

# Master Plan for the Loughborough University of Technology: An Endless Campus?

## *Master Plan for the Loughborough University of Technology: ¿Un campus infinito?*

DÉBORA DOMINGO-CALABUIG

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### Abstract

The Master Plan for the Loughborough University of Technology is a 143-page document that gathers the work undertaken by the institution to become a university, thus benefiting from the educational policies derived from the 1963 Robbins report in Britain. Arup Associates authored in 1966 a proposal whose main characteristic is its ascription to an infinite grid strategy and a systematized project. The different diagrams and growth schemes represent the geometric synthesis of some compositional and constructive rules: three grids overlap to produce a germ drawing to which a growth pattern is added for its territorial extension. For the sake of flexibility and adaptability, the project tries to avoid architectural obsolescence through the achievement of a "universal space unit". Hence, a "discipline" is established whose definition turns out to be a succession of limitations. Through the reconstruction of the design process for the Loughborough University, the multiple meanings of the limit concept are portrayed in parallel to its idea of a continuous and endless campus. A strict internal order, an intentionally open reading of the territory and a constructive standardization produce a kind of visual exhaustion of the whole that could be understood as a limit of spatial nature.

### Keywords

Campus planning, Loughborough University, Arup Associates, mat-building, Open Work.

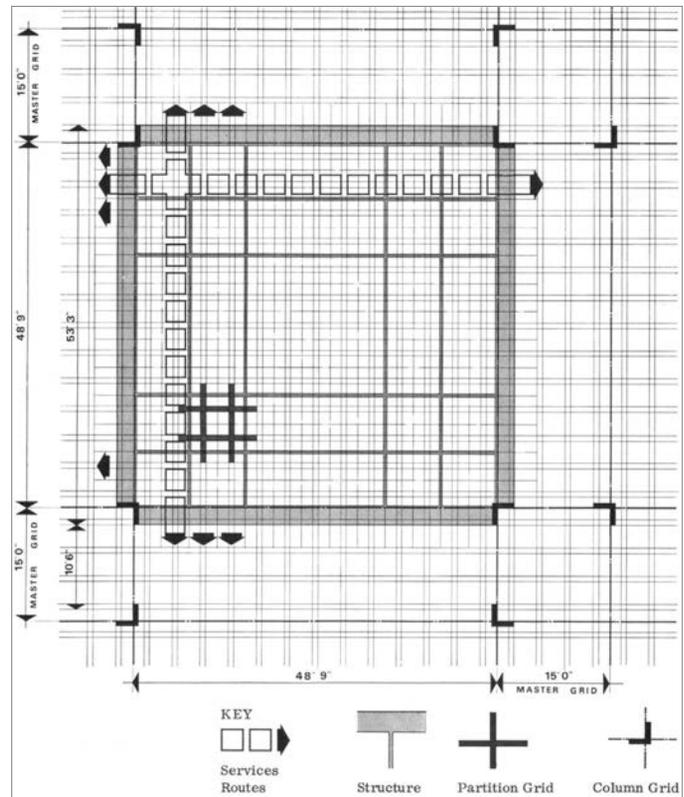
### Resumen

El Master Plan for the Loughborough University of Technology es un documento de 143 páginas que recoge el trabajo emprendido por la institución para convertirse en una universidad, beneficiándose así de las políticas educativas derivadas del informe Robbins de 1963 en Gran Bretaña. Arup Associates firmó en 1966 una propuesta cuya característica principal es su adscripción a una estrategia de retícula infinita y de proyecto sistematizado. Los diferentes diagramas y esquemas de crecimiento representan la síntesis geométrica de unas reglas compositivas y constructivas: tres retículas se superponen para producir un dibujo germen al que se suma un patrón de crecimiento para su extensión territorial. En aras de una flexibilidad y adaptabilidad, el proyecto intenta rehuir la obsolescencia arquitectónica mediante la consecución de una "unidad espacial universal". Se establece entonces una "disciplina" cuya definición resulta ser una sucesión de limitaciones. A través de la reconstrucción del proceso de proyecto para la universidad de Loughborough, las múltiples acepciones del concepto de límite quedan retratadas en paralelo a su idea de campus continuo e infinito. Un estricto orden interno, una lectura intencionadamente abierta del territorio y una estandarización constructiva producen una suerte de agotamiento visual del conjunto que podría entenderse como un límite de naturaleza espacial.

### Palabras clave

Planificación de campus, universidad de Loughborough, Arup Associates, mat-building, obra abierta.

**Débora Domingo-Calabuig** (Valencia, 1972) has been an architect since 1997, after studying in the School of Architecture of the Universitat Politècnica de València (UPV) and the School of Architecture of Paris-La Défense, and a PhD architect since 2005. She joined the Department of Architectural Design at UPV as an assistant professor in 2000, where currently she is a full professor. She held the position of Assistant Director for Research (2012-2016) and was Editor in Chief of the *VLC arquitectura Research Journal* from its launch to 2018. She is also a Research Academy member of the European Association for Architectural Education. Her research is focused on the social consideration of architecture and urbanism during the 60s and 70s. She has co-developed a research project on the mat-building whose results have been published in *Boletín Académico Contemporáneo* (2011), *Proyecto, progreso, arquitectura* (2011, 2012), *The Architectural Review* (2013), *DEARQ* (2015), and *arq: Architectural Research Quarterly* (2016). Recently, this research has led her to the compilation and study of post-war university campuses, with a particular focus on changes in higher education and the planning of new campuses (*Zarch*, 2018; *Eidos*, 2019; *Arquitectura Revista*, 2020). <https://orcid.org/0000-0001-6020-3414>. [dedoca@pra.upv.es](mailto:dedoca@pra.upv.es)



[Fig. 1]. Loughborough University of Technology. Relationship between all grid networks. Source: *Arup Journal 2* (1966): 18.

Anyone who carefully observes the germ drawing of the Loughborough University campus [Fig. 1] may feel the ambivalence of its architectural approach: some particular designs meet the paradox of being imagined to extend or modify indefinitely, but are conceived through a succession of limitations. There are three fundamental meanings of the term “limit”: a line that separates two terrains (boundary or frontier), the end or conclusion of a fact (culmination), and the physical, mood or temporal utmost that can be reached (goal or ceiling). In the master plan signed by Arup Associates in 1966, all these conditions are met at the same time, even when the purpose seems to be the opposite.

“In Loughborough we have tried to design buildings to meet the needs of both growth and change. The lack of a definite brief at the outs —an intelligent refusal to hazard a guess at future developments in teaching disciplines by the client— made the development of such a building the only viable solution.

Our proposals are set out in the Master Plan Report, but briefly the solution was to propose a series of dimensional relationships realised as grid networks, giving a discipline within which the various parts can be related to each other and to the whole”.<sup>1</sup>

## The Loughborough University of Technology

In 1963, the Loughborough Institute of Technology was among the institutions that could qualify for university status thanks to the higher education policies undertaken after the Robbins report.<sup>2</sup> Student numbers grew exponentially year after year, and Britain needed a training boost —especially in the field of technology— if the country wanted to reach to real economic and industrial development. For this reason, articles 389 to 397<sup>3</sup> of the report encouraged converting Colleges of Advanced Technology into universities, and not limiting their training to the scientific field: they should also open up to social sciences and humanities to favour interdisciplinary studies.

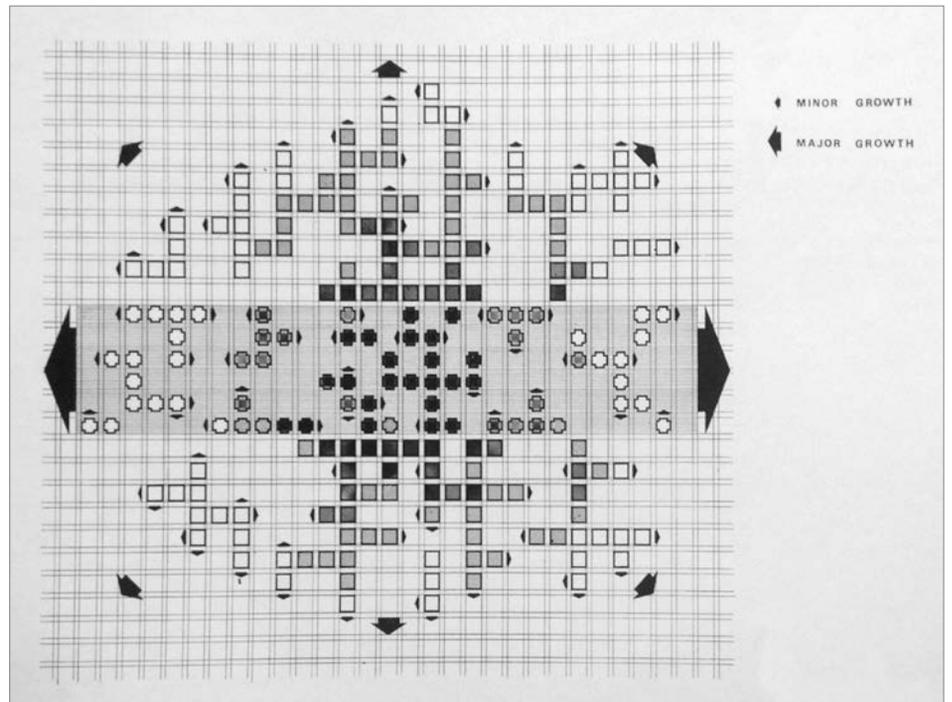
The institution based in the British county of Leicestershire has a long historical background. Created in 1909 as a local centre for further education that taught courses in science, art, and technology, the Technical Institute added training in the munitions industry to its growing and diverse teaching during the First World War. In 1920 it was renamed Loughborough College and, in the early 1950s, it had undergone a fragmentation process based on the main areas of knowledge. Thus,

1 David Thomas, “Loughborough University of Technology; Growth Change and Grid Disciplines”, *Arup Journal 6* (September 1967): 7.  
 2 Michael Beloff, *The Plateglass Universities* (London: Secker & Warburg, 1968), 15–27.  
 3 Lionel Robbins, *The Report of the Committee Appointed by the Prime Minister under the Chairmanship of Lord Robbins* (London: Her Majesty’s Stationery Office, 1963), 130–2.

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[Fig. 2]. Loughborough University of Technology. Growth pattern. Source: Arup Associates. *Master Plan for the Loughborough University of Technology* (1966): 64.

the centre had been subdivided into four colleges: one was dedicated to teacher training, another to art and design education, the third to further education, and the fourth had become a science and technology institute, the Loughborough College of Advanced Technology. Once the Robbins report was approved, the college could aim to a university status, which was later granted under the title of the Loughborough University of Technology. Curiously, the university was amalgamated in the following decades: in 1977, the university and the faculty of education sciences joined, and in 1998 the Loughborough College of Art and Design was absorbed by the university. Currently, the institution is called Loughborough University.

The three years between the approval of the Robbins report and the granting of the university status represented a frenzy of coordinated work between different actors. In July 1963, the Joint Standing Committee on Planning and Development<sup>4</sup> was set up with two fundamental objectives: the drafting of the petition for the Royal Charter —that was finally granted on April 16, 1966—, and the preparation of a plan for the physical development of the campus. Both purposes included a general reflection on the institution's identity and role: on the one hand, the consideration of technology as a discipline at the service of industrial advancement, and on the other, the assumption of the university as a complete training environment that should provide, beyond teaching, a community and social context.

The results of these reflections are collected in a document called *Master plan for the Loughborough University of Technology*: a landscape-format book with 143 pages containing a brief preface by the chancellor, a "Preamble" of the Joint Standing Committee on Planning and Development and, fundamentally, the master plan commissioned to the London-based Arup Associates firm in April 1964. The project was developed from that moment and throughout the following year and had notable dissemination through specialized media. In July 1964 it was already presented as a case study at the symposium on new university planning organized by the Architectural Association and the Royal Institute of British Architects at the University of Sussex.<sup>5</sup> In April 1967, the proposal is scarcely mentioned in an *Architectural Design*<sup>6</sup> article where the firm reviews some scientific laboratories achievements. In 1968 the plan was published in the special issue on universities in *l'Architecture d'Aujourd'hui*<sup>7</sup> and in the Giancarlo de Carlo's book *Pianificazione e Disegno Delle Università*.<sup>8</sup> Two years later, the first photographs

4 Arup Associates, *Master Plan for the Loughborough University of Technology* (Loughborough: University of Technology, 1966), 4–13.

5 Michael Brawne, *University Planning and Design: A Symposium* (London: Lund Humphries for the Architectural Association, 1967), 94–103.

6 Arup Associates, "Building for Science", *Architectural Design* 4 (April 1967): 160–70.

7 Arup Associates, "Loughborough University of Technology, Grande-Bretagne", *Architecture d'Aujourd'hui* 137 (1968): 53–6.

8 Giancarlo De Carlo, *Pianificazione e Disegno Delle Università* (Roma: Edizioni Universitarie Italiane, 1968), 103–8.

of the Civil Engineering building —still under construction— were included in *The Architectural Review* monograph entitled “The New Universities”.<sup>9</sup> Besides, Arup Associates had been editing its journal since 1966, and technical issues related to the prefabricated concrete elements and the service facilities were outlined in their quarterly issues.<sup>10</sup>

The interest aroused by this new university is undoubtedly related to its consideration of an infinite grid and a systematized design. The different diagrams and growth schemes [Fig. 2] are self-explanatory: they show the geometric synthesis of some compositional and constructive rules.

### Master Plan: the game rules

The Loughborough University master plan does not explain what the campus buildings will look like, nor does it conclude in a list of functional needs that relate to precise urban or time planning. It is an atypical document, very balanced in its drawing and written content, without the usual planimetry appendix.<sup>11</sup> Arup Associates simply proposed an instruction manual. The narrative is the result of research involving various agents (the client, experts in pedagogy at the University of Oxford and local authorities) where the main problem is formulated and consequently a solution is offered. The campus should be an adaptable entity that would grow from 1,500 to 5,000 users in the following 10 years.<sup>12</sup> There is almost no variable determined in the brief, and the few data that could be concise —such as the site or the existing academic buildings—, seem to be diluted on purpose: “Specific proposals for the size, height, use and relationship of buildings should be avoided, simply because the data upon which such proposals would be based may well turn out to be inaccurate”.<sup>13</sup>

The university required spaces for formal and informal learning. The first included the departments’ and schools’ demands (lecture rooms, seminar rooms, and laboratories) while the latter derived from the overwhelming need to accommodate the majority of the students on campus since the city had a scarcity of lodgings. However, there was no stable program: certain departments were given priorities, but new ones were to come and offer other degrees.

The institution was also not guaranteed continuous financing. While it was the University Grants Committee that managed state funds, the dependence on political changes was evident. In particular, public subsidies for educational buildings were easier to obtain than those related to residential needs, and therefore the master plan urged the university to find funding alternatives.<sup>14</sup>

Furthermore, the new university was to be located on adjacent 90-acres (36-hectares) land of crops recently acquired southwest of the existing facilities. Commonly in British universities, the peri-urban condition of the campus is on purpose, since some isolation from the urban centre is sought to achieve a concentration’s atmosphere for the students. Consequently, the location also provides the design with a particular degree of autonomy. The site’s description by Arup Associates is neutral and concise: the roads bordered the plot (some of them still underway), and the topography was briefly mentioned (slope from south to north). However, there is no diverse reading of the territory that would make geographical or landscape opportunities emerge.

Finally, the authors of the master plan denied any potential relationship with the pre-existing building, which they described as “finite structures [designed] to satisfy particular, specialized functions”<sup>15</sup> and therefore very limited for their reconversion.

Thus, stripped of any contextual conditioner, the drawing board is blank and available to define “one universal and adaptable building type”<sup>16</sup> that is configured

9 Michael Brawne, “The New Universities”, *The Architectural Review* 147, no. 878 (1970).

10 Loughborough University is frequently mentioned in various articles. Listed here are those intended to explain the design and its construction: F.A. Abbott, “The Design of Electrical and Other Services in Educational Buildings”, *Arup Journal* 2 (May, 1966): 2–8; Philip Dowson, “The Architect’s Approach to Architecture”, *Arup Journal* 2 (May, 1966): 9–19; David Armstrong, “Model Making at Arups”, *Arup Journal* 5 (November 1966): 2–9; David Thomas, “Loughborough University of Technology; Growth Change and Grid Disciplines”, *Arup Journal* 6 (September 1967): 7–15.

11 Both the University of Leeds Development Plan signed by Chamberlain, Powell, and Bon in 1960, as well as the master plan for the University of East Anglia developed by Denys Lasdun in 1963, are documents of noticeable urban character.

12 Arup Associates, *Master Plan for the Loughborough University of Technology*, 47.

13 *Ibidem*, 21.

14 *Ibidem*, 25.

15 *Ibidem*, 41.

16 *Ibidem*, 21.

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as a set of conveniently related elements so that they can assume all variation and change.

“Our proposal is to develop a pattern or discipline which will ensure a sense of order and continuity in the development, but which will be flexible enough to provide the framework within which future requirements can be met”.<sup>17</sup>

It is not surprising to find in this definition the essence and terminology of an architecture characteristic of that time. Continuous patterns as support for flexibility and change were regular in the 1960s. On the one hand, the constant visibility of the debates held within Team 10 must be considered, and especially those by the Dutch structuralist sector, the British Alison and Peter Smithson, and the French-based firm Candilis-Josic-Woods.<sup>18</sup> Actually, this master plan design would fit perfectly in that typology of low height and high density that Alison Smithson would coin years later as a mat-building.<sup>19</sup> The “pattern or discipline” will be a unique geometric basis where the functional programme will come to nestle and the result will be an urban hybrid.<sup>20</sup>

On the other hand, and especially regarding the British and German new universities, several research projects were carried out at that time to study systematized planning that would optimize both the designs and the construction of the campus buildings. Since 1965, a group of architects led by Leslie Martin at the Cambridge school of architecture (later the *Center for Land Use and Built Form Studies*, LUBFS), tried to establish specific relationships between the different academic activities, the spaces that were due to host them and the best location they could have inside a university campus.<sup>21</sup> In collaboration with this same British group, German researchers also explored the parameters that should be combined when designing a new university and focused on the standardization and prefabrication of buildings able to meet all the functional requirements demanded by their educational policies.<sup>22</sup> These works have its origin in both Martin’s seminal article “The Grid as Generator”<sup>23</sup> (in which urban frameworks are observed from the analytical study of their form and density possibilities) and in the LUBFS report n.1 entitled “A Theoretical Basis for University Planning”,<sup>24</sup> focused on higher education facilities. Steadman<sup>25</sup> recently made it clear that these studies were not to assist new master plans or designs, but anyway, the legacy of scientific thought in architecture had a reflection among practitioners.

Arup Associates particularly developed in the 1960s a series of university designs aimed at laboratories in tune with this analytical design process in which the parameters’ study results in a functional programme typification in search of the spaces’ flexibility. Birmingham Mining and Metallurgy Building (1964-66) is the forerunner of three further science complexes. In the New Museums Site building in Cambridge (1966-74), the Loughborough University of Technology (1964-70) and the Addenbrooke’s Development for Biological Sciences in Cambridge (1965-66) similar design strategies are tested by integrating the problems of adaptability and servicing. Loughborough is still a special case in this sequence because it represents the opportunity to conceive a continuum beyond the building scale.

### The definition of a discipline

The previous textual quote contains a term — “discipline” — and a specific annotation — “which will ensure a sense of order (...)” — and both contents are essential for the design strategy understanding. In fact, the chapter “Development of a discipline” is the central text of the master plan, which contains most of the drawings and

17 Ibidem, 21.

18 Alison Smithson, “Team 10 Primer”, *Architectural Design* 21 (December 1962): 559–601; Alison Smithson, “The Work of Team 10”, *Architectural Design* 8 (August 1964): 373–82.

19 Alison Smithson, “How to recognize and read mat-building”, *Architectural Design* 9 (September 1974): 573–90.

20 Débora Domingo, Raúl Castellanos and Ana Ábalos. “The Strategies of Mat-Building.” *Architectural Review* CCXXXIV, no. 1398 (2013): 83–91.

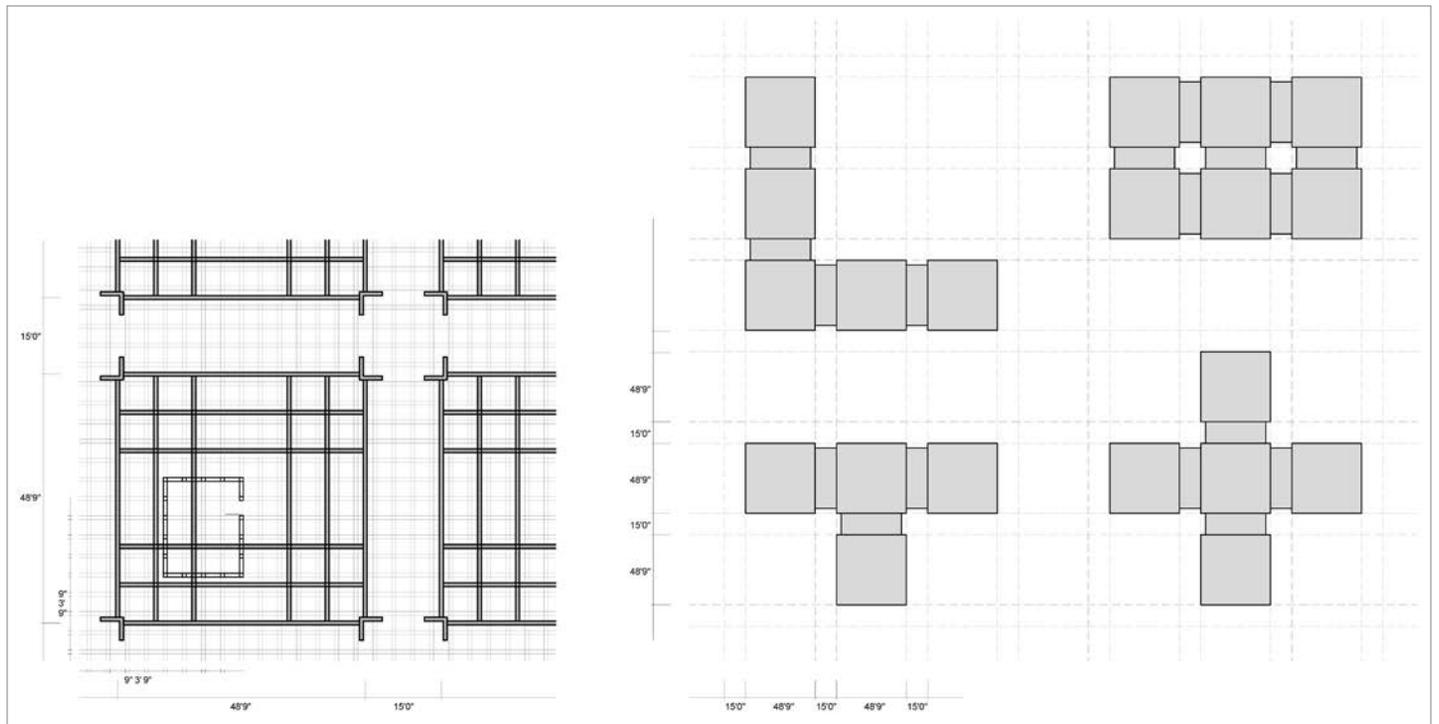
21 Nicholas Bullock, Peter Dickens and Philip Steadman, “Activities, Space and Location”, *The Architectural Review* 147, no. 878 (1970): 299–308.

22 Peter Jockusch and Walter Dunkl, “University Campus Design”, *Architectural Design* 11 (1974): 703–17.

23 Leslie Martin, “The grid as generator”, in *Urban Space and Structures*, Leslie Martin and Lionel March, ed. (Cambridge University Press, 1975), 6–27.

24 Nicholas Bullock, Peter Dickens, and Philip Steadman, *A Theoretical Basis for University Planning* (Cambridge: Center for Land Use and Built Form Studies, 1968).

25 Philip Steadman, “Research in Architecture and Urban Studies at Cambridge in the 1960s and 1970s: What Really Happened.” *The Journal of Architecture* 21, no. 2 (February 2016): 291–306.

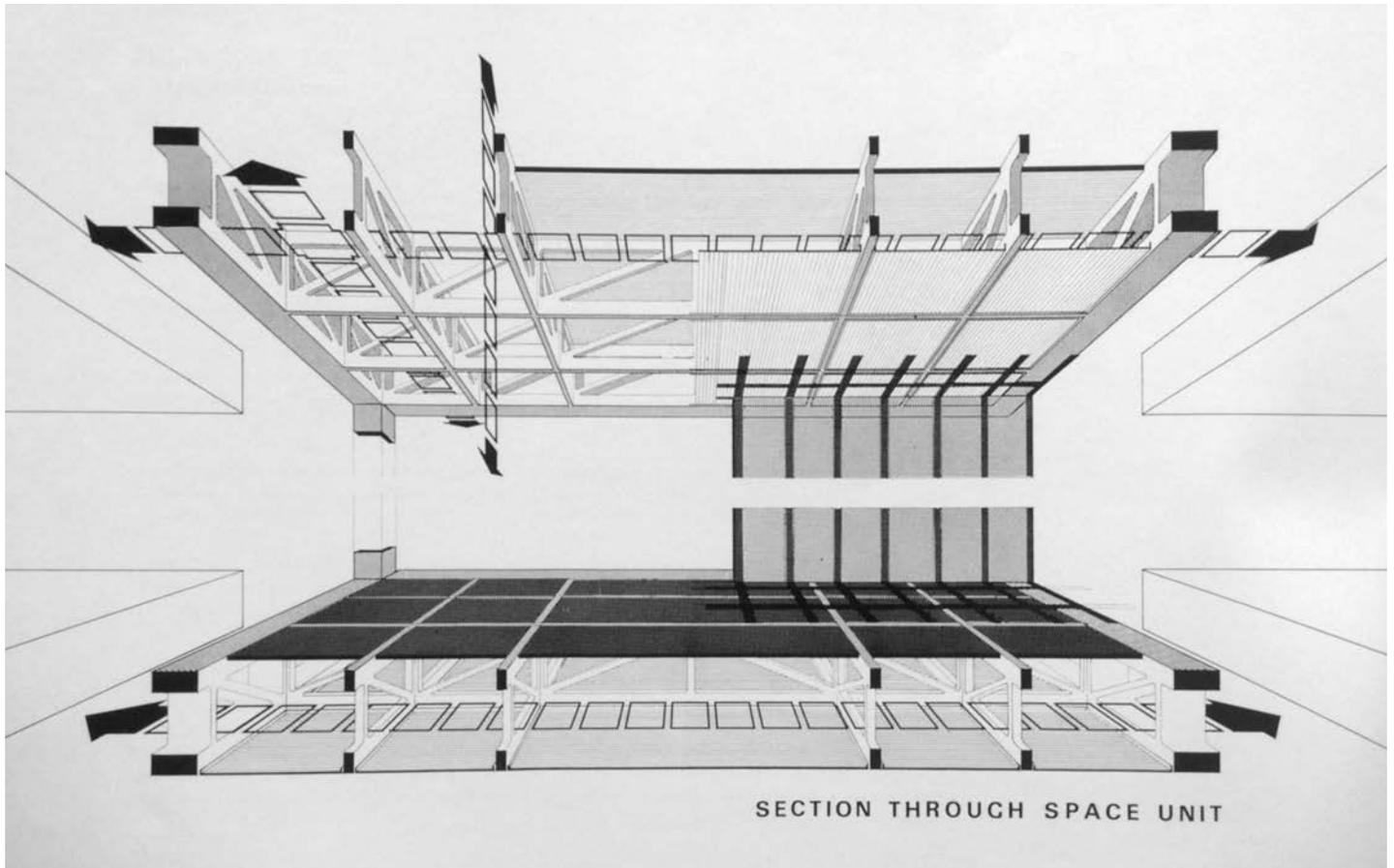


[Fig. 3]. a. (left) Loughborough University of Technology. Partition grid and structural grid. b. (right) Diagram showing possible plan shapes. Sources: Drawings by the author (based on *L'Architecture d'Aujourd'hui* 137 (1968): 54–5, and Arup Associates. *Master Plan for the Loughborough University of Technology* (1966): 106).

diagrams, and in which lies the proposal comprehension. In the book index, this section is preceded by “The Problem” and “The Brief” and followed by the texts related to the master plan’s description, the structure’s definition and services’ provision. The definition of the discipline, also called the compositional pattern, turns out to be the detailed reasoning by which the dimensions and interaction between various three-dimensional and overlapping grids are established. It is about “ensuring a sense of order” by defining those things that can be done and those that cannot.

The starting point is the academic spaces’ needs, which are classified into three types. First, there are heavy or industrial laboratories, then specialized spaces or research laboratories and, finally, generic teaching spaces, such as classrooms and seminars. The goal is to find, for the first two space types, a universal and useful relationship for the partition’s position, the structural elements and the service routes. The results of this inquiry would be subject to verification in the case of the generic spaces, with less functional requirements. A first grid arises from this argument: a tartan network that alternates 3-foot (91cm) and 9-inch (23cm) strips in two directions. The narrow tape will allow to house any partition type (brick, concrete) and the 3-foot one adjusts to the dimensional range of any teaching space, in addition to being a multiple of 9 inches [Fig. 3a].

The second grid to be defined is the structural one. According to the research carried out, specialized teaching spaces require a 50-foot (15m) span so that large surfaces are guaranteed without intermediate pillars. Equally the optimum height for teaching spaces seems to be 10 feet (3m). Hence, the structural module is 50x50 feet —bidirectionality is intended for greater flexibility— and 10 feet high. The beams are estimated at 5 feet (1.5m) height, an adequate dimension to host the services routes and even for eventual access for registration. The heavy laboratories’ ceiling can thus reach 25 feet (7.5m) through a double-height spatial configuration. To allow specific openings in the floors, a modular pattern of ribs subdivides the 50-foot frames. When both partitions and structure grids overlap, one is shifted away from the other: it is about preventing the services pipes, normally integrated into the partitions, from coinciding with main structural elements (beams or ribs) [Fig. 3a].

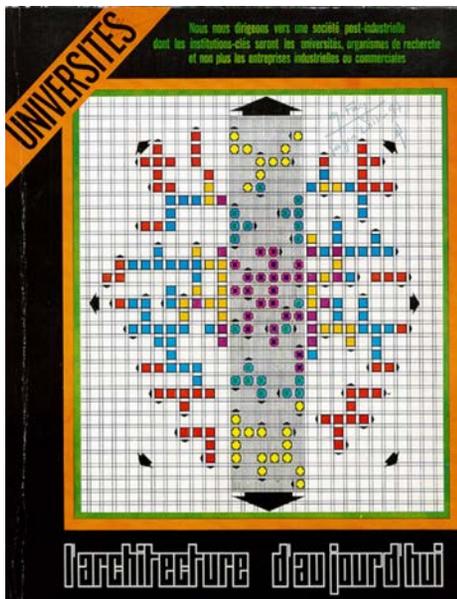


[Fig. 4]. Loughborough University of Technology. Section through space unit. Source: Arup Associates. *Master Plan for the Loughborough University of Technology* (1966): 58.

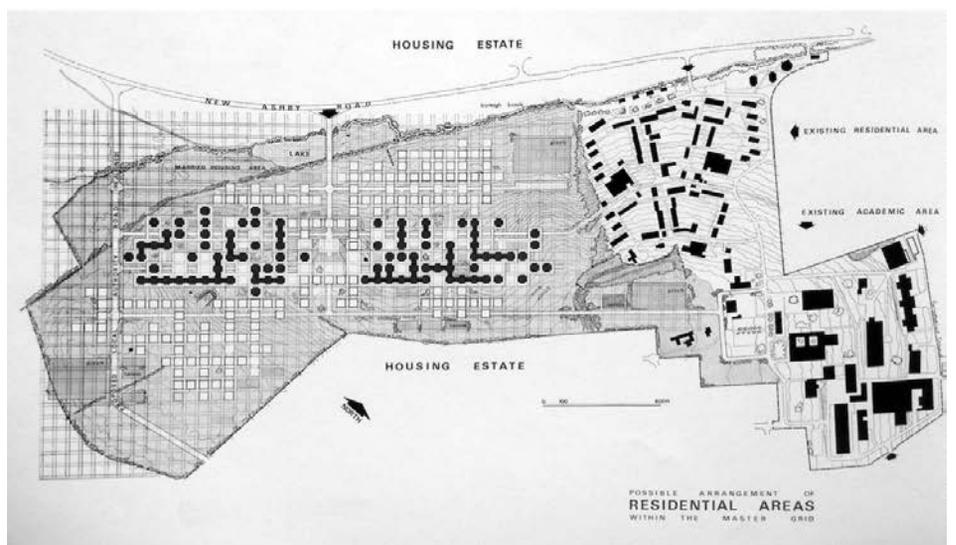
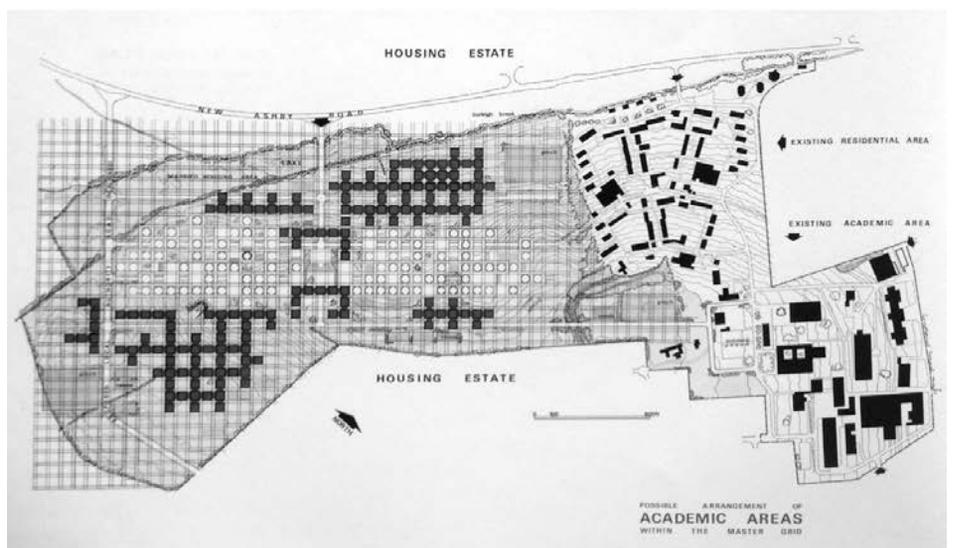
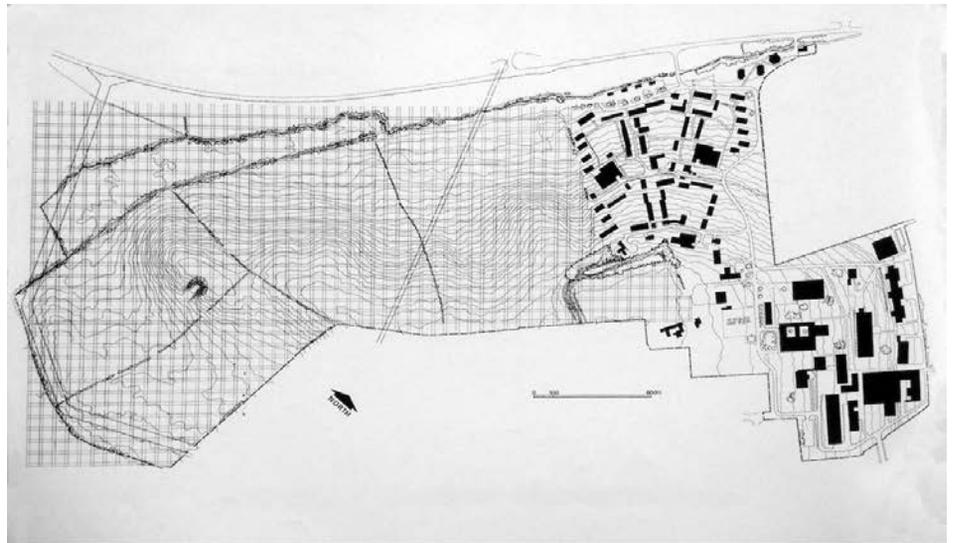
The third and final grid relates to the growth system of the structural module. Instead of adding the 50x50 feet units indefinitely and in both directions, a 15-foot (4.5m) span is used in between modules. Circulation corridors integrating stairs and lifts will fit in this new dimension, which can also be considered an eventual extension of a 50-foot space. The new tartan fabric is called “master grid” and will allow for buildings to have different final shapes [Fig. 3b].

The germ drawing of the master plan for the Loughborough University [Fig. 1] is the result of superimposing these three grids besides pointing out the services routes. As the legend of the drawing specifies, the L-pillars frame the master grid, the structural beams and ribs are shaded in grey, and the partitions grid underlays the whole. The services pipes will find their place between the beam and the first rib of each span, in both directions. The three-dimensional representation of the space unit [Fig. 4] helps to visualize the superposition of elements. Only a few additional lines of the master plan argue that the design result, although originating from academic spaces, will be equally valid to accommodate the less demanding residential needs in terms of dimensions and facilities.

The last illustration included in the main chapter explaining the “discipline” is the one titled “Growth pattern” [Fig. 2], and together with the gridded space unit, both compositional schemes were the most widespread in the contemporary architectural magazines. *L'Architecture d'Aujourd'hui* included its coloured representation for the issue cover focused on new universities [Fig. 5], and although it should be noted that the drawing was rotated 90° from the original (probably due to graphic layout reasons), its coding is more understandable than existing black and white versions. The cruciform units integrated into the striped band (which should be horizontal and not vertical) are the residences with community facilities on the first-floor pedestrian decks, while the square units represent the academic buildings. The colors used could show the functional association of the set or the scheduled campus development. However, this graphic characteristic is not explicit in the project drafting.



[Fig. 5]. *L'Architecture d'Aujourd'hui* 137 (1968). Magazine cover. Source: *L'Architecture d'Aujourd'hui* 137 (1968).



[Fig. 6]. Loughborough University of Technology. Top: The site with the master grid superimposed. Middle: Possible arrangement of academic areas within the master grid. Bottom: Possible arrangement of residential areas within the master grid. Source: Arup Associates. *Master Plan for the Loughborough University of Technology* (1966): 72, 76, 80.

Although the university was conceived from a homogenous and non-hierarchy grid, and the growth pattern was represented on an abstract square frame, the directionality of the site is finally considered when the master grid is adapted to the 90-acre land [Fig. 6]. No correspondence to the cardinal points is found, but simply “the master grid pattern has been set out to run parallel with the main longitudinal contours”.<sup>26</sup> Subsequently, this merely functional justification is clarified by referring to services supplies along the northwest road.

26 Arup Associates, *Master Plan for the Loughborough University of Technology*, 73.

27 Juan Antonio Cortés, *Historia de la retícula en el siglo XX: de la estructura Domi-No a los comienzos de los años sesenta* (Valladolid: Universidad de Valladolid, Secretariado de Publicaciones e Intercambio Editorial, 2013).

### The grid: a succession of limitations

There is numerous literature that has heightened the grid as the geometric basis of architecture, especially throughout the twentieth century. Juan Antonio Cortés<sup>27</sup>

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makes a comparison of the historical flow of gridded architectural works to a reading of its components –the points, the areas, the lines of the network– and as a consequence, he identifies the grid lines to the infrastructural vision of the architecture and the urban planning of the 1960s and 1970s. Actually, the structural understanding of urban services led Shadrach Woods to write *Stem*,<sup>28</sup> and it was from that seminal text that he imagined his natural evolution to the concept of *Web*.<sup>29</sup> The proposals for the Bochum University (Candilis-Josic-Woods, 1962) and the Free University of Berlin (Candilis-Josic-Woods, 1963) are the direct application of these theories where a linear growing system is transformed into a warp<sup>30</sup> in which future functions will be nestled.

Jacques Lucan<sup>31</sup> also intensively addresses the use of the graticule as a compositional tool and traces a historical journey that begins with the observation of the substantial leap made by Mies van der Rohe for the campus of the Illinois Institute of Technology, his two proposal concepts of 1939-40 and 1947. He refers to the concepts of neutralization, democratization and figure-ground organization, thus gathering the terms used by Reyner Banham, Colin Rowe and Rem Koolhaas, and therefore he argues a theory of non-composition based on the opposition to the balance and hierarchy principles. Alan Colquhoun<sup>32</sup> already emphasized these arguments when analyzing the Herman Hertzberger building in Apeldoorn. The Centraal Beheer building is a clear example of a change of attitude in Modern architecture, a sort of evolution from the functional determinism to the organizational pattern that will host a varied possibility of occupations. The fundamental achievement of the building rests on a homogenous grid that becomes visually limited and monotonous.

Thus, the grid is both a pattern organization of lines that work as communication channels and a homogenous surface that feeds a utopian picture. However, when defining the “discipline”, the Arup Associates firm uses the grid as a succession of limitations.

The first limitation is self-imposed, which has to do with wanting to establish an order. In an article about the University of Loughborough that appeared in the *Arup Journal*, one of the architects of the master plan team, David Thomas, assesses the planning grid application in the first building developed, the Civil Engineering building. The first of the conclusions says: “There must be an absolutely ruthless observance of the grid pattern. Any divergence from this discipline quickly causes widespread chaos. Observing the discipline must become second nature to all members of the design group”.<sup>33</sup> The second specifies that “the actual dimensions of the grid network are relatively unimportant —it is the principle that counts—, but we have so far found no reason to vary the basic dimensions of 3 ft. and 9 in”.<sup>34</sup> The design delimitation is based on its composition: lines drawn are boundaries that mark what can be done in each of the intervals, and that possibility is simply limited to what the discipline says.

The second limitation is accepted but not assumed. The land available for the campus and its outline are perfectly described in the master plan: “It is not possible to expand the existing developments much further, so the bulk of the expansion will have to be accommodated on the undeveloped 90 acres”.<sup>35</sup> If the surface is clearly defined, why the design does not enable any strategy for the grid to be ended? Why does the network extend in the drawings showing indeterminate edges that resemble the fabric fringes? The answer to these questions has to do with the will to neutralize the proposal, also with the grid’s autonomy concerning the land’s nature. Finishing the fabric would mean singling it out, and this could only happen by making a detailed reading of the boundary’s particular conditions.

28 Shadrach Woods, “Stem”, *Architectural Design* 5 (May 1960): 181.

29 Shadrach Woods, “Web”, *Le Carré Bleu* 3 (1962): 2–5.

30 Débora Domingo and Raúl Castellanos, “Urdimbre y trama: el caso de la Universidad Libre de Berlín”, *Proyecto, Progreso, Arquitectura* 4 (2011): 30–43.

31 Jacques Lucan, *Composition, non-composition. Architecture et théories, XIX-XXème siècles* (Lausanne, Presses polytechniques et universitaires romandes, 2009).

32 Alan Colquhoun, “Centraal Beheer”, in *Essays in Architectural Criticism: Modern Architecture and Historical Change* (Cambridge, Massachusetts: The MIT Press, 1981), 95-109.

33 David Thomas, “Loughborough University of Technology; Growth Change and Grid Discipline”: 15.

34 Ibidem, 15.

35 Arup Associates, *Master Plan for the Loughborough University of Technology*, 39.



[Fig. 7]. Loughborough University of Technology. Model. Photo: John Donat. Source: Source: *Arup Journal* 6 (1967): 14.

The third limitation is temporary and has as much to do with the indeterminacy of a future time, as with the functional effectiveness of the set. In the first case, the entire design revolves around the idea of change, and the added value of the proposal is to be able to respond to that future time with adaptability and flexibility. The absence of an estimated growth rate and the consequent lack of construction deadlines suggest an indeterminate project without an expiration date. In the second case, only one of the sources consulted refers to a very common limitation in these typological approaches to mat-building: the maximum time for the users to walk in their usual paths. Particularly here, the student will need no more than 10 minutes on foot to get close to the centre, regardless of their location on the campus.<sup>36</sup>

Probably the clearest limitation concerns the constructive system and the fact of designing a set of pieces that will return a combinatoric game. The structural approach—in physical but also compositional terms—points to a limited definition of elements that would enable diverse results. This is an objective in itself whose achievement is met with some satisfaction in the case of the first realised building. The third and final conclusion of the David Thomas' above-mentioned article reads: "It is important to produce performance specifications for elements, and then to work with the manufacturers of each element in producing a design and prototype to meet the specification, within the planned cost".<sup>37</sup> This statement closes a text in which all the components used in the partitions, enclosures and installations of the Civil Engineering building have been enumerated and described as parts of a catalogue.

In contrast to the four previous limitations, a final but less precise one is defined, the one related to the proposal's visibility. Regarding the whole set, it is undeniable that it could incur a monotony close to culmination or visual oversaturation. The photographs of the master plan model attest to this [Fig. 7], the first images for the Civil Engineering building corroborates it [Fig. 8]. The master plan's authors do not seem concerned about an issue that has been subject to criticism and functional discomfort by users of similar systematic projects—"(...) it may be felt by some that the total visual effect will tend towards a uniformity bordering on dullness"—<sup>38</sup> and they consider that the advantages of such a design strategy outweighed its possible disadvantages: "The more complex the planning problem, the greater the need for the architecture to provide a background to the activities which will go on

36 Arup Associates, "Loughborough University of Technology, Grande-Bretagne": 53.

37 David Thomas, "Loughborough University of Technology; Growth Change and Grid Discipline": 15.

38 Arup Associates, *Master Plan for the Loughborough University of Technology*, 97.

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[Fig. 8]. Loughborough University of Technology. Civil Engineering Teaching Building. Model. Photo: David Weaver. Source: *Arup Journal* 6 (1967): 15.

inside and outside it, rather than to make a contribution to the galaxy of modern architectural fashion”.<sup>39</sup> However, it is undeniable that the visuality tops out due to repetition, a fact that may be named as a limit of spatial nature. Mechanisms for highest flexibility and growth evolve into monotonous interior and exterior spaces. Not only could the idea of circulating through long corridors and likeness interior spaces have caused problems of functionality, but also the external image of partially travelled pedestrian platforms according to class schedules would be flat. Stan Allen points out when referring to the term ‘mat-urbanism’ that urban experiences with indeterminate boundaries promises a new sense of connectivity and mobility but “recalls the endless horizontal shopping concourses that have proliferated in the postwar city”.<sup>40</sup>

## Conclusions

Arup Associates developed only part of the campus between 1967 and 1970. The construction of several departmental buildings and a set of residential towers located in the central area was neatly portrayed in the collection of photographer John Donat [Figs. 9 and 10], although the impact of the finished work was not the subject of as much attention as the expectations generated by the master plan.<sup>41</sup> At present, the buildings are clearly recognizable by their cruciform concrete pillars and their striated prefabricated panels. The façades uniformity and seriation throughout the University Avenue contrast with the heterogeneous panorama of subsequent singular contributions.

The work must be valued within its temporal context. The firm Arup itself recognizes that university experiences were an opportunity to conceive prefabricated concrete systems of rapid production for large buildings. The projects developed for Loughborough, Birmingham, Cambridge and East Anglia tested the technological and industrial processes. They also acknowledge that the experimentation was useful for other residential and office buildings commissions.<sup>42</sup> Furthermore, the master plan proposal may be framed in the persuasive and excessive programming of the postwar architecture that used scientific methods to uncover a high degree of indeterminacy between form and function and whose flexibility has now been reinterpreted since the ambiguity and the generic spaces.<sup>43</sup>

The contextual issue is not exempt from the consideration of collective and interdisciplinary authorship. Indeed, both the analysis phase and the design process were carried out by a team of seven people, including two architects, two structural

39 *Ibidem*, 97.

40 Stan Allen, “Mat-Urbanism: The Thick 2-D”, in *Case: Le Corbusier’s Venice Hospital and the Mat Building Revival*, ed. Hashim Sarkis (Munich, London, New York: Prestel Verlag, 2001), 118–26.

41 Stefan Muthesius, *The Postwar University. Utopianist Campus College* (New Haven: Yale University Press, 2000): 269.

42 Arup, *The Arup Journal 1966-2016* (2016): 10–1.

43 Hashim Sarkis, “The Paradoxical Promise of Flexibility”, in *Case: Le Corbusier’s Venice Hospital and the Mat Building Revival*, ed. Hashim Sarkis (Munich, London, New York: Prestel Verlag, 2001), 80–89.

[Fig. 9]. Loughborough University of Technology. Civil Engineering Teaching Building. Laboratory. Photo: John Donat. Source: RIBA Collection.



[Fig. 10]. Loughborough University of Technology. Hall of Residence. Photo: John Donat. Source: RIBA Collection.



engineers, two services engineers and a quantity surveyor. At present, some other contributor from the field of geography, landscape or sociology would probably have joined, and this would have significantly changed the approach to design. It is worth noting, however, the remarkable acceptance by the client, who states

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that: “[Arup Associates team] have interpreted in terms of buildings and layout the flexibility which is essential in the ever-changing field of technology (...)”.<sup>44</sup>

Be that as it may, the particularity of this project is an inherent approach to the unlimited that coexists, in its concretion, with all possible meanings of the term “limit”. Thus, it is the concern for the obsolescence of buildings the reason that moves the design strategy: “The more closely a building is tailored to its function, whatever it is, the more quickly it will become out of date”.<sup>45</sup> Consequently, the answer focuses on the search for a “universal spatial unit”. The word “universal” here responds to its meaning of containing all its possible variations, but just as Mies van der Rohe did with his search for universality related to the isotropic and democratic space,<sup>46</sup> the concept involves refining the design of its particularities to assemble a new whole. This whole is conceptually infinite and seemingly valid for any situation.

In the opposite direction to the previous reasoning, the master plan for Loughborough University is based on various restrictions. The lines that define the dimensional ranges act as functional boundaries: one or another activity will be housed within the strips of the network. The graticule end looks fortuitous but this characteristic is simulated: the plot was delimited from the very beginning. The time limitation is never expressly defined, but there is an insistence on compositional rules that will guarantee a procedural unity forever. Hence, all these design operations refer us to a sort of cheating or visual illusion. Background and figure are confused in both the near and distant gaze —from the first of the grids to the master plot— and finally, the proposal looks like a complex cage that can only be opened with a limited combinatorial series.

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44 Arup Associates, *Master Plan for the Loughborough University of Technology*, 12.

45 David Thomas, “Loughborough University of Technology; Growth Change and Grid Discipline”: 7.

46 Laura Lizondo, “Mies’s Opaque Cube: The Electric Utilities Pavilion at the 1929 Barcelona International Exposition”, *Journal of the Society of Architectural Historians* 17, no. 2 (2017): 214.

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