# RE:ENGINEERING THE LANDSCAPE

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## Abstract

Landscape architects and engineers share a common field of endeavour through design in the public domain, both in the urban and rural environment. The professions are committed to improving the quality and sustainability of public spaces and infrastructure throughout our cities, rural and natural areas. The relationship between the two professions has produced notable outcomes but the opportunities to work in partnership have not yet been fully realised. By embracing an appreciation of aesthetic values in design through collaboration with landscape architects, engineers have the opportunity to play a more significant role in the creation of urban and rural environments that not only function effectively but achieve high aesthetic standards.

This paper explores the influences that have lead to the current general lack of involvement of most engineers in the aesthetic aspects of projects in which they are involved and notes that this was not always the case. The paper also outlines opportunities for engineers and landscape architects to work together in the process of "re:engineering" the landscape to achieve new levels of integration of functional and aesthetic values in order to create more meaningful, enjoyable, equitable and sustainable environments for current and future generations.

**Key Words: aesthetics, engineers, landscape architects, architects , urban design**

## Introduction

The title of landscape architect was first adopted by Frederick Law Olmsted in the United States in the late 1800s. The American Society of Landscape Architects is this year celebrating its centenary. Olmsted formed a strong view that development of public parks within the growing cities of the United States in the mid 1800s was an essential aspect of improving the quality of life for their inhabitants.

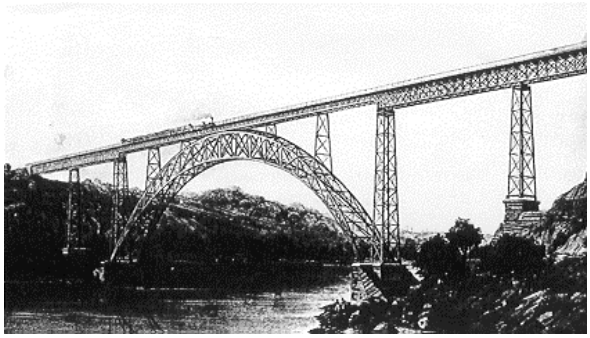
With a rural background combined with some training in "topographical engineering" and a love of nature, his commitment to landscape architecture began with Central Park in New York City. This project involved construction of a completely new park on a 336 ha site in the centre of Manhattan. The project commenced in 1861 on a site that included two major reservoirs and extensive rock outcrops. Massive engineering works were required to create a new naturalistic landscape that is now Olmsted's most famous project. After two years as executive director of the U.S. Sanitary Commission during the American Civil War, Olmsted returned to the Central Park project in 1865 to pursue a 30 year career as a landscape architect.

"Henceforth he pursued by means of landscape architecture the general improvement and civilising of American society that he always had in view. Through that profession he provided urban Americans the scenery that he so loved himself; and in designing schools, villages and estates he provided for the middle class a physical environment intended to promote the community, domesticity and taste that were central to his concept of civilisation."[1]

The genesis of the landscape architecture profession through the leadership of Olmsted took place during a period in which engineers played the leading role in determining the aesthetics of the public domain, particularly major infrastructure developments.

## Engineers and Design in the 19th Century

The industrial revolution had fundamentally changed the relative roles of engineers and architects. Design of the new industrial infrastructure including factories, warehouses, railways, roads, bridges and communications was led by engineers through their mastery of the new technologies created through the industrial revolution. The pre-eminence of engineers during the 1800s is exemplified by the works of engineers such as Gustave Eiffel, who was not only responsible for his famous tower and exhibition buildings of the Paris Exhibition of 1889, but also a series of major bridges throughout Europe, Africa and Indo-China.



*Bridge over the Douro 1875, designed by Gustave Eiffel.*

The role of engineers in the design of structures during the nineteenth century was noted by Giedion. “No other century in the history of the western world developed such hyperbolic building activity as the nineteenth, and none produced such a small number of creative architects. We do not think that this is due to any lack of talent, but rather believe the society gradually killed any creative impulse with the poison of its ruling taste. Sheltered in the shadow of industry and protected by the authority of science, engineers were not hampered in their development, for they did not have to play up to the ruling taste.”[2]

John Norwich supported this view. “The most progressive buildings of the time were therefore the work of engineers rather than architects, using iron the principal new material, boldly and adventurously. It was engineers who created the impressive array of simple, dignified and refreshingly functional buildings, the viaducts, dockyards, textile mills and railway stations...”[3].

Architects had not embraced the new technologies of the nineteenth centaury and were stuck with eclectic styles based on the rules of classical architecture. These were applied to a variety of revivalist styles of previous periods including Greek and Gothic revival.

## Modern Architecture and Engineers

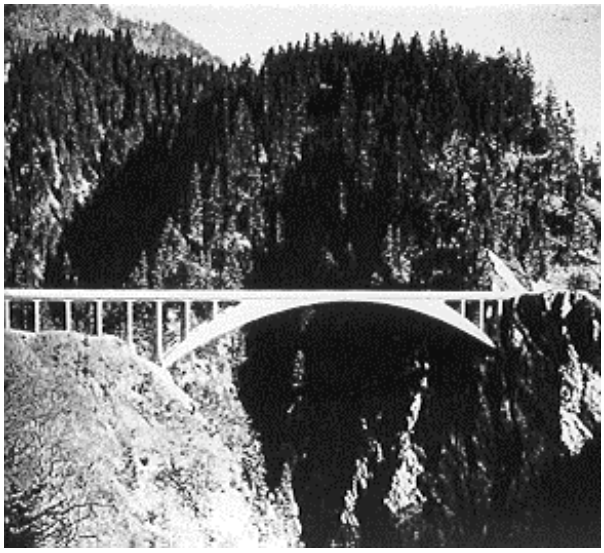
The seeds of change were, however, beginning to germinate in the latter part of the nineteenth century. The revolt against the old systems of social structure in the early part of the twentieth century was manifested in the various fields of art, including architecture. Cubism introduced the elements of space and time into the language of art. Architects would later incorporate these elements into the design of buildings by making use of new technologies and materials developed by engineers. The application of the new technology of reinforced concrete between 1910 and 1920 provided a means of expressing spatial relationships in architecture which the Cubists had developed in their paintings.

Reinforced concrete provided new opportunities to engineers. The Swiss engineer Robert Maillart designed a series of spectacular concrete reinforced bridges through a process of eliminating all that was not functional. The result was a series of elegant bridges in which the volume of concrete was refined to a minimum and the forces elegantly resolved. The form of these bridges derived from the total resolution of their functional requirements through the full application of the new technology of reinforced concrete.

Millart’s bridge designs were the product of a process of resolution into basic elements that used reconstruction as a means of attaining a more rational synthesis.

“Modern art had reached the same result as modern science by entirely independent, intuitive steps. Like science it has resolved

the shape of things into their basic elements with the object of reconstituting them in consonance with the universal laws of nature." [2]



*Salginatobel Bridge 1929-30, designed by Robert Maillart.*

Establishment of the Bauhaus in 1919 in Germany aimed to unite art and industry, art and daily life using architecture as the vehicle. The principles of contemporary art were for the first time translated into teaching and organisation. By 1926 a new generation had set to work in architecture. They understood both the artistic discoveries that had been made since 1910 as well as the new construction methods and materials developed by engineers. They brought these two previously separate realms together and as a result produced what is known as modern architecture. The generation of Le Corbusier, Gropius, Meis van der Rohe and others knew the work of artistic explorers and the new spatial feelings which they had discovered. At last they were able to select from the accumulated developments in engineering those means that were needed to give architectural expression to the new sense of space and time.

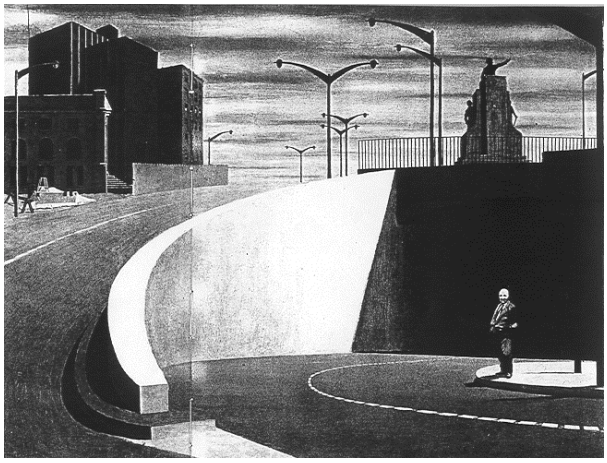
The modern movement was a revolt against stifling rules of classical architecture. The search for pure forms resulted in the overriding principle that "form follows function." Application of the reinforced concrete slab floor without beams began to find application in the period of 1910 to 1920. One of the most readily recognised building forms that resulted from the modern movement was the long high-rise residential slab block. While these structures achieved efficiency of design, many of the buildings have become associated with social dysfunction and alienation. Demolition of a number of these slab blocks in the Pruitt-Igoe housing estate in St Louis in 1972 symbolised a public rejection of the modern movement of architecture, at least as it was applied to high density housing. It marked the beginning of what is referred to as post-modern architecture. The emphasis on functionalism in modern architecture had given way to integrating meaning into architecture through historic references and symbolism.

Engineers as a profession developed a strong affinity with modern architecture as a result of its emphasis on functionalism and the application of new technologies and materials for which engineers were largely responsible. Many engineers felt that they were at least speaking the same language when modern architects talked about "...beauty arising from the essential lines, the fitness and the harmony and so on of a structure...". [4]

In applying the aesthetics of modern architecture to those forms of development over which they had primary control engineers contributed to the creation of built environments in which people often feel alienated and dysfunctional. Within cities this is most strongly manifested in the construction of freeways. Emphasis on efficiency and functionalism has developed road networks throughout our cities without concern for how people feel about the environments in which they live and work and the values and meanings that they associate with those environments. Destruction of important historic values and alienation of people have resulted.

In Sydney, construction of the Cahill Expressway in the early 1960s provided one of the most notable examples of functional design principles applied to urban infrastructure. The painting by Jeffrey Smart titled *Cahill Expressway* (1962) vividly illustrates the alienation of people from this

new infrastructure designed to efficiently carry traffic through the city.



*Cahill Expressway* painted by Jeffrey Smart, 1962.

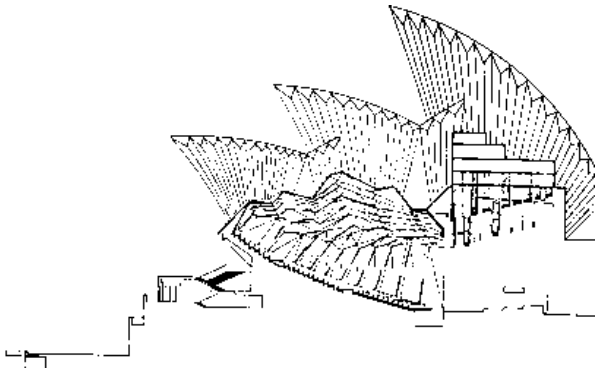
The recently completed M2 motorway in Sydney provides a current illustration of the outcome of focusing on functionalism without any apparent concern for aesthetic considerations in design. The extensive use of sprayed concrete as “cost effective” slope treatment and sound barriers of very basic design, combined with minimal landscape works, have resulted in a motorway that is noted for its low standard of aesthetic quality.

*M2 Motorway, Sydney.*

## Post-Modern Architecture and Engineers

Many architects responded to the obvious negative consequences of modern architecture by adopting a design approach that sought to incorporate meaning not only for the immediate user but also the broader community who do not necessarily use the structures but experience them as part of the public domain.

Giedion [2] refers to the design of the Sydney Opera House by Jorn Utzon as an example of this new architecture which goes beyond the purely functional and tangible in order to enhance the force of expression and add meaning to the built environment. There is no doubt about the aesthetic power of the Opera House as a symbol of Sydney and an architectural icon of international significance. It can be argued that the building goes well beyond the purely functional requirements with the external shell being aesthetically disconnected from the internal performance spaces. Yet to understand its huge success, “One must see the Sydney Opera House as a totality and above all how it fulfils its human purpose. Its only goal is to prepare the audience for a festival.” [2]



*Sydney Opera House illustrating the external shell and internal performance spaces proposed by Utzon.*

## The Emergence of Urban Design

There is growing demand from communities for the design of public and semi-public environments that go well beyond pure functionalism to address their human needs, expectations and feelings. They want environments that bring enjoyment and manifest meaning reflecting historic, cultural and ecological values. The challenge for designers is to understand those values and apply their creativity to achieve successful outcomes. Such outcomes need to make

positive contributions to the emotional and social well being of people as well as the health of the environment of which they are an integral part.

The complexity of planning and design in the public domain demands a commitment to collaboration between the various professions involved, including engineers, landscape architects, planners, architects and artists. The relative roles of these professions in specific projects should vary across the spectrum that extends from dense urban environments through to sub-urban, rural and natural environments. The urban environment is currently the field of greatest intensity of design activity and the area of greatest overlap between the professions.

Urban design is becoming more clearly recognised as having a primary role in influencing the quality of the public domain. Rather than being considered as the exclusive province of any one of the design professions, urban design should be accepted as the most fertile field for creative solutions that result from the professional overlap. This opportunity will only be realised if the professions break down the traditional barriers between them and adopt a new approach to design in the public domain that is based on collaboration and integration of skills. An essential element of this new approach is adoption of a common aesthetic language that will allow effective communication in the design process.

Engineers have a fundamental role to play in this new approach to design of the public domain. However, if they are to fully participate they need to understand and appreciate the language of aesthetics in addition to their emphasis on functionalism. Perception and understanding of the aesthetic components of form, space, scale, movement, rhythm, proportion, balance and composition are essential components of the language of aesthetics. Holgate [5] states that if engineers wish to co-operate with or merely comprehend current architecture they need to learn the concepts and terminology which architects employ in refining and expressing their ideas. The same comment applies to the relationship with landscape architects. Developing this understanding will require an integrated approach led by the various professional institutions and committed individuals. The approach needs to address:

***Education***

- engineering students taking elective subjects in architecture and landscape architecture courses that address the aesthetics of design

- architecture and landscape architecture students taking electives in engineering courses that address the process of engineering design

***Professional Institutions***

- formation of regional Urban Design Forums that bring together engineers, landscape architects, planners and architects to develop and use a common language in the design process

- joint conferences, seminars and workshops that seek to integrate and coordinate the professions involved in urban design

***Individual Professionals***

- acknowledging that the creation of functional, enjoyable, meaningful and sustainable environments is our joint responsibility and challenge

- adopting a mind set that values diversity of approach together with collaboration and cooperation between professions, instead of competition

An important aspect of adopting a common language in the field of urban design is to articulate a shared vision of the overall goal. The work of Kevin Lynch [7] provides some direction through his principles of an idealised city that includes:

- adaptability coupled with a sense of past and future continuity

- equity of opportunity

- diversity of species, habitats and ways of life

- an open and responsive, experimental and engaging character

## Engineers and Landscape Architects

Opportunities for collaboration between engineers and landscape architects are abundant in both the urban and non-urban environments. This collaboration will be most fruitful if engineers can seek a balance between their focus on functional requirements and an appreciation of aesthetic values. Similarly landscape architects need to balance their focus on aesthetic considerations with an appreciation of functional requirements. The search for this balance must be based on mutual respect and appreciation between the professions.

In the non-urban environments the opportunities can be found in a diverse range of project types that include:

- motorways, roads, bridges, railways, pipelines, power transmission and communications networks all of which are linear infrastructure elements that run across the landscape
- mining, quarrying and other resource extraction operations
- sewage and water treatment plants
- materials processing plants
- power stations
- port and marine facilities
- flood control works
- waste disposal
- remediation of contaminated and degraded land
- landscape development and management

Similar opportunities for collaboration exist in the urban environment although the issues to be addressed are generally more complex and the role of the architect is more significant due to the predominance of built form.

## Conclusion

Aesthetic values encompass the perceptual experience of meanings, traditions, familiarity, and contrasts. They involve an inclusive perceptual process that is not exclusively visual, including factors such as space, mass, volume, time, movement, colour, light, smell, sound, tactility, pattern, order and meaning. Aesthetic experience actively involves all the senses. All professions involved in planning and design within the environment, in cities as well as rural areas, have an obligation to understand and respond to the complex and integrated factors that determine its perceived character. Aesthetics are an integral part of design, not an optional luxury that can be ignored. It lies at the heart of how people perceive, respond to and value the environments in which they live.

The importance of aesthetic considerations in the design process is not limited to the large scale and visually prominent elements. The aesthetic quality of the urban environment is the accumulation of a diverse array of elements that are the responsibility of a variety of authorities and professions. In many instances engineers are in a position to determine or influence the design of these elements or the selection of materials and elements to be used. A commitment to careful consideration of aesthetic values of even the most common elements (pedestrian paving, man-hole covers, road surfaces, stormwater drainage, light poles, signs, bins, street furniture) can result in a substantial improvement in the quality of the built environment.

A coordinated approach to design through a partnership between landscape architects, engineers, planners, architects and artists will greatly enhance the aesthetic quality of all environments and make a significant contribution to the quality of life for people living in them.

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## Author Biography

**Noel Corkery** is a consultant with more than 25 years of experience in landscape and environmental assessment and design throughout Australia and Asia. He has managed multi-disciplinary consultant teams engaged in major open space, infrastructure, mining, forestry and landfill projects, often working in collaboration with engineers, planners and architects.

Noel holds master degrees in Landscape Architecture (Cornell University), Forestry (ANU) and Business Administration (AGSM, UNSW). He is immediate past President of the Australian Institute of Landscape Architects (NSW Group) and a member of the American Society of Landscape Architects. He is currently the Asia/Pacific Representative on the Board of Directors of the Society for Ecological Restoration and the AILA representative on the Landscape and Open Space Expert Advisory Panel established by the Olympic Coordination Authority.

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