

## Portland Stone and the Architectural History of London: An overview

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Prior to the advent of frame structures, British architecture consisted of essays in local geology. The exception is London. From the 1620s onwards the utilisation of Portland stone as a construction material in the City and in Westminster increased significantly until the early twentieth century. Its choice depended on a number of parameters. These included availability and suitability for the intended use, the cost of transport from the quarry to the building site, and fashion. Although limestone and ornament were banned by the Modernists, Portland stone was still used in post Second World War British Modern architecture. Its use was governed by propriety imposed by the planning regulator(s). To illustrate this point reference is made to two iconic high-rise Modernist buildings in London, the Shell Centre (1953–1963) and the Economist Development (1962–1964).

Key words: Portland stone. Building tradition. Modernist Architecture. London.

### Introduction

London has no indigenous building stone as the geology of the London Basin is made up of strata of poorly consolidated sand, gravel and clay.<sup>1</sup> Contemporary research being undertaken by the London Basin Forum is geared towards publishing a geological atlas of the city for geotechnical use.<sup>2</sup> It confirms the abundance of clays, the source of stock brick which is the City's historical building material, and the absence of stone from the underlying bedrocks. Yet, stone has been transported and used as a main construction material in London since Roman antiquity.

Given that limestone is not local, it emerges as an exotic building material through the history of building construction in London.<sup>3</sup> Bath Stone was imported but the main limestone which became synonymous with the architecture of London is Portland Stone. This limestone is mined from the Isle of Portland near Weymouth in Dorset, an island with a superficial area of circa 12 km<sup>2</sup> located nearly 200 km to the southwest of London. The island, part of the Dorset and East Devon Coast, has been designated in 2001 as a UNESCO World Heritage Site for its outstanding combination of geological and geomorphological significance.<sup>4</sup>

A recent comprehensive publication on the legacy of Portland stone in shaping the built environment of London is by Hackman,<sup>5</sup> a former civil servant based for

1 BRITISH GEOLOGICAL SURVEY, Building stones of London [online]. [cit. 9.10.2016]. Available on the Internet: <<http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/buildingStonesLondon/home.html>>

2 ROYSE, Katherine R. et al. Geology of London, UK. In: *Proceedings of the Geologists' Association*, 2012 (January), vol. 123, no. 1, pp. 22-45.

3 ELSDEN, James Vincent – HOWE, John Allen. *The Stones of London*. London : Colliery Guardian, 1923, p. 20.

4 UNESCO, Dorset and East Devon Coast [online]. [cit. 20.9.2016]. Available on the Internet: <<http://whc.unesco.org/en/list/1029/>>

5 HACKMAN, Gill. *Stone to Build London : Portland's Legacy*. Wiltshire : Folly Books, 2014, 320 p. The buildings of London and Westminster were the theme of a publication entitled *The Buildings of England: London I* (London : Penguin Books, 1957) issued by the German, later British, scholar of history of architecture Nikolaus Pevsner. A geological guide to the building stones of London, in two volumes, was penned by Eric Robinson, a geologist by profession with a keen interest in cultural heritage. These are *London : Illustrated Geological Walks, Book One*

four decades in an office in central London and whose ancestors were involved in the extractive mineral industry.<sup>6</sup> This book unravels the relationship of this stone to the construction of prestigious heritage buildings of London, architectural statements which echoed the grandeur of the British Empire. It includes references not only to buildings erected in London but also to examples from around the globe. Portland stone had been the favoured cladding material of London's public buildings since the seventeenth century and many of the city's major pre-modernist landmarks feature this stone. This paper addresses the use of this stone in the architectural history of the British Capital with special reference to post-war Modernist buildings. The first half of the article sets out to draw a historical overview. The aim is to outline the geocultural context of the utilisation of this limestone in the building of the City. The second half addresses the use of same in post Second World War architecture. Two iconic high-rise Modernist buildings, namely the Shell Centre (1953 – 1963) and the Economist Development (1962 – 1964), are read within this context.

### The Geology of Portland Stone

What are the properties and characteristics of Portland Stone? Which lithostratigraphical beds of this industrial mineral formation are utilized in the building industry? Portland Stone is a shallow marine oolitic Jurassic limestone extracted from the Portland Freestone Member, the upper part of the Portland Limestone Formation. Besides being fine-grained and durable, it weathers evenly.<sup>7</sup> It has fine weathering characteristics and is suitable for the production of exterior building elements exposed to hostile weather conditions such as copings and plinths at ground level.<sup>8</sup> This member has three lithologically distinct beds each separated by chert beds which, starting from the upper unit, are Roach, Whitbed and Basebed. Each has its own properties which makes it suitable for certain uses and inappropriate for others. Roach is very strong and durable; previously it was hardly used but nowadays it is utilized for decorative cladding. Whitbed is less durable. The Basebed is of inferior quality; it is softer, less durable, paler and more uniform in character than Whitbed. Since it is softer and less resilient, it is suitable for the manufacture of fine carvings for interiors. Fossils are present with the natural weathering processes aiding the harder ones to become more prominent from the surrounding matrix. They are most noticeable in Roach which includes large fossils which tend to leave a visual concave imprint on the fabric once the matrix is lost.

The classic Portland Stone is Whitbed. It is creamy white in colour and weathers into a greyish brown tone. Buildings with exteriors in this material have a distinctive white and black appearance. "*Visitors to London cannot miss Portland stone buildings for the city is the best place in the world to see them. They shine white in the sunshine; they may glow against a dark sky, or almost glisten under floodlights at night.*"<sup>9</sup> On weathering, the

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and *London: Illustrated Geological Walks, Book Two*, both published in Edinburgh (Scottish Academic Press) in 1984 and 1985 respectively.

6 DAVIS, Joanna. Portland: The stone that helped build London. In: DorsetEcho [online]. [cit. 20.9.2016]. Available on the Internet: <[http://www.dorsetecho.co.uk/news/12888615.PORTLAND\\_\\_The\\_stone\\_that\\_helped\\_build\\_London/](http://www.dorsetecho.co.uk/news/12888615.PORTLAND__The_stone_that_helped_build_London/)>

7 LEARY, Elaine. *The Building Limestones of the British Isles*. London: Her Majesty's Stationery Office, 1983, p. 51.

8 WOOLFITT, Catherine. Portland Stone Facades [online]. [cit. 18.9.2016]. Available on the Internet: <<http://www.buildingconservation.com/articles/portlandfacades/portland-stone.htm>>

9 HACKMAN, G. *Stone to Build London...*, p. 1. Also quoted in DAVIS, J. *Portland...*

surfaces exposed to the rain become white while those which are protected accumulate dirt and turn into a darker greyish brown. This characteristic makes Portland Stone buildings stand out from their surroundings. Thus it is not suitable for use in locations where blending with the neighbouring built-up environs, finished in another building material, is desirable.<sup>10</sup> The use of Roach as an architectural stone is recent. Prior to the advent of the twentieth century, it was used in civil engineering works, notably in the construction of breakwaters, and in military constructions.

The 'best bed' which historically used to be specified by architects is not the Bestbed. Elsdon and Howe suggest that the term is a corruption of the name of the relative Portland bed, the most inferior in terms of its structural and weathering properties.<sup>11</sup> Another interpretation is given by Smith, cited in Elsdon and Howe, who suggested that the term dates back to when the only operating Portland quarries were those situated at East Cliff where the Basebed is more appropriate for use in the building industry than the Whitbed, which is more coarse and richer in fossils.<sup>12</sup>

### **The use of Portland Stone in London: A historico-chronological sketch**

A main problem faced by researchers studying Portland Stone is that primary written documentary evidence as a significant part of the archival material on the quarrying of this stone was lost in 1943 when a "*large part of the island's archives were lost when they were given to a wartime salvage drive*".<sup>13</sup> In addition to Hackman,<sup>14</sup> other recent accounts of the history of use of this limestone are by Morris<sup>15</sup> and Stanier.<sup>16</sup>

The early limestone buildings were constructed in materials imported to the London Basin. When the Romans settled in London, they imported limestone from the South Coast and other parts of the British Isles to meet their required supply.<sup>17</sup> Kentish Ragstone and Reigate Stone were utilised until the Middle Ages. Their selection was due to expediency rather than material properties. By the fourteenth century London was importing stone from Portland via sea.<sup>18</sup>

With thousands of buildings constructed in Portland Stone, the historical built heritage of London supports the claim that this limestone was a principal construction material of the city.<sup>19</sup> The first recorded use is in the construction of significant buildings of the British Monarch, notably the Palace of Westminster in 1347, the Tower of London in 1349 and the first masonry London Bridge in 1350.<sup>20</sup> A historical publication on the building stones of Britain which makes reference to several buildings erected in

10 LEARY, E. *The Building Limestones...*, p. 50.

11 ELSDEN, J. V. – HOWE, J. A. *The Stones of London...*, pp. 19-20.

12 ELSDEN, J. V. – HOWE, J. A. *The Stones of London...*, p. 20.

13 HACKMAN, G. *Stone to Build London...*, p. 2.

14 HACKMAN, G. *Stone to Build London...*

15 MORRIS, Stuart. *Portland : An illustrated history*. Dorset : Dovecote Press, 2004, 176 p.

16 STANIER, Peter. *Stone Quarry Landscapes : The Industrial Archaeology of Quarrying*. Stroud : Tempus Press, 2000, 176 p.

17 ELSDEN, J. V. – HOWE, J. A. *The Stones of London...*, pp. 19-21.

18 STANIER, P. *Stone Quarry Landscapes...*, pp. 100-109.

19 WOOLFITT, C. *Portland Stone Facades...* SIDDALL, Ruth – HACKMAN, Gill. The White Cliffs of St James's : Portland Stone in London's Architecture. In: *Urban Geology in London*, 2015, no. 29, p. 1.

20 GODDEN, Mark. Portland's Quarries and its Stone [online], p. 21. [cit. 7.6.2012]. Available on the Internet: <[http://www.dorsetgeologistsassociation.com/Portland-Stone/Portland\\_Stone\\_Document\\_-\\_7\\_June\\_12.pdf](http://www.dorsetgeologistsassociation.com/Portland-Stone/Portland_Stone_Document_-_7_June_12.pdf)>

Portland Stone is by Watson.<sup>21</sup> It was however only in the seventeenth century that it started to emerge as the limestone associated with London. It was the time when its extraction commenced on an industrial scale. It was imported into London in the early part of the century as stone for the Crown.<sup>22</sup> A royal decree was issued at the time to revive quarries working Portland Stone. Inigo Jones was the first to bring shipments in the 1620s for the erection of Banqueting House and Queen's House. Both are nowadays Grade I listed buildings.<sup>23</sup> The former was re-faced in Portland Stone in the nineteenth century, preserving the original details of the elevation.<sup>24</sup> Nowadays, it is widely acknowledged that the Great Plague epidemic of 1665 and the Great Fire of 1666 led to a shift in the built character of London.<sup>25</sup> The former resulted in the death of a sixth of the city's population.<sup>26</sup> The latter, in which a few lives were lost, accounted for the destruction of almost 463 acres of the City including 87 churches. This fire, Hanson argues, is a reason why the plague did not recur as the substandard, rodent infested residential quarters were destroyed.<sup>27</sup> The loss of property in the fire led to several cases of civil litigation between owners and tenants<sup>28</sup> and signalled the need for alternative, non-combustible building construction material. The Great Fire did not mark the death knell of timber architecture.<sup>29</sup> It was used as a building construction material well into the beginning of the nineteenth century notably in housing for artisans and working class population which totalled those of Manchester, Liverpool and Birmingham combined.

*An Act for rebuilding the City of London*,<sup>30</sup> drawn up by Matthew Hale, was enacted in 1666. It included provisions for the reopening and widening of streets. In October of the same year Commissioners were appointed by the King and the City for the rebuilding of the city. They were vested with powers to issue proclamations regulating the width of streets and the building heights of secular buildings. Their authority extended to the building materials and the dimensions of such buildings. *The Act for the rebuilding of the City of London, uniting of Parishes and rebuilding of the Cathedral and Parochial Churches within the said City*<sup>31</sup> was enacted in 1670; it extended the powers of the 1666 legislation

21 WATSON, John. *British and Foreign Building Stones : A description of the specimens in the Sedgwick Museum, Cambridge*. Cambridge : University Press, 1911, 483 p.

22 HACKMAN, G. *Stone to Build London...*, pp. 30-42.

23 HISTORIC ENGLAND, Images of England [online]. [cit. 20.9.2016]. Available on the Internet: <<http://www.imagesofengland.org.uk/details/default.aspx?pid=1&id=207615>>

24 WILLIAMS, Neville. *Royal Homes*. Cambridge : Lutterworth Press, 1971, p. 47.

25 DEPARTMENT OF PLANNING AND TRANSPORTATION, Conservation Areas in the city of London : A general introduction to their character [online]. 1994. [cit. 13.7.2017]. Available on the Internet: <<https://www.cityoflondon.gov.uk/services/environment-and-planning/planning/heritage-and-design/conservation-areas/Documents/Conservation%20Areas%20in%20the%20City%20of%20London%203.pdf>>

26 PORTER, Roy. *London : A Social History*. Cambridge : Harvard, 1994, p. 84.

27 HANSON, Neil. *The Dreadful Judgement : The True Story of the Great Fire of London*. New York : Doubleday, 2001, pp. 249-250.

28 EARLE, Peter. *A City Full of People : Men and women of London 1650 – 1750*. London : Methuen, 1994, 352 p.

29 GUILLERY, Peter. *The Small House in Eighteenth-century London : A Social and Architectural History*. New Haven; London : Yale University Press, 2004, 288 p.

30 'Charles II, 1666: An Act for rebuilding the City of London.' In: *Statutes of the Realm, 1628 – 1680*, Volume 5, ed. John Raithby (s.l, 1819), pp. 603-612. Available: British History Online [online]. [cit. 18.7.2007]. Available on the Internet: <<http://www.british-history.ac.uk/statutes-realm/vol5/pp603-612>>

31 'Charles II, 1670: An Additional, Act for the rebuilding of the City of London, uniting of Parishes and rebuilding of the Cathedral and Parochial Churches within the said City'. In: *Statutes of the Realm, 1628 – 1680*,

for further street widening and regulated the reconstruction of St Paul's Cathedral. The rebuilding of the city required that new buildings were erected in either brick or stone. The former was the principal material; stone was used in more significant buildings.

Portland Stone became popular through the work of Christopher Wren, one of the Commissioners appointed in October 1666, and Nicholas Hawksmoor. Wren was entrusted to rebuild some 51 churches and was instrumental in securing the successful use of this limestone when he opted to utilize it in the construction of St Paul's Cathedral (Fig. 1). His decision to use this limestone enhanced quarrying activity in Portland and encouraged its use as the main building stone of London. He made use of it as a structural material, either on its own or in conjunction with brickwork.<sup>32</sup>

Following the rebuilding of London, Portland Stone continued to be specified for many prominent buildings such as Somerset House (Fig. 2)<sup>33</sup> by William Chambers, and the General Post Office<sup>34</sup> and the British Museum (Fig. 3),<sup>35</sup> both designed by Robert Smirke. Furthermore, this stone was used in unscientific architectural restorations undertaken in the eighteenth and nineteenth centuries. Banqueting House in Whitehall (Fig. 4) was originally faced in Oxfordshire and Northamptonshire stone and dressed in Portland Stone; during renovations undertaken throughout this period, it was clad in Portland Stone.

In the mid nineteenth century, Portland Stone continued being used in constructions associated with business institutions and prestigious public buildings but the architectural philosophy of the time encouraged the use of a combination of polychromatic and polytextural building materials.<sup>36</sup> The period 1850 until 1915 marks the phase when London was the capital of the British Empire. Various public buildings of note were erected over this period. They were the subject of extensive debates focusing not only on their siting but also on who should bear the costs for their erections. An extensive study on the political, financial and social history, themes which are beyond the scope of this paper, has been undertaken by Port.<sup>37</sup>

With the advent of frame structures, the role of traditional building materials became less structural in use. Despite the economic depression of the 1930s, Portland stone remained in the early part of the Twentieth century a main medium through which the iconic image of the built heritage of London was conveyed. Notable buildings and monuments dating to pre Second World War include (i) the Bank of England (Fig. 7),<sup>38</sup> designed by Herbert Baker, where Portland Stone was used for the exterior, (ii) the

Volume 5, ed. John Raithby (s.l, 1819), pp. 665-682. Available British History Online [online]. [cit. 18.7.2007]. Available on the Internet: <<http://www.british-history.ac.uk/statutes-realm/vol5/pp665-682>>

32 ELSDEN, J. V. – HOWE, J. A. *The Stones of London...*, p. 41.

33 <<http://www.somersetthouse.org.uk/history/since-the-18th-century>> [cit. 12.10.2016].

34 WATSON, J. *British and Foreign Building Stones...*, p. 182.

35 WATSON, J. *British and Foreign Building Stones...*, p. 182. <[https://www.britishmuseum.org/about\\_us/the\\_museums\\_story/architecture.aspx](https://www.britishmuseum.org/about_us/the_museums_story/architecture.aspx)> [cit. 12.10.2016].

36 DEPARTMENT OF PLANNING AND TRANSPORTATION, Conservation Areas in the city of London : A general introduction to their character [online]. 1994. [cit. 10.7.2017]. Available on the Internet: <<https://www.cityoflondon.gov.uk/services/environment-and-planning/planning/heritage-and-design/conservation-areas/Documents/Conservation%20Areas%20in%20the%20City%20of%20London%203.pdf>>

37 PORT, Michael. *Imperial London : Civil Government Building in London 1850 – 1915*. New Haven; London : Yale University Press, 1995, 354 p.

38 BANK OF ENGLAND, Inside the Bank of England [online], pp. 4-6. [cit. 12.10.2016]. Available on the Internet: <<http://www.bankofengland.co.uk/education/Documents/museum/insidetheboe.pdf>>

facade of the London School of Hygiene and Tropical Medicine, whose architecture broke with the classical tradition, which was finished in Portland Stone (Fig. 8)<sup>39</sup> and (iii) the Cenotaph, in Whitehall, designed by Edwin Lutyens, which was constructed from the same stone (Fig. 6).<sup>40</sup> Other buildings include Broadcasting House and Shell Mex House by George Val Myer and Ernest Martin Joseph respectively, both Art Deco Grade II listed buildings.



Fig. 1: St Paul's Cathedral (1669-1711)  
(Photo: William Bondin. ©)



Fig. 2: Somerset House (1776-92)  
(Photo: William Bondin. ©)



Fig. 3: British Museum (1823-1852)  
(Photo: William Bondin. ©)



Fig. 4: Banqueting House, Whitehall (1619-1622)  
(Photo: William Bondin. ©)

39 <<http://www.lshmt.ac.uk/library/archives/history/building/>>; [cit. 12.10.2016].

40 BRITISH BROADCASTING CORPORATION, 1918 – 2008: Ninety Years of Remembrance [online]. [cit. 12.10.2016]. Available on the Internet: <<http://www.bbc.co.uk/remembrance/how/cenotaph.shtml>>



Fig. 5: Recent extension to the British Museum clad in Portland Stone (Photo: William Bondin. ©)



Fig. 6: The Cenotaph (1919-1920) (Photo: William Bondin. ©)



Fig. 7: Bank of England (1925-1939) (Photo: William Bondin. ©)



Fig. 8: London School of Hygiene and Tropical Medicine (1926-29) (Photo: William Bondin. ©)

The traditional advantage of Portland quarries over other mineral extraction sites supplying stone to London was the ease of sea transport. In the 1720s Bath Stone emerged as its main competitor. Its properties are similar to Portland although the latter can withstand, on average, three times the compressive strength of Bath Stone. It is also a Jurassic oolitic limestone; it was quarried from Avon and Wiltshire and its colour varies from cream to pale brown. Sea transport routes from Somerset to London coupled with the cheap cost of the raw material ensured a greater demand for its use. The water routes were established in 1810 by Kennet and Avon Canal. Bath and Portland firms combined in 1899 to form Bath and Portland Stone Firms Ltd. The philosophy of the company was clear: Portland stone was for use in public works and large prestige

buildings while Bath was to meet the other demands. Until the turn of the nineteenth century, sea transport was a cheaper and more effective economical mode of importing, in bulk, heavy material such as stone from other parts of the British Isles to London. The Isle of Portland was connected to the mainland via railway in 1865.<sup>41</sup>

### Cultural change affecting the use of limestone

*"If the laws of statics can be safely assumed to be established beyond dispute, the 'laws' of use and pleasure, of convenience and delight, have certainly not as yet been subjected to any Newtonian revolution; and, while it is not inconceivable that in the future they may be, until that time, any ideas as to the useful and the beautiful will rest as untestifiable hypotheses."<sup>42</sup>*

The emergence of the steel frame in the nineteenth century and later demands for high-rise buildings led to a shift in the philosophy of structures which had haunted the art and science of building since the Neolithic revolution. Steel, and later reinforced concrete, replaced and fulfilled the roles of traditional stone. Such structural materials are more efficient than masonry especially in frame structures. Limestone is strong in compression; it is not efficient in resisting bending forces. Its weakness in tension limits its use in lintels, beams and floor slabs.

The philosophy underlying the use of masonry by the Modernists can be expressed in the following Aristotelian syllogisms:<sup>43</sup>

- "S1 *Load-bearing walls are rejected;*  
*Structural masonry is load-bearing [walls];*  
*Hence, Structural Masonry is rejected.*
- S2 *[All] ornament is crime;*  
*Masonry is an ornament;*  
*Hence, Masonry is crime."*

The traditional use of masonry, the medium through which historical styles were conveyed, was not an approved building material. The building construction material which reflected the spirit of the age was ferro-concrete. Britain was the last country in Europe which embraced Modernism. This style, which dated to the turn of the Twentieth century and flourished on the continent during the inter-war period, became the predominant style in Britain in 1956. Developments and changes undertaken in the twentieth century were varied. Comprehending issues and arguments prevalent over this period is more relevant than just opting for the traditional description of stylistic tendencies.<sup>44</sup>

In his essay *The Mischievous Analogy*, John Summerson, a leading architectural historian and critic of inter- and post-war Britain and former assistant editor of the periodical *Architect and Building News* for the years 1934 – 1941, argued that ornament in British Modernist architecture is *"one aspect of architecture where historical analogy*

41 'The Encyclopaedia of Portland History' [online]. [cit. 20.10.2016]. Available on the Internet: <<http://www.portlandhistory.co.uk/introduction.html>>

42 ROWE, Colin. *Architectural Education : USA*. In: ROWE, Colin. *As I was saying : Recollections and Miscellaneous Essays, Vol. 2: Cornellianna*. Ed. Alexander Caragonne. Cambridge : The MIT Press, 1996, p. 60. Originally published in *Lotus International*, 1980, no. 27, pp. 42-46.

43 BIANCO, Lino. *Masonry and the Modernist Ethic*. In: *The Masonry Society Journal*, 2000, vol. 18, no. 2, p. 99.

44 POWERS, Alan. *Britain : Modern architectures in history*. London : Reaktion Books, 2007, 272 p.



has wrought indescribable confusion".<sup>45</sup> Historical traditions, he noted, differentiated between "surface modulation" and "subjunctive architecture". The former is decorative cladding whilst the latter is "the architecture of 'as if'". In his seminal essay *Ornament and Crime*,<sup>46</sup> Adolf Loos did not distinguish between these types of surface decoration and, in exiling ornament from Modernism, he banned both.<sup>47</sup> With respect to post Second World War London, which context/s affected the use of stone in general and Portland Stone in particular in the building construction industry?

### Post-War London Architecture

In the initial post-war years, brick and stone were replaced by metal and glass curtain walls and later also by polished granite. This axiom sounds simplistic in the light of the recent critical publication addressing the first three decades of post Second World War architecture in Britain by Harwood.<sup>48</sup> Going through the various building typologies ranging from universities to cafés, she challenges previous scholarship on the subject. Still, it is officially acknowledged by the Department of Planning and Transportation of the City of London that, despite the fact that some developments respected the city's building traditions and kept making use of masonry, most departed from this approach.<sup>49</sup> Portland Stone was mainly used in office buildings which flourished in the 1950s and early 1960s especially where the architecture was mandatory to complement the existing urban character. The decline in the use of Portland Stone over the period 1960 – 1980 was partly due to the fact that development planning permits were not granted for new office buildings in Central London.<sup>50</sup> Yet curtain walling making use of polished granite cladding was heavily used which highly contrasted with the historical character of the City. Significant buildings of this period are the Shell Centre and the Economist Development.

Located by the River Thames, the Shell Centre is one of the earliest tall buildings in London (Fig. 9). Designed by Howard Robertson and Ralph Maynard Smith, it comprises two main office blocks, east and west of the railway viaduct to Hungerford Bridge, to house about 6,000 workers. The former is L-shaped while the latter is U-shaped. Both are 10 storeys high. A 26-storey block is situated in the U-shaped block (Fig. 10). In-situ pumped concrete was used in constructing the 10-storey blocks while steel frame-structure was used in the tower.<sup>51</sup> Another tall building constructed at the time

45 SUMMERSON, John. *Heavenly Mansions and Other Essays on Architecture*. London : The Cresset Press, 1949, p. 216. The essay *The Mischievous Analogy* (pp. 195 – 218) is based on a lecture delivered by Summerson at the Architectural Association in 1941.

46 LOOS, Adolf. *Ornament and Crime*. In: CONRADS, Ulrich (Ed.). *Programmes and Manifestoes on 20th-Century Architecture*. London : Lund Humphries, 1970, pp. 19-24.

47 BIANCO, L. *Masonry and the Modernist Ethic...*, p. 98.

48 HARWOOD, Elaine. *Space, Hope and Brutalism : English Architecture, 1945 – 1975*. New Haven : Yale University Press, 2015, 512 p.

49 DEPARTMENT OF PLANNING AND TRANSPORTATION, *Conservation Areas in the city of London : A general introduction to their character* [online]. 1994. [cit. 13.7.2017]. Available on the Internet: <<https://www.cityoflondon.gov.uk/services/environment-and-planning/planning/heritage-and-design/conservation-areas/Documents/Conservation%20Areas%20in%20the%20City%20of%20London%203.pdf>>

50 SIDDALL, R. – HACKMAN, G. *The White Cliffs of St James's...*, p. 4.

51 The building of the Shell Centre. In: *The Architect & Building News*, 1962 (1 August), p. 163.

of the Shell Centre, and in close proximity to it, is the Millbank Tower.<sup>52</sup> Designed by Alison and Peter Smithson to provide new headquarters for The Economist and the Economist Intelligent Unit, the Economist Development is one of the earlier modern office developments which complement and enhance the character of the area (Fig. 11). Completed in 1964, it was described by its architects as: "(...) a didactic building, a dry building – deliberately so".<sup>53</sup> The Economist Development is "partly inspired by the organisation of the Rockefeller Centre in New York".<sup>54</sup> It is made up of three separate blocks. They are linked by a raised piazzetta at the south end of a block in St James's. Although all had to house different functions, the appearance, construction and finishes of the blocks are similar.<sup>55</sup> They do not display concrete in a manner typical of brutalism.<sup>56</sup> They are all reinforced concrete frame structures. In each block, flat slab floors span between the external columns and the central service cores.

The Shell Centre, clad in the traditional Base Bed of Portland stone, has the distinctive black and white appearance characteristic of this limestone. The planning brief for this building made it mandatory that it had to be covered in Portland stone.<sup>57</sup> In the Economist Development both the columns and the spandrels between them are clad in Portland Roach which appeared on the market for the first time in 1964. This limestone bed has also been used as paving slabs to the stairs leading to the piazzetta and as a cladding material (Fig. 12). Although its use for decorative purposes had been exploited since the end of the Second World War,<sup>58</sup> the Economist Development was the first in British architecture that exploited this bed for use in buildings. The Smithsons used it for its textural and weathering characteristics.

Although both the Shell Centre and the Economist Development read as office buildings, the original structural material is deliberately concealed. Furthermore, in the case of the former, the resulting appearance is of a load-bearing masonry building. To use Summerson's language, "subjunctive architecture" is eliminated but surface decoration was not eradicated.<sup>59</sup> "British Modernism did not free itself from the issue of surface decoration because in the anxiety to eradicate subjunctive architecture Modernist architects accepted uncritically Loos's thesis."<sup>60</sup> The way forward for British Modernist architecture was to assume a positive outlook to surface modulation: "(...) Whereas 'the subjunctive' is something of which architecture has divested itself with genuine relief and

52 Until Shell Centre's erection, St. Paul's Cathedral and Victoria Tower dominated the Central London skyline at heights of 365 and 340 ft respectively. Following the 1947 Town and Country Planning Act the 100 feet building height restriction stipulated by the 1894 London Building Act was relaxed in 1956, three years after the publication of the planning brief for the Shell Centre site. Also, the 1894 Act restricted the angle subtended by the building's cornice at the opposite pavement to be at least 56 degrees. Under the new Act a plot ratio system was introduced to calculate zoning and regulate building heights.

53 Offices and shops. In: *The Architects Journal*, 1964 (16 December), pp. 1445-1462.

54 JONES, Edward – WOODWARD, Christopher. *A Guide to the Architecture of London*. London : Weindenfeld & Nicolson, 1983, p. 28.

55 STEPHEN, Douglas – FRAMPTON, Kenneth – CARAPETIAN, Michael. *British Buildings 1960 – 1964*. London : Adam & Charles Black, 1965, pp. 94-103.

56 PEVSNER, Nikolaus. *London I : The Cities of London and Westminster*. London : Penguin Books, 1957 (1962 edition), p. 651.

57 The building of the Shell Centre. In: *The Architect & Building News*, 1962 (1 August), p. 161.

58 DIMES, Francis G. Sedimentary Rocks. In: ASHURST, John – DIMES, Francis G. (Eds.). *Conservation of Building and Decorative Stone*. Oxford : Butterworth-Heinemann, 1998, pp. 61-134.

59 SUMMERSON, J. *Heavenly Mansions...*, pp. 195-218.

60 BIANCO, L. *Masonry and the Modernist Ethic...*, p. 98.

*advantage, the modulation of surface is still a teasing and embarrassing problem which cannot be solved in a negative way and demands that change-round from negative to positive, from subtraction to addition (...).<sup>61</sup>*



Fig. 9: The Shell Centre (1953-63)  
(Photo: William Bondin. ©)



Fig. 10: The Shell Centre: Courtyard of U-shaped block



Fig. 11: The Economist Development (1962-64)  
(Photo: William Bondin. ©)



Fig. 12: The Economist Development: paving slabs are in Roach (Photo: William Bondin. ©)

61 SUMMERSON, J. *Heavenly Mansions...*, pp. 216-217.

### Final Comments

The history of the use of Portland Stone in the building industry is inextricably linked with the history of London. It has remained one of the City's main building stones for over half a millennium. The distribution and variety of Portland Stone buildings throw a light on the development of the city. It was traditionally used as a structural material with an intrinsic specific architectural aesthetic. With the emergence of modernist ethic all elements in architecture which conveyed historical references were read as unprogressive and thus banned. Reference to Augustus Pugin's notion of morality in architecture with respect to post-war British iconic Modernist architecture<sup>62</sup> is more rhetorical than factual. Portland Stone was applied to lipstick a building.

The explicit terms used by Parker when discussing the general shift from modernism to postmodernism are 'cross-dressing' and 'transvestism';<sup>63</sup> these can be applied to the use of limestone in the post-war modern architecture of London. The outfit of a transgender is a need whilst that of a cross-dresser is a choice. The use of limestone in post war British architecture is more akin to the former. The notions guiding the practice of architecture are not ethical norms but pragmatic and aesthetical considerations often imposed by the town planning regulator.

Nowadays, urban conservation development planning legislation and policies encourage the use of traditional building dimension stones to visually integrate new buildings with the existing historical fabric of the city. Cladding in Portland Stone has been perceived as an effective way of retaining the character of the city. Clifton-Taylor's television series *The Pattern of English Buildings*, produced by BBC Television, created awareness amongst architects and the general public about the use of Portland Stone through history.<sup>64</sup> In the 1994 issue of the *Natural Stone Directory*, Eric Robinson notes that there is a growing awareness on the part of architects about the use of this stone.<sup>65</sup> This is not only due to its inherent and intrinsic visual characteristics but also due to the planning policies which favour conservation of architectural heritage.<sup>66</sup>

Architects consider Portland Stone to be the material that gives the city its particular character. The World Conservation and Exhibitions Centre attached to the British Museum, a £135 million project, is "constructed using steel frames, Portland Stone and glass, to fit in with nineteenth and twentieth century architecture of the existing

62 BIANCO, Lino. Limestone in Post-war British Architecture : Is it a plea for a return to Pugin? In: *Melita Theologica*, 1998, vol. 49, no. 2, pp. 71-80. David Watkin was the first to address the theme of morality and architecture in his seminal publication entitled same (WATKIN, David. *Morality and Architecture : The Development of a Theme in Architectural History and Theory from the Gothic Revival to the Modern Movement*. Oxford : Clarendon Press, 1977, pp. 17-23). Pugin called for honesty and truth to structure, function, materials and spirit of the time, a theory that he developed in *Contrasts* (PUGIN, Augustus W. N. *Contrasts : or, a parallel between the noble edifices of the fourteenth and fifteenth centuries, and similar buildings of the present day; shewing the present decay of taste*. London : St Marie's Grange, 1836, 50 p.) and in *The True Principles* (PUGIN, Augustus W. N. *The True Principles of Pointed or Christian Architecture*. London : John Weale, 1841, 67 p.).

63 PARKER, Simon. *Urban Theory and the Urban Experience : Encountering the city*. London; New York : Routledge, 2004 (Second edition 2015), pp. 152-153.

64 Robinson makes reference to these programmes in ROBINSON, Eric. A Future Guaranteed. In: *Natural Stone Directory*, 1994, no. 9, pp. 5-6.

65 ROBINSON, E. *A Future Guaranteed...*, p. 5.

66 ROBINSON, E. *A Future Guaranteed...*, p. 5.

buildings" (Fig. 5).<sup>67</sup> This limestone was nominated as one of the UK's Global Heritage Stones, and building projects that make use of Portland stone invariably win awards in the biennial Stone Federation Stone Awards,<sup>68</sup> a fact noted by Siddall and Hackman.<sup>69</sup>

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### BIBLIOGRAPHY

- 'Charles II, 1666: An Act for rebuilding the City of London.' In: *Statutes of the Realm*, 1628 – 1680, Volume 5, ed. John Raithby (s.l, 1819), pp. 603-612. Available: British History Online [online]. [cit. 18.7.2007]. Available on the Internet: <<http://www.british-history.ac.uk/statutes-realm/vol5/pp603-612>>
- 'Charles II, 1670: An Additional, Act for the rebuilding of the City of London, uniteing of Parishes and rebuilding of the Cathedrall and Parochiall Churches within the said City'. In: *Statutes of the Realm*, 1628 – 1680, Volume 5, ed. John Raithby (s.l, 1819), pp. 665-682. Available British History Online [online]. [cit. 18.7.2007]. Available on the Internet: <<http://www.british-history.ac.uk/statutes-realm/vol5/pp665-682>>
- The building of the Shell Centre. In: *The Architect & Building News*, 1962 (1 August), pp. 161-164.
- Offices and shops. In: *The Architects Journal*, 1964 (16 December), pp. 1445-1462.
- 'The Encyclopaedia of Portland History' [online]. [cit. 20.10.2016]. Available on the Internet: <<http://www.portlandhistory.co.uk/introduction.html>>
- <<https://www.lshtm.ac.uk/library/archives/history/building/>> [cit. 12.10.2016].
- <<https://www.somersetshouse.org.uk/history/since-the-18th-century>> [cit. 12.10.2016].
- <[https://www.britishmuseum.org/about\\_us/the\\_museums\\_story/architecture.aspx](https://www.britishmuseum.org/about_us/the_museums_story/architecture.aspx)> [cit. 12.10.2016].
- BANK OF ENGLAND, Inside the Bank of England [online], pp. 4-6. [cit. 12.10.2016]. Available on the Internet: <<http://www.bankofengland.co.uk/education/Documents/museum/insidetheboe.pdf>>
- BIANCO, Lino. Limestone in Post-war British Architecture : Is it a plea for a return to Pugin? In: *Melita Theologica*, 1998, vol. 49, no. 2, pp. 71-80.
- BIANCO, Lino. Masonry and the Modernist Ethic. In: *The Masonry Society Journal*, 2000, vol. 18, no. 2, pp. 95-99.
- BRITISH BROADCASTING CORPORATION, 1918 – 2008 : Ninety Years of Remembrance [online]. [cit. 12.10.2016]. Available on the Internet: <<http://www.bbc.co.uk/remembrance/how/cenotaph.shtml>>
- BRITISH GEOLOGICAL SURVEY, Building stones of London [online]. [cit. 9.10.2016]. Available on the Internet: <<http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/buildingStonesLondon/home.html>>

67 FREARSON, Amy. Rogers Stirk Harbour + Partners completes new conservation and gallery wing at British Museum. [online]. [cit. 9.10.2016]. Available on the Internet: <<https://www.dezeen.com/2014/07/11/rogers-stirk-harbour-partners-completes-british-museum-extension/>>

68 HUGHES Terry G. et al. Portland Stone : A nomination for 'Global Heritage Stone Resource' from the United Kingdom. In: *Episodes*, 2013, vol. 36, no. 3, pp. 221-226.

69 SIDDALL, R. – HACKMAN, G. *The White Cliffs of St James's...*, p. 1.

- DAVIS, Joanna. Portland : The stone that helped build London. In: DorsetEcho [online]. [cit. 20.9.2016]. Available on the Internet: <<http://www.dorsetecho.co.uk/news/12888615>. PORTLAND\_The\_stone\_that\_helped\_build\_London/>
- DEPARTMENT OF PLANNING AND TRANSPORTATION, Conservation Areas in the city of London : A general introduction to their character [online]. 1994. [cit. 13.7.2017]. Available on the Internet: <<https://www.cityoflondon.gov.uk/services/environment-and-planning/planning/heritage-and-design/conservation-areas/Documents/Conservation%20Areas%20in%20the%20City%20of%20London%203.pdf>>
- DIMES, Francis G. Sedimentary Rocks. In: ASHURST, John – DIMES, Francis G. (Eds.). *Conservation of Building and Decorative Stone*. Oxford : Butterworth-Heinemann, 1998, pp. 61-134.
- EARLE, Peter. *A City Full of People : Men and women of London 1650 – 1750*. London : Methuen, 1994, 352 p.
- ELSDEN, James Vincent – HOWE, John Allen. *The Stones of London*. London : Colliery Guardian, 1923, 250 p.
- FREARSON, Amy. Rogers Stirk Harbour + Partners completes new conservation and gallery wing at British Museum. [online]. [cit. 9.10.2016]. Available on the Internet: <<https://www.dezeen.com/2014/07/11/rogers-stirk-harbour-partners-completes-british-museum-extension/>>
- GODDEN, Mark. Portland's Quarries and its Stone [online], p. 21. [cit. 7.6.2012]. Available on the Internet: <[http://www.dorsetgeologistsassociation.com/Portland-Stone/Portland\\_Stone\\_Document\\_-\\_7\\_June\\_12.pdf](http://www.dorsetgeologistsassociation.com/Portland-Stone/Portland_Stone_Document_-_7_June_12.pdf)>
- GUILLERY, Peter. *The Small House in Eighteenth-century London : A Social and Architectural History*. New Haven; London : Yale University Press, 2004, 288 p.
- HACKMAN, Gill. *Stone to Build London : Portland's Legacy*. Wiltshire : Folly Books, 2014, 320 p.
- HANSON, Neil. *The Dreadful Judgement : The True Story of the Great Fire of London*. New York : Doubleday, 2001, 378 p.
- HARWOOD, Elain. *Space, Hope and Brutalism : English Architecture, 1945 – 1975*. New Haven : Yale University Press, 2015, 512 p.
- HISTORIC ENGLAND, Images of England [online]. [cit. 20.9.2016]. Available on the Internet: <<http://www.imagesofengland.org.uk/details/default.aspx?pid=1&id=207615>>
- HUGHES Terry G. et al. Portland Stone : A nomination for 'Global Heritage Stone Resource' from the United Kingdom. In: *Episodes*, 2013, vol. 36, no. 3, pp. 221-226.
- JONES, Edward – WOODWARD, Christopher. *A Guide to the Architecture of London*. London : Weindenfeld & Nicolson, 1983, 512 p.
- LEARY, Elaine. *The Building Limestones of the British Isles*. London : Her Majesty's Stationery Office, 1983, 91 p.
- LOOS, Adolf. Ornament and Crime. In: CONRADS, Ulrich (Ed.). *Programmes and Manifestoes on 20th-Century Architecture*. London : Lund Humphries, 1970, pp. 19-24.
- MORRIS, Stuart. *Portland : An illustrated history*. Dorset : Dovecote Press, 2004, 176 p.
- PARKER, Simon. *Urban Theory and the Urban Experience : Encountering the city*. London; New York : Routledge, 2004, 210 p.
- PEVSNER, Nikolaus. *The Buildings of England: London I [The Cities of London and Westminster]*. London: Penguin Books, 1957, 631 p.
- PORT, Michael. *Imperial London : Civil Government Building in London 1850 – 1915*. New Haven; London : Yale University Press, 1995, 354 p.
- PORTER, Roy. *London : A Social History*. Cambridge : Harvard, 1994, 448 p.
- POWERS, Alan. *Britain : Modern architectures in history*. London : Reaktion Books, 2007, 272 p.
- PUGIN, Augustus W. N. *Contrasts : or, a parallel between the noble edifices of the fourteenth and fifteenth centuries, and similar buildings of the present day; shewing the present decay of taste*. London : St Marie's Grange, 1836, 50 p.
- PUGIN, Augustus W. N. *The True Principles of Pointed or Christian Architecture*. London : John Weale, 1841, 67 p.
- ROBINSON, Eric. *London : Illustrated Geological Walks, Book One*. Edinburgh : Scottish Academic Press, 1984, 98 p.

- ROBINSON, Eric. *London : Illustrated Geological Walks, Book Two*. Edinburgh : Scottish Academic Press, 1985, 142 p.
- ROBINSON, Eric. A Future Guaranteed. In: *Natural Stone Directory*, 1994, no. 9, pp. 5-6.
- ROWE, Colin. Architectural Education : USA. In: ROWE, Colin (Ed.). *As I was saying : Recollections and Miscellaneous Essays, Vol. 2: Cornelliana*. Cambridge : The MIT Press, 1996, pp. 53-64.
- ROYSE, Katherine R. et al. Geology of London, UK. In: *Proceedings of the Geologists' Association*, 2012 (January), vol. 123, no. 1, pp. 22-45.
- SIDDALL, Ruth – HACKMAN, Gill. The White Cliffs of St James's : Portland Stone in London's Architecture. In: *Urban Geology in London* [online], 2015, no. 29, pp. 1-16. [cit. 11.7.2017]. Available on the Internet: <<http://www.ucl.ac.uk/~ucfbrxs/Homepage/walks/PortlandStJames.pdf>>
- STANIER, Peter. *Stone Quarry Landscapes : The Industrial Archaeology of Quarrying*. Stroud : Tempus Press, 2000, 176 p.
- STEPHEN, Douglas – FRAMPTON, Kenneth – CARAPETIAN, Michael. *British Buildings 1960 – 1964*. London : Adam & Charles Black, 1965, 103 p.
- SUMMERSON, John. *Heavenly Mansions and Other Essays on Architecture*. London : The Cresset Press, 1949, 253 p.
- UNESCO, Dorset and East Devon Coast [online]. [cit. 20.9.2016]. Available on the Internet: <<http://whc.unesco.org/en/list/1029/>>
- WATKIN, David. *Morality and Architecture : The Development of a Theme in Architectural History and Theory from the Gothic Revival to the Modern Movement*. Oxford : Clarendon Press, 1977, 136 p.
- WATSON, John. *British and Foreign Building Stones : A description of the specimens in the Sedgwick Museum, Cambridge*. Cambridge : University Press, 1911, 483 p.
- WILLIAMS, Neville. *Royal Homes*. Cambridge : Lutterworth Press, 1971, 128 p.
- WOOLFITT, Catherine. Portland Stone Facades [online]. [cit. 18.9.2016]. Available on the Internet: <<http://www.buildingconservation.com/articles/portlandfacades/portland-stone.htm>>