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JEAN MERMOZ HIGH SCHOOL DAKAR SENEGAL

AFEX Grand Prix 2012 for French Architecture worldwide LAUREATE

SUMMARY

THE NEW JEAN MERMOZ HIGH SCHOOL

September 2006. The TERRE-NEUVE entry, with A. YEDID and ARCHITECTURE & CLIMAT, wins the first prize in the architectural design competition, organised by AEFE (Agency for French Education Abroad), to rebuild the Jean Mermoz French high school.

September 2010. After two years of construction, the high school opens the doors of its new buildings: 17,000 m², to welcome 2,400 pupils – from nursery school to baccalaureate degree – teachers and administrative staff,while awaiting delivery, in 2011, of sports equipment installed in the area where the old prefabs used to be.

March 2012. The AFEX Grand Prix 2012 for French Architecture worldwide is awarded to the new Jean Mermoz high school.

As a new experience of bio-climatic architecture on an urban scale, the constructions and their implementation are a result of a highly contextual initiative based on local resources to develop solutions which are adapted to the know-how which can be mobilised in Senegal today. Aware of environmental issues in a country where priorities are still often elsewhere, this shared initiative is also the result of a fruitful dialogue between the architects and the client. Indeed, since the establishment of its real estate department in 2005, AEFE has initiated a new approach to contracting authority with a strong wish to include local potential.

AEFE, contracting authority for French education establishments abroad, is very pleased that the completion of the high school – which AEFE considers exemplary both as concerns its relation with the architects and its relation with the building company – coincides with the 20th anniversary of its establishment as an EPA (public administrative body).

Phase 2, the construction of the sports facilities where the old prefab buildings used to be is in progress and is completed in the course of 2011.

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1. aerial view June 2010 before the demolition of the prefabs of the old high school

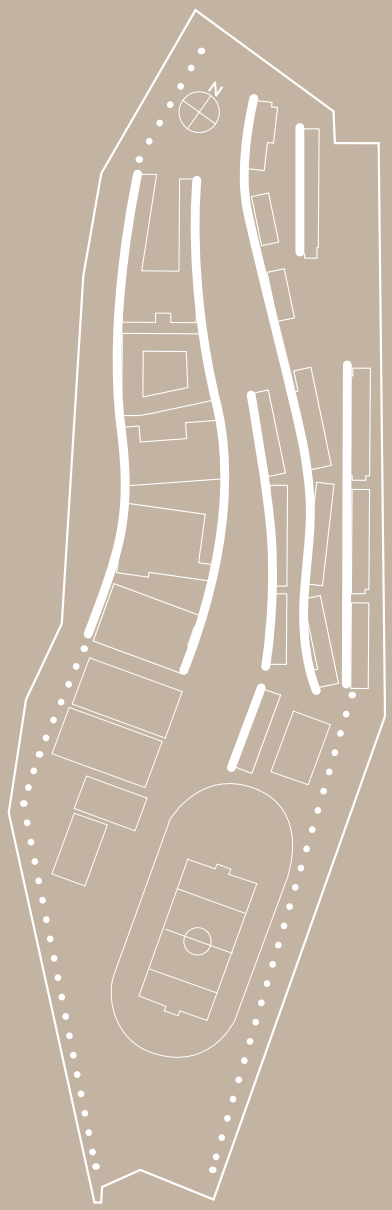
2. Ouakam district

Urban context

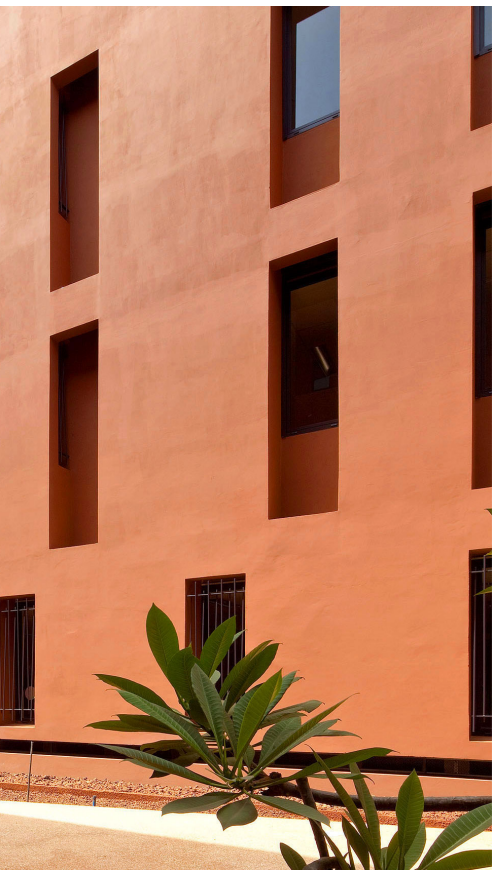
The Mermoz high school is located in the Ouakam district, along the western coast road of the Dakar peninsula. The new buildings replace the old high school, provisionally built in 1994 from precarious prefabricated modular constructions yet benefitting from a highly appreciated vegetal environment.

The school complex welcomes pupils from nursery school level to baccalaureate level. It includes an administrative unit and common facilities such as a documentation centre, a school restaurant, a movable seating multi-purpose hall for different events, a gymnasium and sport facilities. The French high school has particular relations with the surrounding district and there are only two points of contact with the city. It is almost completely enclosed and hardly visible from the urban area. Thanks to its size, the site can also welcome the French community in case of crisis. The project tends to minimize the nuisances imposed on the environment nearby and in particular on the existing urban networks. Traffic and parking of school buses and private cars take place within the school boundaries; There is no signposting nor anticipation: the environmental preoccupations which regulated the project as from its competition phase find here their daily applications within their ecological, economic and urban contexts.

EFFICIENT ARCHITECTURE



The building of the French high school of Dakar is realized in a new political context where budget restrictions force us to think differently. This strong programme restraint constituted a lever for the project's sustainable development challenges. In using local resources and know-how to limit imported techniques and products, the project focused not only on territorial and environmental cohesion but also on economic and social cohesion. The project also wanted to highlight that an alternative to Dakar real estate production, which transposes more often than not an international architecture, very much dissociated from the Senegalese context, could exist...It was once more in this spirit of adapting to the country throughout the studies that a Senegalese construction company, GE, awarded the contract to build the high school.



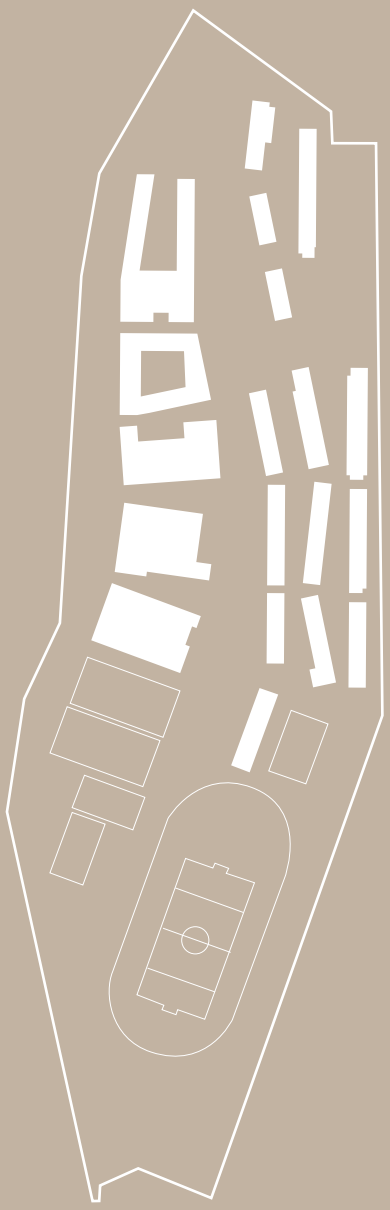
Inseparable from architectural concept, the environmental steps were taken progressively. As from the competition it was our aim to transcend the objectives of simplicity and functional efficiency of the programme to reach a specific architecture: contemporary in its form, economical in its cost and autonomous in its functioning.

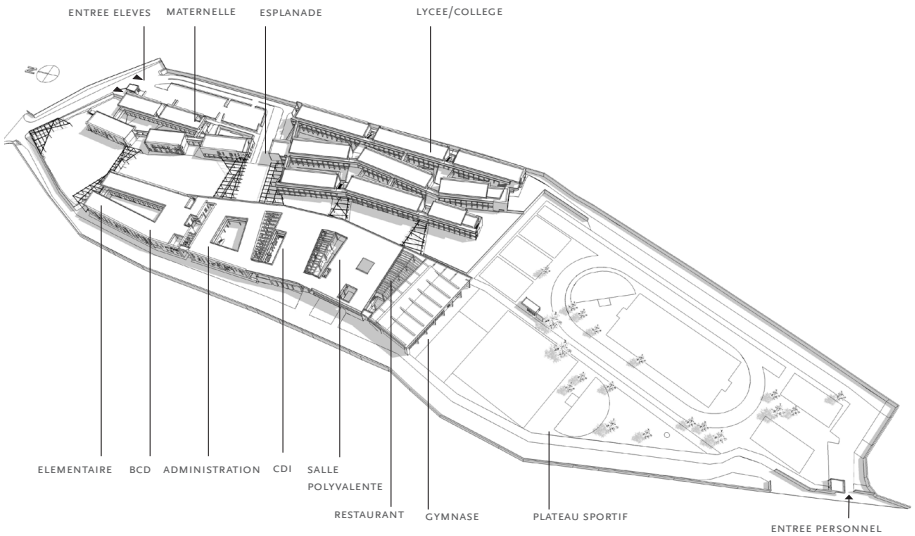
« The nature of the materials, the atmospheric variations (sun, wind, rain, dust, temperature differences) are permanent architectural conditions » said Auguste Perret.

It is this fundamentally architectural basis which determines the composition, the nature of spaces and architectural applications. We immersed ourselves climatically, socially, culturally but more so in the field of bio-climatic architecture, for example the experiments of André Ravéreau in North Africa or Laurie Baker in India.

The general design connects with undulating strips the classrooms with the common spaces, administration, documentation centre, multi-purpose hall, restaurant, gymnasium in a composition governed by the circulation of the trade winds. The solar protection of this entity defines, by means of a unifying protective roof, the physiognomy of the project as concerns classroom buildings which have galleries on one side – indispensable for traditional tropical architecture – and double ventilating walls.

As a spatial conceptual consequence there is a rich ambiguity which characterises the project between the interior and the exterior, offering pupils and teachers full space for education or for leisure.




ENTREE ELEVES
MATERNELLE
ESPLANADE
LYCEE/COLLEGE
ELEMENTAIRE
BCD
ADMINISTRATION
CDI
SALLE POLYVALENTE
RESTAURANT
GYMNASE
PLATEAU SPORTIF
ENTREE PERSONNEL

Part of the city

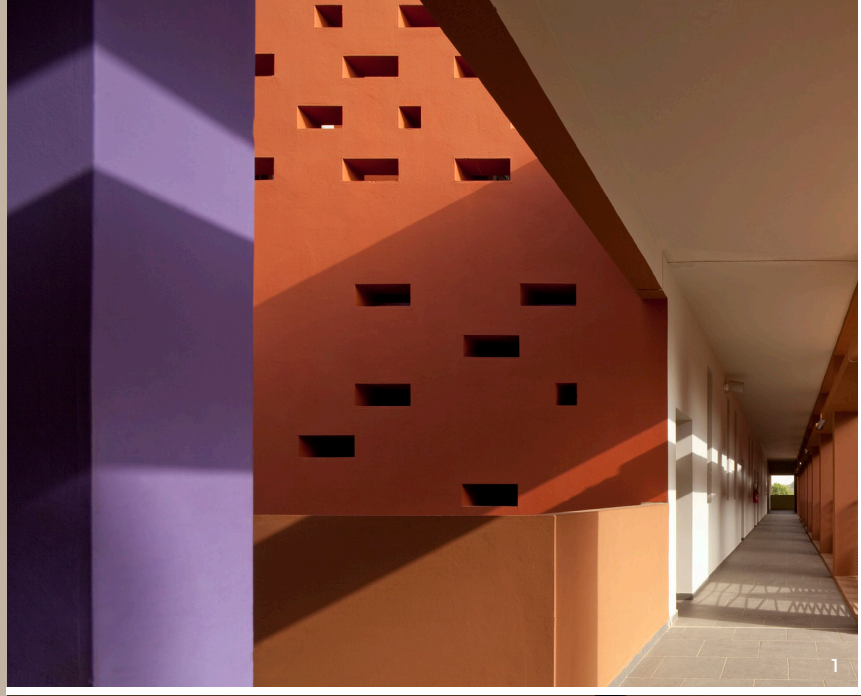
As the importance of the programme imposes a certain function repetitiveness, spatial organisation relies on empty spaces to offer differentiated paths. As in cities, the variety of empty spaces, obtained by the flexible fragmentation and articulation of the buildings takes precedence over the constructive uniformity. Limiting the school to 2 levels and the high school to 3 levels authorises greater proximity of the buildings and conciliates the human and urban scales.

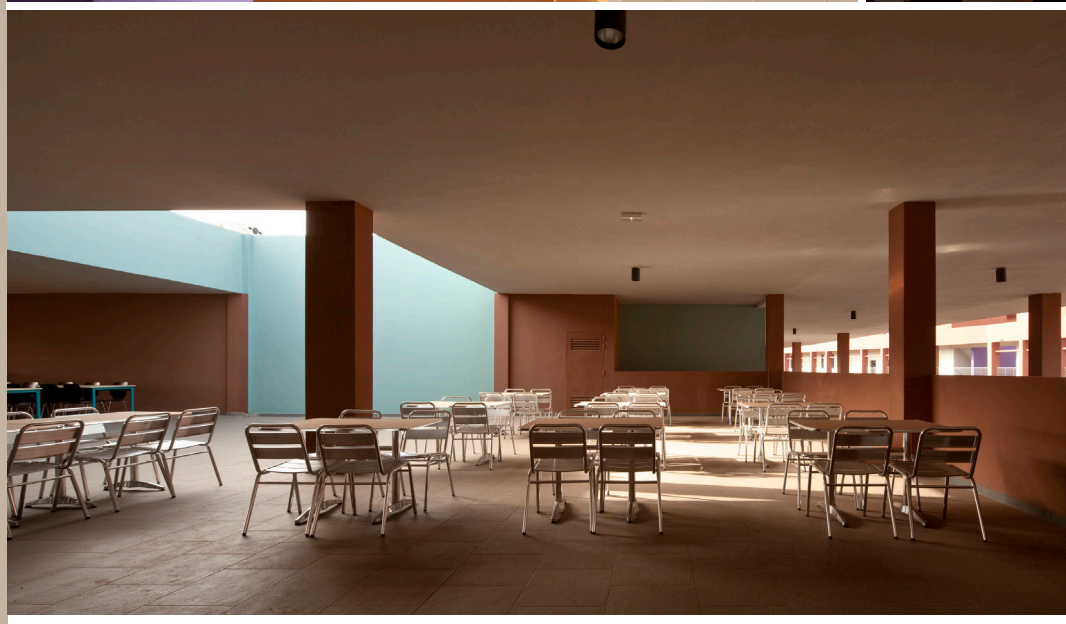
The place of empty spaces

The intertwining of the empty spaces and the full ones, as can be seen on the ground plan, generates numerous transition spaces between the different equipment entities. The implantation of education buildings in narrow strips creates shady interspaces, elongated and narrow patios open at the ends and refreshed by the plantations the shape of which fosters air circulation. Cross-sectional connecting passageways interrupt this linear geometry and provide perspectives of the city, the sky and the Mamelles, the only relief of the Cap Vert peninsula. A large roof covers the common spaces of the high school, administration, documentation centre, restaurant and gymnasium but also connecting cross-sectional pathways. Taking into account the climate, all the paths are outside, as full living spaces, architectural promenades and solar protections. Rocks, vegetation, ground surface materials design are also an integrated part of the project, as are the sun-shading devices and the vegetated playground-pergolas with bougainvillea and other tropical plants.

Colours

Solar protection and facade constitution led to dense and deep colours for the exterior, visually comfortable since there is little reflection. The choice of colours, made with the participation of the Catalan plasticist Miquel MONT, is based on the different shades of laterite which is omnipresent in Dakar and which reinforces the links with the region. A promenade therefore features colour surprises which punctuate and signal identifiable spaces.





1. high school corridors
2. primary school
3. high school
4. restaurant
5. documentation centre
6. nursery school

Thoughts on the colour treatment of the Jean Mermoz high school in Dakar. Miquel Mont, October 2010.

The choice of colours was focused on a range which was coherent with the design and the spirit of the project. It was necessary to distinguish in a subtle way the different buildings and the patios linked to the passageways of the whole high school while maintaining a global view of the other areas of the project: documentation centre, multi-purpose hall, restaurant, administration.

The wish not to adhere to a western interpretation of the project, the hard and strong light of the country, as well as the wish to integrate the colours into the environment, led to the choice of a dense and reddish colour range, inspired by the local soil, notably laterite.

Three main tints, T1, T2 and T3 were implemented for the facades and combined with other colours chosen for the paths, passageways, staircases. A light grey, T0, was chosen for the passageways to create a plastic and spatial contrast between the façade and the paths.

However, this application principle was occasionally adjusted in order to combine readability and plastic quality by attempting to aid spatial awareness as much as a sensual surface reading.

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In specific instances such as the administration patio the following principle was applied: distinguish the space by giving it by means of colour a symbolic quality which is different from the other project areas. The tint selected, more "sober" and "neutral" than the façade, communicates with the effects of the T1, T2 and T3 colours which are reflected inside the offices on wall sections.

The limited interventions inside the classrooms, staircases, documentation centre or multi-purpose hall follow these two principles: coherence of the required range where each colour must function visually with the entity even if they are not next to all the others. And secondly, the logic of spatial positioning of each colour, subject to the area particularities: orientation, its situation within the entity, its light...

One colour is not in itself better than another one, it simply makes more sense when it participates in this complex focus on the environment which it receives and for which architecture is not the sole responsible aspect. It is in this way that it may bring extra qualities to a project and attempt thus to confirm a colour concept which reinforces its coherence.

T1 T2 T3

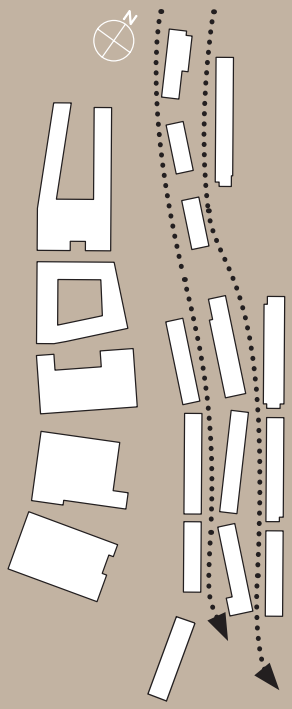
Miquel Mont was born in 1963 in Barcelona. He lives and works in Paris since 1988.

His work investigates the elementary components of painting: the matter, the colour, the gesture... within a large concept, often outside the scope of painting.

His work was on display at FRAC ALSACE in 2008, at CRAC in Sète in 2009... at the KunsthalleBohüslands Museum in Sweden and his work is part of public collections in France (FNAC, FRAC Bretagne, FRAC Picardie, FRAC Corse...) and abroad (Belgacom, La Caixa, Banque d'Espagne...).

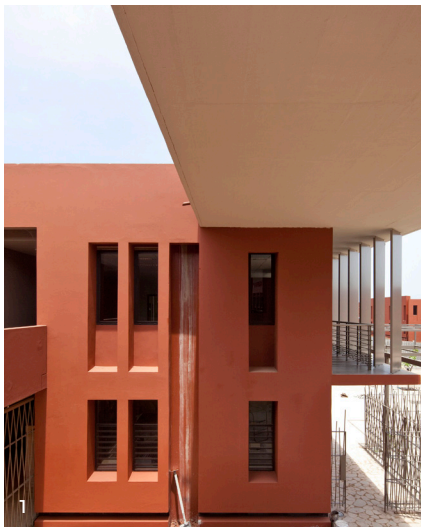
ENVIRONMENTAL SPECIFICS

All the environmental measures were developed as integral parts of the project, within the scope of an environmentally responsible initiative, without labels nor certifications but in the noblest and strictest sense: constructive, economical, social and cultural.



Bio-climatic architecture

The positioning of the buildings in relation to each other generates microclimates in the patios conductive to the natural refreshing of the interior spaces. The tradewinds, particular to the Dakar oceanic climate, justifies the linear and tight organisation of the built structures which amplifies the effect of the breezes and which increases the impression of freshness. The shading given by the constructions limits not only the heating of the walls but also of the outside ground.

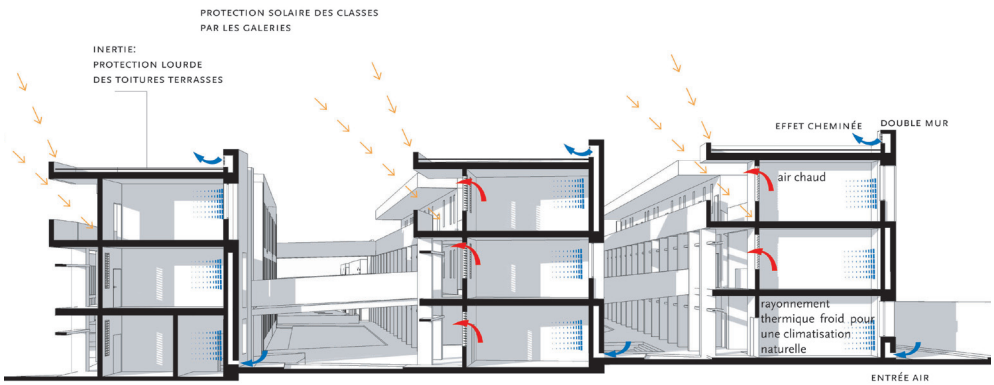


Each building benefits from a combination of several passive solutions for solar protection and refreshment while maintaining natural lighting and acoustic comfort. On the facade in front of the classrooms galleries and protective roofing stop the sun's impact on the facades at the hottest hours. On the rear facade ventilated double walls stop the heating up of the inner walls and constitute thick walls and window casements which limit direct sunlight. This empty space between facades also facilitates the installation of technical columns.

The classrooms are ventilated by natural convection: inwards opening windows in the double wall facades, shutters on the passageway side which also ensure anti-intrusion and allow the premises to cool down during the night.

All the roofs are high inertia; all the classrooms have through-openings and generous natural lighting in line with solar protection, also aided by comfortable free heights. The use of air conditioning, required in the project brief, is thus limited to some months a year, during "hivernage" (hot and wet season, from June to October). Lastly, solar panels for domestic hot water and photovoltaic lanterns for outside traffic complete the concept aimed at reducing expenses and energy.

This result is achieved by essentially very simple means, and therefore economically and easily transferable to Senegal.



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1. double ventilated wall
2. corridor
3. section on teaching buildings
4. high school

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The Dagana experience

The Célestin Freinet experimental school project, built in 2006-2011 at Dagana, northern Senegal, on the Mauritanian border, designed by the architects of Association REUNION-DAGANA, Nelly Breton, Olivier Fraisse and Philippe Delannoy, already applies the principles of bio-climatic construction with a great economy of means; € 150/m² NFA, a site without machine nor electricity. This first construction experience in Senegal, within the framework of a volunteer community partnership, allowed the architects to develop bigger scale solutions for the lycée Mermoz project.

Construction: the ambition of simplicity

With the exception of some work carried out with shuttered concrete, the buildings are built using blockwork and floor hourdis. Local know-how has also been used for the finishing trades: braided grills and guardrails metal work, basalt cobble esplanade, shell concrete gallery floor, paint on exterior plaster. The architecture of this project is aimed at the right note, at sound agreements and at the spatial richness in simplicity so that the project takes its place sustainably in the city.

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1. high school playground
2. coach station access
3. high school patio

Water treatment

Waste water

An autonomous treatment plant was installed to recycle all the waste water. This gives the high school total autonomy and the water is used to water the green spaces. Plants which do not require a lot of water were selected among the local flora so that extra watering would not be necessary.

Rainwater

Rainwater was also dealt with in a particular way, including the infiltration of a great deal of water to limit discharges to the urban undersized and hardly efficient water supply systems. The roofs are designed for slow run-off during the heavy rainfalls in winter by means of a flow restriction system resulting in temporary water storage on the terraces. At the foot of the buildings the water, channeled through big open vertical drip profiles, flows into draining tanks consisting of several layers of basalt aggregate and laterite associated with drains.

This consequently led to the near-autonomous management of waste discharges and to greatly decreased consumption in satisfactory comfort.

Relational quality

With this operation the client wanted to initiate a new building approach abroad and, as from the project brief, expressed objectives of contextuality and simplicity. This initiative was confirmed all along the process by deviating from previous habitual practices, specifically in Africa.

This relationship with Senegal led first of all to the composition of the team which associated, as from the competition, architects and French and Senegalese consultant engineers. The same applied to the devolution of works contracts and the restricted tender procedure resulted in the end in the choosing of the Senegalese construction company GE, established in Dakar. This company won the tender after negotiations and tender specifications which allowed allthe companies to comprehend fully, withequal opportunity, the complexity and scope of the project. Taken into account the extent of work and tight timeframe, specific rules were put into place, both as concerns the client and the architect.

The large local involvement of the client AEFE led to a sole operation supervisor during the project, established in Dakar and later in Rabat and the delegation of the operational and financial contract management to the high school team.

The strengtheningof the architect's appointment during the construction phase by posting a TERRENEUVE architect on the spot made it possible to monitor construction documentation and construction with great reactivity as ARCHITECTURE & CLIMAT was more particularly in charge of daily building site follow-up and part of the building services reviews. Lastly, Consultant Engineers SCO was assigned to assist the company with the building site timetable and supplies.

It is very obvious that the project's success can largely be ascribed to the relationship between client, architect and construction company.

Client

AEFE (Agence pour l'Enseignement Français à l'Etranger, Agency for French Education Abroad) is a public administrative body responsible for the steering and coordinating of the network of French education establishments abroad which includes 461 establishments approved by the Ministry of National Education.

In view of the need to foresee important investments (upgrading and extending existing installations) and the difficulty for the Ministry of Foreign Affairs to ensure funding, AEFE acquired real estate know-how in 2005 and set up its own real estate services.

Since that date AEFE has embarked on an important number of constructions and renovations totalling about € 240m over 6 years. The Dakar project is one of the most important operations. Other operations were delivered in 2009/2010 (Munich, Ankara, Ho Chi Minh Ville) or are being carried out (Algiers, Amman, Cairo, Frankfurt, etc.).

In setting up its projects, AEFE ensures several objectives:

- prioritise mixed architect teams consisting of a French component and a local component,

- develop projects which require the country's know-how and which are carried out by local companies,

- promote project environmental dimension while maintaining the options adapted to the context of the country,

- implement local project management to allow remote follow-up and to guarantee control of costs and deadlines.

CLIENT
DESIGN TEAM

Project management team

TERRENEUVE architects

Established in 2000, the architectural consultancy firm TERRENEUVE, Paris, is active in the fields of urban planning, architecture and interior design and furniture for public projects obtained competitively on the open market and for private commissions from institutions and individuals.

The firm pursues a diversified activity, in a spirit of continuous renewal, marked by the education and career experience of the firm's founders: Nelly Breton, IEP Paris graduate urban planner, then consultant architect for the Ministry of Culture, the French Museum Directorate from 1999 until 2010 and Olivier Fraisse, educated in particular by Henri Tastemain in Morocco. Nelly Breton is also a lecturer of "architecture and museography" at the University of Bretagne Occidentale in Quimper.

The TERRENEUVE approach is based on the examination of the territory, its resources, its cultures and practices, its ambiguities and contradictions. The agency boasts a pluralist culture which is reflected in the creative dynamism of its team and its know-how.

TERRENEUVE is keenly aware of the current construction preoccupations: environmental performance: ecology and sustainable development with a global view : technical, economic and social. For several years the firm has moreover been involved in urban planning in developing countries and participates in the urban management project workshops of Cergy.

TERRENEUVE is a member of AFEX (association of French Exporting Architects). Since 2005 its activities have developed on an international scale, especially in tropical zones: Senegal, Mauritania, Kenya, Mayotte...

TERRENEUVE is currently working on the following projects:

- construction of the French diplomatic campus in Nairobi, Kenya: embassy, residence of the ambassador and housing: 3 224 m² - € 6M BT

- construction af a new middle school 1,000 students in Ouangani, Mayotte: 8 240 m² - € 17M BT

- realization of an International city of tapestry and woven at Art, in Aubusson, France, museum on the former National School of Applied Arts site: 6 608 m² - € 8M BT

- construction of 94 social housing units on eight levels in Paris: 9 152 m² - € 12,275M BT

- refurbishment of the documentation centre and graphic arts collection of the Army Museuml in the Hôtel des Invalides in Paris, a listed historical monument in Paris: 1 090 m² - € 1,3M BT

Among its most notable achievements, resulting in awards and publications:

- Louise Michel library, Paris 20th district, Librarian "Livres Hebdo" Prize 2011

- Nursery and PMI (Mother and Child Protection unit) Hérold, Paris 19th district, City of Paris, new HQE-certified (High Environmental Quality) building, delivered 2007

1. school yard

DATA SHEET

Program

Construction of the French high school including nursery school, primary school, middle school and high school, gymnasium and sport facilities area

Address

Route de Ouakam BP 32 at Dakar, Senegal

Contracting Authority

A.E.F.E. Paris : Pierre Favret, head of real estate, Fleur Petersen /
Sophie Chabanon-Pouget, assistants
Real antenna of the A.E.F.E. at Rabat : Pierre Labadie, project supervisor

www.aefe.fr

Jean Mermoz high school, delegate project manager, Dakar. Claude Coulon / Philippe Lagier, principals ; Valère Pozzobon, head of economic and financial services

Assistant to Contracting Authority

SCO, Abidjan, Sébastien Dorange, officer in charge of operations

Design team

TERRENEUVE Nelly Breton and Olivier Fraisse, representative architects, Paris
Thomas Hus (project architect, studies and construction), Alice Levy-Leblond (project architect, competition), Tina Sickert et Jonathan Myara assistant architects, Laurence François, administration and communication

www.terreneuve.fr

Adam YEDID, associate architect, Paris
Céline Mercier (project architect), Delphine Jaoul (competition)

www.adamyedid-archi.com

ARCHITECTURE & CLIMAT, architects D.O. and construction economist in Dakar
Mohamadou Gueye, project chief engineer

SATOBA Alain Glotin, D.O. structure / ALTO D.O. fluids and environment Eric Escande, project manager ; Clément Barbier and Fabrice Gillard, engineers / GETRAP Pascal Rousseau, construction economist for architectural items

Consultants : Armelle CLAUDE, landscaper / AYDA Yves Dekeyrel, acoustics expert / Miquel MONT, plastic colorist

Programming

POLYPROGRAMME, Paris.

Company

GENERALE D'ENTREPRISES - GE, Dakar. Mame Mor Fall, PDG ; Ahmed Mouhamed Dame Lo, technical manager of the company and site manager; Abdoul Ahad Diallo, assistant site manager

www.generaledentreprises.sn

Supervising office

SCAT Internationale, Dakar. Abdoulaye Sene, officer in charge of operation

Timeline

competition: 2006; studies: 2006-2008
construction site: phase 1: school buildings, 2008-2010 / phase 2: sport facilities and gymnasium, 2010-2011

Surfaces

17,000 m² SHON net floor area + 40,000 m² exterior surfaces
including 14,500 m² usable area, including half-open covered surfaces

Total cost

CFA Franc 1 030 M (€ 15,7 M), 2006 value

Environmental specifics

Waste water treatment: autonomous treatment units for green space watering
Rainwater infiltration: roof top water retention and draining systems at the foot of the buildings
Thermal control: double ventilated walls, natural cross ventilation
Solar protection: double walls, protection roofs and passageways, sun-shading devices, vegetated school yards and pergolas
Patio climate control between buildings: optimization of air circulation between builfings and planted patio
Domestic hot water production: solar panels and solar storage
Autonomous solar lamp outdoor lighting

Main products

woodwork TECHNAL; tiling Royal Moza and NovoCeram; Etalbond; lighting SAMMODE, SEAE, BEGA, I GUZINI; signage and hardware EUXOS; ...

Award

AFEX Grand Prix 2012 for French Architecture worldwide

Photos credits

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