

# "Ecologically Responsible Design, Solar Architecture and the Mythology of the Glass Tower"

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## **Keywords**

Ecologically responsible design, glass tower, Modernism, mythology,  
solar architecture

## **Abstract**

Recent architectural projects by leading designers have incorporated innovative measures to improve energy efficiency in response to the concerns of ecologically responsible design. A remarkable feature of these buildings is the form that they have taken - that of the glass tower. This paper explores the use of *glass-tower* as a metaphor of ecologically responsible design, and enquires as to whether recent 'vanguard' office buildings are good models of green architecture? It is concluded that uncritical use of the 'green'-glass-tower design concept, without sufficient consideration of the complex environmental problems associated with glass-tower, make an alliance between ecologically responsible design and the glass-tower a less than ideal proposition, especially over the long term.

## **Introduction**

Responding to the concerns of ecologically responsible design, Foster, Kaplicky and Rogers, among others, have incorporated innovative cladding techniques to improve energy efficiency, natural ventilation and natural lighting in their recent architectural projects. These projects have been acclaimed by the architectural press as the leading edge of a new 'green' architecture (Chevin, 1994; Foster, 1993; Russell, 1992a; Welsh, 1993). Most remarkable however, is that these 'green' projects are introduced in the guise of the glass-tower, a form often interpreted as an enemy of ecological sustainability (Vale, 1991, p170; Szokolay 1989).

Although there has been a long history of tower building, and of glass use in architecture, the notion of the glass-tower was born in the industrial age, a time when it became technically feasible to produce large panes of glass, mechanised vertical transportation, and tall steel framed structures - which took the place of load bearing walls (Condit, 1962; Heinle, 1989). McGrath and Frost (1937) note Burton's 19th century proposal to convert the Great Exhibition building - one of the earliest and most fabulous examples of steel and glass architecture - into a 1000 foot high glazed tower to function as a 'depository of every branch of art and manufacture'- both local and exotic. Fifty years on, at the beginning of the twentieth century, the mythology of the glass skyscraper was given credence through the rhetoric of Le Corbusier and others (Curtis, 1975), the best known examples of this genre being rendered by Mies Van der Rohe - his projects of 1919 (fig.2) and 1922 (Johnson, 1947). These projects anticipated significant advances in air-conditioning and artificial lighting that occurred mid-century (Hawkes, 1976), removing the necessity for light wells and opening windows, freeing up both plan and facade. Following the footsteps of these past heroes, late-Modern architects have perpetuated glass-tower mythology, allying it with environmental architecture. The intention of this paper is to demonstrate that this metaphorical conjuncture between *ecologically responsible design* and the *glass-tower* is less than ideal.

Before dealing with the 'glass-tower', a discussion of 'glass' mythology will provide an insight into certain positive interpretations of 'glass-tower'.

## **Glass**

McGrath and Frost (1937) cite numerous justifications for the use of *clear* glass in architecture, most notably for the benefits of community health, and its associations with 'high culture' and reason.

Following the decline of Catholicism in the Fifteenth Century, an increasing proportion of uncoloured glass was used in religious architecture with an 'insistence on light at the expense of decoration' - a trend which may be interpreted as an assertion of reason over significance (McGrath and Frost, 1937) . The metaphorical connection of transparency with 'reason' is also made by Atkinson and Bagnel writing in the 19th century, who note the contemplative use of the window, which necessarily had an unobstructed opening of clear, colourless glazing, so that a person could achieve the undistorted contemplation of the external world. Justifying their point via reference to Pliny - the epitome of classical erudition - they state that "this contemplative use of the window meant a high stage of culture; it meant that man

having originally built his house in order to shelter or to separate himself from the universe, now opens it out to look again upon nature from quite a new point of view, to find harmony and a source of strength where originally there had been conflict and fear." Thus clear glazing as means to contemplation became identified with high culture, enlightenment, and the educated.

McGrath and Frost (1937, p162) continue by pointing out the psychological influence of glass to produce curative conditions, together with its ability to be bent so as to eliminate corners, making it an especially useful material as 'practical means to hygiene and health' in infectious diseases or tuberculosis wards. They go on to say that the 'modern scientific outlook' of their era 'led to a general awakening of interest in the therapeutic value of sunshine, particularly in its ability to cure and prevent rickets'. Research was carried out to produce glass as transparent as possible to ultra violet radiation, in order to promote Vitamin-D production (Laurens, 1933). Coloured glasses were even trialed as a deterrent to disease carrying house flies in 1930 (Buchanan-Smith, 1930). In 1931 an internationally agreed daylight factor for clerical work was set, to maintain and improve the standard of health in the work-force (McGrath and Frost, 1937, p458-459). Through modern medical science glass reached 'wonder-material' status, rapidly becoming an architectural panacea for community health.

### **Modernism and the glass-tower**

The early Moderns utilised the mythology of glass to imbue their projects with a validity beyond that of curtain walling on skeleton frame. Following the writings of the Taut and Sheerbart of the Glass-chain (Die Glasene Kette), the Moderns envisioned a world made whole again through the 'unprecedented construction of an entirely glass environment' (Frampton, 1986). This can be read into Le Corbusier's design of the contemporary city - a mechanised utopia composed of *glass apartment towers* aligned geometrically in rows - granting to all the possibility of 'enlightenment-through-contemplation', introducing space, light and greenery into the congested city centre. Curtis (1975) also recognised the influence of Taut and Sheerbart who foresaw a radical transformation of society through the use of glass. Their influence on Le Corbusier's 'crystalline creations' enlivened them with 'metaphysical significance, as a symbol of utopia - glass pointers to the future state of Elysium on earth'. Banham (1960, p267) illustrates the direct influence of the glass-chain on the Bauhaus, noting that Fieninger's cathedral topped with glass beacons was a 'building like a crystal symbol...calling for the elimination of snobbish differentiation between hand

workers and brain workers, just as Sheerbart's 'kings walk with beggarmen...artisans with men of learning'

A parallel may be drawn between the rhetoric of the late-Modernists and these early proponents of glass and tower. For example Sheerbart (1915) states that "Building in brick only does us harm. Coloured glass destroys hatred...we feel sorry for brick culture" Foster (1993, p669) introduces his bias towards glass through a paper calling for an ecologically oriented 'vernacular' which compare masonry to glass swathed in terms of performance - "it was possible to develop walls that one can see through and which in some respects, outperform metre thick stone walls of the past."

Le Corbusier in *Towards a New Architecture*, states that "...the congestion of buildings grows greater, interlaced by narrow streets full of noise, petrol fumes and dust: and where on each storey the windows open wide on to this foul confusion...[towers] lend themselves in particular to a certain development of the facade by means of which all the windows have an uninterrupted view:... Starting from the fourteenth storey you have absolute calm and the purest air... at the foot of the towers would stretch parks: trees covering the whole town...piles of reinforced concrete carrying the streets at a height of 65 feet (1931, pp58-59). Similar concerns are shared by Future Systems' 'Green Building'. Russell's (1992, p112) commentary notes that although 'London's mild climate would seem to make natural ventilation easy, opening windows let in noise and pollution as well as air. The curved base of the building, set well above the street, permits the dilution of noise and pollutants and creates a sunlit garden at grade. By sealing the outer layer of the building and providing fresh air intakes set 55 feet high, natural ventilation can be acceptably controlled.'

It is plain to see that health-pollution-noise-fresh air-'garden'-outlook-contemplation-reason aspects of glass-tower mythology so carefully embroidered by the early moderns has been uncritically perpetuated by these new moderns. Even so, the tower can still be interpreted as retaining its potency as a catalyst for cultural change - an expression of the struggle for stylistic legitimacy (Jencks 1988, p11). So how does the glass-tower fare as a symbol of ecologically responsible design?

### **The glass-tower as a metaphor for ecologically responsible design.**

Taking a broad view of sustainability, maintaining or increasing community health and education standards both for present and future generations are a core objective of ecologically responsible design (UIA/AIA, 1993; Turner and Pearce, 1993). With this in

mind, the glass-tower may be read positively as a metaphor of community health and enlightenment. A mixed reading may be given as to its transformative powers. While a parallel could be drawn between environmentalists' calls for a re-creation of society and the modernist mythology of glass-tower as an icon of architectural and societal transformation, recent interpretations of the tower place it altogether differently - not as a metaphor of change, but as a metaphor for the conservation of an existing power structure (Blake, 1991).

In spite of these favourable interpretations, a number of negative associations lay siege to 'tower' as a metaphor of ecologically responsible design. (i) The 'tower' may be read as the 'flagship' architecture of transnational corporations (Dovey, 1992), which are identified as an enemy of sustainability (NGO/UNCED, 1992, p71). (ii) The 'tower' remains the icon of the early Modern movement's vision of 'mechanised utopia' and centralisation (Curtis, 1975), which is at odds with an ecological design goal of low movement and low-energy use society (Cock, 1991). Similarly 'tower' perpetuates an undue technological optimism (Campbell, 1991), which threatens the realisation of sustainability (Costanza, 1994). (iii) The tower as an international image/commodity (Dovey 1992), acts as an enemy of the local context in which it is placed, and hence is an enemy of sustainability. Moreover the tower representing free market capital is closely associated with short-term gains and unrestrained development, whereas ecologically responsible design stresses foresight, long term planning and human restraint when interacting with non-human nature (Fox, 1990; Millbrath, 1989, p119). (iv) Morris (1992) and Dovey (1992) treat the tower as a vehicle promoting patriarchal culture, a metaphor contrary to sustainable development (NGO/UNCED 1992, p6). (v) Returning to Burton's proposal cited in the introduction, the tower can even be interpreted as an object of colonisation - the (corporate) empire's storehouse of exotic loot, a reading which runs contrary to the notion of *sharing* embodied within sustainability (NGO/UNCED, 1992, p7). (vi) Finally the most damning interpretation draws an uncomfortable parallel between a weak anthropocentric position of sustainability and the tower. If one conceives sustainability having at its core the ultimate set of anthropocentric beliefs - not only that *man* is in the process of killing the earth, and that it is within *man's* power to save the planet, and *man* is going to rescue nature as the instrument to save *man* - what better artifice exists than the glass-tower, by which man can secure the immortality of his species.

The acceptance of the tower as an instrument of sustainability risks undermining the thesis of ecologically responsible design. These various readings of 'glass-tower' are summarised in table 1.

Table 1

Glass-tower mythology and Ecologically Responsible Design (ERD)

<b>Negative Metaphors for ERD</b>	<b>Positive Metaphors for ERD</b>
Transnational corporations	Health
Centralisation	Education-progress to 'high culture' ?
High movement/energy-use society	Artifice? (Human achievement )
Anti-contextual/commodification	Catalyst of social transformation
Short-term planning	Religion-'truth' ?
Unrestrained development	
Technological optimism	
Patriarchal culture (fig 4)	
Masculine/anthropocentrism	
Disconnected from nature	Safety from nature? - contemplation
Sick Building Syndrome	

Chevin passes comment upon Foster's and Roger's recent environmental architecture, suggesting that 'when a superstar [Foster] puts green issues at the top of the design agenda and makes energy conservation sexy, it must be good for the environment' (Chevin, 1994, p35). If the recent work of these architects, i.e. their 'glass-towers', exemplify this green stance, Chevin's claim must be disputed. The negative myths associated with 'glass-tower' heavily outweigh the positive metaphorical readings generated, thus promoting these buildings as 'green' or 'sustainable' sends an incorrect or confused message to designers and public alike, as to what *sustainable* architecture represents, or could be in formal terms. The 'glass tower' may be 'sexy', but it is not good for the environment'.

**Beyond Metaphor**

An alternative way of looking at the recent production of late-modern architecture is to accept the program 'glass-tower' as given, and follow the critique from that point.

Although the overall 'glass-tower' mythology is unpalatable in ecological terms, both Foster and Kaplicy (figs. 1 and 3) have dealt with the pragmatics in awesome fashion. The performance of these buildings has been dramatically improved without compromising the essential aesthetic. These architects have achieved superb levels of transparency through the use of multiple skins as climatic buffer zones - allowing greater user control over natural

ventilation and solar radiation. However debating the virtues of 'glass-tower' in pragmatic terms raises further questions concerning the validity of this brief. (i) The selection of tower rather than a low-rise form *creates* a problem of adverse wind effects for natural ventilation (Aynsley, Melbourne and Vickery 1977). Elevationally undifferentiated highly transparent forms *create* the problems of excessive heat gain, glare and noise (Hawkes, 1976). Nick Baker states that 'by refusing to sacrifice architectural freedom, architects who take this approach, create problems' (Chevin, 1994, pp34-5). In this respect glass-tower as a starting point for design remains questionable. A more constructive design strategy might be one that avoids the practical difficulties associated with 'glass' by taking a route of problem avoidance, rather than problem creation followed up by high-tech problem solving. One path would be to adopt Ken Yeang's seminal idea of a bioclimatic- tower as a *glass-* tower substitute (1992, 1994, fig. 5).

## Conclusion

Green-glass-tower as a design concept is flawed both mythologically and technically. Moreover green-glass-towers provide dangerous exemplars to lesser designers, or developers with budgets of more modest proportions. The possibility of uncritical replication of this aesthetic following iconic design procedures (Broadbent, 1973), without sufficient consideration of the complex environmental problems inherent to the glass-tower, render an alliance of ecologically responsible design and glass-tower a risky proposition.

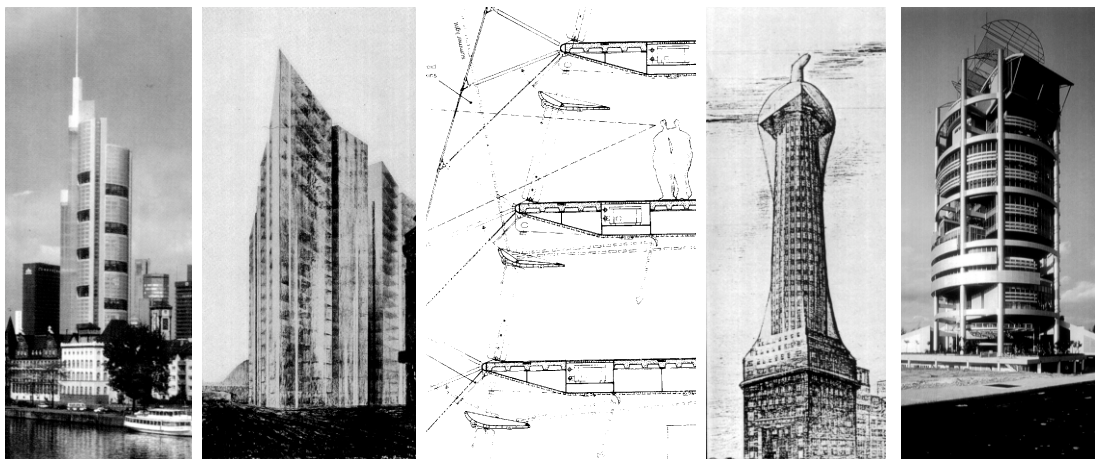


Figure 1  
Norman Foster

Figure 2  
Mies Van der Rohe

Figure 3  
Future Systems

Figure 4  
Chicago Tribune

Figure 5  
Ken Yeang

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