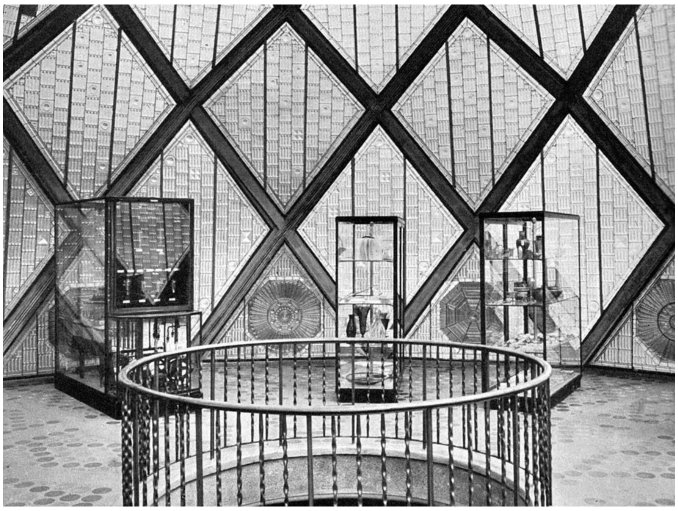
54. *Classroom in research laboratory tower*



55. Gustave Eiffel: spiral staircase of Eiffel Tower, Paris (1889)



56. Antonio Sant'Elia: La Città Nuova (1914)



57. Bruno Taut: Glass Pavilion, Cologne (1914)

58. Konstantin Melnikov: Rusakov Workers' Club, Moscow (1928)

59. Frank Lloyd Wright: Johnson Wax, Racine (1936-39, 1944)

60. Le Corbusier: Maisons Jaoul, Paris (1956)

3.3 STYLE & SYMBOLISM

3.3.1 The "style for the job"

Stirling and Gowan, like many of their architect friends and peers, were determined to shape modern architecture in a new way. To them it could be more complex and visceral than the mainstream styles and fashions which had emerged after the Second World War – dominated by American-style corporate glass towers, the aesthetic banality of the New Towns programme, and what Stirling described as the "finickity, decorative and inconsequential"[31] architecture of the Festival of Britain.

Both architects were committed to finding what Gowan called the "style for the job"[32] – each situation having an aesthetic response appropriate to its function – although Stirling's subsequent loss of faith in this approach was a key reason behind they partnership dissolving in 1964.

3.3.2 Industry & functionalism

Both partners appreciated the architecture of trade and manufacturing. Heneghan writes of "the historic factories, warehouses, mills and docks that both Stirling and Gowan admired, visited together and photographed"[33]. The architecture of the Industrial Revolution was a home-grown form of architecture which could be both functional and symbolic, vernacular and monumental.

Gowan's experience working on designs for light industrial units in Stevenage will certainly have fed into his thinking for the workshops – along with the partners' shared admiration for engineered machines (see 3.3.3). Their enthusiasm for utilitarian finishes and fittings was clear in their earlier domestic projects, but at Leicester they developed this theme into a full and idealised notion of what an environment suitable for technical minds should look and feel like.

3.3.3 The "white heat" of technology

The 1940s and 50s saw a flourishing of innovation and manufacturing in Britain, as in many countries. There was a sense of enormous optimism about the potential of science and engineering to change the post-war world.

New developments in technology powered a period of rapid change in jet-propelled aviation and rocket-fuelled spaceflight. A succession of new aeroplane types, their wings and fins raking ever further backwards, was launched by British aviation companies (63). Engineers from the USA and USSR, competing for dominance of space exploration, created a new aesthetic of tapering rockets, umbilical towers and detachable capsules (65).

The architecture of the Engineering Building clearly references these forms and structures. Its elements are streamlined, both vertically and horizontally; the lift shafts support a rocket-like tower; the research laboratory block is primed to detach and commence orbit.

3.3.4 Victorian Gothic

Grand Victorian office buildings, railway hotels, train sheds and glasshouses were powerful (if, at the time, rather unfashionable) sources of inspiration. In this respect the prime example is perhaps Scott and Barlow's St. Pancras station, a high point of Victorian Gothic with its pinnacled red-brick tower, at the London end of the East Midlands line to Leicester (66).

Another influential brick Gothicist was William Butterfield. The blank facets, sharp buttresses and sheer "oddness"[34] of Butterfield's buildings may be seen reinterpreted in the Engineering Building – and again in Stirling's next buildings in Cambridge and Oxford (64).

James Gowan thought the Engineering Building conformed to "the Ruskin definition of Gothic" which "mentions variety and change and adaptability."[35] The building has no overarching order in terms of symmetry or repetition, but instead is shaped by an almost diagrammatic sequence of functional spaces. The whole ensemble is an assemblage of elements, each of which is designed in response to the specific needs of its internal parts.

Despite being constructed from clean lines and modern materials, the building is resolutely Gothic in its form and spirit. References to Gothic architecture include the steeple-like thrust of the towers, the squat skirt at the ground plane, flying buttresses over the service road, projecting gargoyle spouts, pattern-ribbed soffits, dark corners and crooked pathways. The dominance of pointed forms, sense of craning-over, and lack of symmetry, are all distinctively Gothic characteristics.

3.3.5 Early modernism

Stirling and Gowan's pool of influences from the early years of modernism include:

- Palm House, Kew Gardens, London (1844) by Richard Turner and Decimus Burton;
- the spiral stairs at the Eiffel Tower, Paris (1889) by Gustav Eiffel (55);
- *La Città Nuova* (1914) by Antonio Sant'Elia (56);
- Glass Pavilion, Cologne (1914) by Bruno Taut (57);
- Rusakov Workers' Club, Moscow (1928) by Konstantin Melnikov (58);
- Zuev Workers' Club, Moscow (1929) by Ilya Golosov;
- Salvation Army Hostel, Paris (1931-33) by Le Corbusier;
- Johnson Wax Headquarters, Racine (1936-39 and 1944-50) by Frank Lloyd Wright (59).

3.3.6 Contemporary masters

Stirling and Gowan were also aware of the groundbreaking architecture of their own time. Le Corbusier was a central influence, as were a number of landmark American buildings, widely published and certainly known to Stirling because of his travels there. Key references include:

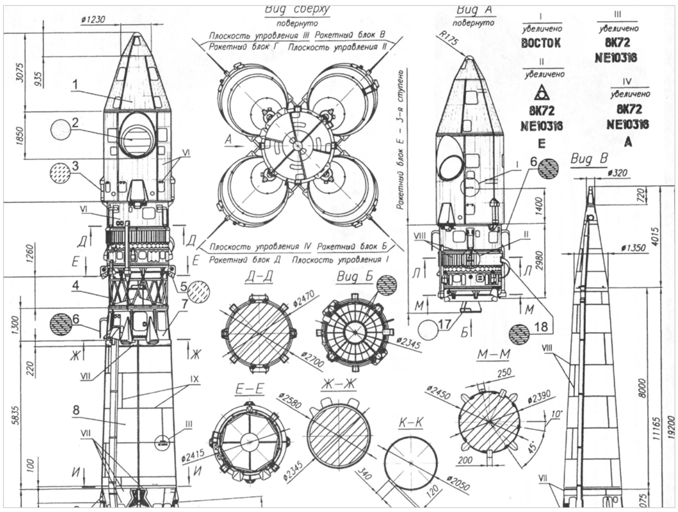
- Maisons Jaoul, Paris (1954-56) by Le Corbusier (60);
- Art & Architecture Building, Yale (1963) by Paul Rudolph;
- Richards Medical Research Laboratories, Philadelphia (1957-60) by Louis Kahn.

61. *View from rear*

62. *View from rear*

63. *English Electric Lightning*

64. *William Butterfield: Keble College Chapel (1876, Grade I)*



65. *Drawings of Russian Vostok 2 rocket*

66. *George Gilbert Scott: Midland Grand Hotel (1868, Grade I)*

4
THE BUILDING IN SERVICE

4.1 1960s & 1970s

By the winter of 1965 James Stirling – his partnership with Gowan having been dissolved two years earlier – was in correspondence with the university about water dripping into the building. After making recommendations to deal with each problem in turn he added that "small leaks may occur elsewhere, but as I understand it these are infrequent and I hope they can be accepted as not being a cause of nuisance."[36]

Girouard notes that "the glazing of the tower leaked badly, especially to begin with," and relates a story from Edward Parkes, who had brought his wife to the building during a thunderstorm and pointed out to her how "the water was coming down the inside of the glass in absolute torrents." Acoustics around the glazing were also a problem: "although the horizontal sound insulation between the rooms was excellent, the vertical was not. As Parkes put it, 'Although you could not hear anybody in the room next door, you could talk to someone four floors above without raising your voice.'"[37]

It is presumed that during this period the triple-height structural laboratory which ran up into S-Block from the ground floor of the workshops was subdivided with floor slabs. No information has been found to date this intervention more precisely.

4.2 1980s

4.2.1 Office glazing

The original patent glazing construction proved to be inadequate for its function. Revisiting the building in 1984 for the *Architects' Journal*, Martin Pawley noted that, in the taller tower, "the floor to ceiling windows are curious – not only does the rain run down the inside as well as the outside of them, but though several are equipped with opening gear, all are bolted shut. This is a precaution… taken after some windows tore loose from their hinges and plunged to the populated campus below."[38]

The office glazing was surveyed by Bickerdike Allen Partners (BAP) in early 1984. They found that:

> "some 90% of fixing screws were noted to be not tight and approximately 50% so loose that they could be rotated and withdrawn with the fingers. Wind vibration... appears to have gradually loosened the screws. Also the waxed asbestos string on which the glass is bedded is slowly losing resilience and shrinking. This increases the potential for glass vibration and further loosening of screws...
>
> "Because of the problems of access and because the glazing cover strips retain four panels each, it is an expensive and difficult operation to replace any pane which is accidentally broken. Such breakages are immediately dangerous because the design of the system does little to retain the broken glass and may loosen the restraint of adjoining panes."[39]

Gaining access to clean or repair became harder still as health and safety legislation tightened over the years. Stirling had boasted of a specially invented gantry, a "supra-rational solution" to the challenge of reaching the tower windows, but by the 1980s this cradle had been decommissioned because of safety fears and it was impossible to perform even basic servicing.[40]

The hinged window openings could not be maintained from either side due to a concealed hinge detail, and the hinges were found to be badly corroded. Many had been fixed shut, denying ventilation to the offices and circulation areas. BAP noted that:

> "the occupants of the building have reported that the thermal environment was originally not good, being too hot in summer and too cold in winter. Permanent closing of ventilators has exacerbated the problem in summer... even on generally cool days, a relatively short period of sunshine could make internal conditions extremely unpleasant."[41]

They concluded that "a solution which does not involve total deglazing is unlikely to be successful."

The office tower façade was replaced the following year with new glass and much thicker framing elements (68). This change was condemned by Girouard as one of "crushing and needless insensitivity"[42].

4.2.2 Workshop glazing

'Retaining clips' were added in the 1980s to the sloping glazing on the projecting points of the diamond gables, to a design by BAP.

4.2.3 Vertical tiling

BAP found "almost immediate water penetration" after spraying a soft joint on the north elevation of the stair tower: "water could be seen to be running along the horizontal tile joints and entering the office tower behind the aluminium glazing bar screwed through the tiling, despite original sealant and externally applied mastic maintenance work. Within fifteen minutes… water was entering the office tower on all levels and formed a large puddle in the entrance foyer." Large numbers of open joints were observed, both in grouting and in soft joints between bays of tiling.[43]

Tile adhesion was observed to be reasonable, largely due to a high-quality tile and keying system but also because shutter bolt holes and other weak concrete details were effectively draining water away from behind the tiles, and because the poor thermal resistance of the walls reduced the risk of water freezing within the wall.

4.2.4 Horizontal tiling

On the terraces the asphalt waterproofing beneath the floor tiles was found to be saturated due to a lack of drainage: "the screed was in fact so wet that it crumbled away in the fingers leaving the hand wet." Large quantities of water where found to be "penetrating the slab".[44] Lime was leaching from underneath the terrace tiles, leaving white stains.

The poor design of the terrace build-up was also causing significant damage to the vertical tiling immediately below. Areas of debonded tiles, hollow-sounding when tapped, were encountered on the vertical surfaces close to the edge of the horizontal terrace on top.

BAP concluded that "the problems can only be satisfactorily remedied by the removal of the existing terrace surfaces and replacement with a waterproof membrane correctly laid to falls, drained at membrane level and with an edge detail designed to prevent water penetration behind the vertical tiling."[45]

4.2.5 Remedial work

BAP estimated costs of "in the region of £450,000" to replace the glazing to the offices and circulation areas with new double-glazing, "of which some £170,000 would lie in the cost of access and deglazing the existing system." The recommended work to cut out and re-grout all tile joints, redesign and remake all soft joints, and provide improved weathering protection at the top of the walls, would be around £75,000. Replacing the terraces and redesigning the edge detail would be around £65,000.[46]

In total the proposed remedial work was estimated at approximately £590,000 – quite a sum when compared to the original built cost of £447,500 only two decades earlier. However, the final details and costs for the works carried out are not known.

4.2.6 Maintenance walkways

In 1987, BAP was employed to install maintenance gantries spanning above the rooflight ridges on both the workshop and S-Block roofs. These provided access to most of the roof gutters for cleaning and maintenance (69).

Note: by 2011 their use in this way was prohibited, although they still proved helpful in allowing visual inspections of the rooflights and north-east S-Block elevation, and for small-scale scaffold access for opening-up works.

4.3 1993

The building was added to the National Heritage List for England at Grade II* in March 1993. According to Elain Harwood of Historic England the heavy replacement office glazing prevented the building receiving Grade I status.[47]

4.4 2000s

A plaque on the top floor of S-Block describes the opening of the Electrical and Electronic Engineering Research Laboratories by HRH the Duke of Kent on 1 October 2002.

The work required for this change may have involved the installation of the partition walls, false ceilings and mezzanine floors which now exist in the same area, although no details have been sourced to verify this.

4.5 2010s

By 2011 the translucent patent glazing applied to the workshops and S-Block was failing badly. Thermal conditions inside the Engineering Building had always been poor, with the glazed façade having what Pawley referred to in 1984 as "the U-values of a paper bag"[48]. However, problems associated with water-tightness, structural stability and access for maintenance were rapidly increasing and severely threatening the building's continued operation.

The university's estate managers had been chasing Stirling's "small leaks" since the building opened. Where alterations had been made to the original roofs, often to seal their leaking joints, in most cases the intervention was a liberal and unsophisticated application of grey silicone (48). Inside, an assortment of *ad hoc* funnels, pipes and buckets (70) were 'engineered' to divert water into drains. A large stain on the parquet flooring in the electronics workshop bore witness to a stubborn leak overhead: its presence next to open Tesla coils gave a powerful sense of the making-do required.

The seals holding the plyglass panels together were breaking down: water was seeping into the fibreglass fabric, bringing disfiguring stains and mould growth (72). Many panels were cracked or discoloured.

Many of the screw fixings holding the aluminium framing together were loosening. Of most concern was a section of the north-west S-Block elevation which was visibly pulling away from the concrete beam behind. The tables and chairs of the café below could be seen through its open joints.

These problems were almost all compounded by the fact that it was not possible to safely access any of the workshop and S-Block glazing without elaborate scaffolding. This meant that relatively straightforward maintenance tasks (tightening fixing screws, for instance) could not be carried out.

A £19.5m project was commissioned by the University of Leicester to upgrade the glazing and building services to the workshops and S-Block. This project included the following interventions.

- The original plyglass and non-insulated aluminium framing and flashings were replaced with a bespoke, fully-insulated glazing system designed to match the appearance and finesse of the original design. The new system provided a greatly enhanced U-value and was tested for impact resistance, water ingress (including into the fibreglass tissue of the glass panes, to avoid the same staining as occurred previously) and colourfastness. The additional weight of the double-glazed units, plus modern-day loading for drifted snow, was substantial; however, the original roof structure was found to have been designed with a significant spare capacity.
- The high-level access walkways installed in the 1980s were removed and replaced with more visually discreet tracks designed for manually-operated maintenance 'trolleys' to roll across the roofs. Ladders descend from the trolleys into the roof gutters, where maintenance staff can fasten a harness restraint into a track on the gutter floor. This system prevents them from walking to the perimeter of the roof.
- Original floor-level heating units were retained and refitted with new equipment, and heating/cooling units were fitted into the largely empty underfloor trenches in the workshop. New aluminium floor grilles were designed to allow easy cleaning.

- The original high-level swan-necked heating and ventilation units, fabricated by Colt, were replaced with new units offering cooling as well as heating modes.
- Where floor trenches were not present under the roofs (principally in the hydraulics workshop on the ground floor and throughout the third floor) arrays of fan-assisted heating/cooling units with integrated lighting were installed at high level. As with the swan-necked heaters these elements were all bespoke designs, intended to match the straightforward industrial aesthetic of the building without pretending to date from the 1960s.
- Globe-shaped ventilation fans positioned in the vertical glazing were refurbished, and several new models fabricated to the same design – in this case deliberately matching the 1960s models as closely as possible. Louvred vents were installed in the roofs, of similar appearance to the original panels but in this case off-the-shelf modern versions.
- All heating, cooling and ventilations elements, with the exception of the manually-operated globe fans, were linked to a digital building management system (BMS) calibrated to control temperatures throughout the workshop and S-Block spaces.

4.6 OTHER INTERVENTIONS

Other changes include the construction of partition walls and mezzanine floors throughout the building and large smoke vents installed on the terrace roofs of both lecture theatres. Details and dates for these alterations are not known.

67. Original three-storey structural laboratory (to right of image), 1963

68. Replacing the office tower glazing, 1984

69. Walkways retro-fitted to workshop and S-Block roofs, 2013

70. 'Bucket' in workshop to catch water dripping through roof, 2013

71. Poster used as shading on non-opaque plyglass pane, 2014

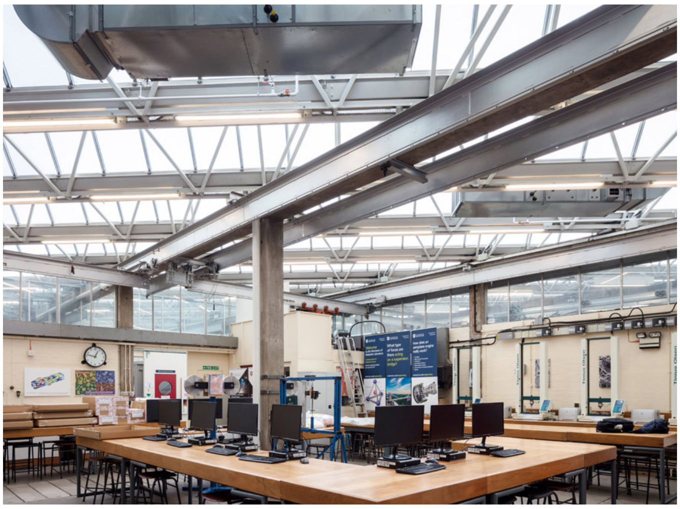
72. Staining within plyglass tissue 2012

73. Removal of original roof, 2016

74. New glazing installation, 2016

75. North-east elevation of S-Block with new glazing, 2017

76. *Ground floor workshop, 2017*



77. *Ground floor workshop, 2017*

78. *Electronics laboratory in S-Block, 2017*

79. *View from library plaza, 2017*

80. *View from library café, 2017*

81. Seating area in circulation space between towers, 2019

4.7 ROLE TODAY

4.7.1 Department

Elain Harwood's history of the building for Historic England, written in 2015, notes that "it survives remarkably unaltered and is still used for its original function despite changes to the way engineering is taught."[49]

The number of students in the department has dramatically increased – up to 600 undergraduates today – with ever-greater pressures on the same restricted space. Many of the internal alterations made over the last fifty years have been designed to fit more students into the building.

For all these changes, most rooms within the building still host activity which might have taken place in 1963. Although computers are increasingly relied upon for analysis and modelling, students still attend lectures and participate in practical experiments where they operate engines, wave chambers and other traditional apparatus.

4.7.2 Landmark

The Engineering Building is a powerful presence on the Leicester skyline. It was the first tower on the campus, before the construction of the Charles Wilson Building (1966) by Denys Lasdun and the Attenborough Building (1968-70) by Arup Associates, and its impact when first constructed must have been considerable.

The building provides an obvious landmark and 'anchor' to the southern part of the campus. Its entrance routes still aligns with natural movements through the campus, although the openness of the original design has been compromised by fencing, car parking and the closure of both the north-east and first-floor entrances – primarily due to problems with through-draughts in the foyer and safety concerns regarding the long entrance ramp. In this regard the building's positive engagement with the landscape immediately around it has been diminished.

Today the perimeter of the workshop roof – perhaps the building's most famous feature – is prominently visible from a new raised plaza outside the main university library building. This part of the campus is very well used, meaning that the Engineering Building forms a key backdrop to much daily student activity: a fine setting indeed.

Distant views revealing the building's collaged form are limited, principally because of a row of mature trees on the edge of Victoria Park.

4.7.3 Emblem

The building features strongly in the University of Leicester's promotional material. It constitutes part of the university's brand identity – reinforced further following the successful completion of the re-roofing project in 2017.

82. *Engineering Building, 2017 (with new glazing to workshops and S-Block)*

83. Replacement glazing, 2017

84. *Replacement glazing (with maintenance trolley rails), 2017*

4.8 PLANNING HISTORY

The following table summarises all of the planning and listed building consent applications made over the history of the building, as listed on the Leicester City Council planning portal.

#	Date	Decision	Agent	Details
005522	13 May 1960	Conditional approval	Stirling and Gowan	Redevelopment of site of old Lancaster Boy's School by the erection of a building comprising engineering teaching laboratories, lecture rooms, staff rooms, etc.
19870728	15 May 1987	Unconditional approval	Bickerdike Allen	Construction of two access walkways across glazed roofs on existing building
19921400	9 February 1993	Refusal	R T Green	New glazed screen wall to 'A' Deck (south-west side)
19940711	27 July 1994	Refusal	Michael Wilford and Partners	Second floor extension to South Block (S-Block) of Engineering Building
19950598	29 September 1995	Conditional approval	Carter Jonas	As above plus internal alterations to doorways and lobbies
19950599	29 September 1995	Conditional approval	Carter Jonas	Alterations to render the building safe for use under the Fire Precautions Act, to include new exit doors to the south-east and south-west elevations of the workshops, new ventilation grilles to the tower
19960210	21 November 1996	Withdrawn	R T Green (UoL)	Replacement of extract fans to south-west façade
19991339	24 February 2000	Withdrawn	University	Bird-proofing of decks and rear soffits to Engineering Building
20001699	16 May 2001	Conditional approval	Isherwood McCann	Internal alterations to form offices, storage and toilet facilities
20011295	26 October 2001	Limited period approval	R T Green (UoL)	Pigeon netting to building
20011538	7 January 2002	Conditional approval	Isherwood McCann	Photovoltaic panels on roof of Engineering Building
20030349	20 May 2003	Conditional approval	Isherwood McCann	External alterations to building
20030262	12 June 2003	Conditional approval	Isherwood McCann	Relocation of maintenance walkway and antenna to roof of building
20041538	1 October 2004	Conditional approval	Isherwood McCann	Internal alterations
20041776	10 November 2004	Conditional approval	Isherwood McCann	Internal alterations
20042111	10 February 2005	Limited period approval	R T Green (UoL)	Retention of pigeon netting to north-west elevation
20061189	12 January 2007	Conditional approval	J H Whait (UoL)	Internal alterations
20061978	17 January 2007	Conditional approval	P Bale (UoL)	Internal alterations
20071988	22 November 2007	Withdrawn	J H Whait (UoL)	Internal alterations
20072280	5 February 2008	Unconditional approval	J H Whait (UoL)	Retention of pigeon netting
20082043	03 June 2009	Limited period approval	University	Temporary building adjacent to the Engineering Building
20101971	7 February 2011	Conditional approval	University (Mike Sandoz – Electrical Services Engineer)	Internal alterations
20110772	11 July 2011	Conditional approval	University (RD Lockwood & Co.)	Removal of timber partitions; erection of double-skin steel partitions; overlay steel floor with rubber tiles
20120952	11 July 2012	Conditional approval	University (BGS Architects)	Roof replacement
20131928	27 March 2014	Conditional approval	University (BDP)	Flue
20131930	27 March 2014	Conditional approval	University (BDP)	Flue – reduced height
20171796	19 October 2017	Conditional approval	University (Montagu Evans)	Chimney repair and reconfiguration
20180245	12 April 2018	Conditional approval	University	Internal alterations

5
SIGNIFICANCE ASSESSMENT

5.1 VALUES

5.1.1 In general

Historic England's *Conservation Principles, Policy and Guidance*[50] ascribes significance on the basis of four perceived heritage 'values', as follows:

- *evidential value* – the potential of a place to yield evidence about past human activity;
- *historical value* – the ways in which past people, events and aspects of life can be connected through a place to the present;
- *aesthetic value* – the ways in which people draw sensory and intellectual stimulation from a place;
- *communal value* – the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.

Depending on the extent of these values, the significance of a building (or its constituent parts) is defined as being *high*, *medium*, *low* or *negligible*. Elements which have a negative effect on the building's significance overall are noted as being *detractors*.

5.1.2 Evidential value

The Engineering Building survives intact as an example of 1960s university building at its most adventurous. As has been discussed, this has brought several problems – particularly concerning the building's environmental performance and the durability of specific materials.

These aspects of the building's design are themselves evidence of widespread (but by no means universal) attitudes within the construction industry after the Second World War: that new materials and methods should be embraced as efficient ways of rebuilding the country, and that energy would always be cheap and plentiful. These themes were echoed in the Sixth Congress of the International Union of Architects, held in London in 1961 with the theme of "New Techniques and New Materials".

Even so, Stirling and Gowan tested the limits of construction technology at the time. Michael Wilford noted that the partners "knew that [they] were being adventurous, and using materials and components in unusual ways – ways that had not been seen before. In these buildings we knew that we were pushing technical boundaries."

The building also exemplifies another important spirit of the age: abstraction. The artist Victor Pasmore, whose own work was powerfully abstract, described the movement in an article in 1951:

> "The revolutionary changes in our means of existence brought about by new discoveries of science (the aeroplane, motor car, wireless, electricity, atomic energy etc.) which mark the character of this century... [reflect] similar changes in politics, social behaviour, philosophy and art. Today the whole world is shaken by the spirit of reconstruction... In painting and sculpture and even architecture, an entirely new language has been formed bearing no resemblance at all to traditional forms."[51]

One of Stirling and Gowan's greatest achievements on the Engineering Building is that their assembled forms appear obscure and unprecedented, in the manner of Pasmore, whilst also keying into a wide range of contemporary and historical references. The building registers as original but somehow familiar: in this it may be safely considered a precursor to architectural postmodernism.

5.1.3 Historical value

Despite Gowan holding at least an equal claim to the authorship of the Engineering Building, it was Stirling who claimed more credit and built the more successful career following its success. This is due in part to his explicit reworking of the building's "engineering style" for two subsequent university buildings in Cambridge in Oxford.

Although both have also been listed at Grade II*, neither of these buildings achieved the deft complexity of Leicester: they are simpler, and their designs lack the ambivalence which Gowan brought to the partnership at Leicester. Nevertheless, the so-called "red trilogy" established Stirling as the creator of extraordinary buildings in a signature style. He successfully claimed for himself the functional-historicist language which the partners had developed together.

Stirling went on to develop a towering presence in the architectural establishment, winning prizes and prestigious commissions. His buildings, of which Leicester remains the most universally admired, inspired many of the most famous British architects of the late twentieth century, including Norman Foster, Richard Rogers and Zaha Hadid. Through them the Engineering Building laid the foundations for the flourishing of High-Tech and Deconstructivism, two major international movements in architecture.

The building's cerebral postmodernism was very different from the superficial PoMo style which bloomed in America during the 1960s and 70s, but it served as an important step towards it. Both Stirling and Gowan used PoMo motifs on projects later in their careers; these buildings, particularly Stirling's, have been significantly reappraised in recent years. 1 Poultry (25) was listed at Grade II* in 2016 as "an unsurpassed example of commercial post-modernism, on a monumental scale, intricate in its planning and rigorously scrutinised and executed."[52]

5.1.4 Aesthetic value

The aesthetic complexity of the building is considerable. Its internal environments span from open-plan workshops filled with shadowless light and engine smells to quiet office spaces with landscape views; from dramatic Piranesian cutaways in the tiled foyers and landings to fine upholstered carpentry in the theatres. It is a building of calm study and constant dynamism.

Through all of this the themes of engineering and abstraction figure heavily, creating an atmosphere which is tough and practical but constantly shifting in shape. Stirling and Gowan were too romantic for pure pragmatism; as John McKean writes, this is Stirling and Gowan, "pretending to play the game, fitting all our functionalist and programmatic presumptions, and then privately blowing them apart."[53]

Every one of Professor Parkes' practical requirements is given a sculptural twist. In the words of Alan Berman:

> "The reducing landings, and their enclosing cascade of glass (85), is one example of how the architects' rigorous analysis of function throughout set up difficult design situations which then required ingenious solutions, offering the opportunity for unique and expressive sculptural responses throughout the building: the workshop roof's crystalline diamond ends were resolved with a baroque geometric finesse; the tower, whose chamfered corners give the opportunity for a bold sculptural concrete haunch to make the transition from eight sides of glass to four corner columns; the raking struts under the workshop cantilever; or the need to drop a thin glass tube from under the solid block of red lecture hall. In all parts of the Leicester building there is an inventive response to functional need which gives it extraordinary richness at all scales, from its strategic spatial arrangement, to its counterpoint of high and low elements, down to the resolution of the smallest detail.
>
> Stirling and Gowan, still young and inexperienced, here display virtuoso architectural skills – a sort of suprafunctionalist inventiveness that turned demands both spatial and technical into high architecture. Where functionalism – as it was generally practiced – would solve problems, Stirling and Gowan set out rhetorically to exploit them.
>
> Colin Rowe describes the building as achieving 'an amalgam of austerity of principle and licentiousness of imagination' which is the root of the extraordinary way in which, fifty years after its design, the building remains constantly fresh and exhilarating."[54]

85. Glazing strip between towers, 2016

5.1.5 Communal value

The Engineering Building holds a particular value for three groups.

- Staff and students of the Engineering department and the University of Leicester more widely, for whom the building is a memorable part of life on campus – particularly with the library plaza and cafe allowing prominent views next to the building's distinctive diamond gables.
- The citizens of Leicester, for whom it is a highly visible city landmark.
- The international architectural community, for whom the building represents a glimpse of what architecture can and perhaps should be: complex and sculptural, visually spectacular and loaded with reference and meaning.

Communal value is most clearly manifest in the last group, with a significant volume of high-quality architectural literature published about the building.

More broadly, though, the building features regularly in lists of the most significant twentieth-century buildings worldwide, including seventh place in the Daily Telegraph's *50 most inspiring buildings in Britain* in 2008. In 1972 the building was featured on a British postage stamp, as part of a set to commemorate modern universities.

5.2 OVERALL SIGNIFICANCE

The Engineering Building unquestionably holds evidential, historical, aesthetic and communal value. It is considered to be of *very high significance* and worthy of Grade I listing.

Despite being a very long way from perfect – deficient in its leaks, in the control of its environment and the lack of means to maintain it – the building is, as Elain Harwood writes,

> "arguably the most original post-war building in England and one of the most distinctive in the world. It stands out as a uniquely British take on modern architecture, a marriage of constructivist forms from international sources with references to local industry that relate it to its function and East Midlands location. Its delight in assembling traditional bricks and tiles into a novel structure of considerable scale and sublime forcefulness pushes modernism from the New Brutalism of the 1950s into the mannerism of the 1960s where functions are not only expressed but relished, while the knowing references to older buildings and the locality hark at the postmodernism that [both architects were] later to adopt."[55]

86. Engineering Building on postage stamp

87. Glazing strip between towers, 2019

5.3 SIGNIFICANCE OF ELEMENTS

5.3.1 In general

The building has adapted over time and not every part of it is of the same significance as the whole. This section breaks the building down into its key constituent parts and assigns a rating to each.

These tables should be read in conjunction with figures 90 to 94.

	High significance
	Medium significance
	Low significance
	Negligible significance
	Detractor

5.3.2 External form

The building's external form remains essentially unchanged from the original construction. All parts are considered to be of high significance.

Significance	Item
High	Expressed shapes and volumes. Each is a clean and pure form, derived intrinsically from the specific function it contains. Each fulfils a different role in the composition; the balance between them is essential to the building's importance overall.
	Expressed structural elements. The few visible concrete members provide an important contrast to the heavy tiled masses and give a powerful vertical thrust to the building's form.
	Glazed forms. The sharp edges of the workshop and S-Block roofs, and the inverted hopper windows on the research laboratory tower, give the building its thrilling serrated edges and memorable 45-degree counter-rhythms. *Note that the significance of the design is somewhat distinct from that of the specific glass and aluminium elements: see below.*

5.3.3 Internal layout

While many areas within the building have been substantially adapted, the original layout is still relatively easy to discern. Elements which distract from the original openness and flexibility are of a lower significance.

Significance	Item
High	Original floor plates, particularly between the towers. The cutaway floors add a lightness and dynamism to otherwise stark spaces, opening surprising views above and below.
	Structural frame. Where it is exposed the concrete frame registers as a more rugged element amongst the precision-cut planes of glass and tiles nearby.
	Locations of original partition walls. These include the spine walls which define the four main areas in the ground floor workshops. *Note that this significance is distinct from the actual wall materials and construction: see below.*
Medium	Original built-in cupboards, shelving, etc.
Negligible	Locations of partition walls, mezzanine floors and room 'pods' installed to create segregated spaces in otherwise open volumes. Whilst some separate offices and storage spaces are clearly required, many of these elements compromise the original (and still valid) concept of flexibility within the building, reducing its overall capacity.

5.3.4 Materials and finishes

Significance	Item
High	Bricks and tiles, except newer replacements including those on the entrance ramp. These elements are used innovatively throughout. Rather than just supporting the building they appear to wrap it, like a taut skin; they are overtly external elements on the inside of the building; and they provide a subtle contrast between different structural volumes (smooth tile for some, rougher brick for others) while appearing almost identical from afar.
	Exposed concrete. Professor Parkes asked that the building would not have a concrete finish. The few elements which remain fair-faced give the structure a spare, skeletal power.
	Workshop and S-Block glazing. These include a diffusing effect which provides even light during the daytime and an internal glow at night. *Note that this significance is distinct from the actual glass panels themselves: the non-original glass panels in particular have a lower significance in and of themselves.*
	Slenderness of aluminium in workshop and S-Block glazing. *Note that this significance is distinct from the actual aluminium elements themselves.*
	Tubular steel handrails. These elements give the building a tough industrial edge.
	Lining to lecture theatres. The curved and slotted 'acoustic' finish gives the lecture theatres a more refined character than the rest of the building: a "soft inside", as Stirling put it[56].
Medium	Parquet flooring. Believed to survive beneath newer flooring, the parquet flooring imparts warmth to several spaces which might otherwise be uncomfortably harsh.
	Concrete flooring in workshops.
	Original aluminium framing to inverted hopper windows, including louvre mechanisms.
	Surviving original glass. The inverted hopper windows in the research laboratory tower, and the slender strips of glass separating this tower from the lift shaft, are the only original elements of external glazing remaining on the building. As essentially 'replaceable' infill components the significance of the material itself is by definition limited, but as older elements they retain a greater importance than the newer replacement panels elsewhere.
	Original partition walls. *Note that the arrangement of original walls has high significance.*
Low	Timber doors. The porthole doors used throughout the building are characterful.
Negligible	Terrace and flat roof finishes. The original terraces featured the same quarry tiling as the vertical surfaces of the lecture theatres. Today the terraces are finished with larger grey-pink square pavers on ballast – a design change made during repair works in the 1980s. The flat roofs are assumed to be the same but have not been inspected.
	Ramp finishes. The ramp featured the same quarry tiling as the vertical surfaces of the lecture theatres. Today it is finished with an assortment of non-original tiles in imitation.
	Carpets.
	Some non-original partition walls and mezzanine floors.
Detractor	False ceilings and ceiling tiles. These elements obscure the original design intent for visibly structural materials wrapping through and around the different volumes in the building.
	Internal (secondary) glazing in the office tower. This has an effect both inside and out: externally, although the secondary framing elements are recessed from the main glazing line their thickness adds to the overall visual 'heaviness' of the tower. Internally their adverse effect is predominantly due to their lack of coordination with the opening elements of the outer skin.
	Internal (secondary) glazing in the research laboratory tower. This has a greater impact internally, where the vertical framing obscures the effect of the angled original windows.
	Some non-original partition walls and mezzanine floors.

5.3.5 Fixtures

Fixtures are elements mechanically connected to the building, including some furniture (principally cupboards and worktops), laboratory/experimental equipment such as pipework, and building services.

> *Important note:* several items of basic mechanical and electrical equipment are listed here as being of high significance. This applies only for as long as they are functional. Every reasonable effort should be made to keep them in use as intended.
>
> Once they have been condemned from a technical perspective they will lose much of their special significance.
>
> For the Engineering Building to remain 'alive' – both as an environment fit for modern-standard learning and teaching and as the diagrammatic engineering 'system' it was designed to be – it must adapt its systems carefully in the spirit of the original design. Unless they are clearly labelled as exhibits, elements which are not 'truthful' (in the sense that they actually do what they appear to do) should be removed.
>
> This approach means that, for example, the Colt control units installed for the pneumatically-operated roof louvres in the workshop which have now been replaced should be taken down. They have lost their function and, in this context, their significance – indeed, they might even be considered as detractors.

Significance	Item
High	Spotlights in circulation spaces.
	Globe fans on S-Block elevations. *Note that several of these components are modern replicas fabricated in the 2010s.*
	Original fixed benches in workshops.
	Original benches in lecture theatres.
Medium	Original under-bench radiators, built-in convector heaters, fin-tube radiators, etc. Although not all original these elements were designed or selected to integrate neatly with the surrounding fabric.
	Original distribution boards and switchgear.
	Original exposed pipework.
	Original door handles and ironmongery.
	Original light switches, sockets, etc.
	Cranes and winches.
Low	Non-original bespoke timber benching.
Negligible	Non-original radiators, convector heaters, etc.
	Other non-original components including switches, sockets, ironmongery, etc.

5.3.6 Fittings

Items not fixed to the building, including loose furniture, freestanding laboratory/experimental equipment and artwork, do not form part of its legal protection. However, they do have a strong influence on how it is experienced. For this reason policies have been agreed which concern loose furniture and chattels.

This category includes laboratory and experimental equipment.

Important items in the building include the *Leicester Tapestry* (also known as the *Anniversary Tapestry*) which was installed in Engineering in 1982 to mark the University's 25th anniversary (88).

According to the University's website:

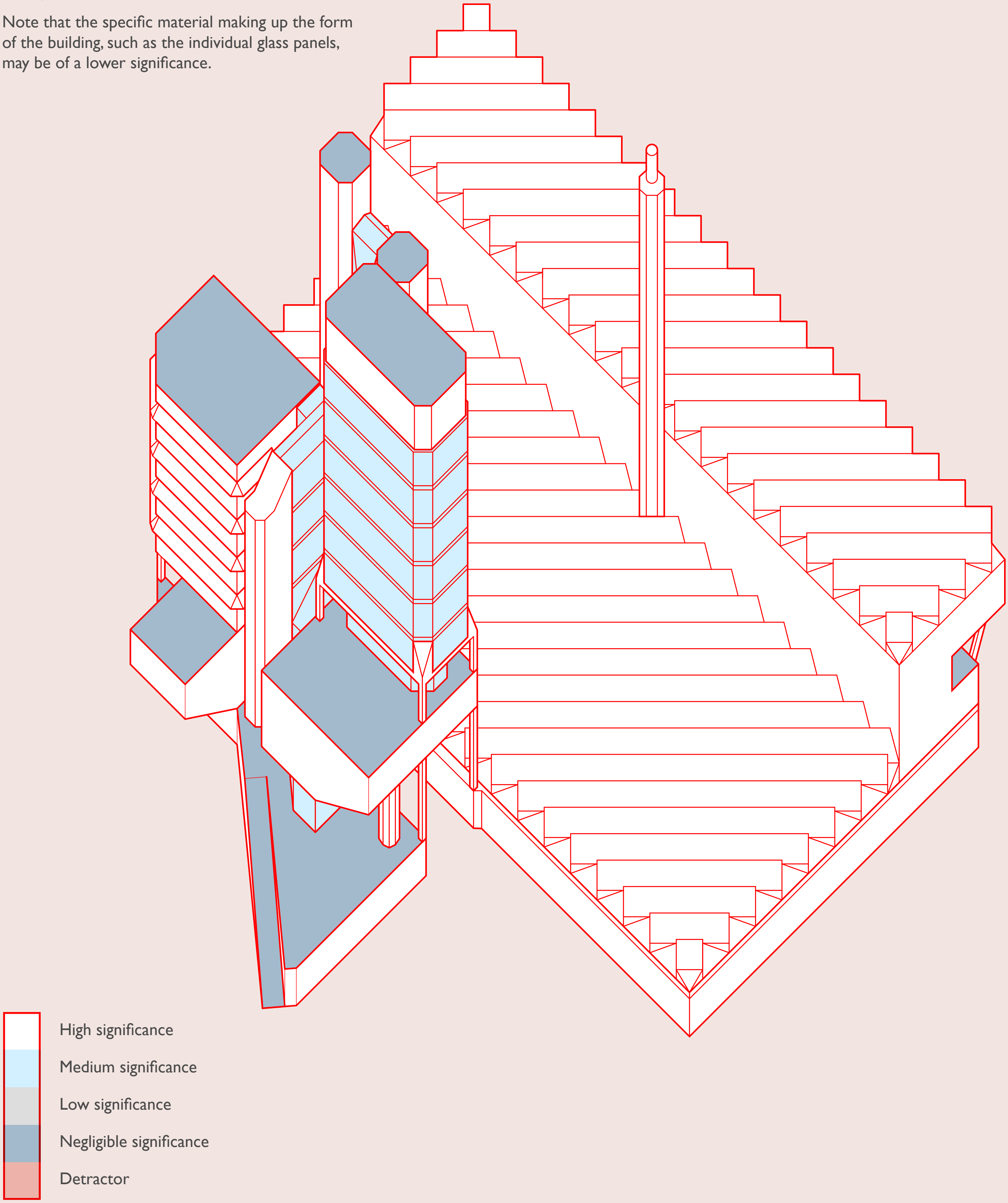
> "Paolozzi, who was a friend and admirer of architect James Stirling, was approached by Professor Douglas MacLellan (Head of Department 1965-1988)... Like some machines in the engineering laboratories, the tapestry is a series of pieces of design, which interrelate and counterpoint each other. As in a machine, each element plays a vital role. Symbols used come from a variety of scientific sources covering a long period of time. The atomic table, for example, is from a German children's schoolbook of the twenties yet the recurrent squares within squares now appear in the latest magazines on computer graphics. Other symbols owe their origins to dynamos, hydraulic presses, a computerised weather map, high power microwave electronics, certain types of sacred geometry, Wulff's law, electric cables, the camera lens, and notions of phanotron. Students, professors and visitors should therefore be able to recognise, think about and hopefully enjoy the artist's imagery and weavers' skills."[57]

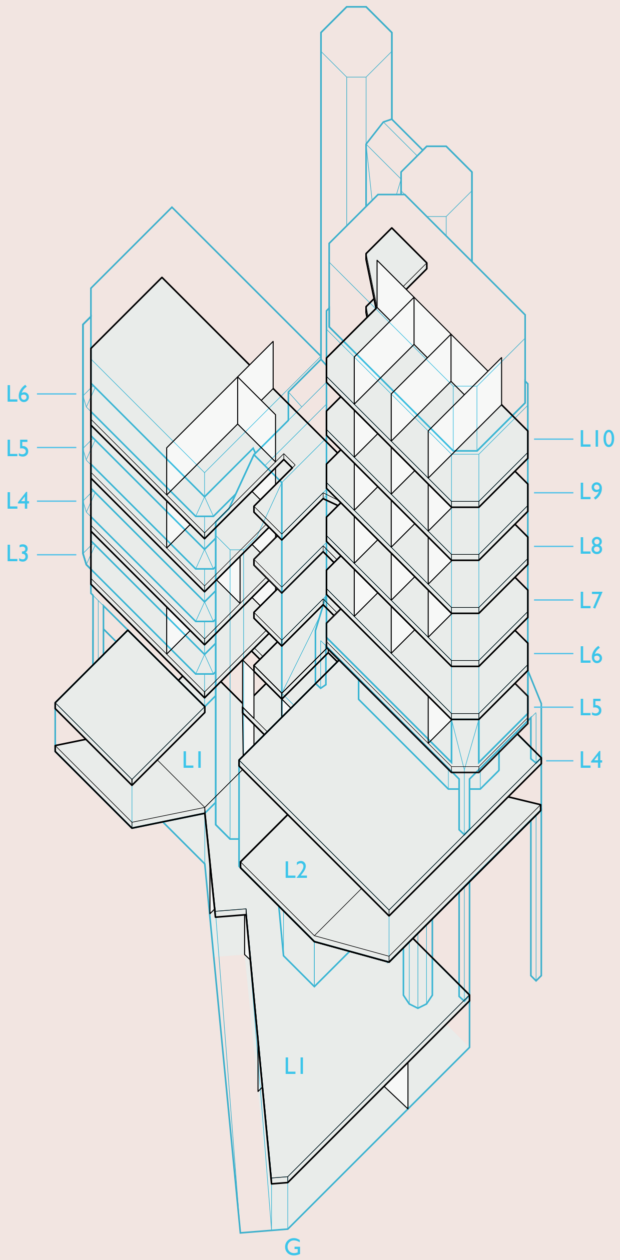
88. Leicester Tapestry (Paolozzi, 1982) in the Engineering Building

89. Ground floor workshop, 2017

90. Significance of external form and fabric

Note that the specific material making up the form of the building, such as the individual glass panels, may be of a lower significance.



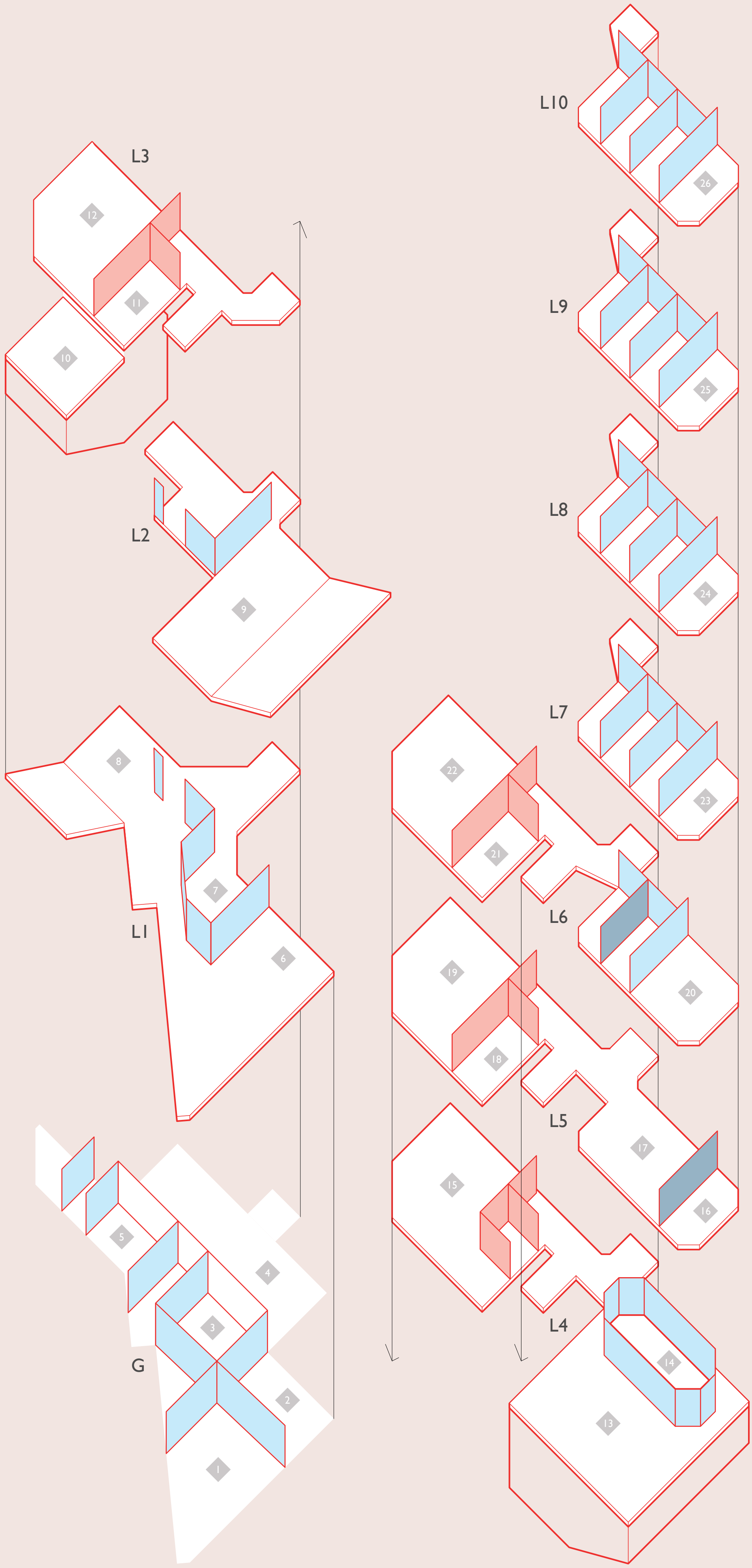


91. Axonometric aerial view of towers (after Stirling & Gowan) with floor plates

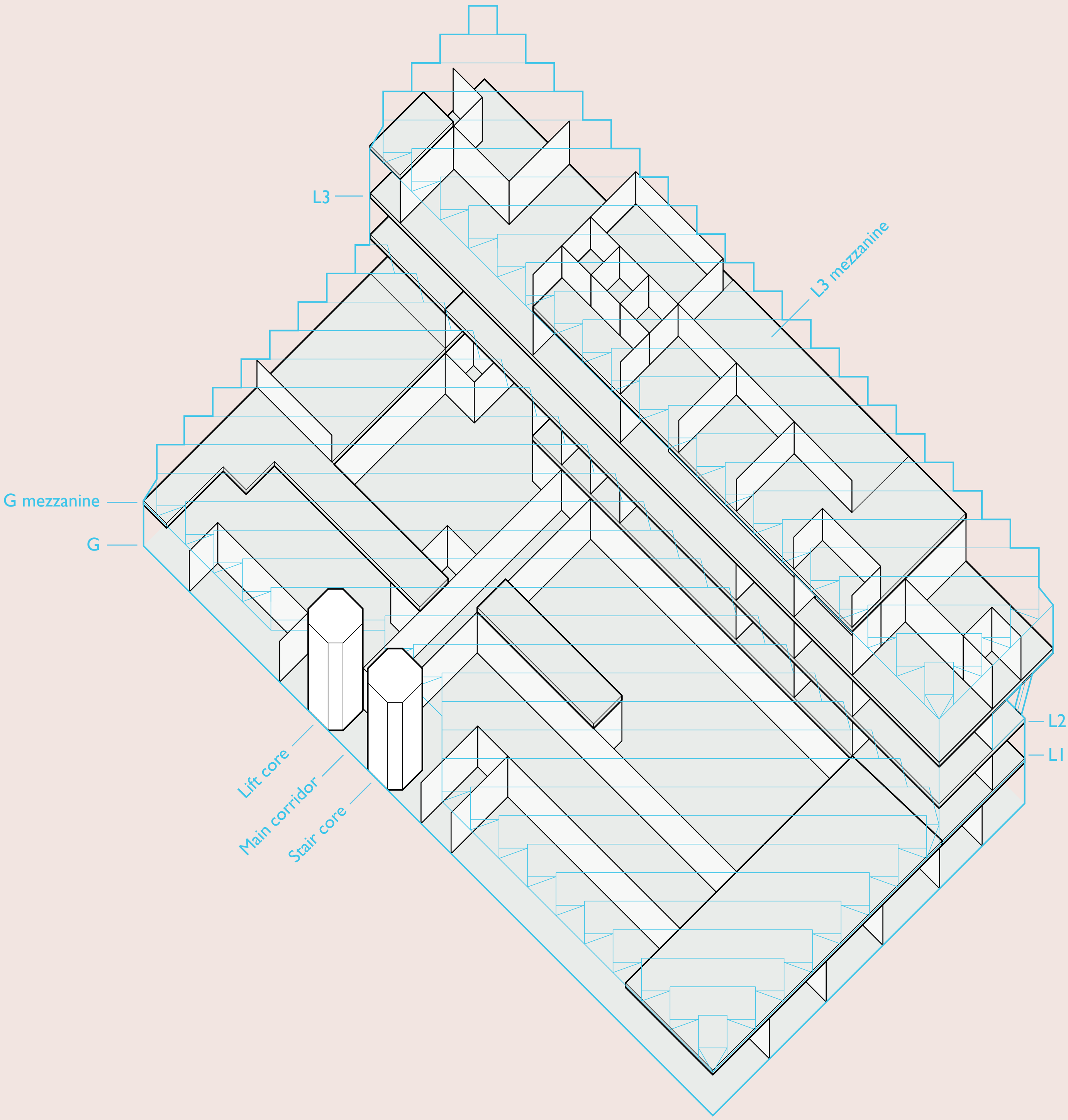
92. Significance of tower floor layouts

Room key (simplified):

1. Male toilets
2. Male washing room
3. Storage and changing room
4. Entrance foyer
5. Plant room
6. Terrace
7. Foyer mezzanine
8. Lecture Theatre 1
9. Lecture Theatre 2
10. Roof terrace (not used)
11. Office
12. Laboratory
13. Roof terrace
14. MacLellan Room
15. Shared workspace
16. Shared office
17. Office
18. Office
19. Shared workspace
20. Offices (Head of Department)
21. Office
22. Shared workspace
23. Offices
24. Offices
25. Offices



High significance
Medium significance
Low significance
Negligible significance
Detractor

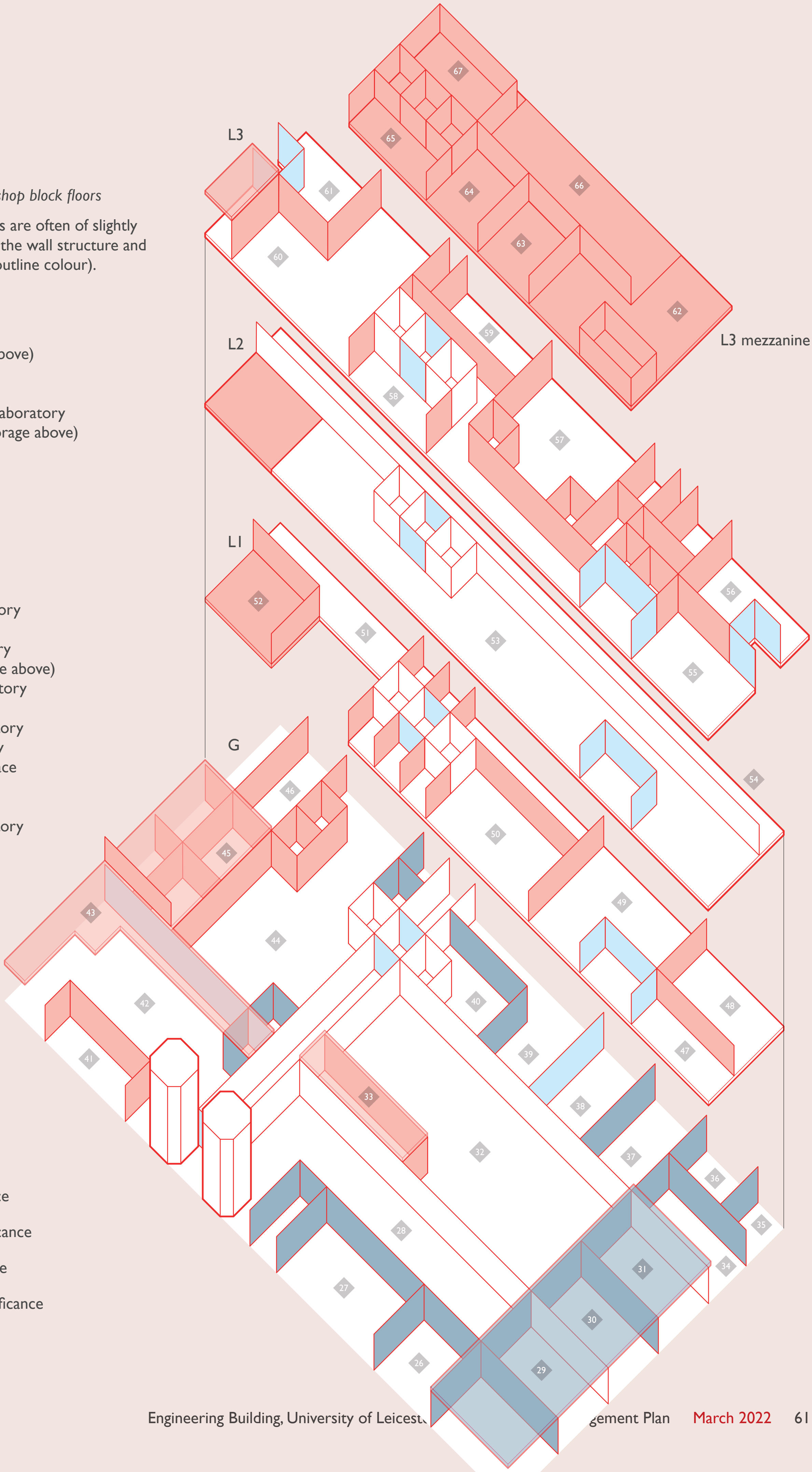


93. Axonometric aerial view of workshop block (after Stirling & Gowan) with floor plates

94. Significance of workshop block floors

Note that wall locations are often of slightly higher significance that the wall structure and finish (hence different outline colour).

26. Store
27. Workshop
28. Workshop
29. Storage (storage above)
30. Test chamber
31. Test chamber
32. Thermodynamics laboratory
33. Seminar room (storage above)
34. Storage
35. Storage
36. Storage
37. Laboratory
38. Laboratory
39. Storage
40. Storage
41. Office
42. Hydraulics laboratory
43. Storage mezzanine
44. Materials laboratory
45. Laboratories (office above)
46. Microscopy laboratory
47. Office
48. Electronics laboratory
49. Control laboratory
50. Mixed teaching space
51. Young's Mezzanine
52. Office / storage
53. Electronics laboratory
54. A-Deck
55. Laboratory
56. Laboratory
57. Offices
58. Storage
59. Offices
60. Laboratory
61. Laboratory
62. Office
63. (False ceiling)
64. Storage
65. Storage
66. (False ceiling)
67. Office



High significance
Medium significance
Low significance
Negligible significance
Detractor

6
CHALLENGES & OPPORTUNITIES

6.1 INTRODUCTION

The University of Leicester's Estates and Campus Services team are primarily responsible for maintaining the fabric of the Engineering Building, while the Engineering department looks after operational matters such as experimental equipment, storage and accommodation for staff and students. Under the stewardship of these two groups the building functions successfully as a centre for teaching and research.

However, both organisations struggle at times to manage the building, and it shows. Aspects of the original design still present serious challenges. Unfortunately, subsequent changes (although well-meaning) have sometimes created major additional problems. Planned projects and significant capital expenditure may be required to address these issues.

Over the years, as with many institutional buildings, small-scale interventions have accumulated to become large negative impacts. The seemingly uncontrolled growth of *ad hoc* signage (section 6.3.5) is a good example of this. Preventing and reversing trends like these will require proactive management and an increased understanding of the building's heritage significance.

This section presents a range of key challenges, grouped into basic themes. They are not presented in any order of priority.

6.2 EXTERNAL APPEARANCE

6.2.1 Basic maintenance

One factor contributing to the Engineering Building being undervalued at present is its shabby appearance. The building is difficult to clean and maintain, and always has been: its complex geometries, deep recesses and dark corners make for arresting architecture but are hard to reach with a simple squeegee or screwdriver. Although a lack of cleaning might be considered a superficial problem, a lack of servicing and maintenance becomes a far greater problem over time.

As part of the recent reglazing works new access systems were installed on the workshop and S-Block roofs to allow safe access. On the towers, both of the original access cranes and cradles have now been decommissioned and the tower glazing is not cleaned at all.[58] Localised scaffolding is currently the only method for attending to problem areas, which is disruptive to the operation of the building.

What access systems and methods are appropriate to enable general maintenance?

6.2.2 Tower glazing

The 1980s replacement glazing to the tower increased the visual weight of its façade "like a string vest on a Modigliani".[59] It adds considerably to a sense of visual clutter on the building, particularly now that the workshop roofs are clean and uniform again. It makes the landmark tower appear unloved – and harder to love.

Worse still, the double-glazing is failing. Many units are fogged with condensation due to the unit seals breaking down; some are filling with water. Its contribution to the energy performance and occupant comfort of the building, although presumably far better than the original single-glazing, is poor.

Can the appearance and performance of the glazing on the towers be improved?

6.2.3 Tiles and bricks

Staining and discolouration is fairly common in brickwork and ceramic products due to its porosity and exposure to pollution and moisture.

Unglazed fired clay exposed in this way will naturally change colour with time. However, when discolouration is particularly pronounced it can highlight fundamental detailing issues. Staining around the podium area may indicate poor drainage or detailing to the terrace level.

The most severe damage is to the balustrade on the terrace at Level 1. A number of tiles have de-bonded and require repair and replacement.

Can the appearance of the tiles and bricks be improved? How can matching tiles and bricks be sourced, if required?

6.2.4 Pigeons

The complex form of the building, made up of angled slopes, ledges and recesses, provides convenient roosting locations for pigeons. Where no deterrents are in place, the areas can quickly become dirty: this is occurring on the recently-replaced S-Block glazing below A-Deck.

How can bird deterrents be installed without compromising key views and details?

6.2.5 External storage

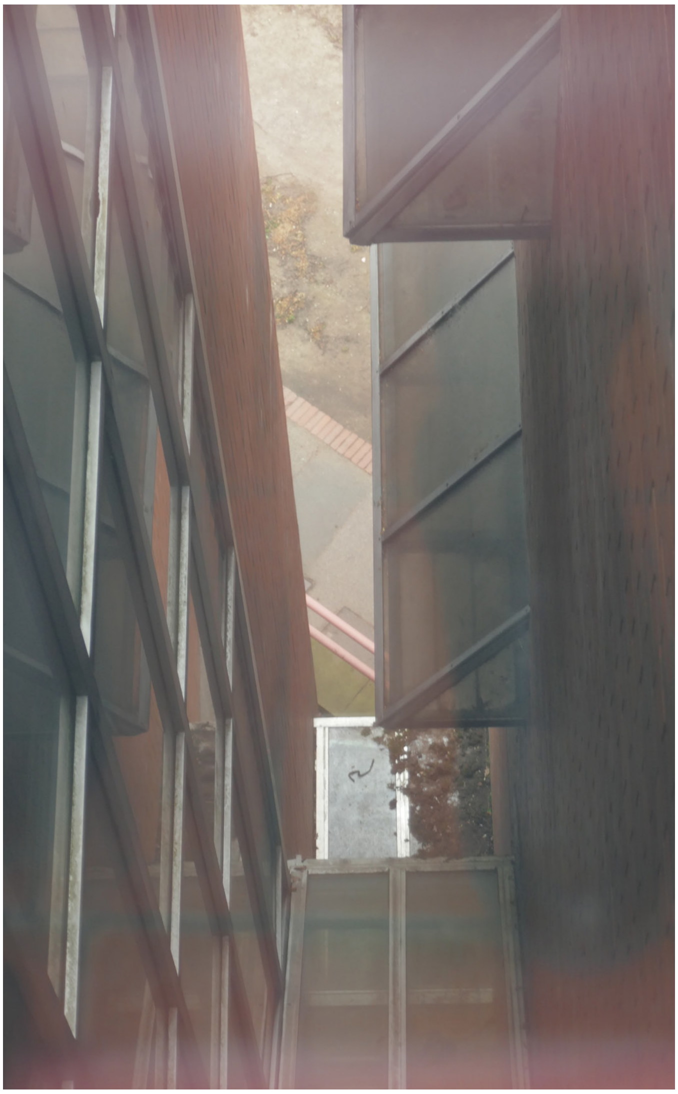
The service area to the rear of the building is often cluttered with piles of redundant equipment.

A caged enclosure containing gas canisters adjacent to the north-east elevation is in the process of being removed to a more sensitive location.

Can storage units be designed sensitively to accommodate different items and help keep key views of the building free of clutter?

95. *Stained tiles, coarse glazing details, dirty glazing*

96. *Dirty, inaccessible glazing*



97. *Dirty, inaccessible glazing*

98. *Heavy framing elements in 1980s tower glazing*

99. Dirty, inaccessible glazing

100. Moss growing in recessed brickwork joints

101. Stains on lecture theatre tiling

102. Pigeon droppings on new S-Block glazing

103. Rubbish dump on service access road to rear

104. Cage for gas canisters (to be removed)

6.3 INTERNAL APPEARANCE

6.3.1 Materials, textures and finishes

The restrained palette of materials and surface finishes contributes strongly to the building's architectural identity. Several internal changes have taken place over time which detract from their effect. These include:

- false ceilings and ceiling tiles obscuring tiled and concrete finishes of high significance;
- a variety of carpets laid on top of original parquet flooring, also obscuring floor hatches;
- large printed posters stuck to raw concrete walls in S-Block.

> Can the architectural environment be enhanced by removing obscuring finishes and mismatching elements?

6.3.2 Subdivision in workshop/lab areas

Non-original partition walls and mezzanine floors have been used throughout the building to subdivide open-plan workshop and laboratory spaces and create smaller cellular rooms.

These rooms reduce the inherent flexibility of the building and limit the overall number of students and staff which it can comfortably accommodate. The subdivision also significantly degrades the quality of the open-plan spaces, diminishing the effect of long views with the dramatic roof structure overhead (such as that shown in image 51, now completely lost).

> Could department activities be carried out in a more flexible, modern way, with at least partially reinstated open workspaces?

6.3.3 Furniture

The building retains some excellent original furniture, including bespoke seating in the lecture theatres and several workshop desks (some fixed, some mobile). However, much of the furniture in the building is of poor quality and lacks consistency in form, colour and material. It neither responds to the unique characteristics of the listed building nor provides a fresh, modern contrast.

The interiors pose a significant challenge in terms of choosing appropriate modern furniture: with the exception of some rooms the interior aesthetics are emphatically *not* the 'blank canvas' provided by most modern buildings. They may be clad with rich red tiles, or have walls filled with equipment. It should not be a surprise that modern furniture does not always suit these spaces.

In some cases it may be most appropriate to utilise materials which suit the building's history. Bespoke wooden benches, for instance, are a key feature of the workshops and may as easily be used for computer work as for more traditional practical experiments.

Elsewhere there is an opportunity to bring modern elements into the building and help bring it to life for today's students. Furniture can be an excellent way of updating the appearance and atmosphere of a historic space, not least because it may easily be removed again in the future. Colours and shapes must be chosen very carefully to complement rather than clash with the original 1960s aesthetics.

> Can the building's furniture be updated and rationalised?

6.3.4 Storage space

The building contains a huge quantity of unsorted and unclaimed material, from remnants of large experiment rigs to shelves of unused text books. A significant amount of space could be made available and useful by clearing out old material and not allowing it to build up again.

> Can storage be monitored in a smarter way? Can staff and students work more flexibly, so they do not need assigned desks with storage space?

6.3.5 Signage

Signage in the building is currently an incoherent assortment of old, new and everything in between. The building is also plagued by hundreds of less formal signs, from printed A4 paper notices to a proliferation of asset monitoring stickers, hazard warning signs, proprietary product labels, etc.

The diagrammatic, functionalist nature of the building should mean that it is easy to move around and understand, with tidy utilitarian spaces. The mass of *ad hoc* signage creates the opposite effect: the building appears chaotic and inefficient.

The quantity of *ad hoc* signage appears to be increasing in the building: perhaps because as clear wayfinding is lost in the visual noise, staff feel they need to add yet more signs to communicate more clearly. Inevitably the opposite effect is achieved.

> Are there simple (and relatively standardised) systems with which the University can unify and simplify signage and wayfinding in the building? Are all of the other stickers and signs really necessary?

6.3.6 Colours

The colour scheme of the building is reasonably well defined but without a clear design guidance maintenance staff will generally just use the closest match available. This means that the consistency of decoration through the building is gradually diminished.

> Do original paint specifications exist? Are any standard specifications in use?

6.3.7 Bins

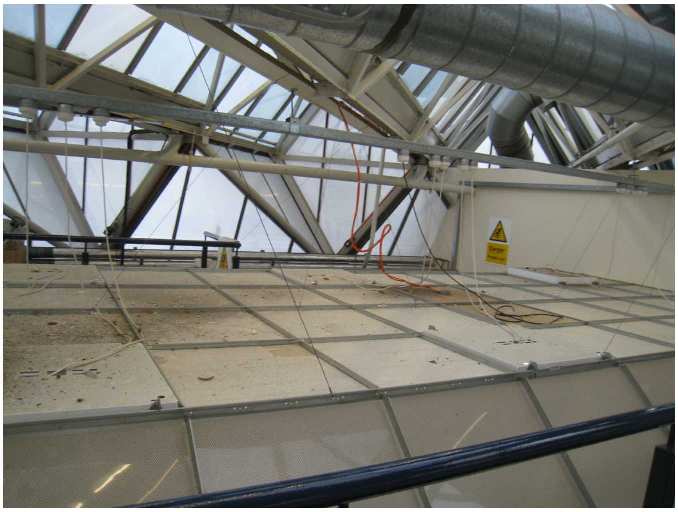
Large multi-purpose waste bins are located in all main circulation spaces. These have been installed across the campus as part of the University's commitment to reduce waste. It is understood that staff are expected to empty their personal bins into the larger bins to reduce cleaning staff time. However, the size and style of the bins compromises the key connecting spaces within the building.

> Can the bins be moved into less visually disruptive locations? The circulation spaces are generally very small: does bin usage justify having one large bin for every landing?

105. Ceiling tiles in MacLellan Room

106. Research laboratory significantly degraded from original design

107. Inefficient, low-quality office space under false ceiling in S-Block



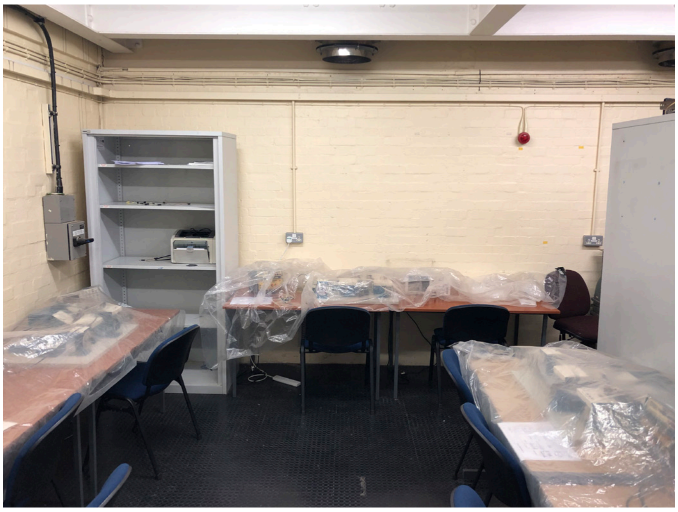
108. False ceiling in S-Block: unusable space obscuring views of the roof

109. Office space on mezzanine level in S-Block

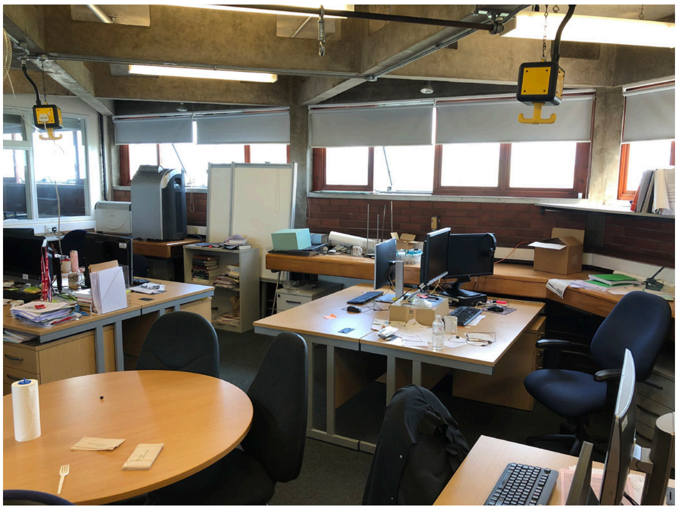
110. Mezzanine floors in workshop block

111. Underused, oversized desks on workshop mezzanine

112. Insensitively-designed mezzanine balustrades, cluttered furniture



113. Low-quality teaching space due to lack of flexibility elsewhere



114. Cluttered environment in research laboratory

115. Cluttered furniture and underused storage space

116. Unused display cabinet and mismatching furniture in tower

117. *Mismatching furniture and disorderly storage in S-Block*

118. *Apparently uncontrolled clutter in S-Block*

119. *Apparently uncontrolled clutter in S-Block*

120. *Clutter in S-Block laboratory space*

121. *Apparently uncontrolled clutter in S-Block*

122. *Apparently uncontrolled clutter on workshop mezzanine*

123. 'Old-brand' sign board in foyer

124. Signs on floor with mismatching typography

125. Poor-quality paper stickers, mismatching typography

126. Confusing jumble of signs and nomenclature

127. Redundant and ad hoc signs and stickers

128. Mismatching gender-neutral toilet signs; residue from earlier sign

129. Paper signs and duplicate warnings in workshops

130. Towers: pink handrails, red doors

131. S-Block blue handrails, blue doors

132. Cabinets painted inappropriate colour in S-Block

133. Oversized bins and ever-present cleaning signs in tower

6.4 BUILDING SYSTEMS AND PERFORMANCE

6.4.1 Toilets

The size of changing room, washing and WC facilities in the Engineering Building is disproportionately high for male students. This is evidence of the gender profile of the student body in the early 1960s, which would have been predominantly male. It is now anachronistic and impractical: an aspect of the building's heritage which, although interesting in its own way, is a direct hindrance to how students and staff use and relate to the building today.

> Are there any opportunities to rebalance the provision of WC facilities? Can the layout of the toilet area be reconfigured?

6.4.2 Fire

A study by Arup, completed in September 2019, has identified a list of ways in which the Engineering Building does not comply with modern fire regulations. Priority items include: escape signage; disabled refuges and fire water main in the tower; fire stopping to penetrations though fire-resisting elements; combustible furnishings and storage in lobby areas; and occupancy control to limit excessive numbers of people using escape routes at the same time.

Although it is unlikely that listed building consent will be granted for works to bring the building fully into line with modern fire standards, it may still be possible to achieve substantial performance gains and improve fire safety.

The glass louvres in the office tower and the smoke vent openings above each lecture theatre currently open automatically in the case of the fire alarm being activated – even for a routine test event. Unfortunately they do not close automatically once the situation has been resolved. Depending on when the alarm is triggered this can lead to uncontrolled temperatures and water ingress.

As noted in section 6.6.3, the smoke vents on the lecture room roofs also restrict their safe use as accessible terraces.

> To what extent can the existing building be modified to improve fire performance? Could the automatically-opening smoke-venting elements be improved – or removed?

6.4.3 Occupant comfort

The building has long been notorious for its inadequate environmental performance, although building services equipment in the workshops and S-Block were overhauled as part of the recent reglazing project: new heating, cooling and ventilation units were installed, all controlled zonally and linked to a centralised management system.

Conditions in the tower were addressed to some degree by the replacement of the original glazing in the 1980s, although this part of the building continues to perform poorly. Recent complaints from tower occupants concern both excessively hot and cold temperatures and a lack of ventilation control. Many opening vents in the façade do not work: some are jammed closed, some left open. High solar gains result in very high temperatures, particularly on sunny summer days.

The fin-tube radiator heaters in the tower are known to be underpowered, with no control based on occupant requirements or levels of activity.

A creative and holistic approach will be required, particularly given the architectural constraints of the listed building, to provide meaningful improvements on the current situation. The design process must also consider several other factors affecting occupant comfort, including aspects such as humidity and glare.

> Can occupant comfort be upgraded, across a number of factors, with smarter controls?

6.4.4 Energy efficiency

Alongside occupant comfort, the carbon footprint of the building must also be considered. The existing heating system in the tower is known to be highly inefficient.

The heritage sector must play its part as the United Kingdom aims to become carbon-neutral by 2050. A study commissioned by Historic England in 2019 notes that:

> "we can reduce the carbon emissions of historic buildings by over 60% by 2050 through refurbishment and retrofit... Research also demonstrates that the speed at which carbon is reduced in buildings has a greater impact than the scale of retrofit showing that the sooner actions are taken the more effectively we can address carbon in buildings."[60]

Achieving major gains in efficiency is likely to involve some major changes within the building. In this case the arguments made in section 5.3.4 about the significance of redundant building services equipment will be influential: if the poor performance of the original heating equipment (for example) cannot be enhanced *in situ*, or offset by other means, it may be untenable to keep it in use. If it is decommissioned, it loses its heritage significance in the context of the building and should be removed. Any replacement equipment should be designed to complement the functionalist spirit of the building.

This is a complex matter which will require detailed multidisciplinary design input. Building services in the tower are intrinsically linked with the condition and performance of the glazing (section 6.2.2).

> How can the performance of the Engineering Building be improved, in order to contribute to the urgent need to reduce carbon emissions?

134. Disproportionately large WC accommodation for male students

135. Disproportionately large washing accommodation for male students

136. Inadequate WC facilities for female students, with taped-off urinals

137. Heaters, fan and other electrical equipment in office

6.5 SPECIFIC MACHINERY AND EQUIPMENT

6.5.1 Workshop and laboratory equipment

Most of the freestanding tools and rigs in the workshops and laboratories are not fixed to the building and are likely to be classified as chattels. In this case they are not protected as part of the building's listed status (see section 5.3.6).

Several pieces of workshop equipment have a real vintage charm and certainly contribute to the 'heritage' environment. Although their continued maintenance and use should be encouraged, this should not prevent them from being replaced if the need arises.

Documentary evidence of equipment in the workshops and laboratories, showing how the department's equipment has changed over time, is limited.

> Could workshop and laboratory equipment be recorded in use, to form an archive of the changing nature of engineering in the building?

6.5.2 Cranes, winches and trapdoors

The ability to manoeuvre large items around the building was an important early design requirement. It was achieved in some ingenious ways, including by allowing the upper floor of the S-Block to project over the rear service road.

Cranes, winches and trapdoors are all fixed in place and therefore qualify as fixtures (see section 5.3.5). They *are* protected as part of the building's listing.

That said, as functional items an assessment of their own significance follows the same logic as other technical equipment 'on display' throughout the building. If their continued use cannot be justified, their value is diminished and they should be replaced by something which works – provided that replacement parts are designed to complement the architecture. *Note that listed building consent would almost certainly be required for work of this nature.*

Much of the lifting gear in the building is believed to be out of use, and may therefore qualify for this treatment.

Floor hatches throughout the building have been carpeted over or roughly sealed up to reduce draughts, etc. As less visually-prominent parts of the lifting system, and with thermal performance and energy efficiency in mind, it may well be appropriate to upgrade these and improve air-tightness and insulation.

> Lifting equipment is an important part of the original design. If existing equipment cannot be used safely, can replacement parts be found to allow this functionality to be reinstated? Would that be of value to the different workshops?

6.5.3 Globe fans

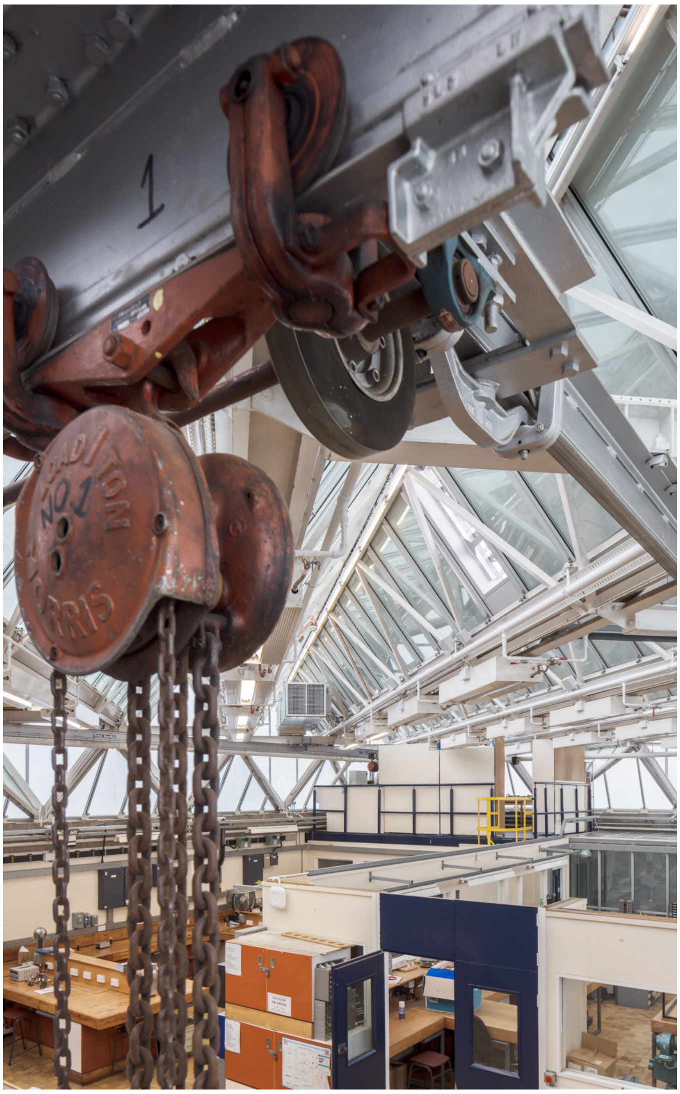
Ventilation to the lower S-Block floors is provided via globe-shaped fan units mounted in the glazing panels. Most of these were removed, serviced and reinstated as part of the recent reglazing work. A number of new replica units were also fabricated to meet a slightly increased ventilation demand.

Despite these units being in service for well over fifty years, staff have now taped over the fans – apparently for safety reasons. As well as disfiguring an important aesthetic design feature in the laboratory space, the silver duct tape is preventing the fans from providing the important ventilation required to the rooms.

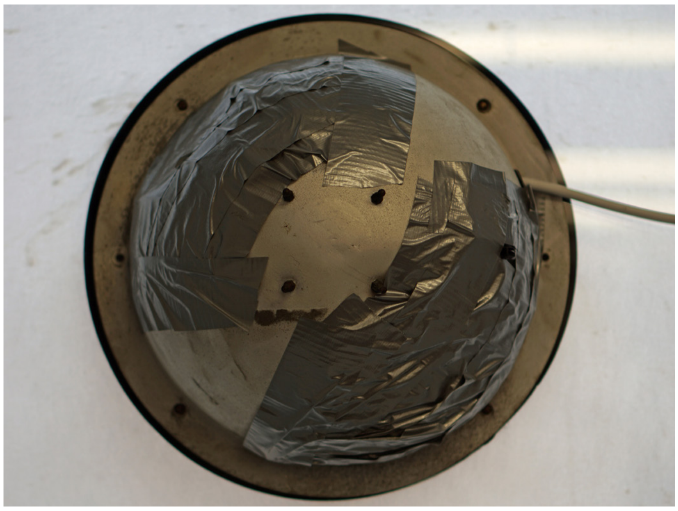
> If safety is a legitimate concern regarding the globe fans, can they be adapted sensitively to allow their safe operation?

138. Workshop machinery, likely original

139. Original building services equipment



140. Hoisting equipment in third-floor workshop, S-Block



141. Taped-up globe fan

6.6 ACCESSING THE BUILDING

6.6.1 Accessibility generally

The Engineering Building was not designed to accommodate less physically able occupants, and perhaps unsurprisingly it falls short of modern standards.

Specific concerns, provided by Disabled Go (now AccessAble), include heavy entrance doors, deep stair risers with no contrasting edge, reflective internal surfaces with poor colour contrast, manually-operated swing doors; lecture theatres with no handrails or step-free access to the speaker's podium; a lift with no mirror, no audio announcement and controls too high; and poor fittings in the accessible toilet.

Can the building be adapted to perform better for less able students, staff and visitors?

6.6.2 Entrances

The entrance sequences of the building are important for its relationships to the campus and Victoria Park. Stirling in particular went on to make urbanistic movements and alignments a key aspect of his designs; Leicester is certainly an important early example of this thinking.

The Engineering Building's sophisticated approach and arrival sequences, and the dynamism of the double-level foyer space, have both been substantially diminished by the closure of the entrance doors at podium level. Despite being locked these doors may still be reached via the tiled ramp, along with the dramatic latecomers' staircase leading up to the back of Lecture Theatre 2 and an elevated terrace which could be of significant value to students in the summer months.

It is understood that this first-floor doorway has been locked due to two principal problems: draughts in the foyer and safety concerns on the ramp. Given the significance of this part of the building – both externally, as the building's 'prow' facing Victoria Park, and internally, looking out from the first-floor social space adjacent to the main entrance – these assumptions should be reviewed.

The long ramp forms part of the fire escape strategy, allowing emergency egress through both the first-floor entrance doors and the latecomers' staircase down from Lecture Theatre 2. Its slope and potentially slippery tiled surface are known to not comply with modern standards.

The ground floor foyer doorway immediately opposite the main entrance is also currently locked. While it does not contribute in the same way to axial movements from the campus into the building it does form a potentially useful route for Engineering staff through to the ancillary buildings to the south of the building.

What if the assumptions relating to the ramp and foyer were reconsidered? Could reinstating the original entrance routes be beneficial for the department?

6.6.3 Terraces

The roof surfaces of the two lecture theatres were designed to be accessible terraces with pleasant views over Victoria Park. Both are locked off at present. The larger terrace, with access from the MacLellan Room, is a particularly generous space in a prime location on the campus. It could provide excellent break-out space for small conferences or events. A large smoke vent from the lecture theatre below, and balustrading with larger openings than currently recommended, may mean that the area may benefit from some adaptation.

Access to the top of Lecture Theatre 1 is from a classroom, through another of Stirling and Gowan's 'secret' doors which blend with the adjacent brick walling. This might also need to be adapted if the terrace was to be brought into a similar usable condition.

Allowing access to the two terraces would involve some adaptation work, but could the use of these spectacular spaces be of benefit to the university?

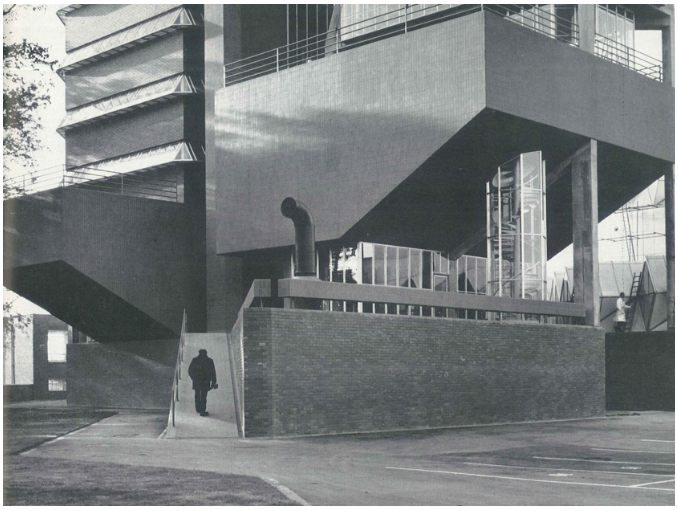
6.6.4 Security and access control

The main areas of the building are currently freely accessible, and visitor access is essentially uncontrolled. Tap-in card readers are used to register student attendance but not staff, contractors or members of the public.

Free movement through such an important building should be seen as a positive thing. However, visitor numbers should at least be monitored. Potential security risks due to uncontrolled access may also require mitigation.

The building is likely to require a tightening of access monitoring, if not overt security. This will require careful management, particularly with regard to the installation of new fixed equipment in the tiled circulation spaces.

Can the building retain a sense of uncluttered openness, particularly in the foyer, and still provide an increased level of security if required?



142. Ramp to podium terrace, as shown in original press photographs

143. Unsightly warning signs on L1 entrance doors

144. Rear entrance, now always locked

145. Terrace above Lecture Theatre 1, with unsightly smoke vent

146. Fine panoramic view from L4 terrace above Lecture Theatre 2, with smoke vent in foreground

6.7 SETTING

The Engineering Building is a prominent building on the skyline of Leicester, visible from great distances as one of the three distinctive university towers. It is most dominant looking south from Victoria Park, where it may be seen without any buildings in front or overshadowing from behind. The trees in the park are now very large, however, and obscure much of the building when in full leaf.

The building's immediate setting to the west has been enhanced by the upgrading of the David Wilson library and piazza, both of which provide excellent views of the diamond-shaped roof gables with the tower in the background.

Other key viewpoints include the axial approach to the tower looking south-west – still relatively free from obstructions.

The approach to the rear of the building is perhaps the most compromised, with a low-grade late-C20 building, shipping containers and a low shed building obstructing views of the S-Block elevation.

> Can the prominence of the Engineering Building within the University of Leicester campus be protected? Or enhanced?

147. Towers visible above trees in Victoria Park

148. View along key axial approach route through campus

149. View from rear, with sheds and shipping containers

6.8 ROLE AS A MODERN UNIVERSITY BUILDING

6.8.1 Engagement and reputation

The Engineering Building benefits from huge acclaim within the architectural community. Its reputation with staff and students at the university is less positive.

> Would engagement with staff and students help to 'unlock' their understanding of architecture? Would that encourage them to cherish and care for the building?

6.8.2 Flexibility

The general assumption in the Department of Engineering is that nothing can be changed in the building due to its listed status. The flexibility envisaged by Professor Parkes (the "one essential concept" in his brief to the architects) has effectively been lost. However, this assumption is not correct: conservation should not mean stasis, particularly in a building built for the development of technology.

> What are appropriate limits within which flexibility and change might be allowed?

6.8.3 Space constraints

An important factor which limits the building's potential is the number of staff and students it must accommodate. Designed for 200 students, it now hosts 600 undergraduates across BEng and MEng courses, 100-120 postgraduates and 100-120 PhDs. The department has spread out into other buildings (R Block, Michael Atiyah Building and two sheds to the rear of Engineering) in order to cope with demands on space.

The Engineering Building itself has been adapted to create more capacity by subdividing large open areas with mezzanine floors. This has created additional problems, such as the housing of write-up desks in the hottest part of the glazed workshop.

Ever-increasing computer work demands different patterns of use compared to the practical, manual learning the building was originally designed for. Large spaces within the workshops and laboratories have become static spaces with desktop computers. This is changing, however, with laptops and other mobile computing tools allowing more freedom.

The Department of Engineering still places a considerable emphasis on practical workshop work, but now accompanied by the so-called 'digital twin': analysis on a computer immediately adjacent to the actual physical experiment. Some of the spaces in the Engineering Building work better for this than others.

> How could the workshops and other rooms be best configured for the range of studying types now required?

6.8.4 Student expectations

The nature of higher education has changed radically from the 1960s, particularly in terms of what students expect for their fees. Today's students expect high-quality, modern facilities, including comfortable social learning spaces and large, open-plan spaces which encourage inter-disciplinary work and the sharing of ideas.

In many ways the ideals of Professor Parkes align with this attitude. The flexibility and openness inherent in the design of the workshops in particular should be well suited to modern learning.

> Is there a way to celebrate and 'sell' the idea of the Engineering Building having a distinctive and valuable 'vintage' atmosphere – something a bit different, but still appealing to the modern student?

150. University of Leicester: 2019 undergraduate prospectus

7
LEGAL REQUIREMENTS & STAKEHOLDER ENGAGEMENT

7.1 NATIONAL POLICY

7.1.1 National Planning Policy Framework

The *National Planning Policy Framework*, first published in 2012 and revised in 2018, sets out the government's planning policies for England and how they are expected to be applied. Policies dealing with the conservation and enhancement of the historic environment are set out principally in Section 16.

> Local planning authorities are directed to provide "a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats.[61]

7.1.2 Listed Buildings and Conservation Areas Act 1990

Sections 66(1) and 72 of the Planning (Listed Buildings and Conservation Areas) Act 1990 place a statutory duty on the decision-maker (in this case Leicester City Council, with Historic England and the Twentieth Century Society as statutory stakeholders) to have special regard to the desirability of preserving listed buildings and their settings and to pay special attention to the desirability of preserving the character and appearance of conservation areas.

> Listed building consent must be obtained from the local planning authority for any proposed work to alter or extend a listed building in a way that affects its character or appearance as a building of special architectural or historic interest.

7.2 COUNCIL POLICY

7.2.1 Leicester City Core Strategy (adopted July 2014)

Leicester City Council's Core Strategy "sets out the spatial planning strategy for the City until 2026. It includes a description of the issues facing the City, a vision of the City in the future and objectives and policies for new development."

> Spatial objective 10
>
> To preserve and enhance Leicester's heritage. To achieve effective protection for the historic environment by avoiding significant harm and securing adequate mitigation where appropriate. To promote the conservation, enhancement, sensitive use and management of historic and cultural assets.[62]

> Policy 18: Historic environment
>
> The Council will protect and seek opportunities to enhance the historic environment including the character and setting of designated and other heritage assets. We will support the sensitive reuse of high quality historic buildings and spaces, promote the integration of heritage assets and new development to create attractive spaces and places, encourage contemporary design rather than pastiche replicas, and seek the retention and re-instatement of historic shop fronts and the protection and where appropriate, enhancement of historic public realm. Within the regeneration areas particular importance will be given to the integration of the historic environment with new development through encouraging heritage-led regeneration.[63]

7.2.2 Leicester Heritage Action Plan

The Leicester Heritage Action Plan is "a long term rolling programme that is updated annually, [capturing] what has been achieved in the last year, what we hope to achieve in the next year and a longer term agenda to guide and inform discussion on future direction. Divided into five key themes, it reflects and encompasses the various aspects of the Council's involvement in the historic environment."

> The Heritage Action Plan states that, as part of an "agenda for the future 2018-22", the council will work with partners to start to develop management plans for key groups of assets, where a significant property owner has recurring works that would benefit from such an arrangement.[64]

7.3 UNIVERSITY POLICY

7.3.1 Campus Development

The University of Leicester's current campus masterplan (dated September 2017) defines its "vision for the future."

> Transform the current facilities to create a contemporary, flexible and high-quality environment that inspires collaboration, achievement and wellbeing.
>
> Create the right conditions for the delivery of world-class academic activities.
>
> Attract top-level staff, students and partners.
>
> Engage with the local community and create an institution the city of Leicester will be proud of.
>
> Preserve the special character and heritage of our University whilst setting the foundations for a long-term, prosperous future.[65]

7.4 STAKEHOLDER CONSULTATION

The CMP-specific consultation undertaken is listed below. It is important to note that this follows several years of collaboration between Arup, the University of Leicester and the different heritage stakeholders during the recent project to reglaze the workshops and S-Block.

In some cases a shared understanding about operational and conservation objectives had already been in place for some time.

7.4.1 Estates

Date	Meeting topics
1.4.19	Understanding aspirations; agreeing core CMP aims
4.9.19	Potential WC reconfiguration and signage
4.9.19	Presentation of CMP approach to Estates
20.9.19	Workshop with signage team to develop options
10.10.19	Fire safety project and its interface with the CMP
10.10.19	Potential works to WC area
18.11.19	Presentation of draft CMP to Engineering and Estates
20.2.20	Discussion around policies
13.7.21	Email conformation of policy amendments

7.4.2 Engineering

Date	Meeting topics
1.4.19	Meeting with Head of School: understanding aspirations; agreeing core CMP aims
3.7.19	Site visit with building manager
3.7.19	Site visit with Deputy Head; discussion about finding win-win scenarios which Engineering could support
18.11.19	Presentation of draft CMP to Engineering and Estates
1.10.20	Briefing for new Head of School and Head of College
18.2.21	Discussion around aims for the CMP
12.5.21	Focussed session to agree amendments to polices
10.8.21	Email confirmation of policy amendments

7.4.3 Heritage

Date	Meeting topics
20.9.19	Presentation of draft CMP to Historic England and Leicester City Council conservation officers; discussion around main concepts
10.10.19	Letter of support from Historic England (see below)
29.10.19	Meeting with Leicester City Council conservation officers on site to discussion potential works to electrical distribution in tower (presented in the context of the CMP)
30.9.21 7.10.21	Email confirmation of policy amendments from Leicester City Council, Historic England and the Twentieth Century Society

Historic England do not officially approve documents like this one, so they are not included as a signatory in section 1.6. However, their formal feedback letter (written by Janine Dykes) included various supporting statements including the following.

> "We recognise the wording of the original brief given to Stirling and Gowan and its essential concept for the building to be flexible as engineering is not a static thing. This is a central theme in the CMP and we agree that the building should be able to adapt to the needs of the current engineering students and engineering practices. An obvious point to address is the balance of allocated female and male toilets.
>
> "Historic England agrees that the building services have always augmented the architecture and this should remain the case.
>
> "The CMP mentions ambitions to re-instate the ramp and

re-open terrace and entrance. We are supportive of this as we feel it would better reveal the building's interest by re-instating the original design conception and enable the building to engage with the wider campus more successfully.

"We are wholly supportive of the initiative to engage with the students that use the building and give them a better understanding of its significance.

"We welcome the aspiration to adopt an identified colour palette that will be named by RAL number to ensure no mistakes. Maintaining a consistent palette of furniture would create a more unified appearance and better reveal the building's significance rather than the ad-hoc arrangement that currently detracts from it.

"Rationalising the existing signage and creating a suite of signs would de-clutter the building which would be brilliant."

7.5 VIEWS FROM THE ARCHITECTURAL COMMUNITY

7.5.1 Jim Stirling and the Red Trilogy

The Engineering Building has been a source of inspiration for many top architects across the world today. The following quotations are extracted from *Jim Stirling and the Red Trilogy*, in which many famous architects reflect on the enduring importance of Engineering and its cousins in Cambridge and Oxford.

Most of the essays make no reference to the importance of James Gowan to the Engineering Building design: testament, again, to the extent that Stirling's later fame eclipsed that of his former partner.

7.5.2 On composition

Richard Rogers:

> "[Stirling and Gowan's] work married the tradition of red-brick building, which is so English, with the crystalline structures of the Industrial Revolution – the simple glazed industrial window systems of that period and the hard, red engineering brick of the northern tradition. … The work was so powerful and so radical that I think I can say that Jim Stirling was, with Lutyens, the greatest British architect of the twentieth century."

Sunand Prasad:

> "The extraordinary juxtapositions and jumps of scale, and the use of colour, and the unblinking ability to choose from what is available whatever may be appropriate, and to use it: this gives to the work an emotional charge. ... It is extraordinarily powerful, although relatively small. You just can't take your eyes off it.
>
> It appears to be so free; it is obviously engaged with technique and materials and yet makes an entirely humane and believable place that looks good from a distance and also when you get up close.
>
> It is a great essay in the elements of architecture. ... It is a direct and energetic assemblage of the raw material of architecture: the programme – lecture theatre, north lights, circulation towers – together with matter – patent glazing, brick, concrete – all of which make inspirational architecture. It is utterly gorgeous. Stirling for me embodies synthesis. That is why he recalls Hawksmoor with his wild ability to invent out of a pre-existing set of forms."

7.5.3 On conservation

John Tuomey:

> "The whole set of them [the 'red trilogy'] needs to be maintained, for the vitality of architecture, for the line not to be broken in the riddle of the histories of architecture that allows us to connect Hawksmoor to Butterfield to Stirling, and to whatever will come after."

Edward Jones:

> "Since the end of the Second World War the English have demonstrated an appetite for cosy nostalgia in their buildings and an embarrassment about, and an avoidance of, ideas in their architecture. The three red buildings took these prejudices head on and they are immensely important for that alone. It is now time that they enjoyed a sympathetic convalescence and be allowed to take their rightful place in the not always comfortable story of English architecture."

Richard MacCormac:

> "These buildings are outside the mainstream and maybe, at present, don't seem part of the evolutionary future of architecture. But their DNA is somewhere in all architectural practice and their unique inventiveness is reason to preserve them."

David Kohn:

> "Leicester... represents a direction to be rediscovered – the role of a true classic... In order to maintain a culture of architecture we need to recognise the value of experiencing classic buildings, and also accept that the work necessary to maintain classics serves the future of architecture no less than to preserve its past."

7.5.4 On technical problems

Norman Foster:

> "Condemned for technical failings that today could easily be put right... [the Engineering Building] has been scarred by insensitive 'upgrading' and now in its turn faces the threat of 'redundancy'. Yet, as Jim would remind us, were he here, taste is fickle. I am sure this endangered trio [the 'red trilogy'] will eventually find new supporters, just as the work of Butterfield, Waterhouse and the first generation of red-brick university builders – unloved in the 1950s and 1960s – found its own champions. Let's hope so, because the history of English architecture would not be complete without them."

Alan Berman:

> "The shortcomings of these buildings can be overcome, they can be repaired and modernised to meet today's standards of performance. The technology is available; it is only the will that is required."

Peter St. John:

> "What I like most about these buildings is their magnificent unconcern for convention, their effort to be socially adventurous, as well as to make a thrilling work of art. It's the kind of admiration one feels for daring experiments that fail, and one is wary that these buildings have many problems and weaknesses. But if any modern buildings in Britain are worth the effort of preservation, it is these."

7.5.5 On education and inspiration

M.J. Long:

> "Students can learn by going to Jim's buildings and by trying not to ask what they look like, but what they are. His buildings can teach us to go beyond terms like 'landmark building' and 'gateway building'. His architectural productions are integrated and recognisable creatures."

Will Alsop:

> "It's interesting to question why young architects should look at these buildings. First and foremost, I think they should take the trouble to go inside them and just enjoy them. It will give them a lift. I'm not sure how much this would inform their work – it would just inspire them to do whatever it is they want to do."

151. Corridor in workshop block, 2019

8 POLICIES

8.1 POLICY THEMES

The University of Leicester, with the support of Leicester City Council, Historic England and the Twentieth Century Society, commits to upholding the following key headline policies, all of which are defined in more detail in the following tables.

- Maintain and uphold a Conservation Management Plan for the Engineering Building.
- Use the building to help attract and inspire the engineering talent of the future.
- Improve the safety, comfort and productivity of staff and students working in the building.
- Allow the Department of Engineering to grow.
- Protect the building's landmark role on the university campus.

8.2 ADVISORY GUIDELINES

The right-hand column of the following tables provide advisory guidance, proposed by Arup, to facilitate achieving the policy aims in a holistic and integrated manner.

Each policy is marked with a note to classify it as one of the following:

- NOW – to be carried out as soon as possible;
- NEXT – to be incorporated into general operational management and/or planned preventative maintenance lists;
- LATER – to be addressed as a long-term maintenance project, possibly requiring significant capital works expenditure.

Important notes

Although the University of Leicester acknowledges that the advisory guidelines represent a positive, sensitive and comprehensive response to the policies, due to budget constraints it cannot commit to carrying them out. They are presented here to provide a potential 'road map' for the future of the building.

Leicester City Council, Historic England and the Twentieth Century Society have agreed that this road map represents an appropriate way forward for the building, subject to the detailed scrutiny of the listed building consent process, including stakeholder consultation, as appropriate.

Leicester City Council has agreed that the University of Leicester can proceed with work *without* a formal listed building consent application, but only on condition that:

- the decision diagram in section 8.4 suggests that listed building consent is not required;
- the 'advisory guidelines' in this section are followed;
- in case of doubt, the Conservation Advisor (Thomas Pearson at Arup) has been contacted for initial screening advice.

Policy theme 1 Maintain and uphold a Conservation Management Plan for the Engineering Building

Reference	Policy aim	Advisory guidelines
Policy 1.1	Adopt a conservation-led approach to the future repair and management of the building, based a comprehensive understanding of its heritage significance.	NOW Set up checklist processes to trigger alerts to appropriate people if work is proposed for the Engineering Building.
Policy 1.2	Accept and uphold this Conservation Management Plan, conserving and adapting the building in line with its policies and using it to streamline the process for obtaining listed building consent as appropriate.	NOW Consult the CMP (and the decision diagram in particular). Contact the Conservation Advisor if in doubt.
Policy 1.3	Update the CMP after the first three years, then quinquennially or following any major change to the building.	NEXT

Policy theme 2 Use the Engineering Building to attract and inspire the engineering talent of the future

Reference	Policy aim	Advisory guidelines
Policy 2.1	Provide educational facilities which are comparable and competitive with other universities nationally and globally: an engaging environment in which to study and teach.	NOW Prevent the building becoming a 1960s relic by allowing some modern touches to complement its distinctive original atmosphere.
Policy 2.2		NEXT Allow engineering technology to move forward by renewing outdated equipment and machinery used for experiments if required. Space is tight in the building and redundant laboratory equipment should not be preserved simply as relics. Well-ordered cabinets showing historic components, or framed photographs of equipment *in situ*, may be used to keep records of earlier activity.
Policy 2.3		NEXT Allow teaching and learning environments to be flexible to keep up with latest teaching practices. For example, provide space within laboratories for both practical and hot-desk computer work, enabling the so-called 'digital twin' (digital modelling alongside physical experiments).
Policy 2.4		LATER Reinstate flexibility within the building by creating multi-use spaces which support a diverse range of teaching needs.
Policy 2.5		LATER Remove non-original partitions and ceilings dividing spaces which were originally open, in order to allow greater flexibility.
Policy 2.6		NOW Avoid the further subdivision of spaces, as far as possible. If a need for subdivision arises, carry out an exercise to review the suitability of proposals with respect to heritage constraints, costs, efficiency of space usage elsewhere, etc. New partitions should be installed out in a way which rationalises the existing accommodation and complements the significant features of the original design.
Policy 2.7	Communicate the original design to staff, students and visitors.	NOW Explain the architecture of the building to students and staff, celebrating its design and history and its relevance to their work. Produce educational material to be shared during induction periods for new staff and students, and also on open days. This may include a printed handout introducing the architecture, a lecture on the building during the first term of students' degree courses, and a display poster in the foyer.
Policy 2.8	Reveal or reinstate original features to celebrate the architecture.	LATER Remove and replace the 1980s glazing to the towers, matching the original glazing system as far as possible in terms of framing dimensions and module geometry. See Policy 3.8. Off-the-shelf curtain-wall systems must not be used. Standard modern systems are generally based on accommodating much larger glass panes, and have correspondingly wide framing elements. The replacement system must allow the internal glazing face to be accessed for cleaning, even if secondary glazing is required.
Policy 2.9		LATER Reintroduce access to the building via the long ramp and entrance at foyer mezzanine level (162). This has the potential to reactivate the outdoor terrace space, allow better use of the mezzanine break-out space, and improve flow into and out of the lecture theatres. A risk-assessment approach may be required to avoid major alterations to the balustrade height, which is known to be lower than recommended. Repairs will be required to the tiled balustrade. The tiles on the ramp itself will require replacement to improve traction. Given that the significance of the ramp form is higher than the non-original ramp tiling, a new non-tiled non-slip finish (coloured to match the adjacent tiling) may be a reasonable compromise. Minor alterations may be required to the foyer mezzanine entrance.
Policy 2.10		LATER Investigate implications of reintroducing access to external terrace space adjacent to the MacLellan Room (162). This could become an excellent break-out space for small events and conferences. The terrace provides fine panoramic views and might become one of the highest-value spaces on the campus. Accessibility and safety standards will require a risk-based review, particularly regarding the original balustrade components and the lecture theatre smoke vent. These details may dictate the viability of the scheme. The smoke vent itself may be due for reconsideration, given the problems associated with water ingress after fire alarm activation (6.4.2).

Policy 2.11	Reveal or reinstate original features to celebrate the architecture. (Continued)	NEXT Conserve all tiled surfaces. Remove any temporary over-finishes such as the ceiling tiles in the MacLellan Room. Careful trialling of techniques for the removal of adhesives may be required. Repair damaged tiles with appropriate matching elements. The following criteria should be followed as a starting point for a matching tile product. • Manufacture: via pressing or possibly extrusion. Careful control is required to avoid directional grain and 'orange peel' texture due to expanding chamotte following extrusion. • Dimensions: to match original, paying special attention to joint thickness • Finish: unglazed; natural red colour with tiny black spots; flat colour and texture; vitrified fire skin with very little sheen; no orange peel to surface. • Shape: chamfered arrises; pressed texture to rear to give a keyed surface for bonding. • Body: very finely ground; coal/coke mineral inclusions producing black spots. Chamotte not visible.
Policy 2.12		NEXT Remove false ceilings in research laboratories to expose concrete soffits (152).
Policy 2.13		NOW Remove posters and stickers from all surfaces throughout the building, except those in designated display cases and on noticeboards. This includes out-of-date safety warnings, asset management labels, event flyers and all other informal notices and posters. See Policy 2.18.
Policy 2.14		NEXT Remove all formal signage relating to room use and wayfinding throughout the building. Replace with new consistent suite of signage: see Policy 2.20.
Policy 2.15		NEXT Remove main sign board from tiled wall in foyer. Replace with free-standing sign (161).
Policy 2.16		NEXT Remove display boards (recycled from the re-roofing project hoarding) from the main S-block staircase.
Policy 2.17		NEXT Remove large display boards in the main workshop corridor which have been screwed onto the frames of glass-fronted display cases. Position the equivalent display boards, if required, *inside* the display cases.
Policy 2.18		NOW Use existing timber-framed, glass-fronted display cases for all *ad hoc* signage. This will require some rationalisation of how the different cases are used and who is allowed access. See Policy 2.13.
Policy 2.19		NEXT Consider reconstructing original workshop benches currently in storage (160) as a first option when new worktops are required.
Policy 2.20	Use new elements simply and consistently to improve the building's appearance and assist with wayfinding and orientation.	NEXT Adopt a new suite of permanent signage which is used sparingly and consistently throughout the building (156). Signage for doors should allow for temporary customisation within a consistent system.
Policy 2.21		NEXT Adopt a consistent approach to temporary signage which matches the permanent elements in colour, typeface and general design. Remove all temporary signage after use. Freestanding static frames (with no fixings to the building) may be used, such as to provide wayfinding on open days. They should be treated as temporary elements onto/into which consistent signage and notices are positioned as appropriate. Wherever practicable, free-standing elements should not obstruct key views. Temporary signage should complement the architecture in a similar way to other furniture.
Policy 2.22		NOW Install as few safety notices and asset management labels as possible. Position them to be as visually discreet as possible.
Policy 2.23		LATER Position new elements such as security pass scanners as visually discreetly as possible.
Policy 2.24		NOW Adopt the approved colour palettes for all principal painted surfaces and floor finishes (157).

Policy 2.25	Use new elements simply and consistently to improve the building's appearance and assist with wayfinding and orientation. (Continued)	NEXT Identify a suite of furniture which complements the internal aesthetics of the building while still being relatively cost-effective and easily sourced. The emphasis should be on consistency. Bespoke or built-in furniture may be used, although care must be taken to not limit the flexibility of space usage. For hard furnishings, varnished solid wood should be the default option. Other materials such as veneered wood may be considered, but must be complementary to the overall interior design. The upholstery of soft furnishings should generally be red within the towers and blue within the workshops and S-Block (158).
Policy 2.26		NEXT Remove unsympathetic furniture across the building. The building contains a wide variety of mostly low-quality furniture and the intention should be to unify this over time.
Policy 2.27	Allow the building's service equipment to complement the architecture.	NEXT Maintain all original fixtures mounted to wall, doors and ceilings. This includes components from heating equipment and lighting through to door handles, light switches, sockets, etc. If replacement is required due to safety concerns or irreparable technical deficiencies, components shall be designed to complement the surrounding architecture. New components should generally match the material finishes and colour of the original element, although these details are subject to confirmation depending on the specific situation. Standard off-the-shelf products are unlikely to be appropriate. Listed building consent is likely to be required.
Policy 2.28		NEXT Express all cable runs, ducts and other service routes honestly and pragmatically but with a high quality of finish, avoiding fixing into tiled surfaces wherever practicable.
Policy 2.29		NEXT Maintain existing lifting, craning and winching equipment throughout the building. These components will assist the flexibility and future use of the spaces. Where existing lifting equipment is no longer compliant with modern safety standards, replacements may be sourced. New components should generally match the material finishes and colour of the original element, complementing the surrounding architecture.
Policy 2.30	Keep the building clean and tidy.	NOW Carry out a full biennial inspection of the tower glazing, tiles, brickwork and other materials to monitor their condition whilst no cleaning or maintenance is carried out.
Policy 2.31		NEXT Clean the external envelope of the building as part of a regular programme of inspection and pre-emptive maintenance. This work will require a clear strategy for safe access, incorporating the approved plans developed in 2017 for accessing the replaced workshop and S-Block glazing. The bespoke rolling ladder unit required to maintain workshop roof glazing must be procured, and additional new systems and equipment may also be required. The design of these items must be very carefully considered as part of the listed building consent process. Cleaning should include the internal faces of glazing units and inside the cavity between external and secondary glazing elements, and the careful removal of plant growth from the podium brickwork.
Policy 2.32		NEXT Explore new technologies for cleaning complex areas. The work carried out by the 2019 Masters in Engineering Management student projects provided initial research into drone and robotic cleaning methods. Further study could result in safer and more efficient cleaning processes for hard-to-reach areas.
Policy 2.33		NOW Service all access equipment regularly to facilitate maintenance.
Policy 2.34		NOW Allow adequate time for staff to complete all internal cleaning tasks, including the removal of "wet floor" signage after use. Allow space in storage areas to house signage and other cleaning items out of sight.
Policy 2.35		NEXT Rationalise the positioning of bins in circulation spaces. The number, size and poor architectural quality of the current units is disproportionate for their position in the building, particularly on the small landings in the tower. Waste and recycling points may be more effective if housed closer to the office spaces – or alternative versions which are smaller and more sympathetically designed might be used instead.

Policy 2.36	Keep the building clean and tidy. (Continued)	NEXT Rationalise all temporary storage in common areas to ensure that storage units are utilised efficiently and complement the architectural qualities of the space.
Policy 2.37		NEXT Carry out an annual review of equipment. Dispose of unnecessary items.
Policy 2.38		NEXT Keep key approaches and the rear access road clear of clutter.
Policy 2.39		NEXT Install bird management systems in problem areas. Designs should not compromise key architectural features and viewpoints. Pigeon spikes or wires on globe fans and façade ledges should be relatively discreet.
Policy 2.40		NOW Prevent any fixings through wall tiles.
Policy 2.41		NEXT Establish methodologies for repairing damage such as redundant fixing holes in concrete and tiles, considering aspects such as colour-matching and compatibility of materials.
Policy 2.42	Review all artwork in the building.	NEXT Conserve the Paolozzi tapestry (88) *in situ* as an nationally-important site-specific artwork. Replace sign board clamped obtrusively around handrail and replace with more sensitively-designed alternative.
Policy 2.43		NEXT Assess all artwork hanging in the building to ensure its relevance and quality. Remove works which do not contribute to the architectural quality of their location.

Policy theme 3 Improve the safety, comfort and productivity of staff and students working in the building

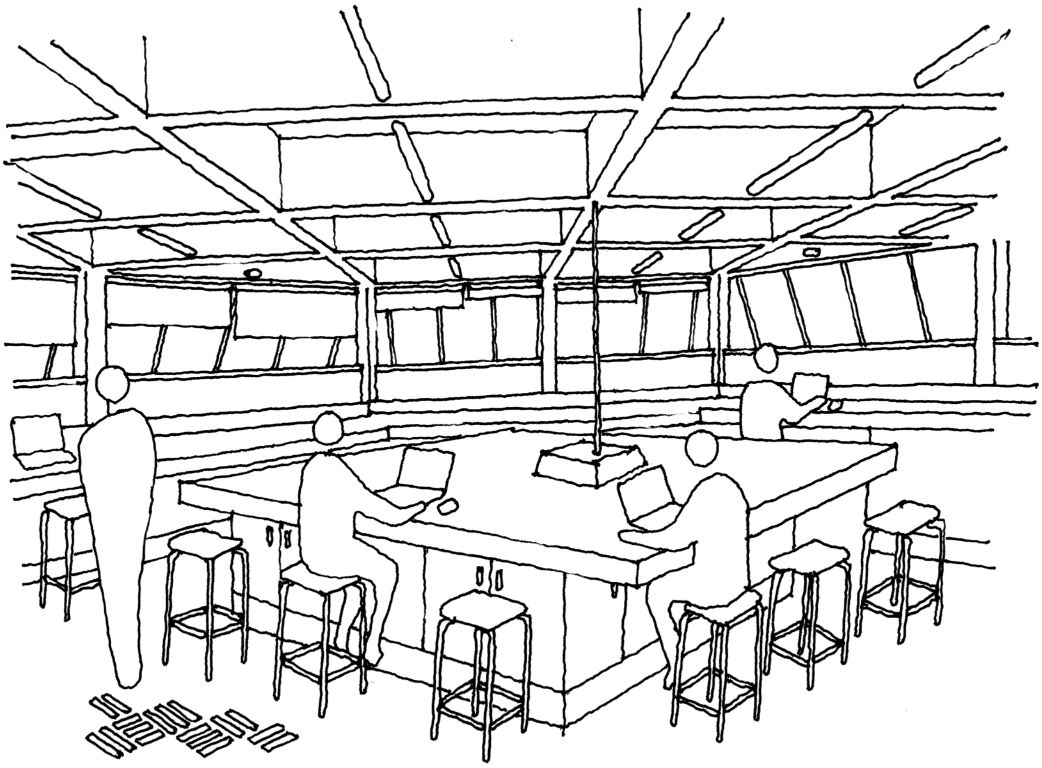
Reference	Policy aim	Advisory guidelines
Policy 3.1	Improve fire safety	NOW Complete review of fire strategy for building, incorporating conservation into considerations for potential alterations.
Policy 3.2		NEXT Upgrade fire safety as appropriate within the context of this Conservation Management Plan.
Policy 3.3	Improve inclusivity, diversity and equality	LATER Reconfigure ground floor toilets to allow more gender-balanced facilities whilst respecting evidential value of original layout (155).
Policy 3.4		NEXT Review access arrangements for less able-bodied staff and students, following the assessment by AccessAble (formerly Disabled Go) in the first instance. Upgrade items where appropriate in line with the other policies of the CMP.
Policy 3.5	Promote collaboration and idea-sharing	LATER Improve the flexibility of teaching and breakout spaces to create more versatile, open spaces which facilitate the cross-pollination of ideas.
Policy 3.6		LATER Improve connectivity between Engineering and the Michael Atiyah Building. This may involve allowing access through the secondary glazed foyer entrance.
Policy 3.7	Address very poor temperature control (Interlinked and mutually dependent)	NOW Empower staff to understand their building and how it functions, allowing them to take more control of their environment. A building induction for new starters should describe how to use the existing heating and cooling system to create as comfortable an environment as possible.
Policy 3.8		LATER Remove and replace the 1980s glazing to improve thermal conditions. This scheme should include solar control, insulation, integrated shading which is robust and easy to maintain, and opening parts which provide occupants with simple control over their environment. See Policy 2.8.
Policy 3.9		LATER Allow renewal of outdated equipment and machinery relating to heating, cooling and ventilation. Where appropriate, and specified as part of the listed building consent process, original components should be recorded and potentially exhibited as heritage samples in orderly display cases.
Policy 3.10		LATER Control temperatures with modern zonally-controlled, energy-efficient heating and natural ventilation systems – and comfort cooling if it cannot be avoided by any other means.
Policy 3.11	Upgrade power supplies	LATER Increase electricity supply to office spaces and study zones. Many more power sockets are needed than the building currently provides.

Policy theme 4 Allow the Department of Engineering to grow

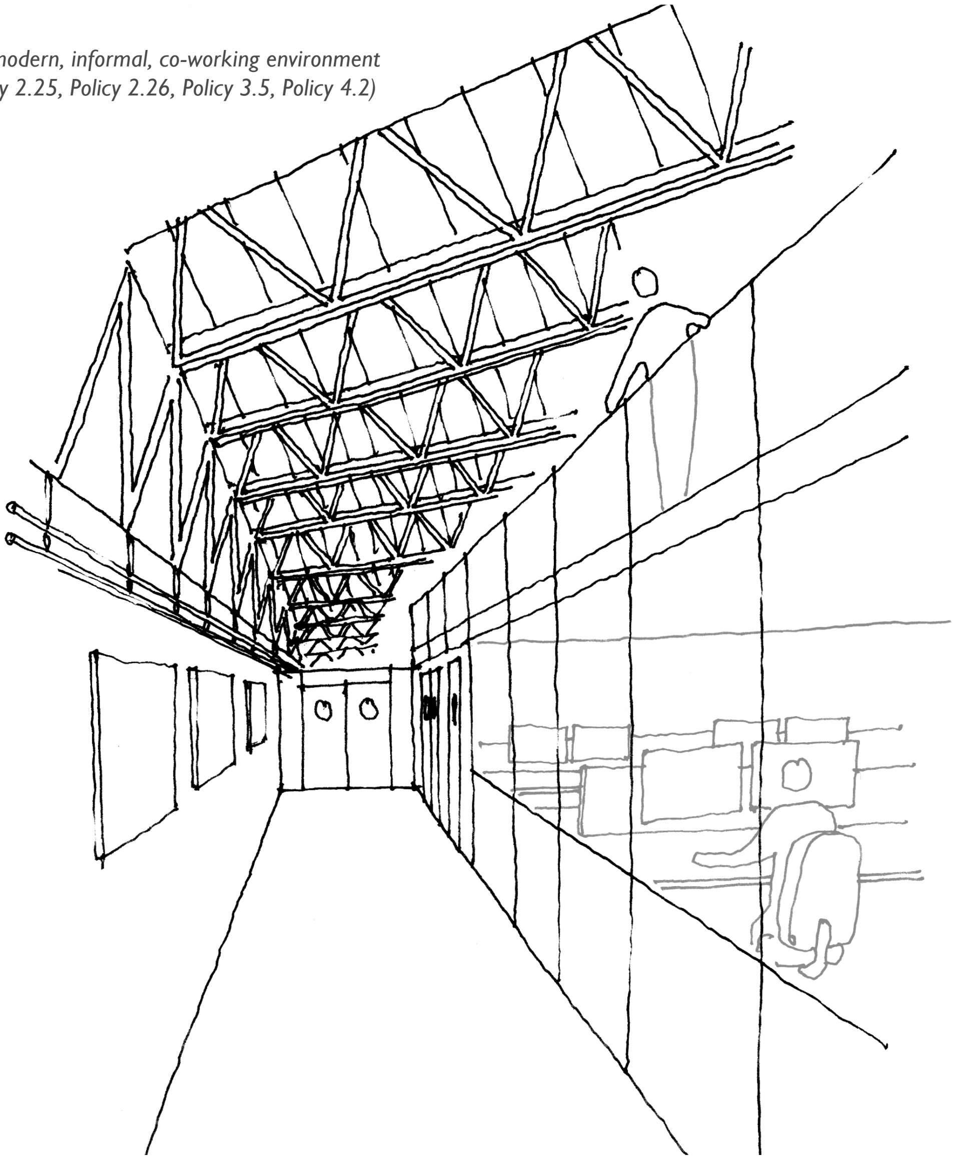
Reference	Policy aim	Advisory guidelines
Policy 4.1	Use space more flexibly	LATER Remove partition walls to reinstate some of the original open-plan arrangement. Flexible working spaces can hugely improve space utilisation and increase student numbers operating effectively in the building.
Policy 4.2		NEXT Consider flexible working practices such as hot-desking to allow a greater number of users working within the building (152, 153, 154). With many students and staff using laptops, dedicated cellular desk spaces may not be required. Communal working areas can be attractive and highly productive.
Policy 4.3		LATER Rationalise how departmental operations are situated within the building and elsewhere on campus, in order to allow future growth. Where specific conditions are required it may be more effective to relocate some functions into a less architecturally-sensitive location.
Policy 4.4		NOW Carry out an annual review of equipment and storage in the building, and dispose of unnecessary items to free up space for active use.
Policy 4.5	Use technology more innovatively	LATER Explore the use of mobile software licences to allow flexible computing as opposed to static computers on desks. Dongle-type licences could allow staff and students to work more flexibly throughout the building. To be considered in conjunction with campus-wide IT strategy.

Policy theme 5 Protect the building's landmark role on the university campus

Reference	Policy aim	Advisory guidelines
Policy 5.1	Defend the building's skyline from surrounding architecture	NEXT Restrict future development to avoid compromising key aspects of the building, including its skyline and silhouette. No buildings should encroach on the building's distinctive form when viewed from the principal axial approach routes through the campus and from Victoria Park. Developments on the site to the rear (south-east) of the building should be limited in height, form and materials so that they do not challenge the dominance of the Engineering Building's remarkable rear elevation and roofline. Views to and particularly along the raking buttresses to the rear of building should be given prominence.
Policy 5.2		NEXT Restrict light pollution from adjacent developments to avoid compromising the architectural effect of the Engineering roof at night where the workshop glazing glows. This includes limitations on spotlights or highly glazed buildings.
Policy 5.3	Urban realm	NOW Ensure key approaches and sight lines are kept free of signage, banners, lighting masts, etc., which obstruct the view of the building.
Policy 5.4		LATER Improve connectivity with the wider campus, including demarcated pedestrian access through the car park, reinstatement of the access ramp or through-route to the Michael Atiyah Building. It is acknowledged that car parking throughout the campus is likely to undergo significant changes in the near future, so there is a degree of uncertainty about the long-term viability of certain access routes.

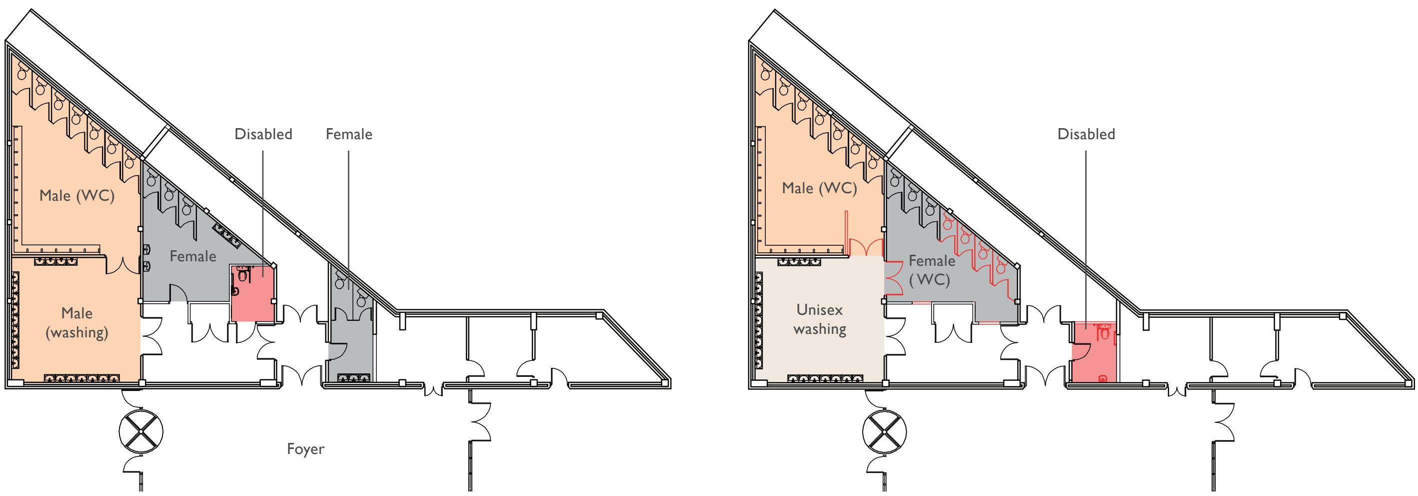


152. Possible design for research laboratory room: a modern, informal, co-working environment (see Policy 2.3, Policy 2.4, Policy 2.5, Policy 2.12, Policy 2.25, Policy 2.26, Policy 3.5, Policy 4.2)

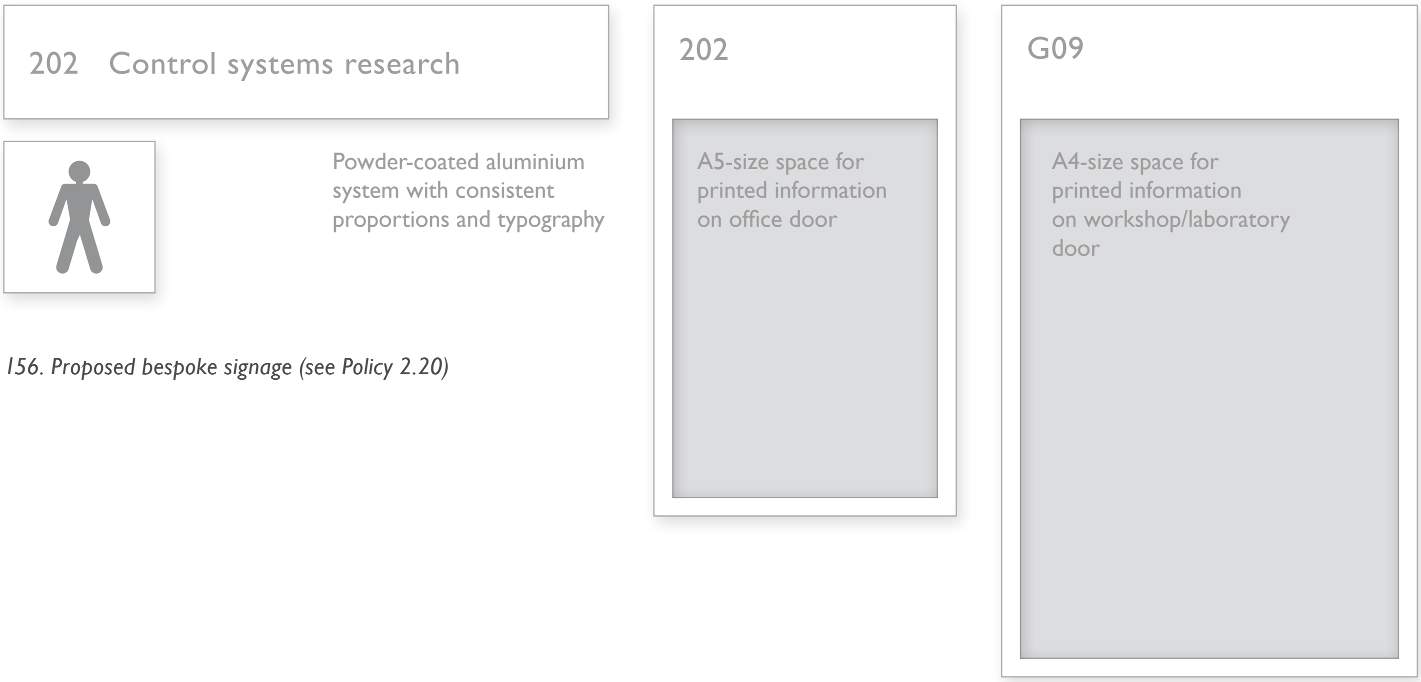


153. Rearrangement of non-original ceilings on L3 of S-Block to open up views of roof while also providing more formal study and write-up space (see figure 154, Policy 2.3, Policy 2.4, Policy 2.5, Policy 2.12, Policy 2.25, Policy 2.26 and Policy 4.1)

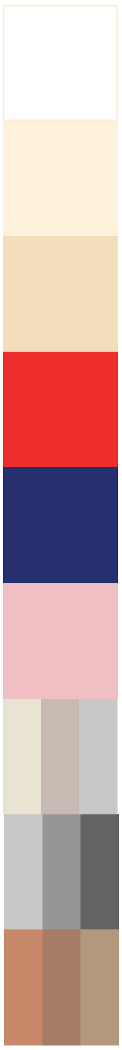
154. Possible amendments to S-Block L3 and L3 mezzanine: existing arrangement (left) and possible rearrangement (right, with new elements in red) (see figure 153 and Policy 2.3, Policy 2.4, Policy 2.5, Policy 2.12, Policy 2.25, Policy 2.26 and Policy 4.1)



155. Possible amendments to ground floor toilets: existing arrangement (left) and possible rebalanced design (right, with new elements in red) (see Policy 3.3)



156. Proposed bespoke signage (see Policy 2.20)



Some walls
Latecomers' staircase steelwork
(white)

Walls generally
RAL 1015 (magnolia)

Lecture theatres: walls below dado height
RAL 1014

Doors: podium, workshops, towers
RAL 3002 (red)

Doors: S-Block
Handrails: S-Block
BS 381C 104 (blue)

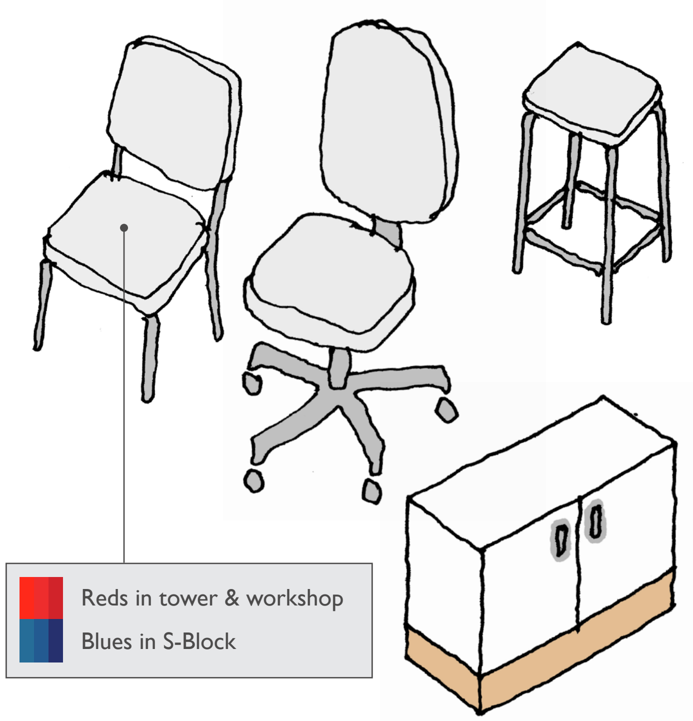
Handrails: foyer, tower staircases, terraces
RAL 3022 (pink)

Electrical equipment, cranes, etc.
Generally neutral colours, some metallic
Colour TBC depending on specific case

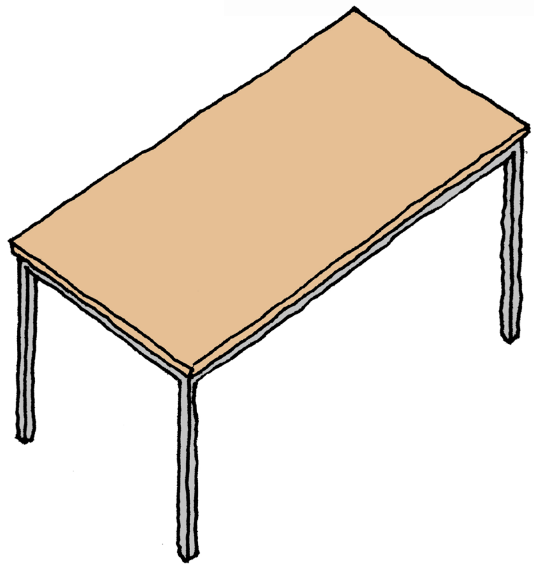
Carpets and linoleum
Greys
Colour TBC depending on specific case

Parquet flooring
Exposed, varnished timber

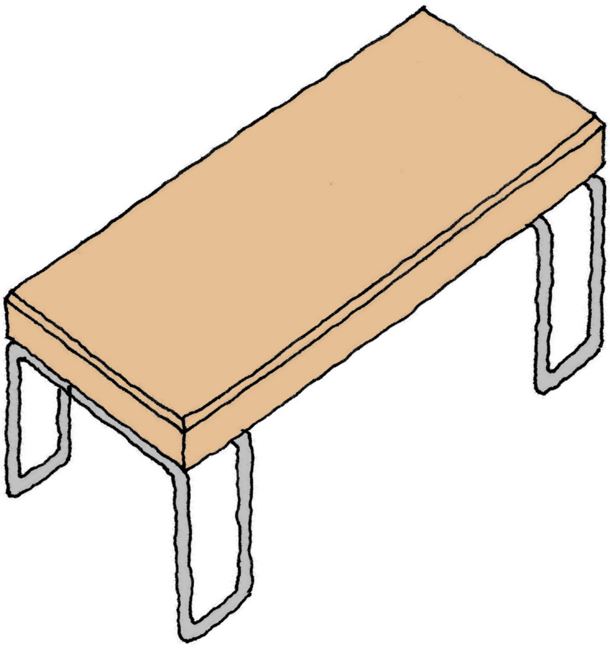
157. Colour palettes (see Policy 2.24)



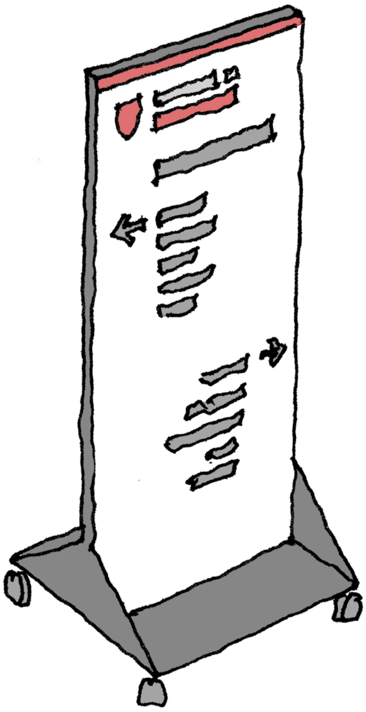
158. Furniture
(see Policy 2.25)



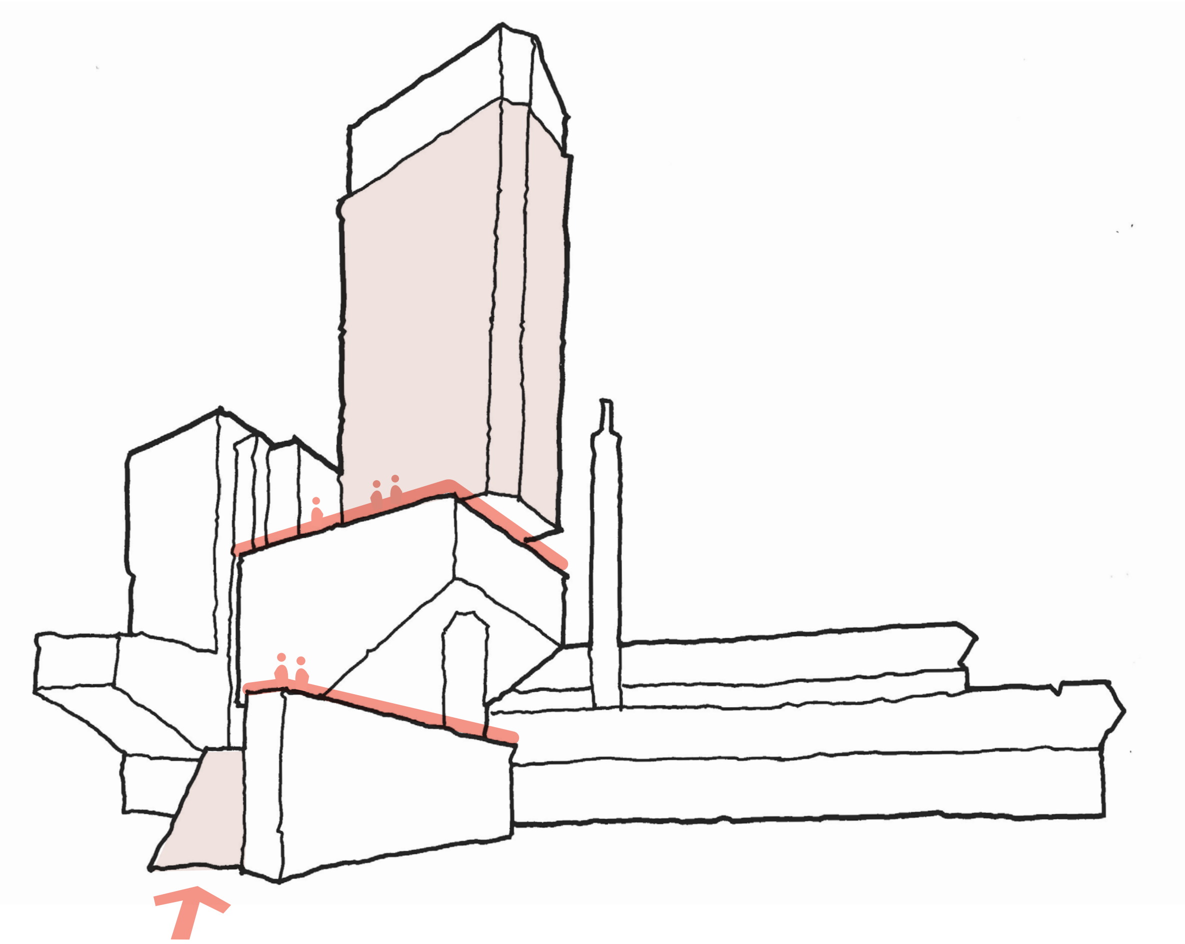
159. Glass-fronted cases used to rationalise displayed information (see Policy 2.18)



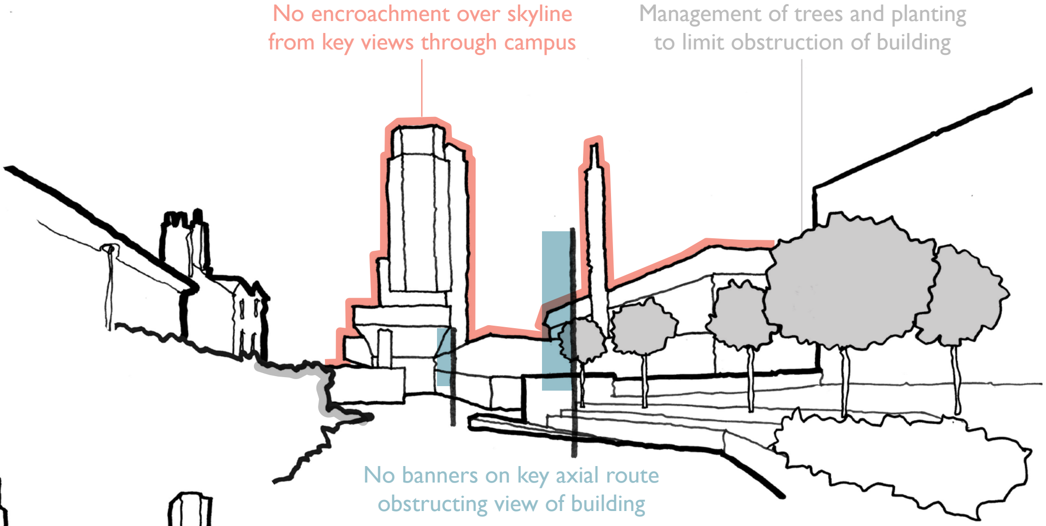
160. Original bench: many remain in service; several are dismantled in storage and may be reconstructed (see Policy 2.19)



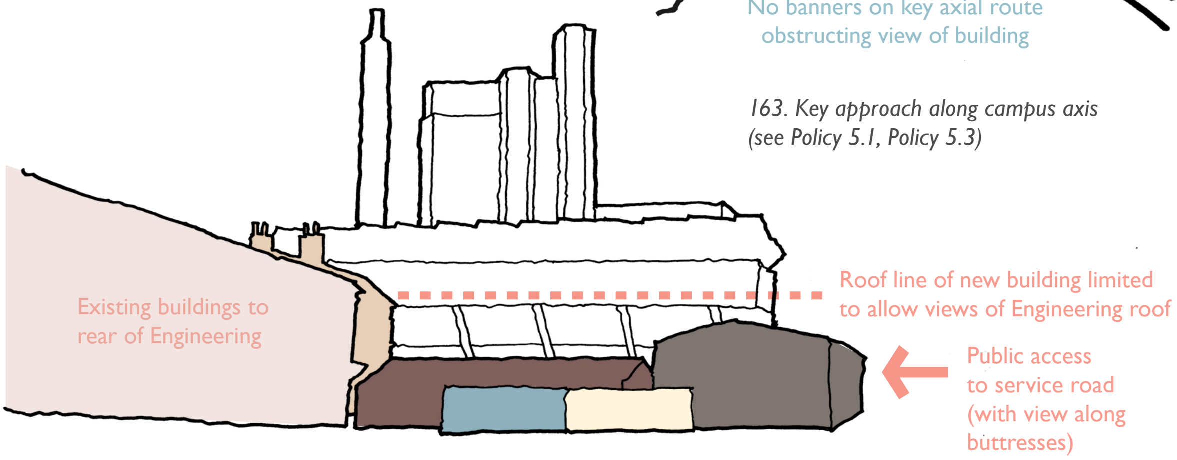
161. Free-standing sign board, as used elsewhere on the campus (see Policy 2.15)



162. *Refurbished tower glazing; reinstated use of entrance ramp and access to terraces (see Policy 2.8, Policy 2.9, Policy 2.10, Policy 5.4)*



163. *Key approach along campus axis (see Policy 5.1, Policy 5.3)*



164. *Key approach from rear, with potential development site (see Policy 5.1)*

8.3 RECOMMENDED PRIORITY ITEMS

The following table is a summary of Arup's recommended next steps for the University of Leicester, based on an understanding of aspirations shared by the three key stakeholder groups (Estates, Engineering and the heritage bodies; see section 7.4).

They have been selected on the basis that they will have the greatest impact on overall usability, comfort and appearance, but also in returning original features and enhancing architectural features. In terms of fundraising these items may provide the best value-for-money at this stage.

This list is a starting point. It should be refreshed in line with the rest of the CMP going forward.

Action	Advantages	Disadvantages	Cost	Policies
Address the poor performance and appearance of the office and research laboratory towers. This item involves two significant co-related actions. • Overhaul the building services in the towers. • Replace the glazing, including (potentially) the inverted hopper windows in the research laboratory classrooms.	Benefits to reputation of building and department due to improved appearance. Substantially improved comfort conditions inside tower.	High cost, including complex scaffolding requirements. Disruption to building occupation during works.	£££££	Policy 2.8 Policy 3.8 Policy 3.9 Policy 3.10
Reorganise subdivided rooms on L3 of S-Block. • Create room for more staff and students. • Provide high-grade agile working space with breakout and storage areas – all under the building's dramatic glazed roof.	Significant improvement to students and staff with accommodation closer to that offered by departments in newer buildings. Larger area of dedicated hot-desking as quiet write-up space. Increased student capacity. Rationalised storage facilities. Exploitation of previous investment in replacement roof.	Change to settled behaviour within department: fewer private offices and study rooms. Disruption to building occupation during works.	££££	Policy 2.3 Policy 2.4 Policy 2.5 Policy 4.1
Remove clutter and low-quality finishes and furniture to reveal and celebrate original features. Focus on research laboratory rooms in first instance.	"Wow factor" reinstated to unattractive teaching and study space. Increased emphasis on flexible co-working and sharing of ideas. Prospectus-worthy spaces with unique architecture: high-grade marketing material.	Potential cost of bespoke fittings and furniture.	£££	Policy 2.12 Policy 2.13 Policy 2.26 Policy 2.35 Policy 2.36 Policy 2.37 Policy 2.38
Reconfigure ground floor toilet provision.	Rectification of embarrassing gender imbalance in toilet accommodation. Improved inclusivity in line with University commitments. Removal of potential legionella risk due to standing water in underused male facilities.		££	Policy 3.3
Provide educational material to students and staff to encourage understanding of and engagement with architecture.	Simple activity. Potential effect on "hearts and minds" of occupants, encouraging them to be proud of "their" building. Greater chance of occupants caring for building and improving its performance. Enhanced reputation of department.		£	Policy 2.7 Policy 3.7
Removal of signs, stickers, posters, etc. and replacement with simple, consistent signage in keeping with architecture.	Improved wayfinding. Tidier environment.		£	Policy 2.13

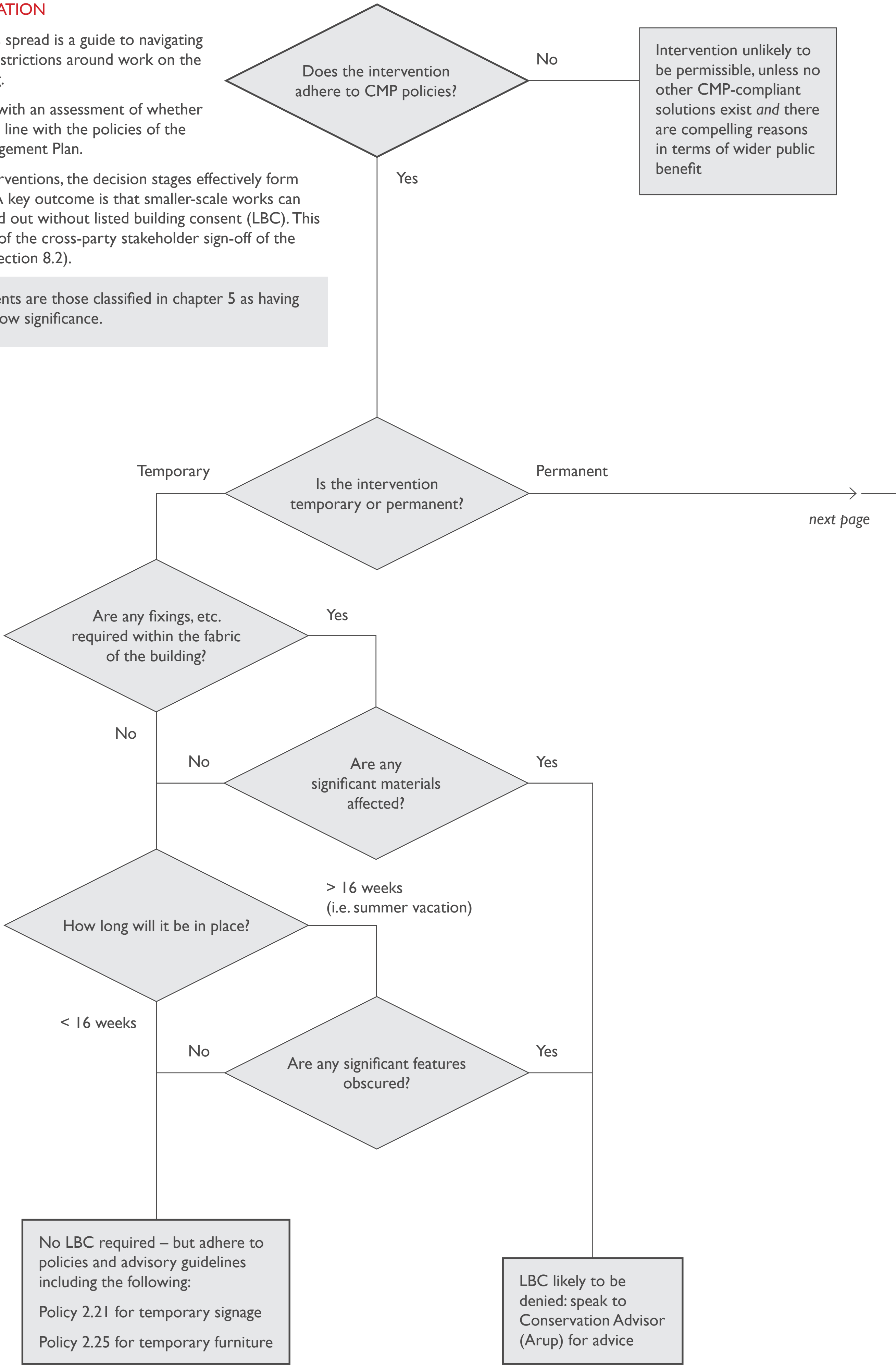
8.4 IMPLEMENTATION

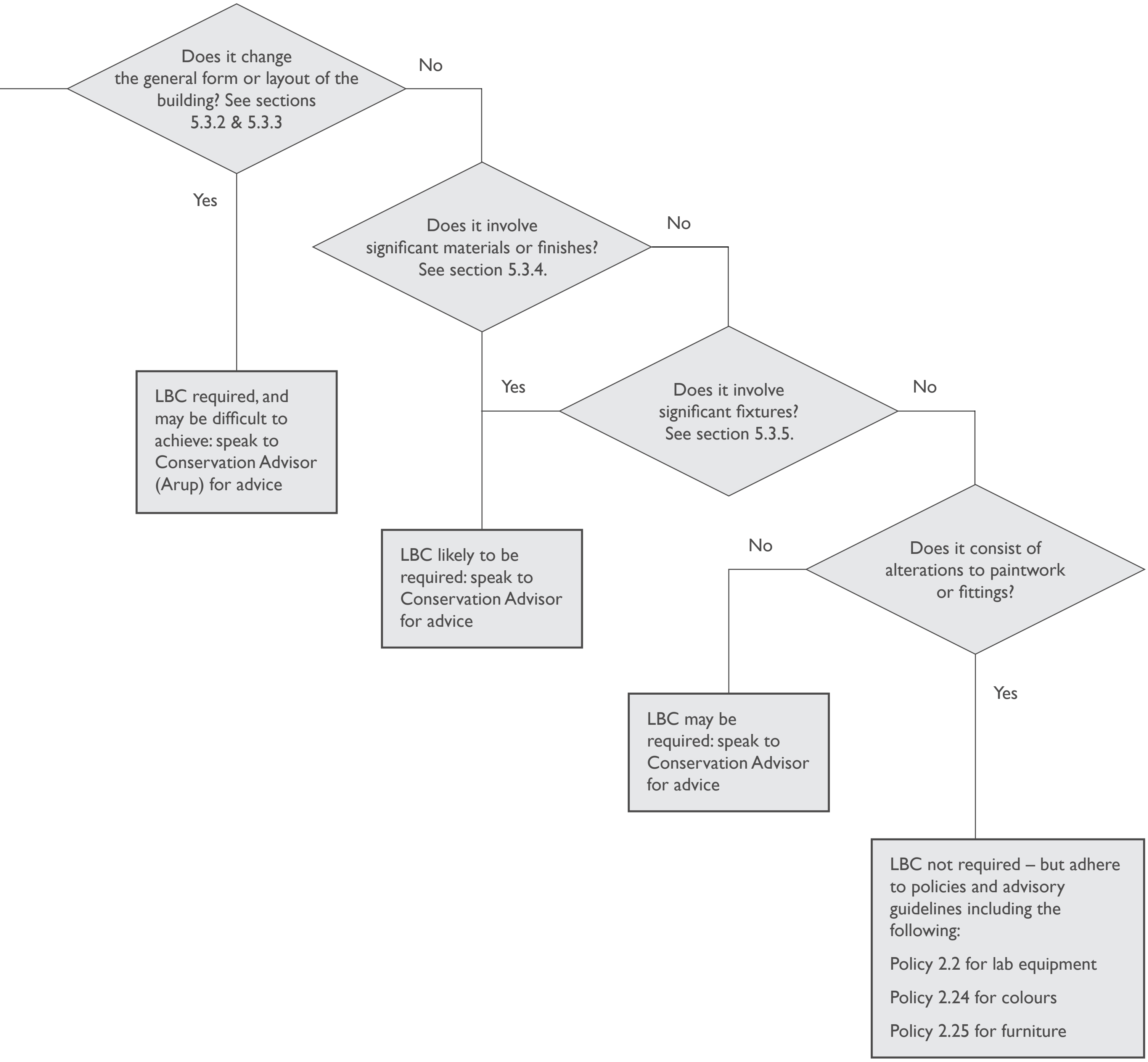
The diagram on this spread is a guide to navigating some of the legal restrictions around work on the Engineering Building.

The process starts with an assessment of whether the proposals are in line with the policies of the Conservation Management Plan.

For permanent interventions, the decision stages effectively form a filtering process. A key outcome is that smaller-scale works can effectively be carried out without listed building consent (LBC). This is possible because of the cross-party stakeholder sign-off of the Plan (described in section 8.2).

'Significant' elements are those classified in chapter 5 as having high, medium or low significance.




Does it change the general form or layout of the building? See sections 5.3.2 & 5.3.3
No
Yes
LBC required, and may be difficult to achieve: speak to Conservation Advisor (Arup) for advice
Does it involve significant materials or finishes? See section 5.3.4.
No
Yes
LBC likely to be required: speak to Conservation Advisor for advice
Does it involve significant fixtures? See section 5.3.5.
No
Does it consist of alterations to paintwork or fittings?
No
LBC may be required: speak to Conservation Advisor for advice
Yes
LBC not required – but adhere to policies and advisory guidelines including the following:
Policy 2.2 for lab equipment
Policy 2.24 for colours
Policy 2.25 for furniture

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4 Parkes, July 1959
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6 Crinson, p.232
7 Crinson, p.247
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15 Girouard, p.113
16 Pearson, p.13
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24 Crinson, p.231
25 Harwood
26 Banham, 1964
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43 Bickerdike Allen Partners pp.9-10
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55 Harwood
56 Harwood
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62 Leicester City Council, 2014, p.24
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64 Leicester City Council, 2017, p.13
65 University of Leicester, 2017

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Emily Sutton, Arup: 81, 87, 97, 99, 100, 101, 105, 127 (left), 128, 129, 144, 145, 149, 154, 155, 162, 163, 164

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