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CRESCEENDO

12

Promises of a “fertile” city

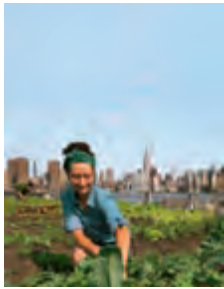
How can we meet
the energy challenge?
The symbolism of walls

Building for sustainability

Hydromedia™, new generation
permeable concrete
Portrait of a young mason
in Ecuador



bringing materials to *life*™



Cover
> City dwellers working in their community gardens in New York.
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BRUNO LAFONT
Chairman and CEO
of Lafarge

“New ways of building
the cities of tomorrow”

by the year 2050, two-thirds of the world's population will live in an urban environment. Cities will have been transformed, and hundreds of millions of men and women will have adopted new lifestyles.

This constitutes both an enormous challenge and an immense opportunity for the construction sector. It will be a challenge because the housing needs of this new urban population will be combined with increasingly urgent warnings about the growing shortage of natural resources. And an opportunity, because this situation inspire us to invent new solutions and devise new ways of building.

As a player in the construction sector, our primary responsibility is to increase the sustainability of the towns and cities we construct. To achieve this, we are committed to reducing the carbon footprint of our products and of buildings, improving their energy efficiency and optimizing construction costs.

Our chief asset in this is concrete. It has a low environmental footprint and is available throughout the world at a reasonable cost. Although it is centuries old, it offers unlimited potential for innovation and progress. The concrete of today bears little resemblance to that of yesterday, and yet it still offers us promising prospects. Our challenge today is to optimize its properties so that it is seen as an essential material in sustainable construction solutions. Our research and development activity is focused on this objective.

In parallel, we are carrying out far-reaching work in partnership with construction industry professionals, particularly those whose role it is to design buildings: architects and urban planners. By constantly listening to their needs and collaborating with them, day after day, on solutions that will enable them to achieve the architectural, technical and economic potential of their projects, we are playing an active part in constructing a sustainable world that is adapted to new lifestyles.

In the news

Right page photo
> *A passer-by* in a
public park in Mumbai
(Bombay), India.



CONSTRUCTION

A white cloud hovers over the red vines of Saint-Émilion

BEYOND THE VINES GROWING IN THE CHEVAL BLANC VINEYARD AT SAINT-ÉMILION IN SOUTHWESTERN FRANCE, a magnificent new storehouse looks down on them. A palace in white dedicated to red wine, the building's interior space is entirely devoted to the work of maturing this grand vintage wine. The highly original, softly curved lines give the building the lightness of a cloud. Architect Christian de Portzamparc wanted the storehouse to appear to "float gently above the vines". The illusion of movement is rendered perfectly by four curved elements just 40 cm thick, cast in Agilia® concrete. The complex structure houses a fermentation cellar and a barrel cellar, with everything designed according to the needs of the wine production process. The dimensions, the choice of raw materials and the colonnades invite calm and contemplation. A refined setting in which this highly valued vintage wine can mature. ■

PUBLICATION
THE CITY VERSION 2.0

"CITIES AND DIGITALIZATION" IS THE TITLE OF A REPORT THAT FOCUSES ON THE USE OF DIGITAL TECHNOLOGIES to promote responsible and environmentally-aware urban development. It is based on innovative pilot projects carried out in France. Bruno Lafont, Chairman and CEO of Lafarge, personally presented the report to the Mayor of Chongqing at the fifth meeting of the Chongqing Mayor's International Economic Advisory Council (CMIA). ■



ENGINEERING
THE ÉCOLE DES PONTS PARISTECH AND LAFARGE PREPARE FOR THE INNOVATION OF TOMORROW

A TRAINING PROGRAM IN THE FIELD OF BUILDING MATERIALS HAS BEEN AVAILABLE SINCE 2006 AT THE ÉCOLE DES PONTS PARISTECH through the Lafarge-sponsored Chair in "Materials Science for Sustainable Construction". The masters degree of the same name champions a unique interdisciplinary approach (chemistry, mechanics, physics etc.) that focuses on the ecological footprint of materials. It prepares students to contribute to tomorrow's scientific progress, whether they go on to work in industry or for research organizations. Lafarge provides grants that enable foreign students to take part in the training and allow participants to attend international conferences and complete part of their studies abroad. Most of the participants in the masters program have decided to continue with research leading to a thesis. ■

Each year, the Carbon Disclosure Project (CDP) assesses 500 major corporations regarding their strategies and initiatives in the fight against climate change. In 2011, Lafarge was ranked in the Top 10 overall worldwide for the second year running. ■ LAFARGE is the world's top industrial operator and cement producer, and is the highest-placed French company in the Disclosure index.



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EXPLORING

AT A GLANCE

“GREEN” LUNGS

Areas of greenery in urban areas contribute to air quality, the absorption of CO₂ and more broadly to the comfort of their inhabitants. They also play a part in regulating temperatures, and thus influence the energy consumption of buildings. In some cities, particularly in developing countries, green spaces take the form of farmland, which is indispensable to the survival of the population. |

PLANTS AS CARBON SINKS

Urban greenery is a largely under-estimated resource for reducing the carbon emissions of cities. This is the conclusion of a study published in July 2011 by the British Ecological Society in the *Journal of Applied Ecology*, based on measuring the quantity of CO₂ that could be absorbed by greenery in Europe’s urban zones. |

2/3
of the world’s
population will live
in cities in 2050.

For the first time in the history of humanity, the population of cities and towns exceeded that of the countryside in 2007, according to the

World Bank. By 2050, the number of city-dwellers is expected to practically double to

6.3 billion
people, compared
to 3.4 billion today.

> SCIENCE

THE PHENOMENON OF URBAN ISLANDS

The built surface of towns and cities stocks and increases the heat from the sun’s rays. Using heat-sensitive cameras, studies carried out by NASA over the city of Atlanta, USA, (nicknamed Hotlanta by locals partly for its extreme nightlife and partly for its scorching summers) demonstrated that during periods of intense heat, the difference in temperature between areas of vegetation and urban areas could be up to 20°C!

Biodiversity under threat. THE AUSTRALIAN RESEARCH CENTER FOR URBAN ECOLOGY HAS CONDUCTED A STUDY OF THE EXTINCTION RATES OF PLANT SPECIES IN 22 LARGE CITIES AROUND THE WORLD. IT SHOWED THAT VERY DENSE CITIES, SUCH AS New York AND Singapore, HAD LOST MORE THAN 90% of their original flora. ON THE OTHER HAND, THE “greenest” CITIES, SUCH AS San Diego, USA, OR Durban, South Africa, STILL RETAIN AROUND TWO-THIRDS.



© Pauline Daniel

In many of the world’s large cities, the idea of devoting more space to parks and gardens as part of the urban fabric is gaining ground, a trend that helps meet environmental concerns and covers cultivated land issues.

Promises of a “fertile” city

For hundreds of years, cities have developed by opposition to nature. Although it wasn’t their only function, urban space has for centuries provided man with a defense against bad weather, encroaching vegetation, even wild animals. Over time, of course, green spaces have been preserved or created in the urban fabric, but mostly with an orderly and controlled vision and a distinct demarcation line between built and green areas. And without any genuine ecological thought. This concept reached its peak with the development of industrial and post-industrial cities. In more recent years, mentalities have changed. This is a direct consequence of a rise in environmental concerns and

Numerous urban generation projects now demand an alternative connection between built space and the natural environment.

> *Kings Park*, a haven of green in the center of Perth, Western Australia.

fears generated by rampant urban growth throughout the planet. Stemming from Scandinavian and Anglo-Saxon countries, this tendency is based on a different relationship between the city and nature, and more particularly its most visible form, vegetation. Whether for the creation of new residential neighborhoods, the renovation of densely populated zones or the rehabilitation of brownfield sites, numerous urban generation projects now demand an alternative connection between built space and the natural environment. Cities such as Berlin, Munich, Copenhagen and Helsinki, to give just four examples, have adopted urban development plans that emphasize eco-neighborhoods and more “natural” vegetation. The new place accorded to greenery goes much farther than ornamental considerations or the pleasure for inhabitants of living in greener cities. At a time when the reduction of carbon



© Wim KLERKLAUF-REA

> **Organic vegetable garden**, tended by local community members in Caracas, Venezuela.

Plants first of all constitute outstanding carbon sinks and contribute to air quality.

emissions is a priority, plants first of all constitute outstanding carbon sinks. They contribute to air quality, and are also excellent temperature regulators due to the phenomenon of evapotranspiration (*see below*). “Several studies have shown the eco-systemic benefits of planted surfaces in urban zones,” points out Élisabeth Dorier-Apprill, a professor of geography at the University

of Provence, France, specializing in urban environments. “These include reducing temperature variations as well as combating pollution, increasing ground permeability, reducing stress, limiting illness and disease, and so on.”

The goodness of green

But the regulation of temperature, the fight against pollution and beneficial effects on the health of city-dwellers are not the only advantages of patches of nature within the urban environment. When they are cultivated, green spaces can also become a source of food. In many parts of the world, city-dwellers grow their own food. According to the United Nations Food and Agriculture Organization (FAO), there are around 700 million of them. “In countries with a humid tropical climate, you will often find fruit trees or a small piece of land in front of a house, intended to feed the family,” explains Dorier-Apprill.

These urban farmers are primarily in emerging or developing countries, but there are more and more cultivated surfaces in large western cities. On the model of allotments

dating back to the late 19th and early 20th centuries, new agricultural spaces are being developed on the periphery of cities, even in the very heart of certain eco-neighborhoods. Often using organic farming methods, people grow fruit and vegetables either for their own consumption or for selling on short supply chains. A number of organizations created to help people excluded from the labor market have chosen this sector as a means of providing work opportunities. One such example is the Jardins de Cocagne (“Gardens of Plenty”), a European network of non-profit associations that promote the production and distribution of organic fruit and vegetables.

City-center farming

It is hard to imagine meeting the food needs of three and a half billion city-dwellers by this means alone. However, the new concept of vertical farms is now opening up new prospects for urban agriculture. The idea is to use buildings of several stories for the hydroponic (soil-free) cultivation of fruit and vegetables, as well as for poultry and shellfish. Production in these high-tech buildings is possible in all seasons due to a system of very low-consumption lighting, a highly water-efficient, closed-circuit irrigation system and fertilizers produced by recycling plant waste.

“Vertical farms can produce yields thirty times greater than those produced by traditional intensive farming, which is occupying more and more land at the expense of biodiversity,” remarks Dr. Dickson Despommier, Professor of Microbiology at the University of Columbia

“The new concept of vertical farms is opening up new prospects for urban agriculture.”

and inventor of the concept. “Producing food in close proximity to where it is needed also avoids the need for transportation over long distances, and so reduces carbon emissions.” The first prototypes of these vertical farms are already operational in Japan (Nuvege in Kyoto), the Netherlands (PlantLab at DenBosch) and South Korea (a government project in Seoul). In view of the mounting world population and the increasing scarcity of arable land, who knows? Perhaps Dr. Despommier’s idea will turn out to be a clean and sustainable solution for feeding the population of the planet! ■

APART FROM THEIR USEFULNESS IN REPROCESSING CO₂, PLANTS ALSO HELP PREVENT TEMPERATURE PEAKS IN THE CITY... WHICH, IN TURN, HELPS REDUCE CO₂ EMISSIONS.

Places to keep cool

The existence of green spaces helps keep the thermometer under control. Through the phenomenon of plant evapotranspiration, the temperature in and close to gardens is regulated. This function can be precious in cities, where the built surface amplifies heat from the sun by approximately 30% and where air-conditioning systems working at full capacity consume energy heavily.

“The phenomena of urban density and global warming join forces to create extreme conditions in periods of great heat,” explains Stuart Gaffin, an associate research professor at the Columbia University Earth Institute. “In New York, the temperature rises above 30° C around fifteen times per year, and the situation is expected to get worse over the coming decades.” Hence the interest of the green roofs

and green walls that are springing up in our cities. “But these solutions are not appropriate for all situations and all climates,” observes Élisabeth Dorier-Apprill. “Transposing them directly to semi-arid climates, as could have been done in New Cairo, Egypt, or Marrakech, Morocco, can be catastrophic for water resources. In our latitudes, on the other hand, the regulating effect of green spaces is very effective!”



© Wouter Wiels

PASCAL CRIBIER
Landscape architect

A dream of gardens

What do you think of the trend of reintroducing more natural green spaces into cities?

Pascal Cribier : It's a mirage. Whenever there is human intervention, the very idea of nature no longer exists. You have to be lucid: a garden is pure artifice, the exact opposite of nature.

THE LANDSCAPE ARCHITECT PASCAL CRIBIER IS AN OUTSPOKEN AND CONTROVERSIAL FIGURE. HE ELOQUENTLY EXPRESSES HIS ICONOCLASTIC VIEWS, MAINTAINING HIS CONVICTION THAT IN LANDSCAPE ARCHITECTURE IT IS POSSIBLE TO COMBINE POETRY WITH EFFECTIVE URBAN SUSTAINABILITY.

That sounds surprising, coming from a landscape architect ...

P.C. : I love nature, genuine nature, nature that develops spontaneously because seeds are re-sown according to the rhythm of the seasons. But there's nothing natural about landscapes. They result from political, economic and cultural decisions. They are always manufactured, with a logic of efficiency.

So in that case, how do you “manufacture” your gardens?

P.C. : All my projects are based on a contextual vision: I go out onto the land, I feel the ground, I observe what is already growing there. Too many projects dispense with these things that I think are fundamental. And I would say that I have a radical approach in that I design real gardens, not public service amenities.

What do you mean by that?

P.C. : These days, people often install playgrounds, skateboard tracks, basketball nets, all surrounded by a bit of greenery. They are places that don't generate any poetry. In my view, people need to admire beautiful blooms as much as to watch kids playing basketball.

Do you have examples of parks or gardens that meet your criteria?

P.C. : The parks in London are a success, particularly Hyde Park. The Central Park Reservoir in New York and the Buttes Chaumont in Paris are sublime. They transport us out of the city, to a timeless place.

Aren't there any contemporary projects that find favor with you?

P.C. : Of course there are! I adore the High Line, the disused elevated railroad line that the City of New York has

converted into a greenway. I'm also impressed by the Cultuurpark Westergasfabriek, which is a radical transformation of a disused industrial site near Amsterdam designed by Kathryn Gustafson.

How would you describe your ideal urban garden?

P.C. : My perfect dream is to create a garden of perhaps thirty or forty hectares with plants that would be able to grow at their own speed by switching off the street lighting at night. Inside there would be a real space devoted to real nature, which would be off-limits to the local residents. It would be a sanctuary reserved for scientists, who could observe the flora and fauna and then tell us about it. I've never been asked to do this, but I haven't lost hope! ■

Rising energy costs and stringent regulations governing carbon emissions constitute a double challenge for industrial operators. In every sector, companies have adopted policies designed to optimize their energy consumption while continuing to explore alternative paths of research and development.

How can we meet the energy challenge?

BACKGROUND

In 1973, it was estimated that proven oil reserves would provide thirty years of consumption.

But by 2003, oil consumption had risen to 150% of them! Today, experts estimate that current reserves represent forty years of consumption. This is not really a series of bad calculations! Technological progress has made it possible to extract reserves that were once inaccessible, due to deep offshore drilling, for instance. And price increases have made it profitable to extract reserves that were thought to be too costly when the price per barrel was low.

Since the turn of the previous decade, energy prices have risen steeply.

Increasing worldwide demand continues to drive prices higher which weighs heavily on industrial costs.

boosted by emerging development markets, world energy consumption – notwithstanding the economic crisis – is growing by 3% annually, and this is generating market tension. For industrial operators, especially in industries with high energy consumption (steel, cement, glass, aluminum, chemicals, refining, paper, etc.), this is a critical strategic issue, firstly in terms of competitiveness, since spending on energy can constitute between 10% and 30% of production costs. Next, in terms of securing supply, particularly in emerging markets, where the infrastructure does not always make it possible to guarantee transportation. And finally, because in the fight against climate change, all companies are obliged to cut their carbon emissions. All energy-hungry sectors have therefore embarked on programs seeking to reduce energy expenses.

Getting the mix right

Coal, gas, oil and electricity have not all undergone the same price variations. In order to guarantee supply and restrict the consequences of price fluctuations, some industries make use of

a number of types of energy, proportions of which vary according to circumstances. Companies endeavoring to reduce both their dependence on fossil fuels and their carbon emissions are also adding renewable energies (recycled waste, bio-fuels, etc.) to their energy mix.

In a context of strong price volatility, it is also possible to ensure a constant purchase price by negotiating contracts with suppliers on a long-term basis. And when the nature of the industry allows, specific measures can be taken to help contribute to reducing costs: for example, plants may operate only when they pay off-peak prices for electricity and can be put on standby at peak periods. The same principle can be applied to “stockable” energies by building up reserves when prices are low. “Of course, it’s possible to achieve marginal savings by managing supplies intelligently,” observes Emmanuel Haton, Director of European affairs for the BP group. “But for industrial operators, the only truly compelling method over the long term is energy efficiency, i.e. the improvement of processes in order

“The cheapest and least polluting form of energy is the energy you haven’t consumed.”

...

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FACTS

By 2030, energy consumption is expected to increase by **40%** in emerging markets.

Approximately **85%** of the world’s energy requirements are met from non-renewable resources.

Oil prices hit a record high of **US\$ 144.27** per barrel in July 2008.

More than **65%** of greenhouse gas emissions are due to world energy consumption.

Source: International Energy Agency.

> *Storage area for rice husks used as an alternative fuel in the kilns of the Arasmata cement plant, India.*



© Jared Moosy / Redux-Réa



© Bernard Richebel

“Energy efficiency is a winning strategy”

Three questions for **Olivier Appert**, Chief Executive of IFP Énergies Nouvelles.

Is the energy question more complex for companies to manage today than in the past?

Olivier Appert: Without a doubt. Companies are confronted by an increasingly complex picture with regard to energy which they find it hard to make sense of. Now, industrial strategies are not suited to uncertainty. What's more, the energy question is becoming more important for them because the price of energy is rising and there is no reason why the trend that began at the start of the last decade won't continue.

Where does this uncertainty arise from?

O.A.: There are several factors. Fukushima and the drilling platform accident in the Gulf of Mexico can seriously call energy policies into question, as we saw happen recently in Germany. The Arab Spring uprisings and developments in Libya and elsewhere can provoke a risk of destabilization of the North Africa/Middle East region, where two thirds of petroleum reserves are concentrated: quite obviously, this is a source of uncertainty. New technologies allowing the extraction of shale gas and coal gas have changed the situation as far as the energy mix is concerned. And I would add to this the prospects of changing carbon emissions regulations, which are hanging like a sword

> Shale gas drilling rig, Texas, USA.

This extraction process, whose impact on the environment is highly controversial, remains forbidden in some countries.

of Damocles over industries that consume energy heavily. And the final factor is all the uncertainty surrounding the deregulation of energy markets.

What strategy should we adopt to cope with these transformations?

O.A.: Companies have developed expertise in dealing with price volatility, and have created tools allowing them to be supplied at the lowest price. This may entail taking advantage of market opportunities created by deregulation, or replacing one form of energy by another, as occurred in the United States, where shale gas mining has had the impact of a windfall. But the only valid course of action over the long term is that of energy efficiency. It corresponds to two crucial issues that industrial players face, the cost of energy and the security of supply, and it helps them prepare for the arrival of stricter carbon emission regulations. It's a winning strategy, because by focusing on everything that enables them to reduce consumption, and thus their emissions, companies end up making their entire industrial process perform better. ■

IFP ÉNERGIES NOUVELLES

IFPEN is a public-sector innovation and training center. Its mission is to provide public players and industry with solutions for meeting challenges posed by climate change, energy diversification and water resource management. IFPEN's research programs and expertise have acquired an international dimension.

Its research focuses on five strategic priorities:

renewable energies, sustainable resources, eco-friendly production, eco-efficient processes and innovative transport.

EXPLORING THE QUESTION

... to produce a given quantity with the use of less energy. The cheapest and least polluting form of energy is the energy you haven't consumed.”

Optimizing processes

Over the years, considerable reductions in energy consumption have been achieved by adapting production tools and processes. In the aluminum industry, for instance, energy consumption per ton manufactured has fallen by one third since 1950. It is much the same story in the iron and steel industry, where the rationalization of processes has produced significant results. “By improving our production methods, increasing recycling and adapting our processes, we managed to cut our CO₂ emissions per ton of cast iron produced by 18% between 1990 and 2005,” states Emmanuel Rodriguez, General Manager, Energy, at Arcelor-Mittal. Similarly, in the oil refining industry, in which energy represents one third of costs, oil companies operating in Europe have successfully maintained their competitiveness in the face of more restrictive regulations. “Although the most up-to-date industrial facilities are frequently the most efficient, European refineries are among the best performing in the world, even though they are not among the most recent,” points out Emmanuel Haton. “Whatever the industrial sector, progress is most often the result of improving existing tools,

“Whatever the industrial sector, progress is most often the result of improving existing tools, processes and ways of doing things”

processes and ways of doing things. Major technological breakthroughs are rare in the industrial universe of raw materials processing,” argues Thierry Berthoud, Managing Director, Energy and Climate at the World Business Council for Sustainable Development (WBCSD). Denis Petit-Maire, International Technical Director of Saint Gobain Glass, a sector where energy accounts for one quarter of production costs, is of the same opinion: “Since the 1980s, we have had an R&D structure tasked with finding the major innovation that would give us a ten-year lead over our competitors. And thirty years later, it's our policy of continuous improvement that has been responsible for reducing our energy consumption by around 25%. But we still continue to invest in R&D, in the hope of a technological breakthrough.”

Future technological progress

This hope may possibly come to fruition in the steelmaking industry, thanks to a European research program launched ten years ago by 48 companies and bodies operating in the sector. Named ULCOS (Ultra-Low Carbon Dioxide

Steelmaking), the project set itself the target of cutting carbon emissions by at least 50%. The innovations emerging from the project, which are expect-

ed to revolutionize the entire production chain, are likely to give rise to the first industrial applications in 2016.

“We have no option but to reduce our dependence on fossil energies, particularly gas and oil,” asserts Jean-Paul Bouttes, Head of Strategy and Prospective at the EDF group, “less for reasons of physical scarcity, because resources do exist, than for geopolitical, economic and environmental reasons. In this regard, electricity is an efficient energy carrier, because it can be produced from a number of different primary energy sources.” Electricity can make it possible to reconcile supply security, competitiveness and climate, provided we adopt suitable technologies, particularly in developing countries. Hydro-electricity, onshore wind farms and nuclear power do not emit CO₂. And a number of promising technologies, such as offshore wind farms and solar energy, should gain ground. All these solutions, combined with carbon capture technologies and, of course, improvements in energy efficiency, enable us to look forward to a cleaner and more sustainable future. ■

LAFARGE HAS UNDERTAKEN AN AMBITIOUS PROGRAM FOR TRANSFORMING WASTE INTO A SOURCE OF ENERGY.

Looking for alternatives

Energy is increasingly expensive, fossil fuels are starting to become scarce and carbon emission levels are rising. In view of this triple observation, technical teams at Lafarge began to explore the possibilities of alternative fuels. **The aim** was to replace conventional energy sources in the production process by waste. The Group has now

carried out a large number of initiatives to incinerate in its kilns used tires, sludge, solvents, used oil, biomass and various types of industrial waste as a substitute for natural gas or coal. **In September 2011, waste covered 15% of the Group's energy needs**, versus 11.7% in 2010. To make further progress, the Group has now set up

a unit specifically dedicated to industrial ecology strategy, which will be responsible for organizing recovery streams and supplying alternative fuels to the various sites. A joint project launched by Lafarge and WWF in Canada is also investigating the feasibility of creating a business for the production of biofuel (see following page).

Energy accounts for roughly

30%
of the production cost of cement.

94%
of the energy consumed by the Group is used in cement manufacturing.



© Ignus Gerber / Médiathèque Lafarge

> **2.7 million tons** of waste and biomass are incinerated every year by Lafarge plants around the world.

Lafarge has been interested in developing alternative fuels for many years. Working in partnership with WWF, it is currently investigating the feasibility of creating an agricultural activity for producing biofuels in Canada. The project offers a solution to pressing environmental and industrial concerns. It is now delivering its first results.



Biofuel trials point the way to green energy

In October 2010, a flurry of activity could be seen around the Lafarge cement plant in Bath, Ontario, Canada. Numerous farm machines were constantly coming and going, delivering bundles of crops for shredding, while farmers from the region looked on, supervising operations.

The cement plant was not being turned into a farming cooperative, but it was carrying out a full-scale trial of the diversification of energy sources. For three days, the cement plant's kiln ran on coal, added to

which were shredded crops that had been grown on the land surrounding the facility. The use of biomass as an alternative fuel is not a new idea. "But it is currently based on the principles of industrial ecology, and consists in recovering fragments of plants such as husks, shells and stalks not utilized by other local industries," comments Steven Price, Senior Director, Conservation Science & Practice at WWF Canada. The availability of these alternative fuels thus depends upon other sectors of activity. The project that was

The science of plants

A research team at Queen's University in Kingston, Ontario, is taking part in the project initiated by Lafarge and WWF, comparing different plant species according to their energy output and water consumption. But some of the crops can also have hidden virtues. "Some of the plants under study have the capacity to discharge carbon into the soil," explains research scientist Erin Jaggard. "This is very useful, because high carbon content makes soil rich and fertile."

PARTNERS FOR TEN YEARS, LAFARGE AND WWF HAVE JOINED FORCES TO CARRY OUT A PROJECT FOR DEVELOPING A BIOENERGY BUSINESS IN CANADA. HERE ARE BOTH SIDES OF THE STORY.



ROB CUMMING,
Environment and Public Affairs Manager
of Lafarge's Cement business in Ontario

High performance, low emissions

How were the trials organized?

We transported plants to the facility and shredded them onsite. We then fed this biomass into the kiln. An independent company came to perform a comparative reading of emissions, first with our normal fuels and then with the addition of biomass.

Was the test conclusive?

The 10% portion of alternative fuel was used for three days. Not all the results have been analyzed to date, but it's fair to say it was successful. On the one hand, we observed no reduction in the performance of our kiln, and, on the other hand, CO₂ emissions generated by the fuels fell by around 8%.

Were local communities involved in the project?

Of course. It was local farmers who cultivated the crops on land belonging to the cement plant. Their involvement is essential for two reasons: for one thing, any environmental initiative is more effective when local communities are aware of it, but, more than that, the farmers could well become our suppliers in the future.



STEVEN PRICE,
Senior Director, Conservation Science
& Practice at WWF Canada

A broad and enriching partnership

How did WWF Canada come to take part in the project?

Lafarge and WWF have been partners for ten years. In 2008, when Lafarge launched a biofuel production research project, the Group naturally contacted WWF in Canada. We were interested straight away, because we also believe in the future of this type of alternative fuel.

The partnership then became broader, didn't it?

Yes. Queen's University, the Royal Military College, and the Federal and Regional authorities all wanted to be involved with the project. The diversity of viewpoints and approaches enabled us to enrich our research and helped generate better results.

What are the next steps?

We want to create a biofuel production model that is both economically viable and environmentally friendly. WWF is contributing to defining the standards to which biofuel production will have to comply. In particular, it's necessary to limit water consumption and carbon emissions relating to this activity. In the future, Lafarge will insist that its suppliers comply with these criteria so that a responsible alternative energy business can develop.

launched in 2008 in Canada goes much further than this, because the objective is to establish a specific production stream.

> ENSURING SUPPLY

Working in conjunction with WWF Canada and Queen's University in Kingston, Ontario, Lafarge is looking into the possibilities offered by the creation of this activity, which lies at the intersection of the agricultural and industrial sectors. But to open the way to the production of an economically viable biofuel, the correct choices have to be made right from the start. The species of plants grown, the techniques for transformation into biofuel and the most environmentally-friendly production methods have to be chosen scientifically.

"If it's not all properly thought out, the creation of a new agricultural business could increase water consumption, destroy natural habitats or encroach on land used to cultivate crops for human consumption," points out Price. Lafarge and WWF are analyzing these questions hoping to devise a responsible development model. The Group is still in the early stages of the process, but the experience it is acquiring today will give it a valuable lead in this field. In the framework of its partnership with WWF, the Group has committed itself to cutting its greenhouse gas



> Several hectares of land belonging to the Bath facility have been cultivated by local farmers in order to produce the crops necessary for the diversification of energy sources.

emissions and; more broadly, to reducing its environmental impact. The use of fossil fuels has a high environmental impact and is contributing to climate change.

"If it takes ten years to develop a new fuel production infrastructure, then it's better to get started ten years early," reflects Rob Cumming, Environment and Public Affairs Manager at Lafarge Cement, Eastern Canada. "On matters as important as this, it is essential to have a long-term vision." ■

6

USA
The power
of mural art

Inspired by a Mexican artistic movement dating back to the 1920s, muralism has been part of Philadelphia's cultural identity for well over twenty years. Launched by artist Jane Golden in 1984, the Mural Arts Program invites both experienced artists and beginners to paint frescoes on the walls of the city. The aims were to promote dialog between inhabitants, encourage people to embellish their environment and keep young people out of delinquency. Such was the project's success that the city authorities were soon supporting and financing the program. Today around 3,000 frescoes adorn the walls of a city once well known for graffiti and criminality, and are the pride of its inhabitants.



© René Matthes / Hervis

The symbolism of walls

Scars of ancient conflicts, vestiges of the Cold War or barriers to terrorism and immigration, walls criss-cross the planet. Over the years, artistic and cultural activities have breached these barriers intended to isolate or exclude people.



6

CHINA
The biggest wall
of them all

The Great Wall of China remains to this day the world's largest fortification in terms of length, surface and volume.

Intended to defend the country's northern border, it stretches over roughly 6,700 km, from the border with North Korea to

the Gobi Desert. Its width varies between five and seven meters, its height between six and eight meters. The time taken to build it was proportional to its vast dimensions: commenced in the 3rd century BC, it was not completed until the 17th century. During these two thousand years, an estimated ten million workers died and were buried close to the Wall, making it also the world's largest cemetery.

From the *limes* that delineated the Roman Empire to the Maginot Line, from medieval ramparts to the Great Wall of China, walls have been a recurrent phenomenon in human civilization. Major separation walls have been built throughout history, leaving a strong imprint not only on the landscape but also in the collective memory. Demonstrating man's inability to resolve conflicts, the walls of the contemporary world sometimes embody frontiers. This is the case of the wall built by Kuwait the full length of its border with Iraq. But not all of them demarcate countries; they can also separate regions, cities, even neighborhoods. The Berlin Wall separated citizens of the Soviet Bloc from those of the West for thirty years, and the Nicosia Wall in Cyprus has divided the Greek and Turkish districts of the capital since 1974. Similarly, in Belfast, Northern Ireland, Protestants and Catholics continue to confront each other across walls of segregation. Although the conflict is officially over and the terrorists have dropped their weapons, the two communities perpetuate a philosophy of separation by building what they call "peace lines". Even in the city's cemetery, a wall separates the victims of the civil war between Loyalists and Republicans. According to a 2008 poll, 60% of the local population want to see the walls demolished but they only envisage this happening in the distant future.

Artistic expression

But walls that keep some people out or others in serve a dual purpose. All forms of prevention invite violation, and walls inspire people to find ways of subverting them. Some people seeking a better life have the courage to go over them, while others give voice to their freedom of expression on the very surfaces that curtail their freedom of movement. Like the Berlin Wall, all 155 kilometers of which were tagged and covered with graffiti, the walls in Belfast have become canvases on which to protest and invent. Now an integral part of the urban landscape, some 1,400 frescoes have become the "signature" of the city, just as the long dismantled Berlin Wall now belongs to the cultural heritage of the reunified Germany. Far from Europe, on the Israeli-West Bank separation barrier, artists and anonymous members of the public have taken possession of kilometers of blank surfaces inadvertently provided by the Israeli authorities. Thus the highly politicized, British street artist Banksy, renowned for his social-

ly aware and subversive graffiti, produced nine paintings supporting freedom in 2005: they show children building sand castles, imaginary landscapes, a little girl carried away by balloons. In 2007, the photographer JR staged an unofficial exhibition called "Face 2 Face", consisting of enormous portraits of Israelis and Palestinians displayed face to face on both sides of the security barrier. They temporarily transformed the "wall of shame" into a plea for reconciliation.

Remembrance and sharing

Other walls, relics of a more ancient past, have survived through the centuries, gradually gaining universal symbolic significance. One of the world's most iconic sacred walls is the "Wailing Wall" in Jerusalem, a place of prayer and meditation for Jews. It also supports the esplanade on which the Dome of the Rock and the Al Aqsa mosque stand, Islam's third holiest site after Mecca and Medina. The Communards' Wall in Paris, the site of bloody massacres during the Paris Commune uprising, has also become a gathering place, a symbol of the struggle for liberty. More modern walls are also designed to have a commemorative dimension. Numerous examples forming part of recently built monuments include the Caen Memorial in Normandy, near the D-Day beaches, and the Shoah Memorial in Paris. Like pages of history set upright, such walls enable visitors to read messages of hope or stand in remembrance: a quotation in one case, the names of the victims of the Holocaust in the other.

In a similar spirit, a commemorative fresco in honor of the champion of the destitute, ...



ENGLAND How Hadrian's Wall helped foreigners settle

Begun in AD122 on the orders of the Emperor Hadrian, keen to protect the Empire from attacks by tribes from Caledonia (present-day Scotland), the fortification stretches 120 km from the mouth of the Solway Firth to Newcastle-upon-Tyne. Early in the 5th century, the decline of the Roman Empire saw the garrison's 9,000 men progressively abandon their posts and

settle in the region as simple peasants. So against all expectations, the Wall ended up helping foreigners integrate into the local population.



FRANCE The Wall for Peace creates discord

Designed by artist Clara Halter and architect Jean-Michel Wilmotte, this wall, which bears the word "peace" in 49 languages, has been the subject

of much controversy since it was erected in March 2000 in front of the École Militaire on the Champ-de-Mars in Paris. Although originally installed for just four months as part of the Millennium celebrations, the metal structure clad in wood, stainless steel and glass is still there ten years later, much to the displeasure of its detractors, who are opposed to its location, its legality and even its artistic value. Which is an ironic twist of fate, given that this is a monument to peace inspired by the Wailing Wall in Jerusalem and a gathering place for human rights' activists.



KOREA Protection for migratory birds

The last vestige of the Cold War, the demilitarized zone that divides the Korean peninsula in two along the 38th parallel is a tragic reality for the people living in the two countries, but it is a blessing for migratory birds. In spite of the presence of countless landmines, thousands of herons and whooping cranes flock to this no-man's-land to spend the winter months each year.

© Forget-Gautier / SagaPhoto



> The Berlin Wall, covered in tags and graffiti all along its 155 kilometers.

... Abbé Pierre, inaugurated earlier this year in Paris, is a reminder to passers-by of the plight of the homeless: the text of a celebrated radio appeal made by Abbé Pierre during the harsh winter of 1954 is stenciled onto the wall to form a portrait of the charismatic campaigner. The work of artist JonOne, the fresco was commissioned by the Paris City Hall and the Abbé Pierre Foundation. Back in October 2009, the Foundation temporarily installed a "solidarity wall" in Marseilles, France, attached to which were about 120 mailboxes symbolically providing an address for those without a home.

Abolishing indifference

The high visibility of walls makes them a perfect medium for artists and a place for dialogue accessible to all. One example is called "I love you: the wall", located in a garden off the Place des Abbesses in Paris. On a 40m² enameled lava stone surface, calligrapher Claire Kito has inscribed the message "I love you" in 311 languages and dialects. All these written forms were collected over many years by the lyricist Frédéric Baron, who had the idea of making this wall surrounded by greenery into a place of dreams and sentiments for others. Whether they're made of earth, wood, corrugated iron, barbed wire or concrete, walls have always had a powerful effect on populations living beside them. Efforts to escape from them remind us, too, of the invisible walls raised by hatred and ignorance, less tangible but nonetheless real, that have to be brought down. The most famous of them was the Iron Curtain, which took forty-five years to fall. ■

Right-hand page,
photo of the
> Grand Stade,
du Havre, France.

© Patrick Boulen / Codah



MOVING FORWARD

MOVING FORWARD

AT A GLANCE

FACTS

Buildings represent roughly

40%

of energy demand and

30%

of greenhouse gas emissions.

85%

of a building's greenhouse gas emissions relate to its use (heating, air conditioning, hot water, maintenance, etc.).

> REGULATIONS, STANDARDS AND LABELS

FRENCH THERMAL REGULATIONS (RT)

All the French legal requirements intended to limit the energy consumption of new buildings.

BBC-EFFINERGIE

("bâtiment basse consommation"
= Low-Consumption Building)

The French energy efficiency label introduced with the RT 2005 thermal regulations. It stipulates consumption of less than 50 kWh of primary energy per square meter per year for heating, hot water, auxiliary appliances, lighting and air-conditioning. It will be mandatory in the forthcoming RT 2012 regulations, which will be effective January 1, 2013.

HQE®

(High Environmental Quality)

A voluntary environmental quality management method process for construction and refurbishment operations.

LEED®

(Leadership in Energy and Environmental Design)

North American certification for high environmental quality and high energy efficiency buildings, currently employed in over 70 countries.



EFFICIENT BUILDING™ with Lafarge encompasses the Group's approach, commitments and offerings surrounding sustainable construction.

Lafarge. LAFARGE DEVOTES ► **2/3** OF ITS RESEARCH BUDGET TO SUSTAINABLE CONSTRUCTION. THE GROUP HAS SET ITSELF THE TARGET OF CONTRIBUTING TO ► **500 ENERGY EFFICIENT CONSTRUCTION PROJECTS** IN FRANCE AND OTHER COUNTRIES AND DEVELOPING ► **10 PRODUCT RANGES** AND INNOVATIVE SOLUTIONS by 2015. IN THE CONTEXT OF ITS SUSTAINABILITY AMBITIONS FOR 2020, LAFARGE HAS COMMITTED ITSELF TO reducing CO₂ emissions PER TON OF CEMENT PRODUCED BY ► **33%** COMPARED TO 1990 LEVELS. ➔

© Charles Callaghan / Lafarge Media Library

To meet needs for housing and infrastructure while limiting the ecological impact and energy consumption of buildings, construction industry players have been compelled to adopt new working methods. Lafarge has introduced a new wide-ranging approach enabling it to offer professionals in the sector customized support while providing them with effective and innovative solutions.

Sustainable construction, a sector in transition

how can you stop greenhouse gas emissions from mounting in a context of rapid urban growth, given that buildings are today the source of roughly one third of worldwide carbon emissions? "To limit the ecological impact of constructions, it's no longer enough to act on one isolated aspect, such as simply favoring one material over another," explains Bernard Fauconnier, Director of the Sustainable Construction project at Lafarge. "On average, the phases of construction and destruction only represent 15% of the carbon emissions associated with a building. The use of the building, particularly the energy consumed for heating and air-conditioning, has a much greater environmental impact. This is why you need a global approach to design, construction and utilization."

On average, the phases of construction and destruction only represent 15% of a building's carbon emissions.

> The first museum to be LEED® Gold certified the Grand Rapids Art Museum (GRAM), in Michigan, USA, was built using concrete and recycled materials.

This is the principle of the EFFICIENT BUILDING™ approach adopted by the Group in 2010. Beyond its role as a supplier of materials, Lafarge intends to offer environmentally and economically effective solutions which consider the entire lifecycle of a building. These solutions consist in optimizing the constructive function of elements and combining materials with complementary properties in order to reduce ...

... the energy consumption of buildings, while obeying cost constraints since the building systems must remain fully affordable.

A range of solutions

“Criteria relating to sustainable construction encompass many factors,” observes Fauconnier. “There’s energy consumption for heating and air-conditioning, of course, which you can reduce by improving the insulation, the ventilation or, better still, the thermal inertia of the building. But favoring materials that withstand the test of time, retain a high end-of-life usage value and extend the longevity of buildings also contributes to reducing the environmental footprint, as does designing structures for multiple purposes, such as housing, offices and retail premises.”

Current requirements with regard to sustainable construction are stipulated in a number of standards and regulations, like RT 2012 in France, as well as various labels, such as LEED®, HQE®, and so on. These specifications provide a framework that helps define priorities and measure progress.

For more than a year, teams of Lafarge engineers have been working on compiling a catalog of building systems that can be adapted to comply with the standards and challenges of sustainable construction throughout the

Sustainable construction represents a significant growth vector

world. These systems are based on the combination of different materials (including complementary components manufactured by other companies, such as glass and insulating materials) and innovative building principles. As a result of this work, Lafarge is currently offering roughly thirty such systems, and around fifty more ideas are under development. “This offer has come about thanks to our close collaboration with a panel of construction sector players, including architects and engineering offices,” says Fauconnier. “Our aim is to respond to their needs right from the design phase of their projects, in order to derive the maximum benefit from our solutions.”

Global issue, local contrasts

By definition, sustainable construction is very much an issue of the future, but there still remains great disparity in usage, standards and legislation. “On the international scale, sustainable construction represents a significant growth vector for the Group,” notes Bernard Fauconnier. “But the situation is sharply contrasted from one geographical region to another. In some emerging countries, environmental considerations are reserved for a handful of iconic buildings which serve to showcase new know-how. The criteria of sustainable construction are still little-known, but there are certain precursory signs heralding that change is on the way, and it could be fast. But in France, the United Kingdom, the United States, Canada and China, for instance, sustainable construction is already a reality.” In some countries, the rise of energy efficiency and sustainable construction criteria in valuing property is inciting investors to take action in anticipation of future standards in order to protect their property from depreciation. ■

CONCRETE-BASED BUILDING SYSTEMS MAKE IT POSSIBLE TO ACHIEVE A HIGH LEVEL OF ENERGY PERFORMANCE WHILE MAINTAINING A GOOD CARBON BALANCE.

Concrete benefits

Produced using locally available resources, concrete’s properties of economical cost, physical resistance and thermal inertia are well adapted to the challenges of sustainable construction.

Concrete is economical. It is a composite material that can be produced throughout the world using abundantly available natural or recycled minerals. Highly resistant to erosion and pollution

and offering excellent thermal inertia, concrete can also be adapted to satisfy very specific needs thanks to variations in mix design.

In November 2010, a study carried out in France by the Environment and Energy Management Agency (ADEME) compared the carbon impact of a number of building systems, including wood, concrete and brick.

The results showed that concrete has an identical or superior carbon balance than that of the other materials.

The carbon impact of a house built with concrete blocks is 150 kg of CO₂ equivalent per square meter, all building systems falling within the 140 kg to 200 kg bracket.

© Patrick Boulen / Codah



The new “Grand Stade” in Le Havre

France’s first ever positive-energy sports stadium is being built and will be managed according to HQE® principles.

It is scheduled for inauguration at the end of 2012. Located in the outskirts of the city, the 25,000-seat facility has been designed to produce more energy than it consumes.

The materials have been chosen for their ease of maintenance and their low environmental footprint.

Concrete was preferred: 43,000m³ of CEM V cement supplied by Lafarge’s Le Havre plant has been used to build the foundations of the technical facilities, the bleachers and stands, making it possible to reduce the concrete’s carbon emissions by 22%.

The structure will incorporate 1,500m² of photovoltaic panels installed on the roof, optimized thermal insulation for closed spaces and regulated temperature and lighting depending on the use of the facility. A rainwater recovery system is used both to water the pitch and for bathroom amenities.

As French regulations become increasingly stringent and changes are occurring to specification practices, Lafarge is transforming its methods and offering new solutions.

Transformation in France

Developments in the regulations relating to sustainable construction (RT 2012) have caused upheavals in the building materials market. The direct consequence has been strong penetration of wood and brick structures. “France’s Grenelle Environment round tables acted as an electric shock, because they enabled alternative offers to advance rapidly. As far as specifiers are concerned, you could start to see misapprehensions forming with regard to the ecological superiority of such and such a material. These ideas were often groundless, but they profoundly shook up the sector,” recounts Sandra Boivin, Marketing Director, Concrete, Lafarge France. In the face of this market confusion, Lafarge has focused its action on two priorities: houses and apartment blocks. In parallel, by positioning itself as a partner and developing collaborations

with customers and specifiers, the Group is campaigning to restore concrete and cement to their rightful place in sustainable construction.

> TAKING THE INITIATIVE

“We also have to re-establish the reality of our products’ figures in terms of their environmental footprint. We are closely monitoring the drafting of the decrees following the second Grenelle round table, and we are pushing for the inclusion of performance indicators such as HQE®. As far as communications are concerned, our Pro-Éco policy is a way of simplifying and bringing together our initiatives in favor of sustainable construction. We have recruited technical experts and trained our sales force so that not only are they ambassadors for our systems and solutions when ...



© Eric Touraille - Cécile Robin

HOUSE BUILDER CÉCILE ROBIN HAS TAKEN UP THE CHALLENGE OF DESIGNING AN ENERGY-EFFICIENT TOWNHOUSE SUITABLE FOR THE URBAN CONTEXT OF TODAY.

Cécile Robin and Lafarge create a positive energy home

The design of an energy-efficient townhouse by house builder Cécile Robin benefits from the qualities of concrete.

The following technical solutions are among those employed for this

130m²

house with patio:

foundations in self-compacting concrete, underpinnings in concrete, walls in insulated pumice concrete blocks, a floor slab insulated by polystyrene structural

floor units, porous concretes for the patio floor and access areas, double-glazed windows, a patio designed to capture heat in the winter and reduce energy needs, a thermodynamic water heater, single flow ventilation and

24m² of

photovoltaic panels on the garage. Launched in fall 2011 with handover due in spring 2012, the site receives regular visits and is filmed.



© Ignus Gerber / Lafarge Media Library

> **In the north of Vancouver**, Canada, the Brook Residence, a construction using high-performance Agilia® concrete, has been awarded LEED® (Leadership in Energy and Environmental Design) certification.

••• dealing with specifiers, but they can also advise contractors, particularly small-size ones,” points out Caroline Nivelles, Marketing Director, Cement, Lafarge France.

> THE PERFORMANCE CHALLENGE

Giving contractors advice today also means preparing for the standards of tomorrow. On January 1, 2013, the BBC-Effinergie low-consumption building label will no longer be an incentive but mandatory defining new thresholds for the energy efficiency of new buildings.

And starting in 2012, legislation will insist that the energy consumed by heating, hot water and air conditioning is divided by three. In 2020, thermal regulations are expected to go further still, and require new build structures to be positive energy. “In thirty years, buildings have become twice as energy-efficient. And this trend will go faster and faster, because the standards are increasingly strict. From this viewpoint, we are experiencing a thorough revolution in regulations: over the next four years, buildings will bring down their energy consumption threefold,” explains Arthur Vinson, Building Systems Manager for Lafarge’s Cement Business in France.

> PRACTICAL CONFIRMATION

To respond to these new constraints, two innovative projects have attracted attention: concrete blocks using pumice, which is a natural insulator, are easy to lay and provide an environmentally friendly solution for structures of less than three stories, such as houses; and Thermedia™ 0.6, a concrete that reduces thermal bridges by more than one third in buildings taller than three stories, such as apartment blocks, without requiring any change in construction techniques. “We are also contributing actively to a number of projects for ecological buildings,” adds Sandra Boivin. “These projects give practical confirmation of the effectiveness of our materials and building systems for improving energy efficiency and reducing carbon emissions.” This work is far from complete, but it should continue to bear fruit on the French market. ■

Over the past thirty years, buildings have become twice as energy-efficient



© Hervé Piraud / Lafarge Media Library



© DR

RODOLPHE VILLION

> **Maisons Bernard Jambert and Jambert**, have collaborated on this townhouse compliant with the BBC-Effinergie label for low-consumption buildings.

Making sales teams ambassadors of sustainable construction

What is the practical impact of the new environmental regulations? **Rodolphe Villion**, Special Building Products Development Manager, Concrete, Lafarge France, replies.

What has changed in your way of working since the new marketing strategy was introduced?

Rodolphe Villion: As salespeople, we need more and more technical skills and we have to spend more and more time supporting projects. Even when a product is highly innovative, it is no longer differentiated compared to the competition. We have to demonstrate that our solutions fit into an overall approach of sustainable construction. Sales team training that began in 2010 is therefore not only to give them thorough background knowledge on the subject, but also to give them all the regulatory information so that they are capable of drawing up an environmental dossier, calculating the carbon balance of a concrete mix, and so on. Everyone is given training in all Lafarge’s building systems across all the Group’s businesses, with a specialization in the segment in which he or she operates.

Have the people you deal with changed?

R.V.: Customers need to meet salespeople to discuss their concerns,

expectations and restrictions. Either because they want us to help them comply with the environmental chapter in their specifications or because they are looking for low carbon-emission solutions that optimize energy consumption. This is why we are now contacted directly by developers, local authorities, architects and engineering offices.

Does Lafarge play a part in training its customers?

R.V.: Yes, it does. Lafarge arranges sessions for customers – building contractors, masons and distributors – which are intended to help them understand sustainable construction and to promote its products. These initiatives are helping them keep pace with the historic changes that our sector is currently experiencing. ■



Working in close collaboration with the architects and with a determination to find solutions, Lafarge supplied materials that were ideally suited to the development of a large recreational area in northeastern Spain. The outcome was productive – an aesthetically bold result that meets strict environmental standards.

Innovative concrete for eco-friendly urban space

inaugurated in May of this year, the new Plaza del Milenio in Valladolid, northern Spain, has a futuristic appearance. This public space has been created with green and gray Artevia® concrete and its cycle track is made with a specially formulated permeable concrete: both Lafarge achievements. “The Valladolid city hall had high ambitions for the plaza development and had decided to make the principles of sustainability central to the project,” relates Luis Felipe Garcia, Special Products Manager for Lafarge Aggregates & Concrete business in northern Spain. “As we knew that our products are perfectly compatible with environmental preoccupations, we went to see Sacyr, the contractor that had been awarded the project, with catalogs and samples. Following this, the architects

wanted to meet with us to ask us for an alternative solution to the one they had chosen.”

The choice of materials

The dialog between the architects and Lafarge’s technical sales teams went on for several months, and as a result of this rewarding collaboration, Lafarge adapted its materials so they would correspond precisely to the specifications. “For the pavement, we were looking for a material that was both elegant and modern. We wanted the ground to be an element that forms a natural transition between the grass on the riverbanks and the cupola,” explains Sacyr’s site manager, Beatriz Díaz Lopez. “The project was very open, but our objective was clearly to favor sustainable



© Lafarge Media Library

Environment first

Beyond the choice of materials, environmental preoccupations guided every aspect of this project. For example, the plaza produces renewable energy from both solar and wind sources. In particular, it incorporates 140 m² of photovoltaic panels. Some features are recovered and recycled elements, chief

among them the cupola, which originally served as the Thirst Pavilion at Expo 2008 in Saragossa. All the lighting operates with LEDs, more energy-efficient than conventional lights. And underground, twelve charging points are available for electric vehicles.

materials. After many tests, demonstrations and modifications – the work of Lafarge’s technicians was decisive for the outcome of this phase – we found that the materials were suitable.”

Tailored solutions

“As far as the cycle track is concerned, it had to be identifiable without jarring with the rest of the plaza,” continues Díaz Lopez, “and most of all, we had to solve the problem of cycling in the rain. The permeable concrete that we used allows rapid drainage of the water and stops the surface from becoming slippery.” The system that was eventually chosen even makes it possible to recover rainwater, which can be reused for watering the gardens. And beyond supplying tailor-made materials, Lafarge’s full-service offering constituted an advantage by comparison with competitors. “Thanks to Aplytec, a service that we provide for supplying and applying concrete using specialized concrete installers, not only did we supply the materials but we also applied them onsite,” points out Garcia.

A recreational space

Only a short time ago, the Plaza del Milenio was just a big parking lot, but today it has become a bustling urban space. Its spectacular cupola houses a venue dedicated to cultural events (concerts, conferences, sports events, etc.), standing in the middle of a vast recreational area, where trees, fountains and landing stages line the route of a promenade and cycle track running alongside the Pisuerga river. For Luis Felipe Garcia, the success of the plaza is worth any number of sales presentations. “This operation will contribute to the reputation of our concrete. Even though the Spanish construction sector is experiencing hard times, more and more customers are turning to value-added materials, because they allow them to imagine new solutions they would never be able to achieve using ordinary concrete.”



BEATRIZ DÍAZ LOPEZ, ENGINEER AND SITE MANAGER AT SACYR

No compromise on quality

“When I discovered Artevia®, the works on the Plaza del Milenio had already started. So this was the first time we had worked with this kind of concrete. We were looking for a material that was attractive, functional and long-lasting. This triple demand was very difficult to satisfy. Working with Lafarge teams, we were able to test, compare and improve a number of solutions. This took time, but Lafarge managed to adapt the formulation of its products to meet each of our demands.”

With climate change responsible for increasingly intensive rainfall, dealing with stormwater runoff has become a critical issue. A new high-quality permeable concrete has been developed by Lafarge to meet this challenge. Its name? Hydromedia™.

Hydromedia™, new-generation permeable concrete

1 Preventing risks and conserving resources

The construction of roadways and parking lots creates enormous impermeable surfaces that impede the absorption of rainwater by the earth. “A number of countries – the United States, Canada and the United Kingdom among them – have shown a growing interest in the control of flood risk,” points out Bruce Willmer, Director of Marketing and Product Development, A&C Division. Improved surface water management also contributes to conserving water resources. In the United States, the use of permeable concrete capable of rapidly draining rainwater is taken into account in granting LEED® certification for the environmental performance of buildings. As part of its commitment to innovation designed to promote sustainable construction, Lafarge decided to devise a product to meet this requirement.

2 The development process

As of 2009, Lafarge Research Center set about improving the performance of permeable concrete. Existing materials presented two major disadvantages: application was complex and the surface was not robust. “Traditional permeable concrete is difficult to pour and it dries very fast,” explains Fabien Perez, Engineer and Head of Product Development at the Lafarge Research Center. “To provide Lafarge with a material that would be effective all around the world, we have tried to create tools and specifications that will enable each subsidiary to develop a high-quality permeable concrete by selecting locally available aggregates and binders.”

3 Full-scale trials

Two years of research and trials were needed to develop Hydromedia™. “We were fortunate to be able to collaborate with local teams working in the field,” recounts Perez. “This meant that we were able to try out different solutions in the UK, France and Canada, and have instant feedback. This empirical approach saved us a lot of time.” What was the result? A high-resistance permeable concrete that’s very easy to apply. “What we have done is make Hydromedia™ a concrete that flows and slides as if we had oiled the aggregates at the same time as it hardens,” smiles Perez.

> WATER IS ABSORBED RAPIDLY

Benefits: the concrete and subbase aggregates act as buffers when rainfall is very heavy, and help reduce concentrations of pollutants in rainwater (esp. sediment and particulate matter).

> STORED WATER IS RETURNED TO THE GROUND SOIL

Benefits: the soil breathes and maintains a normal level of humidity. Living soil is more able to remove pollution from the water that passes through it. In an urban environment, damp ground soil retains its load-bearing capacity, but when it dries out it can present a hazard for buildings.

> THE MATERIAL CAN BE USED TO CREATE A RAINWATER DRAINAGE SYSTEM

Benefits: thanks to the permeability of the system, and the available storage in the underlying aggregates, rainwater is diverted away from the urban drain system. The surface remains practicable, and the wastewater drainage and treatment network does not become overloaded.

4 A system for managing the rainwater flow

Hydromedia™ new-generation permeable concrete facilitates the rapid draining of water from the ground surface into a permeable subbase of coarse aggregate where it is gradually released into the ground soil. The permeable concrete

acts as a filter, hydrates the soil and feeds into the water table. The filtering effect assists in the removal of suspended solids, heavy metals and solid particulate matter, thus helping to reduce pollutant loads on the groundwater. In urban environments, where excessive rainfall can saturate wastewater treatment systems, the use of permeable concrete makes it possible to create a specific rainwater flow system. Hydromedia™ can thus contribute to improved management of water resources.

THE ADVANTAGES OF USING PERMEABLE CONCRETE TO BETTER MANAGE RESOURCES IS ATTRACTING ATTENTION IN THE WORLD OF SCIENCE.

Under close study

The Kortright Centre for Conservation, an environmental and renewable energy research institute in Toronto, Canada, is taking an interest in Hydromedia™. In partnership with the University of Guelph, the center has undertaken to measure the effectiveness of a rainwater recovery system based on the use of a new-generation

permeable concrete. Sixty cubic meters of Hydromedia™ concrete were poured to create a parking lot, and pipes were laid in the foundations. The flow and quality of the water passing through the network, will be measured throughout the year until 2012. A similar study is also being carried out in France by the National

Institute of Applied Sciences (INSA) in Lyon, in the context of its Eco-Campus project. Hydromedia™ is especially recommended for the construction of sidewalks, parking lots, pedestrian areas, cycle tracks and roads with little traffic. It is also suitable for tennis courts and road subbases.

© Charlotte Cauwer

Taking a close look at the past can open up perspectives for the future. Segundo Caiza Buñay, a young Amerindian Ecuadorian, saw his future change when he worked on the country's first museum of Pre-Columbian art. Here is his extraordinary tale.

Segundo Caiza Buñay

A genuine work of art



"I am 32 years old now, and I came to Quito when I was 17 in search of a better life," he recounts. In 2004, he was hired to work at the new Casa del Alabado site as a *guachimán*, the local term for a watchman. His job was to keep a watch on the site and carry out a variety of tasks. But Segundo was a very good worker, and very soon he caught the eye of the site managers. In a short time, he had become a mason, and once the construction works were completed, the museum hired him as a technician.

Renovation, a specialist sector

Today, the museum houses a collection of five thousand Pre-Columbian artifacts acquired from the Amerindian peoples of Ecuador. Located in the heart of colonial Quito, the Casa del Alabado is typical of this form of 17th-century architecture. The 1,800 m², two-story edifice is built around a series of interior courtyards. Left derelict for decades, the building posed a considerable challenge to the restoration team.

"I was used to working on new projects," explains Segundo. "Here, it was completely different. We had to combine modern and traditional building techniques and reuse as much material as possible to keep construction costs down. We made new adobe walls out of clay bricks and straw. On the upper floor and for the roof, we laid bamboo on the timber frame. And we re-laid the floor of the courtyards with pebbles. We consolidated all of this using 300 bags [15 tons] of pozzalana-rich Lafarge cement, which is more ecological. We still had to adapt and modify the quantities to achieve a mortar that was suitable for adobe bricks." Segundo found the demanding work required great care, but it was fascinating. And it was valuable experience: trained directly by architects and restorers on the site, Segundo and his colleagues have now become sought-after

specialists. For there is no shortage of renovation projects. The success of the Casa del Alabado operation has encouraged the city authority to launch a renovation program for the entire neighborhood.

Public recognition

The project of renovating the Casa del Alabado in order to turn it into a museum aroused the interest of the Ecuadorian documentary maker, Gabriela Calvache. With financial support from a number of partners, including Lafarge, she recorded the work of the restoration teams working on site. Her film, *The Silent Walls*, was shown at the Quito Panamerican Architectural Biennale in 2010, attended by site workers, urban planners and architects. "We were very proud to see our work appreciated," confides Segundo. In

truth, masons are not used to being applauded, photographed and interviewed! Several clips from the documentary have been incorporated by Lafarge into a training video for masons which includes a technical presentation of the brand's products as well as a course on safety practices (a topic that is little discussed in Ecuador). Today, Segundo Caiza has a steady job and is starting to have time for other, more personal projects: "I want to build a house for my wife and eight-year-old son and do all I can to make sure he can go to school."

"We had to combine modern and traditional building techniques."



> The vast renovated building now houses the Museum of Pre-Columbian Art, Quito.
CASA DEL ALABADO
<http://www.precolombino.com/>

An influential trade

In Ecuador, masons exercise a great deal of influence on a construction site. It's not uncommon for a site engineer to seek advice from the masons' foreman on the best products to use. In addition to promotional operations set up at points

of sale, participating in the financing of Gabriela Calvache's documentary was an opportunity for Lafarge to get its products better known and to showcase the city's artistic heritage. Since 2006, the Group has also supported a training program for

young masons from deprived backgrounds at the Escuela Taller Quito I. This three-year course includes technical classes on the use of cement as well as practical work on jobsites. The young people graduate and rapidly become decision-makers on construction sites.

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Sugar Beach on Lake Ontario, a waterfront redevelopment using Artevia, Claude Cormier, Landscape Architecture + Urban Design, Toronto, Canada.
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“What I have left behind in this building is the work of my own two hands. I have put a lot of myself into it.” The structure that Segundo Caiza Buñay is speaking of so passionately is the Casa del Alabado. This Colonial-style building dates from 1671, in the golden age of Quito, capital of Ecuador. Today it houses the country's first museum dedicated to Pre-Columbian art. The city of Quito is has been classified as a UNESCO world heritage site for its Colonial-style architecture. Segundo, who hails from an Amerindian community near Chimborazo in the central region of Ecuador, has lived and worked in the city for around sixteen years.



Crescendo magazine presents
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