

# Historic Buildings and light from above

The appearance of roof lighting is a relatively recent occurrence in our architectural history. Yet flip the pages of any architectural journal or view any city or urban area from above today and it will quickly become apparent that lighting from above is now an important aspect of our architectural legacy. It is difficult to find any new public or commercial building without a prominent rooflighting feature nowadays, or a domestic roofscape without a multiplicity of rooflights. This was not always the case. Rooflighting has gone from non-existence to ubiquity in the span of about 300 years.



***Pantheon in Rome***

notably the Pantheon in Rome of circa AD120 - used toplighting deliberately for its dramatic effect, turning the inside of this building into a unique sheltered outside space. The Pantheon illustrates how in relatively wealthy and secure societies architecture, freed of the concerns of defence or specific economy, can start to explore extended possibilities - here lighting from above in addition to its structural callisthenics.

In Britain and throughout most of Europe rooflighting did not appear until developments in the process of glass manufacture made larger and relatively cheap glass sheets available. It is

Throughout history buildings and building groups have used lightwells and atria as devices for gaining light, ventilation and security in a dense or deep-plan environment. They were first seen in the earliest cities of civilisation - those of the Tigris/Euphrates valley at least 3000BC. While the atrium form evolved for purely practical reasons and the top lighting element implicit in the form almost 'accidental', some early buildings -

easy to see that in our climate a roof opening such as that of the Pantheon would merely let in rain - so larger overhead openings into buildings, (apart from those in domestic property necessary to allow the smoke of a fire to escape) are not really found until a reliable and inexpensive means of glazing them was possible. In an example of how architectural development mirrors society's capabilities and aspirations, the 'advent' of rooflighting did not occur until both the technology and the 'use' for natural toplighting combined to generate first limited use of, and thereafter widespread use of rooflighting. The development of glass manufacture - the most essential part of any rooflight - is a case in point.

Glass manufacture itself dates back to at least 2500BC but its use in windows did not really occur until around 1000AD at which time glass manufacture developed in Europe almost exclusively to supply the ecclesiastic 'market'.

This was the great age of cathedrals. Glass was manufactured using either the cylinder or spun method of manufacture, neither of which had really changed since they were first introduced. The largest sheet that could be produced using the spun method was approximately 1.3 metres square. But such sheets were expensive and rare - too expensive to use in anything but the most prestigious buildings. Although spun or crown glass was much preferred for its clarity and lustre the basic size of sheet produced by this method would never increase much in size, was labour-intensive, and consequently has remained a relatively expensive glass. Developments in casting and polishing glass by Perrot and



***Notre Dame de Paris***

others from 1687 produced promising results. The size and quality of panes manufactured using this process rose rapidly. By 1789 cast glass was machine polished, and by 1794 polished plate glass was available in any size up to approximately 1.9m x 2.97m, though larger panels were still expensive. The casting of glass, not relying upon the 'art' involved in glass spinning, lent itself to production on an industrial scale and as the volume of glass produced went up, so the price came down. Glazed windows, which had been uncommon in all but the largest houses in Britain up to the late 16C became more widespread and were in general use by the end of the 17C. Thereafter, as glazing improved in quality and became cheaper the extension of its use beyond the glazing of vertical windows became feasible. The technology was in place for extended use of glazing by the end of the Regency period, and then along came the Victorians.

In British domestic architecture the appearance of rooflighting came after a series of changes in domestic planning and construction that reflected society's increasing sophistication and more intensive use of its domestic buildings. These changes, beginning as far back as the Tudor period, included the gradual abandonment of the 'hall' building type in favour of full two-storey construction, the adoption of the dedicated fireplace, the internalisation of staircases, and the beginnings of the use of the space within the roof itself. New buildings built after 1600 started to incorporate these 'new' features, whilst older buildings were frequently improved as necessity demanded. As infilling of the hall frequently brought the tie beam of the previous roof construction into an inconvenient position only a few feet above the level of the new first floor, the roof structure of the original building was often reconstructed during expansion and, for the first time, may have incorporated dormer windows and rooflights.

The changes that were occurring in domestic architecture were dramatically accelerated by the onset of the agricultural and industrial revolutions of the 18C and 19C. The population of Britain exploded from 8.3m persons in 1770 to 14.2m by 1820. New materials and methods of construction were introduced and where roof spaces had seldom been used before, use of the roofspace became much more widespread, bringing with it the requirement for light and ventilation.

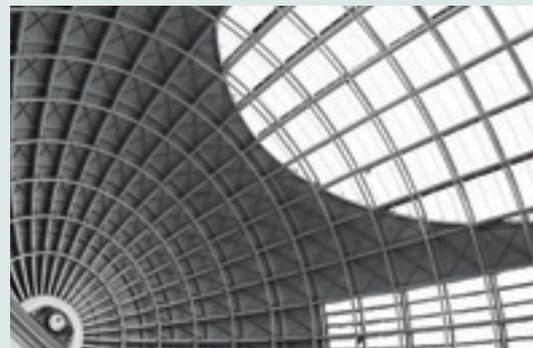
Rooflights as such are not found much before the mid 1700's on account of the size/price problem of glass and a general preference for dormers. The earliest and simplest form of rooflight was a sheet of glass inserted into a tiled roof in lieu of

a roof tile. This had the advantage of being relatively cheap, but the disadvantages of not being easily cleanable, difficult to repair if broken and unable to open to provide ventilation. Consequently this form of rooflighting was used primarily in secondary or agricultural uses. The earliest openable rooflights used in domestic architecture appear to have been timber framed with a lead-clad timber kerb and an opening casement (also lead-clad) which overhung the kerb on all sides. The lower edge of the glass would be left free of framework in order to allow a clear run for rainwater to run off the rooflight. Rooflights of this type can be found on many Georgian and Regency residential buildings, usually tucked away around a side or rear elevation in a position where a dormer window would be architecturally undesirable or physically problematic.

By the time the Victorian era dawned glass had become relatively inexpensive and available in good-quality large sheets. The Victorians, self-confidently built buildings on a scale previously unheard of and with a collective panache and flair that has seldom been matched since.



*Example of sheet of glass*



*Leeds Corn Exchange*

Building types that had never existed previously were evolved during this period such as the great railway stations, which utilised vast areas of overhead glazing. Other deep-plan public building types of this time such as the Leeds Corn Exchange and University of Oxford Museum would not have been possible without the use of overhead glazing - they would have had to revert to the restrictive lightwell building form.

The most famous Victorian building, the Crystal Palace of 1850 employed rooflighting on an unprecedented scale, as did the great glasshouses that preceded and succeeded it. Overhead



*Crystal Palace 1850*

*Somerset House; rooflights supplied by the Rooflight Company replaced the originals*



glazing became ubiquitous from the great buildings of the time to the more humble 'orangery' or 'conservatory' attached to the Victorian dwelling. Further up, on the main roof of a Victorian dwelling, mass-produced rooflights of cast iron became available at about the time of the Great Exhibition and their use in domestic architecture has continued up to modern times. Large-scale overhead glazing was achieved by means of the patent glazing which was similarly devised, developed and confidently used by the Victorians in all manner of structures from railway stations to museums.



On the domestic side, improvements in the thermal and weathering performance of cast iron and timber rooflights have since brought the small-unit rooflight up to date and into a position of prominence as a domestic building element today. This may partly be on account of its relative cheapness compared to dormer windows (roughly 25%-30% of the cost), and the fact that size-for-size they admit more light than a dormer. However it must be stressed that domestic rooflights seldom appear to be

seen as other than a necessity and they take an architecturally subservient role to other elements such as doors, windows and dormers, etc. As has been mentioned previously, almost the opposite is true of rooflights to public buildings.



*A typical cast-iron rooflight installed in a residence*

Though toplighting through rooflights has become widespread in both the domestic and public realms, lighting from above is not often used by designers for its own particular qualities. In domestic work it is generally used for utility purposes only, while in public buildings it is invariably 'mixed' with sidelight. As anyone who has visited a toplit gallery will know, toplighting, when separated from sidelighting, generates in our country (with its almost permanent cloud 'filter') almost vertical white light from above. The effect can be ethereal, even luminous. It may be that our eyes are used to seeing objects in sidelight, and toplight - like theatrical low light, throws our senses slightly out of kilter. When not sheltered under louvres, scoops or frosted glass (as in galleries), and if/when cloud moves away, rooflights can act as a kind of inverted sundial or moonlight more effectively than a vertical window.

Clearly, once glass technology facilitated its application, toplighting through rooflights was used successfully in this country to facilitate deep planning of larger buildings, and domestically to bring the space under a roof into practical use. Hopefully, apart from offering us economy and planning



convenience, toplighting through rooflights will, in the right hands, continue to bring us the unique sensation of light from above, achieved in buildings as diverse the Pantheon, the Dulwich Picture Gallery and the Johnson Wax Building.

*The Conservation Rooflight® from the Rooflight Company designed to replicate the cast-iron model.*

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