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# AN ARCHITECTURE OF PARTS

*Architects, Building Workers and Industrialisation  
in Britain 1940–1970*

CHRISTINE WALL



# An Architecture of Parts

This book is unique in describing the history of post-war reconstruction in Britain from an entirely new perspective by focusing on the changing relationship between architects and building workers. It considers individual, as well as collective, interactions with technical change and in doing so brings together, for the first time, an extraordinary range of sources including technical archives, oral history and visual material to describe the construction process both during and in the decades after the war. It focuses on the social aspects of production and the changes in working life for architects and building workers with increasing industrialisation, in particular, analysing the effect on the building process of introducing dimensionally coordinated components.

Both architects and building workers have been accused of creating a built environment now popularly discredited: architects responsible for poor design and building workers for poor workmanship. However, many of the structures and ideas underpinning this period of rapid change were revolutionary in their commitment to a complete transformation of the building process. *An Architecture of Parts* adds to the growing literature on changes in the building world during and immediately after the Second World War. It is significant, both empirically and historically, in its examination of the ideas, technology and relationships that fired industrialisation of the building process in mid-century Britain.

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**An Architecture of Parts: Architects, Building Workers  
and Industrialisation in Britain 1940–1970**

*Christine Wall*

# An Architecture of Parts

Architects, building workers  
and industrialisation in Britain  
1940–1970

Christine Wall

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**Dedicated to Douglas S. Wall (1924–2012)**

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# Abbreviations

AA	Architectural Association
AACP	Anglo-American Council on Productivity
AASTA	Association of Architects, Surveyors and Technical Assistants
ABT	Association of Building Technicians
ARCUK	Architect's Registration Council UK
ASB	Architectural Science Board
ASW	Amalgamated Society of Woodworkers
AUBTW	Amalgamated Union of Building Trade Workers
BATC	Building Apprenticeship and Training Council
BICRP	Building Industry Communications Research Project
BINC	Building Industry National Council
BRS	Building Research Station
BS	British Standards
BSI	British Standards Institute
CEU	Constructional Engineering Union
CITB	Construction Industry Training Board
CLASP	Consortium of Local Authorities Special Programme
COID	Council of Industrial Design
dc	dimensional co-ordination
DIN	Deutsches Institut für Normung (German Institute for Standardisation)
DLO	Direct Labour Organisation
ECA	European Co-operation Administration
EPA	European Productivity Agency
EWO	Essential Work Order
GTC	Government Training Centre
IB	industrialised building
ICE	Institute of Civil Engineers
ISE	Institute of Structural Engineers
ITB	Industrial Training Board
LCC	London County Council
MHLG	Ministry of Housing and Local Government
MoW	Ministry of Works

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NFBTE	National Federation of Building Trade Employers
NFBTO	National Federation of Building Trade Operatives
NJCBI	National Joint Council for the Building Industry
NPOT	New Pattern of Operative Training
OECD	Organisation for Economic Co-operation and Development
OEEC	Organisation for European Economic Co-operation (superseded by OECD in 1961)
PBR	payment by results
RIBA	Royal Institute of British Architects
RICS	Royal Institute of Chartered Surveyors
RSM	Research into Site Management
SMM	Standard Method of Measurement
VET	vocational education and training

### **Archives**

MRC	Modern Records Centre
PRO	Public Records Office
RIBA	Royal Institute of British Architects
TNA	The National Archives

### **Journals**

<i>AD</i>	<i>Architectural Design</i>
<i>AJ</i>	<i>Architects' Journal</i>
<i>IBSAC</i>	<i>Industrialised Building Systems and Components</i>
<i>MQ</i>	<i>Modular Quarterly</i>
<i>NBL</i>	<i>New Builder's Leader</i>
<i>OAP</i>	<i>Official Architecture and Planning</i>
<i>RIBAJ</i>	<i>Journal of the Royal Institute of British Architects</i>

# Introduction

The reconstruction of Britain at the end of the Second World War demanded a rapid increase in output from a construction industry suffering severe shortages of labour and materials. The solution proposed was the industrialisation of production, predicated on the rationalisation of design and construction processes, and the use of non-traditional materials and methods, which had been thoroughly researched during the 1930s. These, together with dimensional co-ordination of building components and modular design, were among the innovations promoted throughout the 1950s and 1960s as key factors in increasing the efficiency of construction. They also produced an identifiable, modern aesthetic – although it can be argued that this, in many cases, was an unintended consequence of the techniques used.

This book describes the key transformations in the mid-twentieth-century building world as industrialisation took hold and ‘process’ rather than ‘product’ fired the imagination and dominated debates on construction, for both architects and building workers. This period saw transformations in the structure of the building industry in terms of size of firms and forms of employment; in education and training as barriers between vocational and architectural training increased; in management and organisation as industrialised building became prevalent; in the skills and occupational structure of the workforce, and in the increasing invisibility of the manual construction workforce in discourses on the production of the built environment.

It focuses on the social context for production at a time of rapid technical change: the social structure of the construction industry, its gendered composition, its social stratification and the different routes for acquiring specific education, training and skills are examined in depth. This reveals the relationships, interactions and increasing distance between architects and building workers over three decades. Industrialisation threatened the status of both architects and building workers and both groups experienced far-reaching changes in their working lives and education and training. This book provides an account of the introduction of a new system of production, one that transformed the traditional role of the skilled worker and also that of the architect.

## 2 Introduction

The book is structured into three parts: Part I introduces the ideas underpinning industrialisation and the social context for their implementation in the British building industry. Part II presents an in-depth analysis of the work of the Modular Society from 1953 onwards, and its campaign for a universal system of modular co-ordination. This was considered in many quarters to be fundamental for the successful industrialisation of the construction industry. The concept of modular component building was essentially abstract, originating from an engineering and mathematical base. It assumed the imposition of order and sequence on the building process and though this implies a change to the social process of building to accompany the precision of a minutely planned exercise, site processes were often ignored. Part III describes the nature of work for architects and building workers in relation to industrialised methods of building and contextualises these in contemporary and historic accounts of the period. Finally, Chapter 10 draws together these three distinct strands in a new appraisal of the post-war period of reconstruction.

### Technical change in the construction industry

Innovation, defined as the application of invention in order to increase efficiency and ultimately profit, is an essential factor in the process of industrialisation. There are remarkably few texts that focus on innovation in the construction industry; in fact, it is notable by its absence from economic histories. This makes the achievement of Marian Bowley, in her comprehensive account of the British building industry published in 1966, especially noteworthy. In *The British Building Industry: Four Studies in Response and Resistance to Change* (1966), Bowley describes the difficulties in introducing innovations in both structures and methods of building and design. She notes that by the end of the Second World War, technical knowledge in construction had outstripped architectural and building practice. Despite a large 'stock' of technical innovations in both materials and components for building acquired from both government-funded and private business research during the inter-war years, there was very slow uptake in the building process.

She then proceeds to analyse 'the system' by which buildings are produced and finds that the separation of design from production is a serious defect in organisation. She traces the historical origins of this separation culminating in the 1931 Architects Registration Act, which prevented members of the profession from holding a profit-making position in the building industry. The consequence of this was that builders' sons were trained as engineers in order that they could join the family firm, as, unlike architects, professional engineers had no such exclusionary clause in their constitution. Architects became more closely aligned with the client and, therefore, distant from the construction industry. But contract norms still gave architects the powerful position of supervising the whole building process after creating designs that

were first of all handed to engineers for structural detailing and then to surveyors for costing. Bowley, throughout her account, accuses the architectural profession of being the weak link in the chain of production and innovation due to architects' lack of technical knowledge and ignorance of costing, resulting in designs of no 'economic rationality'. She concludes:

[T]he traditional organisation of the profession is not appropriate for providing the design services required today . . . It might be desirable to integrate into one profession all the disciplines which are required for the design of buildings and their production, establishing a common basic education and varying degrees of specialisation.<sup>1</sup>

Bowley does not consider the training or skills of the workforce to be a factor in the efficiency of building. Here, labour is regarded as a commodity and is discussed only in relation to scarcity or surplus. The consequences of full employment in the 1950s are described in terms of effective site organisation, so that labour is utilised continuously in order to save costs. To maximise efficiency, she suggests the introduction of full preparation of design drawings before work starts, components that do not have to be adjusted on site, more pre-assembly of components and dimensional co-ordination. Bowley's history describes an industry held tightly together by a rigid and institutionalised establishment that is incapable of change. She compares it to a complicated mosaic of ill-fitting relationships between designers and builders and considers improvement impossible until the pattern of relationships becomes more suitable for efficient building.

David Gann (2000) has defended the construction industry as 'innately innovative' as opposed to Marian Bowley's description of the industry as a passive recipient of innovations from other sectors. However, he still depicts it as an industry suffering from serious structural deficiencies described as 'ghosts' haunting the industry, acting as barriers to innovation. He argues that when innovation does take place, it occurs within a closed loop inside the framework of an individual project so that only marginal benefits diffuse out to the wider industry.<sup>2</sup> Gann includes only a limited analysis of innovation in relation to social processes and structures, but both he and Bowley present an industry fractured by the often opposing interests of users, designers and builders and constrained by the poor communication between these actors.

The slowness of the construction industry to apply innovations can also be interpreted as part of a wider problem inherent in the education and training of engineers and architects in Britain. This argument is put forward by those typified by David Edgerton,<sup>3</sup> as 'declinist' historians of technology, for example, Barnett (1986) and Wiener (1981), who blame Britain's perceived poor economic performance since the war on low levels of specialist technical education, especially in comparison with Germany.<sup>4</sup> This theme was reiterated by Landes (1998) who describes the British provision of tech-

#### 4 Introduction

nical education as lacking in clear policy and having been allowed to ‘grow like a weed and . . . once grown [treated], like a poor relation of “proper” schools and universities’.<sup>5</sup> The declinist view also includes the poor funding of research and development in British industry, by both government and within firms, as a factor that resulted in lack of innovation (Landes, 1969; Mowery, 1986). This declinist view is challenged by David Edgerton, who argues in *Warfare State: Britain 1920–1970* (2006), that Britain supported a growing and dynamic armaments industry as well as developing a welfare state. This is exemplified by Donald Gibson’s appointment as Chief Architect to the War Office in 1957, where he directed a research department, which developed the NENK method, an industrialised system for military dwellings.

Michael Ball (1988), however, considered construction as having characteristics that made it unique in comparison with other industries, whereby the division between design and production is an outcome of the social divisions of labour imposed by the contracting system.<sup>6</sup> Innovation in technique is limited under this system by a number of factors. First, there is the fragmentation of the building process between a number of agents: designers, surveyors, contractors, plant-hire firms and materials suppliers. Second, there is the nature of the competition created by the competitive tendering procedure won on the basis of lowest cost. Third, Ball cites the exploitation of labour where discontinuity arises from laying off workers in time of slack, disbanding of a team at the end of a project and extensive subcontracting and self-employment. All these factors lead to poor transmission of knowledge within the industry.

Ball also describes the role the state takes in legalising the framework for the contracting system and as a major client in the post-war years of the Welfare State and notes the strong alliance between contractors, the state, and the professions against the demands of the workforce. Building workers were seen, even under Harold Wilson’s Labour governments as ‘a problem of the building industry’.<sup>7</sup> Ball demonstrates that, in the post-war years, construction cycles were no different from other manufacturing industries; in fact, there was comparatively less variation in output. By contrast, construction showed very much higher variation in employment than other sectors of the economy so that ‘the success of capital was won at considerable expense to the workforce’.<sup>8</sup>

Economic histories of the construction industry in the twentieth century, for example, Hillebrandt (1984), and Powell (1980), take a largely neo-classical view so that the developments and dynamics of training, education and social relationships are not analysed. Marxist perspectives, explaining change in terms of crisis, revolution and discontinuity, provide richer sources for analysis through a theoretical breadth that includes political events, and the interdependence of economic and social development.<sup>9</sup> An extensive collection of writings exemplifying this approach can be found in the collection of the Bartlett International Summer School (BISS) Proceedings.<sup>10</sup>

This has recently been reviewed (Clarke and Janssen, 2008) and assessed as arising in response to particular political developments of the time, but many of the debates and assumptions, in particular, the centrality of the labour process to production, are still important as a way of understanding built form and how it expresses the condition under which it was constructed.

The post-war era of industrialised production of housing has been documented from the perspective of housing policy (Donnison, 1960; Cullingworth, 1966), political economy (Merrett, 1979), social history (Burnett, 1986), and technological change (Russell, 1981; Sebestyén, 1998). Of those accounts that take a technological standpoint, one in particular stands out by including elements of both the political and social context for innovation: R.B. White's *Prefabrication: A History of its Development in Great Britain* (Building Research Station, 1965). Here, the prefabrication movement of the 1920s and 1930s is regarded as a precursor to industrialisation and the inter-war period as a time of innovation in both materials and techniques. White agrees with Bowley in noting the extensive research into non-traditional methods of building existing in Britain and the bulk of the book is taken up with meticulously detailed and illustrated accounts of these experiments and summaries of the government reports that affected construction. He acknowledges that, by the 1950s, other Western European countries were leading in their use of tower cranes and industrialised systems for multi-storey building but, unlike Bowley, does not blame this late uptake of mechanisation in Britain on the structure of the construction industry but on government policy. White argues that post-war policy was not wholly committed to industrialisation, being based instead on 'expediency and emergency measures' without any long-term planning for industrialisation. This lack of commitment was based on the assumption that traditional methods would be returned to when the numbers in the construction workforce had been increased. This dual approach resulted in:

a dispersal of effort over the whole field of research into alternative methods . . . The reversion to traditional or 'improved traditional' methods in house building . . . was nevertheless, rapid enough to inhibit the further development of those non-traditional systems that had attained some temporary measure of success.<sup>11</sup>

While agreeing that prefabrication is commonly introduced to combat skill shortages by shifting more of the labour input into the factory rather than on the site, White does not subscribe to the view that site assembly only requires semi-skilled labour, 'in non-traditional building the new skills are often said to be generally better understood and performed by those who have had a basic training in some traditional craft or process'.<sup>12</sup> The school building programme is taken as an exemplar and White concludes optimistically that prefabrication and industrialisation are inevitable but that there is no reason for this to be incompatible with 'a better visual background'.

## 6 Introduction

The first major text to undertake an examination of the political and organisational forces behind the production of industrialised dwellings was that of Dunleavy in 1981. In *The Politics of Mass Housing in Britain 1945–75*, he argues that high-rise flats were built mainly because of construction industry pressure from large contracting firms. He cites contractor-funded feasibility studies, industrial advertising (using examples from the *Municipal Journal* aimed at local government personnel) and a high-profile industrialised building campaign based on the success of the school building programme, together with the availability of heavy prefabricated systems from France and Scandinavia.<sup>13</sup> Other factors were the link between high-rise and the architectural ideology of the Modern Movement, the popular association of high-rise with technical progress and erroneous planning methodology that argued in favour of high-density urban high-rise in order to preserve scarce and expensive land.<sup>14</sup> In this account, construction labour does not appear to exert any influence on either the introduction or the demise of high-rise buildings and industrialised processes.

Brian Finnimore (1989), however, situates his account of factory-built, post-war housing firmly within the economic framework of the Welfare State and considers the roles of both architects and operatives. He traces the initial resistance of building craft unions, represented by the National Federation of Building Trades Operatives (NFBTO), to industrialisation in the 1950s, giving way to acceptance by the mid-1960s. The trade union movement is presented as being in an ambiguous position. Strong propaganda from the government on the drive for public-housing renewal made union leaders sensitive to public opinion and they did not want to betray class loyalties by being seen to impede the slum clearance programme. At the same time the membership was wary of the introduction of industrial methods, as they were feared by many to result in a loss of craft skills.<sup>15</sup>

Although Finnimore notes the increase in semi-skilled workers during this period of industrialisation, particularly the period of heavy pre-cast concrete panel systems, he does not relate this to the question of appropriate training and skills for concrete work. He does, however, state the neo-classical economic argument on productivity: that the cheapness of British building labour inhibited attempts to fully industrialise house production and that economies would only be realised, in comparison to traditional house building, if wages were higher.

The publication of *Tower Block* in 1994 by Miles Glendinning and Stephan Muthesius gave a new perspective on the same phenomenon.<sup>16</sup> Whereas the two previous authors are united in their interpretation of industrialised high-rise housing as a failure of national housing policy and positively damaging to the working-class tenants forced to live in the flats, Glendinning and Muthesius set out to convince that high-rise housing was not entirely an unqualified disaster. They focus on the local framework that enabled high building to progress with such rapidity in the short years in which it proliferated and consider the main agents to have been the designers

and 'producers'. Here 'producers' are defined as the councillors and supporting officials who provided the political and organisational impetus behind large-scale production.

In a complete reversal of Dunleavy's findings, they assert that local government officials, both architects and engineers, acted to assist councillors and that it was 'frequently their duty to cajole the contractors into offering large package deal contracts for high blocks'.<sup>17</sup> Although a large part of the book concerns production, the definition of 'producers' used precludes any examination of the role of labour except for that of the local authority Direct Labour Organisations (DLOs). These are mentioned intermittently, and usually unfavourably, as the only form of organised building labour to have any direct effect on what was built.<sup>18</sup> Despite this, the authors are aware that the 'political and architectural rhetoric of mass-production and system-building was curiously detached from the day-to-day organisation of building'.<sup>19</sup> They do not consider that industrialisation led to de-skilling of the labour force and indeed comment on its beneficial effects on site organisation. An engineer who worked on one of the first tower crane sites, a London County Council development in 1953, is quoted as describing the site as having 'complete order and an absence of workmen in contrast to the traditional over-populated, semi-organised rubbish dump'.<sup>20</sup>

The most comprehensive architectural account of the era of industrialised building is Russell's 1981 survey of systems building.<sup>21</sup> This starts with the traditional Japanese house and takes in the late nineteenth and late twentieth century and, while centrally preoccupied with viewing industrialisation through an architectural lens, includes at every stage of development an analysis of the role of labour. This is refreshing and unusual in an architectural history and provides interesting material on the types of skill required for industrialised building. Russell claims that the building industry in the 1980s was still craft-based and that arguments for industrialisation, made by contractors and architects and based on skill shortages, were selective. For this he cites the CLASP school building programme, where skill shortages only arose sporadically and were not constant:

Many of the schools consortia found, not that there were shortages of craftsmen, but that often there were complaints that contractors could not use the craft skills which were available but had to learn new ones to go with the nut and bolt technology.

(Russell, 1981, p. 318)

### **The concept of skill in the construction industry**

It is impossible to consider the issue of skill without referring to the labour process, a theoretical concept originating from Marx's theory of surplus value, summarised by Linda Clarke as 'the process whereby labour is appropriated, subsumed and consumed within the production process'.<sup>22</sup> The only

## 8 Introduction

significant text to apply this to the construction industry is Linda Clarke's (1992) *Building Capitalism*, which focuses on the building labour process in the development of Brill Farm, later to become Somers Town, in eighteenth-century London. Here, it is argued that the particular form of urbanisation that arose in this district was dependent on the changing conditions and relations of production between building labour, contractors and land-owners. In effect, Clarke argues that the built environment was transformed in time, in a manner specific to a particular place, by the production process.

For building labour, the definition and recognition of skill are of paramount importance in negotiating wages, the content, form and control of training and in forming individual and collective identity. The usual British notion of skill is conceived as the ability, usually physical, to fulfil a particular task or activity in the workplace in order to produce a given output. It can be traced from the eighteenth century, from Adam Smith through Ruskin to Braverman and is a peculiarly Anglo-Saxon notion, used in a similar way to 'know-how' and 'technique', the worker with 'skill' being understood to possess know-how appropriate to the task in hand (Clarke and Winch, 2006).<sup>23</sup> The earliest formulation of Ruskin's interest in the process of building is found in *The Seven Lamps of Architecture* published in 1849: 'I believe the right question to ask, respecting all ornament, is simply this: was it done with enjoyment – was the carver happy while he was about it?'<sup>24</sup> This is probably the most often quoted and frequently misquoted, reference by Ruskin to the emotional state of the craftsman while at work. It was written at a time when the Gothic revival was in full swing and partly in response to Pugin's books, *Contrasts* (1836) and *The True Principles of Pointed or Christian Architecture*, published in 1841, in which he argued that the Catholic architecture of the late thirteenth century should be taken as exemplary. The most familiar example of this architecture is Barry and Pugin's Houses of Parliament, started in 1837 and finished in 1860. Ruskin answered Pugin from a different religious standpoint and through a meticulous study of the early Gothic (1200) cathedrals of Salisbury and Normandy, which he illustrated with careful measured drawings, published as engravings in *Seven Lamps*.

This interest in the well-being of the craft worker, and the relations between architects, builders and workers was a theme that recurred throughout Ruskin's life. Years later, in his *Fors Clavigera* letters to the "working men and labourers" of England, Ruskin dispensed with his usual publisher in an attempt to communicate directly with his readership through a series of monthly pamphlets setting out the means to put his ideals into practice.<sup>25</sup>

This emphasis on happiness was more than a straightforward plea for ethical and just conditions of employment. Ruskin conceived buildings as a testament to the quality of human labour expended on them and thus as an expression of the human soul in material form. In other words, he believed that the quality of architecture was directly affected by the state of the worker who produced it – but as Ruskin's definition of what constituted

architecture was limited to buildings with decoration/ornamentation, he was referring initially not to all building workers but in particular to ornamental masons. He extended his ideas on this subject in the sixth chapter of the second volume of the *Stones of Venice* (1853) entitled 'On the Nature of Gothic Architecture' which became an influential tract. Here, Ruskin proposes that true Gothic architecture is characterised by the combination of its elements; which he explains as the mental tendencies of the builders and its forms – the pointed arches, vaulted roofs and other architectural characteristics. Ruskin elevates work produced by free Christian men over the classical architecture of Greece, which was the work of slaves. Even if freedom results in imperfection and mistakes, at least it is the outcome of a man at work not a machine or man toiling as an 'animated tool'. He argues that, 'Men were not intended to work with the accuracy of tools, to be precise and perfect in their actions',<sup>26</sup> and equates imperfection with good architecture, asserting that precision and accuracy of workmanship are more often a sign of poor architecture and rarely a sign of the best.

Ruskin explains the revolutionary, political uprisings of the working classes in the 1840s as due not to low wages, starvation and famine but because of 'the degradation of the operative to a machine'. This results in a 'lack of pleasure' in work and the loss of the working man's soul with the division of labour into repetitive tasks of factory work. He encourages the middle classes not to buy mass-produced goods because of the poor working conditions implicit in their manufacture: an early plea for ethical consumption. He also argues against the separation of intellectual and manual work saying; 'it would be well if all of us were good handicraftsman in some kind, and the dishonour of manual labour done away with altogether.' Following on with the famous phrase that inspired so many Arts and Crafts architects; 'The painter should grind his own colours; the architect work in the mason's yard with his men.'<sup>27</sup>

Ruskin has been criticised for being historically inaccurate, especially in his descriptions of medieval working practices, but there were contemporary reasons for his romanticisation of medieval working life. Ruskin's elevation of it can be seen as a response to the form of employment commonplace in the manufacturing industries of England by the mid-nineteenth century, in particular, the division of labour and the miserable conditions found in many small sweatshops.

Brian Hanson (2003) has suggested that Ruskin's ideas were reinforced through contact with George Gilbert Scott who recounted his visits to Germany in the 1840s. German building processes constituted a social microcosm highly compatible with Ruskin's amalgam of the artistic and the political. A good example of this was the restoration of Cologne Cathedral, started in 1820s, and called for by Schinkel as necessary as:

a monument whose method of construction would implant in the nation something that would bear fruit . . . recalling the old craftsmanship ethic