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An architect and Ponts et Chaussées qualified engineer, Marc Mimram's activity is twofold: engineering and design and architect engineer. He is the author of a number of art publications and architectural projects throughout the world (Solferino footbridge in Paris, Strasbourg-Kehl footbridge – France, Beng Bu and Feng Hua bridges – China, the Moulay Al Hassan bridge, Rabat – Morocco). He is a professor in architecture (Marne-la-Vallée, Princeton).

The world leader in building materials, with operations in 76 countries, Lafarge holds a top-ranking position in each of its activities: Cement, Concrete, Aggregates and Gypsum. The inventor of materials to serve architectural creation, Lafarge has for many years now worked in close partnership with architects worldwide, pushing back the limits of concrete ever further to foster the construction of architectural feats and contribute to sustainable construction methods.

«At a time when architects have to reconcile an increasing range of constraints, whether they be environmental, urban development, technical or esthetic, to bring their projects to life, concrete provides them with virtually limitless scope. We are proud to serve their art, with a material which, every day, achieves new levels of performance, a material which stimulates their creativity, a material of its time.»

Bruno Lafont,
Chairman and CEO of Lafarge



Lafarge
61 rue des Belles Feuilles - BP 40
75782 Paris cedex 16 - France
www.lafarge.com
architecture.lafarge.com

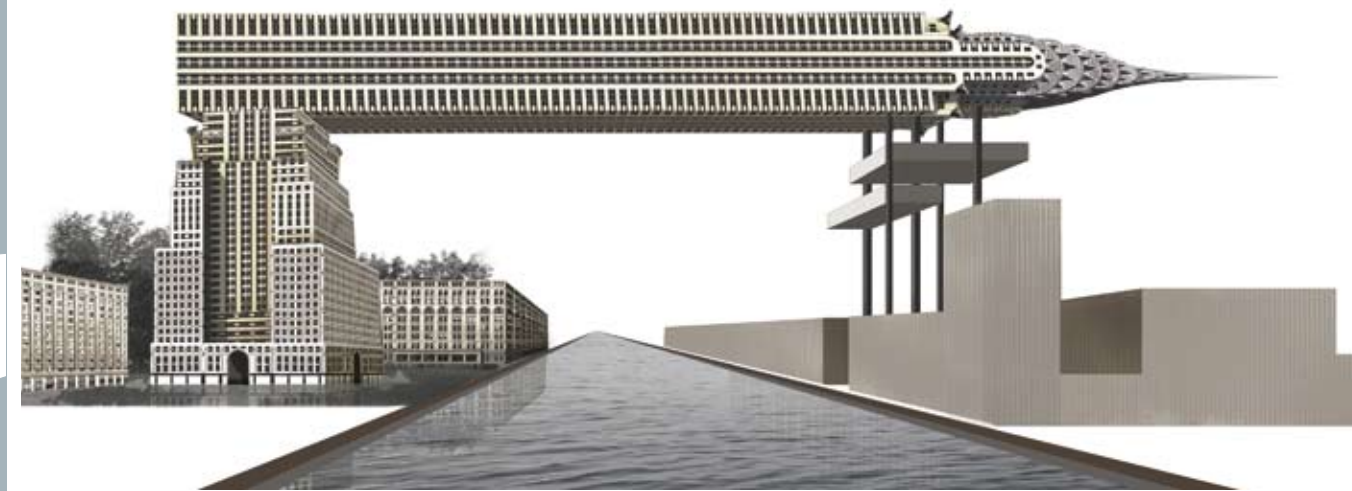


LIVING BRIDGES

4 projects

Marc Mimram
architect-engineer

In partnership with



Summary

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Pursuing its research in partnership with renowned architects, Lafarge has teamed up with architect and engineer Marc Mimram to rethink the role of infrastructure in city planning. This project follows “Hypergreen”, a tower concept meeting the sustainable development requirements of world megacities, designed by Jacques Ferrier.

Living within infrastructure, a metropolitan horizon

The work of architects and engineering departments on new types of concrete, Ductal® in particular (the Lafarge range of ultra high performance fiber reinforced concretes) is ongoing and has now been extended to take in a more global study. The success encountered by “Hypergreen” with both the media and professionals validates this potential-oriented approach undertaken with designers downstream of industrial production on the fringes of the commercial sphere. The reception given to the first

Ductal® achievements by architects Rudy Ricciotti, ECDM (Combarel-Marrec) and Moatti & Rivière in particular in various fields of application, ranging from engineering structures to facings, completes and consolidates this success. Experimental projects and achievements give form and meaning to innovation, reflecting the values that act as a driving force for the Lafarge Group and its commitment to responsible, sustainable development. It is in this spirit that Lafarge, whose materials are present in the heart of cities with over a third of its production used for infrastructure, wished to be part of a study on city planning and act as a key player in sustainable construction, able to go beyond its products to propose new building solutions with a reduced ecological footprint and extended social role.

The study undertaken by Marc Mimram in partnership with Lafarge goes beyond engineering structures as normally devised to take into consideration the issue of infrastructure in all urban, spatial and social dimensions, well upstream of their technical definition. Marc Mimram points out that urbanization is largely conditioned by infrastructure that precedes development or at least foreshadows planning. A city is formatted by infrastructure, the logic of which

Living within infrastructure a metropolitan horizon

Left to right:

- The Landscape Bridge, la Courneuve, France.

- Accommodating structure, New York, USA.

is imposed upon it, whether pre-existent on the heels of ongoing urbanization. «*You simply need to go to Beijing, Tianjin or Shanghai to realize that cities are still having to be thought out, organized and built around infrastructure*», he affirms as a connoisseur of China, familiar with the world's megacities.

Rethinking their role

Devouring space and causing disruption, infrastructure is not generally well perceived and the rapid urbanization throughout the world⁽¹⁾ is intensifying the problems inherent in its impact on the landscape. «Cities and their inhabitants do not like

infrastructure – it is considered a necessary evil», indicates Marc Mimram, who proposes to start from this observation to show how this can be reversed.

«*How can we transcend disruption to the landscape to reconcile infrastructure with the city? How can we get inhabitants to consider it with a favorable eye and change its image back into a positive one, making it appear as the «common asset» that it also is and finally become a «common place» for socializing and sharing in the heart of the city?*» – this is the issue outlined by Lafarge in a preliminary memo on this study.

Following on from the tower, the archetype of metropolitan scale is the bridge, a rhetorical representation par excellence of

infrastructure, considered here from a wider perspective, in its relationship with the landscape and even its inhabitability.

«*We need to consider bridges in the same way as towers, in the form of inhabitable structures where the horizontal aspect replaces the vertical one,*» proposed Marc Mimram. «*After the towering city discovered in Manhattan by Louis-Ferdinand Céline in Journey to the End of the Night, depicted as being «upright, absolutely straight and scarily stiff,*» the idea sought is to lie the city down again, taking advantage of the crossing effect.» The proposal immediately suggests a soothed image of the metropolitan dimension, as if coaxed and domesticated, rich in potential.

A functional object providing a link, a bridge is necessarily a project situated and engrained in a given reality. Contextual by definition, it lends itself to case studies, preferably to theoretical study of a generic object without foundation. «*The local characteristics of the landscape and social-economic development, including local concrete production conditions, give value to the specific rather than the generic,*» pleads the author of the study who undertook a wide-scale stakeout operation before choosing various locations for their relevance, such as La Courneuve (France), Shanghai (China), New York (United States) and Moscow (Russia).

Metropolitan dimension

The study of an inhabited bridge by Marc Mimram prompted architect and city planner, Djamel Klouche⁽²⁾, to come back to the question of towers «*which focalizes debate and wipes out discussion*» by risking a final comparison, «*bridges at least are not cul-de-sacs like towers, necessarily hierarchic or else segregated due to their height. Discussion is currently focusing on towers as the sole, miraculous response to metropolization.*» Among the ten teams asked to reflect on «*Greater Paris*» project for 2009, Djamel Klouche suggests turning our backs on towers that «*suffocate debate and block metropolitan thought*» to move on to other, equally operational archetypes that are a product of numerous scales. In this respect, he feels that bridges are «*eminently more urban than towers and are representative of many more metropolitan values.*» He emphasizes that they are «*also visible from everywhere and have a comparable symbolic dimension.*» The architect/city planner considers that the tower issue is not a new one and that there is certainly something else to be invented at the present time. In this approach, the main obstacle encountered is of a cultural nature. «*Infrastructure is perceived as diabolical and there is no culture established for these structures.*» Marc Mimram recognizes «*the schizophrenic dimension*» of this subject but states that «*infrastructure nonetheless offers enormous potential for the creation of new locations for centrality and new icons*».

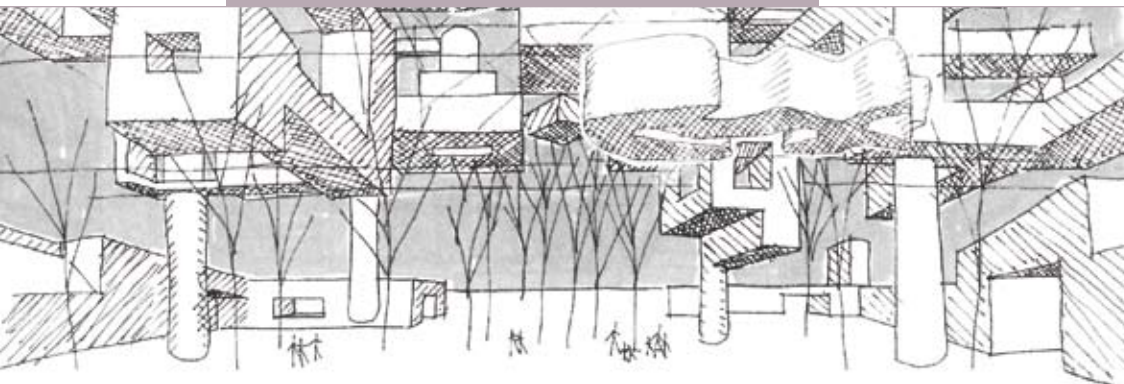
(1) According to the United Nations Population Fund (UNFP), the number of city dwellers exceeded the 50% mark in 2007, with over 3.3 billion people living in urban zones. By 2030, this proportion will amount to 60% of the world population with 5 billion city dwellers.

(2) The statements made here are taken from a working session attended by Marc Mimram, the study author, Djamel Klouche, architect and city planner, Marc Hatzfeld, sociologist, several executives and researchers from Lafarge and François Lamarre, architect and journalist. The study was also followed by Laurent Becker, Martin Fougeras Lavergnolle and Véronique Hours from Mimram's office.



Living within infrastructure a metropolitan horizon

Left to right:
- *Spatial City* – Yona Friedman.
- *New Babylon* – Constant.



Reversing the outlook

This review, backed by a historic retrospective, raises a number of questions and opens up a number of areas for thought through the use of several essential references that mark out architectural production. The inventory of the Paris bridges and analysis of the historic forms of the Renaissance give rise to a host of configurations and features associated with the crossing aspect, denoting refreshing conceptual liberty. Inspired draughtsmen from the 20th century, architects such as Sant'Elia and, above all, Hugh Ferriss, who moves from towers to dams and bridges, deliver a spectacular vision of metropolitan cities via over-dimensioned, largely surrounded structures, vectors of

in-depth transformation. From infrastructure constructions to inhabited megastructures, architecture is giving a new twist to its reference points and updating channels of thought, pushing utopia to the absurd, from the constructivist delirium of El Lissitzky to the proliferating structures of Yona Friedman, not forgetting Archigram's «*Walking City*» and «*Plug-In City*». Contemporary Berlin thus outlined a linear city link above its Ring. The city of Curitiba, south of Sao Paulo, built a hypercenter served only by public transport (buses with their own site), heralding new forms of urban organization. Brazilian architects designed the building like an element of infrastructure, reversing the outlook, as it were. Lina Bo Bardi has set a fine example with the Sao Paulo Museum



of Fine Art – a bridge suspended between two pillars, facing the city.

Developing cities on the basis of the essential issue of flows and mobility has become an obvious fact, applicable all over the world and it calls for an imaginative response which is still somewhat lacking. The result of all this work is to give a vision of extra-territorial architecture, as if established off the ground, dominating the world, out of sync with reality, camped on the banks of utopia. Vittorio Gregotti's University of Calabria flies across hills and valleys in a similar manner to the Genoa motorway viaducts which stand out from the city. Fanciful visions or reality, these projects give a renewed outlook on infrastructure, questioning its end-purpose and shape, looking at structures upside down. Which is the horizon, what trace do they leave on the ground, what could they accommodate?

Using infrastructure or including various types of occupancy in its wake or shadow draws an avenue to the future in the heart of a city. The horizontal line of a roof is all it takes to give infrastructure an accommodating structure. How should it be occupied? How to enhance the value of all these neglected aspects before envisaging other more explicitly urban forms in the future?

Ills and remedies

Marc Hatzfeld, a sociologist and observer of the suburbs, recognizes for his wisdom, confirms the poor perception of infrastructure in general and proposes to transcend this observation by establishing links with the people that rub elbows with them rather than use them. «*Cities create tension between two groups of players – the decision-makers and the inhabitants – who generally never meet. My problem is to know how to associate the population, the residents in particular, with design and decision.*» Marc Hatzfeld considers that the answers to the problem of the forming of enclaves necessarily involve a planning policy which establishes the place and role of infrastructure to heal wounds, make good and repair slackened or uncompleted urban fabric. «*Linking flows and functions in infrastructure should foster acceptance by inhabitants, prevent the formation of enclaves and reconcile the city with its infrastructure*», he adds. New urban crossing or linkage mechanisms may constitute timely corrective or complementary action to build cities. «*Innovative infrastructure is called upon to correct deficient infrastructure*,» the sociologist points out, agreeing with the architect-engineer on the need to use the resources of

the problem to solve it. «*Infrastructure creates links – this is even its primary function – and we should not refrain from using this to construct new ones at all levels in all registers*,» states Marc Mimram. Backed by his experience in China, he observes that now, more than ever, people everywhere need to move around. «*In Tianjin, a city with 11 million inhabitants downstream of Beijing, where the river flows into the sea, there were only two bridges on the river only five years ago. I built two at one-year intervals and there will soon be eleven*,» he observed. «*How can we create a metropolis other than by its infrastructure?*», he asks, displaying skepticism in light of the urban boulevard solution presented as a cure for all ills.

Marc Hatzfeld also warns of this prevalence of flows in technical ways of thinking, taking care that we do not only produce «*circulating objects*» but also inhabited objects, with other uses and potential for social life. Everyone agrees on this point which is nonetheless often refuted by the solutions implemented.

Living within infrastructure a metropolitan horizon

Left to right:

- Collage based on the MASP by Lina Bo Bardi, Sao Paulo, Brazil.
- Collage, offshore platform; Monaco
- The landscape bridge, la Courneuve, France.
- Inhabited infrastructure, Lyon Confluence, France.
- (Top) Hugh Ferriss, 1929, New York, USA.

Turning infrastructure back into something positive

Attached to the visionary works of Le Corbusier or Hugh Ferriss, Marc Mimram is convinced that *«we now need to come back to infrastructure and other structures using the resources of our era. Belonging to the same horizontal register, bars and bridges are themes to be revisited and cross-matched.»* Rejecting inevitability and nostalgia, Djamel Klouche points out that *«new technical ability can also produce quality.»* Marc Hatzfeld shares this desire to forge ahead by turning disadvantages into positive points.

Infrastructure therefore deserves to be from now on

nurtured with an imaginative outlook, directing constructive thought. The new crossing typologies as defined by Marc Mimram associate the two themes in current trends of thought, density and diversity, erected as urban virtues. They will satisfy the three urban, technical and ecological dimensions required of an operational structure or development system, along with sustainable development. On an urban level, one should think beyond infrastructure and see it as an opportunity.

On a technical level, what structural, plastic material should be used to capture formal registers that are freer and more ambitious than those of conventional bridge-type structures? Concrete – the material most consumed worldwide after

water, available everywhere and now a high-tech product that allows for an infinite number of possibilities, a local, social material par excellence – is an essential part of this line of thought. The variety of responses is commensurate with the number of situations that dictate the production and process conditions (poured on the spot and/or precast, etc.). Ductal®, a high-tech material, now allows new types of light, inventive structures to be created, and opens up numerous possibilities to be explored.

From an ecological standpoint, everything is still to be invented and recorded, starting with a renewed conquest of the landscape, combining infrastructure and geography. Structures establish a landscape and technique. In the

future they will be used even more as a basis to establish their urban dimension, paying greater attention to people and limiting their environmental footprint with a flourish.

The study conducted by Marc Mimram in partnership with Lafarge opens up new, promising horizons that should inspire the planners, developers and inhabitants of every city in the world.

François Lamarre
Architect and journalist





On the outskirts of the world's cities, the unrest in the suburbs is due to the creation of enclaves, creating residential areas isolated from other districts and city centers. La Courneuve, in the Paris suburbs, illustrates this with a park of the same name cut off from the rest of the district by a motorway.

LA COURNEUVE

Corresponding to the artifice of the bridge could be an artifice of nature, not camouflage but a landscaped unity, providing a service for the city and opening up the horizon.

The Landscape Bridge

La Courneuve The Landscape Bridge

Left to right:

- Green circulation areas.
- Inhabited circulation areas.
- Inhabited area.
- Interior landscape.
- (Top) Layout plan.

The La Courneuve park is enjoyed by people out for the occasional walk, with the notable exception of anyone from the actual district itself. A paradoxical situation that can only be set to rights by bridging. Marc Mimram sees it as two languages in an area, one urban the other landscaped, winding above roadways, setting aside traffic and disturbance.

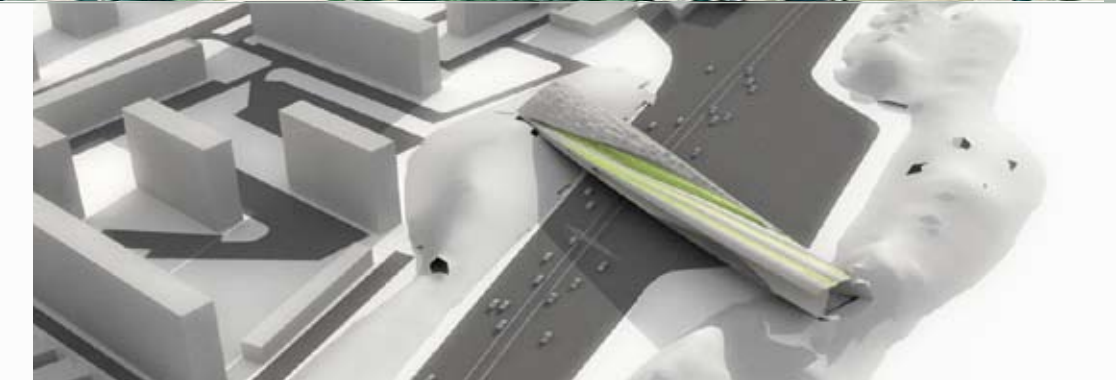
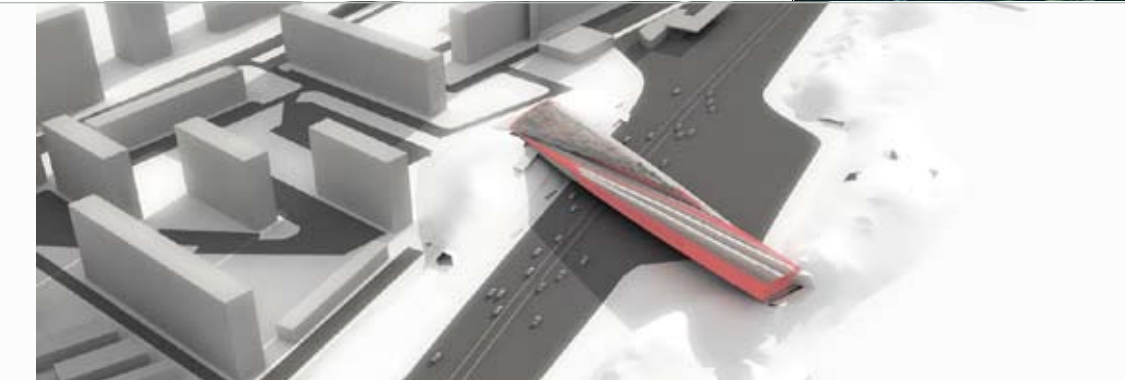
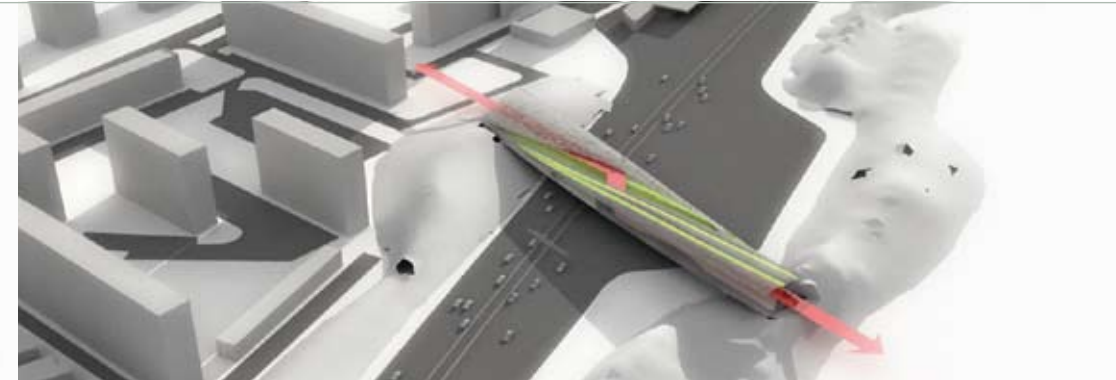
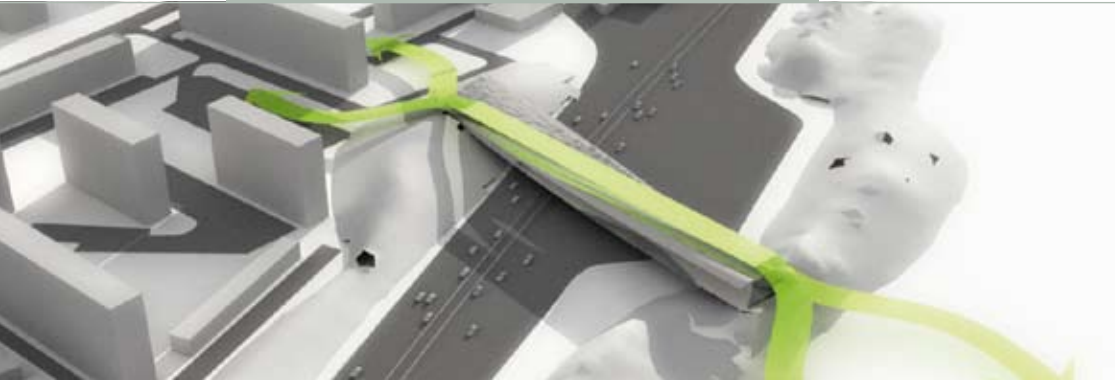
This «*landscape bridge*» is a natural extension connecting two sections of the area «*like a two-colored scarf weaving park and city together in a twist along a fold.*»

The structure takes on a landscaped dimension as a continuation of each bank, the scope of which extends beyond the actual bridge deck, taking on an unprecedented

volume and plastic definition that is not unlike a Möbius strip.

The strip-like structure can be readily devised and projected in Ductal®, since major infrastructure cannot disregard this ultra high performance fiber reinforced concrete which increases the structural and plastic capacities of conventional concrete.

«This geographic discovery tool, this urban clip, would consist of numerous landscaped elements to re-qualify and heal the scars in the land crossed.»



La Courneuve

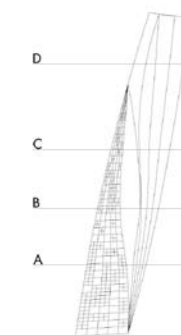
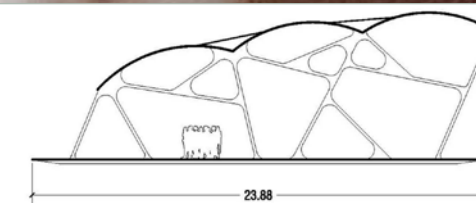
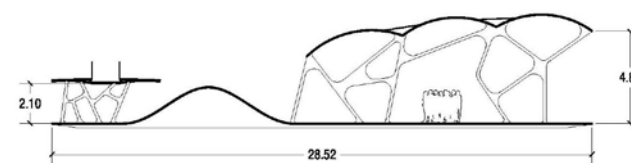
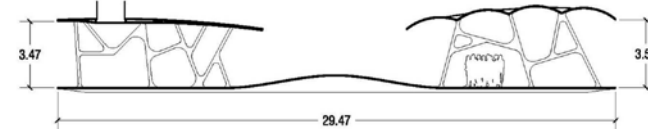
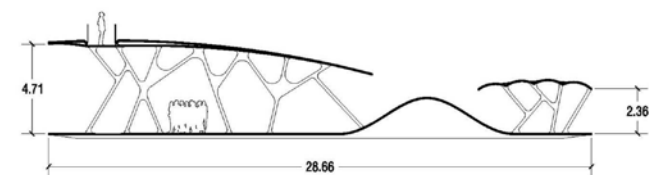
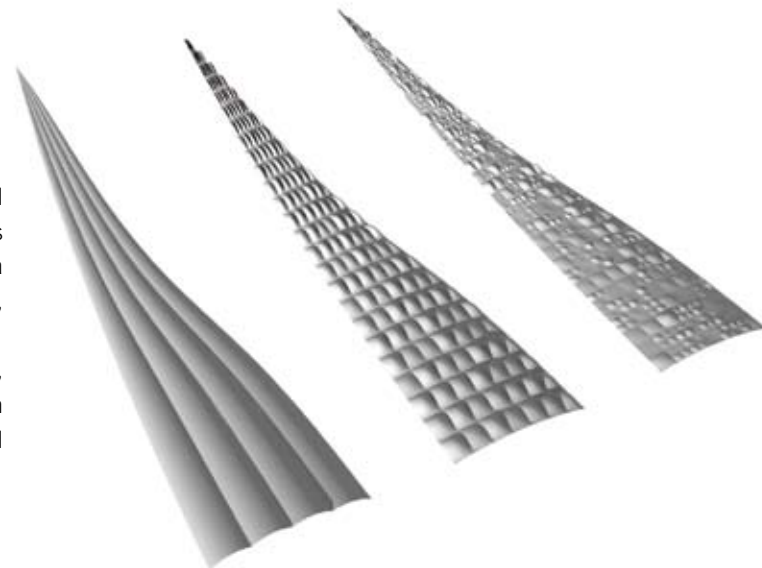
The Landscape Bridge

Left to right:
 - Section AA - Section BB - Section CC - Section DD.
 - Section plan.
 - (top of page 12) Variations on a Ductal® ultra-high performance fiber reinforced concrete roof module.
 - (top of page 13) Mesh structure above the highway, the bridge heals the scars on the land.

A technological recognition

The material lends itself to improvement in vaulted constructions and large soaring structures with thin shells from the great era of Nervi in Italy and France and Candela in Mexico, not forgetting the founder of pre-stressing, Eugène Freyssinet.

These heroic architects, dependent on an abundant, qualified labor force, can finally come back to life with the advent of new, ultra-technological, industrialized processes.





Fascinating by its fast expansion, Shanghai is in the spotlight with the Universal Exhibition to be held in 2010, on the heels of the Olympic Games in Beijing.

SHANGHAI

The Rooftop Bridge

To say there is an under-side to a bridge is a euphemism. However, this under-side should not be considered as a necessary lower part to the part above but, on the contrary, be given status as a public space that generously exceeds the purely functional quality of the surface.

Shanghai The Rooftop Bridge

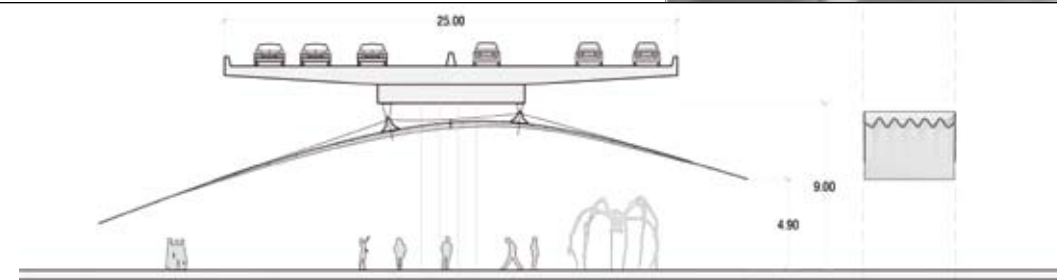
- Left to right:
- Curved design.
 - Wavy and perforated design.
 - Basic module for the creation of a canopy.
 - Cross-section.
 - Module design.
 - (top of page 17) Canopy modules using Ductal®.

Invasion by roadways as far as the Bund, along the Huangpu, the Chinese megacity is facing hitherto unforeseen mobility problems, making road infrastructure omnipresent at a height in the heart of the city. The dimension of the structures suggests we consider the apron as a roof and its underside as a potential public area acting as a bridge as well as other associated functions. The image of the rooftop bridge is a necessary one in many situations, modifying even the perception of existing bridges that can, as a result, develop further and change to the benefit of urbanity.

Considering the bridge as a roof

Let us forget the under-side and consider the bridge as a roof covering public areas by qualifying them. This roof constitutes an accommodating site, offered to the city free of charge by determining the places that it magnifies. Sheltering under a bridge means being accommodated in a public area in an open, plural manner, like daises that signify a place by designating it. Architecture is often tempted to sublimate this primary shelter by offering a roof rather than the limit; the under-side rather than the façades. Is the Mies Von Der Rohe National Gallery not primarily an immense roof offered to everyone, endeavoring to erase the

«This canopy, drape, fold, panel or cantilever marks everywhere the attention of the infrastructure to the city it crosses.»



Shanghai The Rooftop Bridge

Views of Canopy modules using Ductal®.

limits of façades to put the spotlight on the accommodation function and push back the social filter of the threshold, the crossing element represented by the façade?

Places to live and share

Considering a bridge as a roof, looking from time to time at the places it qualifies in the city, singling out significant spaces in the outline while, at the same time part of the unity of the infrastructure, means extending the simple functional status of the infrastructure taking off from the ground to gratify the lower part of the city from which it is attempting to escape.

Let us find these anchorages in the city once more, extend the simple infrastructure casing to make it a roof and thereby magnify the spaces shared by locating important public places beneath the roof for mutual benefit.





As the icon of the contemporary world, New York inspires us to dream of inhabited bridges that would allow us to take advantage of its magnificent geographic situation modeled by the river and the tremendous landscape of the banks, at the same time opening up solutions to the issues of space and density of a developing city.

NEW YORK

The Accommodating Structure

Bridges are a structure used to provide a crossing, often limited to the single function of transit. However, such structures can extend beyond transit to meet other urban challenges, opening up a dialogue between the city and its surrounding landscape, creating a counterpoint to the high rise urban constructions.

New York The Accommodating Structure

Left to Right:
- Layout plan.
- General elevation view.

Here the vertical city lies down to outline mega-structures on the river likely to offer residential potential. The river is crossed by a girder structure around a central core bearing and supporting a grill, the cavities of which are inhabited, a *«sort of bone-like structure extruded between the two banks.»*

We wish to explore this accommodating structure quality that can be inherent in a bridge both by increasing the urban situations and exchange of functions this can create and by the modularity, assembly and juxtaposition of elements that evolve with time and can be related to this accommodating structure.

Due to its immense inertia, the structure can then no longer

be limited to an opaque frame but become transparent lacework within which transit flows can be maintained. The structure enables an elevated street to be constructed between two broken open façades consisting of volumes detached from the ground.

«This city built around the superstructure can thus become a city of relationship, a city of development, dialoguing with the landscape in which it is situated.»



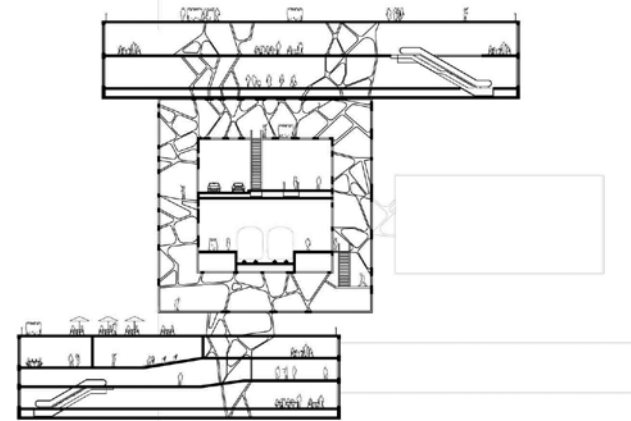
New York

The Accommodating Structure

- Left to right:
- Interior view.
 - An urban situation.
 - Cross-section.
 - View by night.

Building dialog

This towering city must not be seen as an independent element, leaving the lower side to its gloomy fate and its past history. On the contrary, it must use its infrastructure to set up a dialog between the tall buildings, weaving a new frame of reference above ground, in which infrastructure can play a positive role, a service which goes beyond transit flows and finds its place within its environment as a multi-functional resource, opening out into the nascent city, an embodiment of its role as a representative structure, a public amenity and even as a factor of production in direct link with the public service provided by infrastructure.





The concept of an inhabited bridge can be transferred to Moscow, with an inhabited bridge representing the crossing concept and the city in a merged form, similar to the anthological image of the Ponte Vecchio over the Arno, marking the golden age of inhabited bridges.

MOSCOW

This unity built into the landscape goes beyond its inherent transit function to embrace pathways, multiple walks and varied outlooks standing out against the landscape.

The Inhabited Structure

MOSCOW

The Inhabited Structure

- Left to right:
- An urban situation.
 - Layout plan.
 - Ductal® mesh assembly principle.
 - View from central circulation area.

This inhabited bridge tradition can now regain its full meaning thanks to modern structural developments, the new opportunities offered by new building materials, and the attention paid to urban planning. All this in relation to the river that saw it come into existence and the surrounding geography and urban development that justify its construction.

It is interesting to note that in the meantime the vertical, upright city has developed around these conditions of transport (lift), supply (fluids) and structure, each time exceeding height limits, soon to reach the 1-mile tower that Frank Lloyd Wright dreamed of.

It is time to look at this progress, setting these towers on

their sides once again to transform them into inhabited bridges and return to the conditions of geography.

The inhabited bridge can achieve this new synthesis between technology, geography and urban attention, by marking in the pathway of the infrastructure a particular sequence in relation to the landscape in which it is situated.

«Geography, orientation, landscape and history are conditions that are equally as decisive as the resistance of materials in the choices they allow us to make on the situated project.

The bridge then enters into dialog with the landscape, takes from it its decisive structural elements and the scale of its components.

However, a bridge is not a solitary object; it magnifies here the Moscow geography that saw it come into being.»

