BRUSSELS GREENBIZZ / GENESIS - PASSIVEHOUSE SYMPOSIUM 2013

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ABSTRACT

Located on a long-abandonned and polluted 4-hectare industrial site near the city center, BRUSSELS GREENBIZZ is part of a large-scale 14-hectare urban development called TIVOLI, publicly funded by European FEDER funds *and the SDRB (Société de Développement pour la Région de Bruxelles-Capitale). This sustainable neighborhood includes both housing (+/-450 units, on site end 2014) and economic facilities in which GREENBIZZ (12.000sqm) holds the pivotal role* (FIG I.).
The project, presented at its competition phase in this paper, proposes workshops for environment-oriented businesses and spin-offs (low-energy), an incubator (nzeb) and office space (passive), plus an array of extra amenities open to the public including exhibition space and café. Two principal volumes (phases I and II) articulate a new public plaza offering transition between the more industrial quartier to the south and the more urban and residential one to the north. Sitting in limbo between these apparently opposed activities, the project's role is to create synergy: encouraging visitors as well as occupants, confirmed specialists as well as young entrepreneurs-to-be, adults as well as children to be part of the collective emulaton housed within. Its dynamic, generous, and permeable organisation, its mission to create responsable employment, and its clearly expressed sustainable identity all carry the same message.
Sustainable design can and must be about so much more than implementing energy-efficiency and responsable material-sourcing … sustainable design must be about implementing hope.

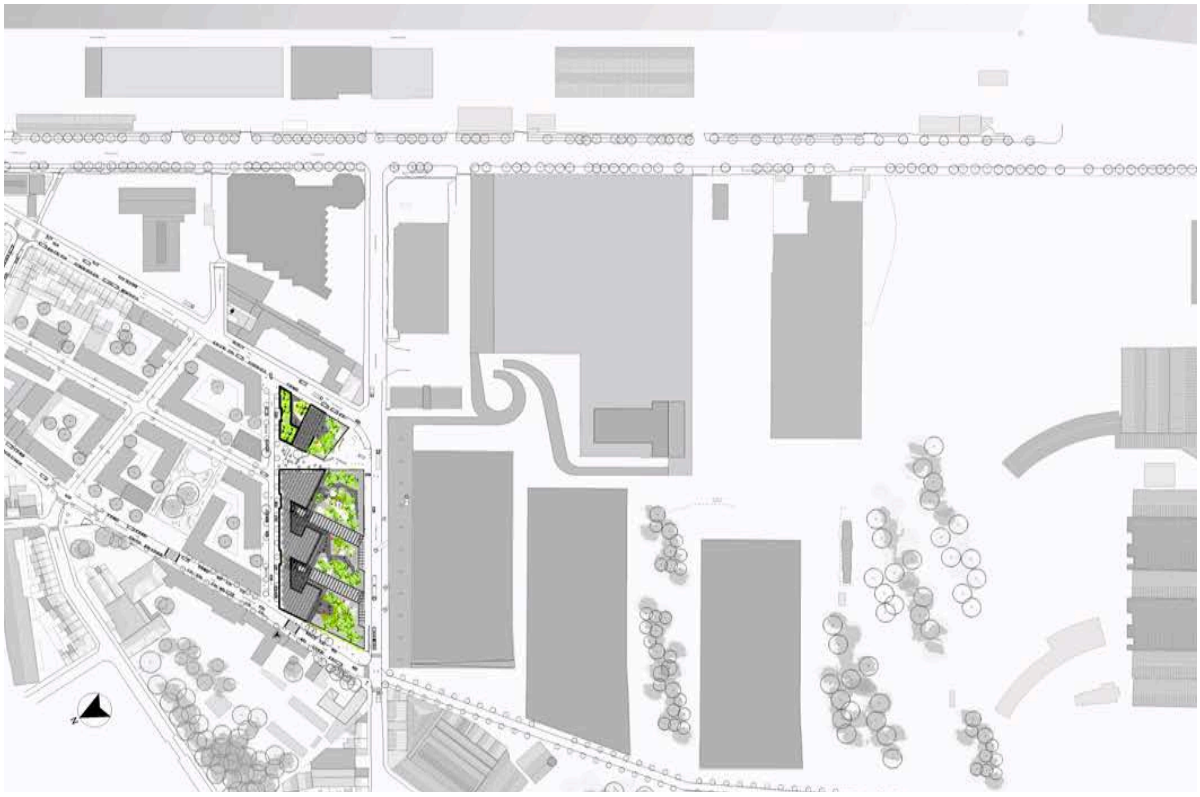


FIG I: SITE PLAN

1. IDP

GREENBIZZ is the result of an Integrated Design Process made possible by the active implication of all team members: client, engineers, architects but also City/Regional/and Environmental Authorities. (TABLE I.).
Thorough open-ended option-testing and a resilient collaborative process push shared individual insights to shape the synthetic whole … each individual's thinking being deformed then modified following interaction with other individuals' thinking … the design proposal gradually morphing into a pertinent answer materialised by the built form.

Client	SDRB (S. Stevelinck)
Architect	Architectes Associés (L. Claeys M. Lacour, E. Léonard, S. Leribaux et al.)
Structural Engineer	Setesco (L. Sottiaux, F. Michaux et al.)
Technical Engineer	Flow Transfer International & Istema (P. Delagaye, A. Janssens et al)
Sustainability Engineer	Cenergie (J. Dugnoille, A-L. Maerckx et al)
Certification PEB and BREEAM	Cenergie (J. Dugnoille, A-L. Maerckx et al)
Securité&Santé	Health & Safety Consulting
Acoustique	Daidalos Peutz (B. Cosemans et al)

TABLE I: TEAM MEMBERS

2. GENESIS

Philosophy
The ensemble is designed open and permeable, expressing **exchange** and **osmosis** … a breeding ground for **collective emulation** infused by environnemental consciousness. Architecture is about identity and as such GREENBIZZ's identity is dynamic and interactive, built and unbuilt forms suggesting not just momentum but a readiness to share that momentum with anyone rubbing close.
The porous character is reinforced by **strong public liaisons** Tivoli-Canal and Tivoli-Tours&Taxis, sparking connections between these very different zones. Without fail, all extra non-built square meters have been alloted to the new public plaza federating neighborhoods/populations/functions indiscriminately (FIG II.).
The project is organised as follows:
phase I to the west of the plaza, on site before end 2013, and
phase II to the east, still at permit stage at today's date.

FIG II. VIEW NEW PUBLIC PLAZA

Phase I.

1° Acces (nzeb) Occupying the most strategic corner on site, **the grand entrance lobby** is a high-ceilnged light-filled communal space greeting occupants and visitors, but also the quartier and all its inhabitants. The open and modular volume allows for exhibitions, meetings, group activities or other events, and is completed by a cafeteria that should sprawl out onto the street and plaza whenever weather permits.

The corner position allows for fluid acces to meeting rooms and administration at mezzanine level, to the incubator above, and to workshops behind (FIG III.).

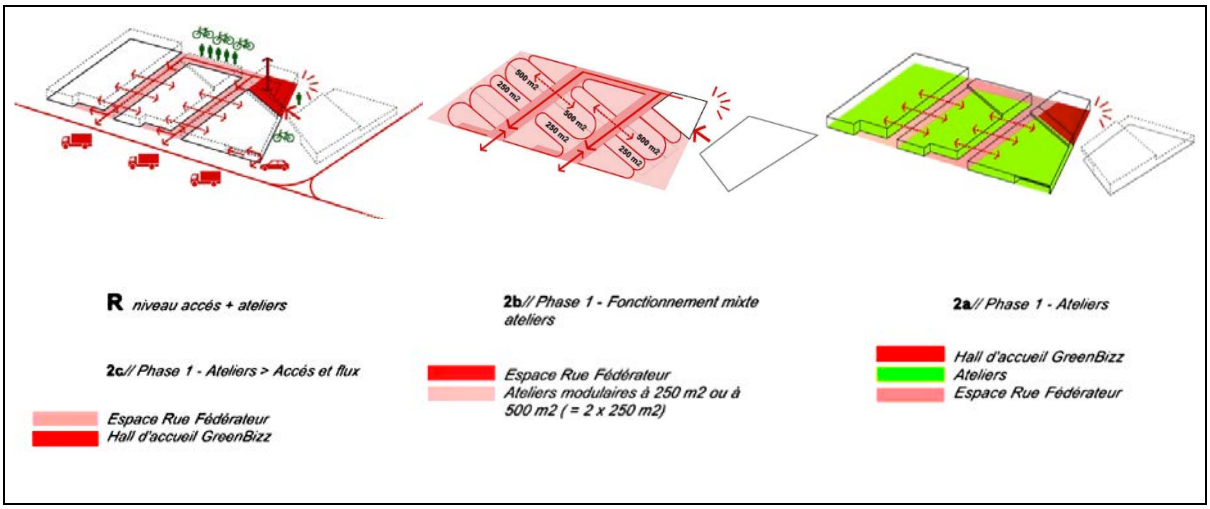


FIG III: EXTERNAL CIRCULATIONS

2° Workshops (low-energy) Six and eight meters high inside, workshops face each other alongside **two covered open-air streets** federating activities arranged along them. These streets are shared collective space welcoming very diverse animations, **permeable** and **see-through** on their north-south axis (Tivoli north and Lefèvre south), offering the show of bustling animation to neighbors and passer-bys at street-level and from above: trucks and carts delivering merchandise, workers coming and going … all this under a **glass canopy** maintaining activity rainy days included.

All vehicle acces (trucks, cars, deliveries, …) is concentrated south on the rue Lefèvre on this noisy and traffic-ridden side of the block, ensuring as such that the three other sides are assured relative calm. At night's arrival gates are closed for security reasons (FIG III.).

Both streets are hooked up north to a perpendicular promenade alongside the residential quartier Tivoli and the proposed shared street-space parallel, this promenade leading directly back to the entrance lobby and out onto the plaza OR up to the incubator at rooftop level. This **east-west pedestrian backbone** used by both workshop and incubator occupants is fully visible on its entire length street-side … hoping to make the liveliness going on inside the building more the clincher than the building itself (FIG IV.).

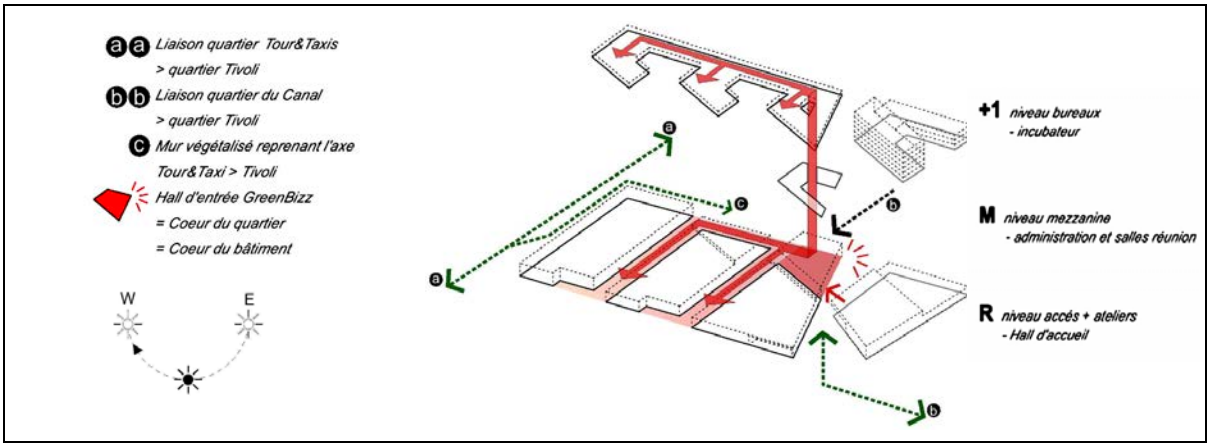


FIG IV: BACKBONE

3° Incubator (nzeb) This modular workspace is positionned above the east-west promenade, in linear concentration north-side leaving the south-side free for extensive rooftop planting.
Perched above the workshops but only one-level thick, the incubator lays low in order to ensure maximum sun penetration into housing along Tivoli, bridges the bustling open-air streets below, and gently folds itself around two sun-filled patios. Designed as one more shot at osmosis, these patios overlooking green roofs provide a visual and spatial breather, partly sunny and partly shaded by the photovoltaïc canopy above (FIG V.).

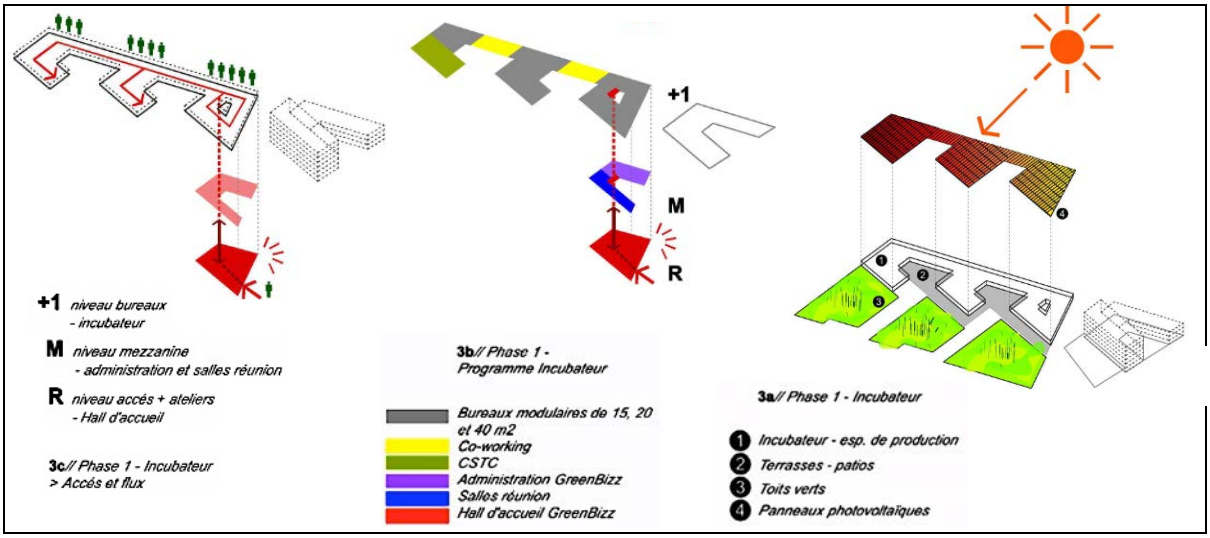


FIG V: INCUBATOR

Phase II.
1° Acces (passive) Volumes at street-level step back creating a covered acces zone opening onto the plaza, but follow street alignment along the rue Claessens and the quartier Tivoli. Concentrating acces on the plaza, and facing the grand entrance lobby of phase I, this positionning re-inforces the Tivoli-Canal axis, but especially re-instates the importance of the new public space and its role as connector : between phases I and II, between inside and out, and between occupants and neighbors.
2° Workshops (low-energy) Phase II workshops are identical to those phase I, but are fewer in number.
3° Offices (passive) Standard workspaces meeting Brussels' standard office requirements top off phase II, floorplates wrapping themselves around a three-sided planted courtyard facing the Ecole des Bateliers's courtyard rue Claessens … again shared unbuilt space making connections. Phase II rises higher than phase I, but is positionned so as not to cast exagerrated shadows on neighboring housing (FIG VI.).

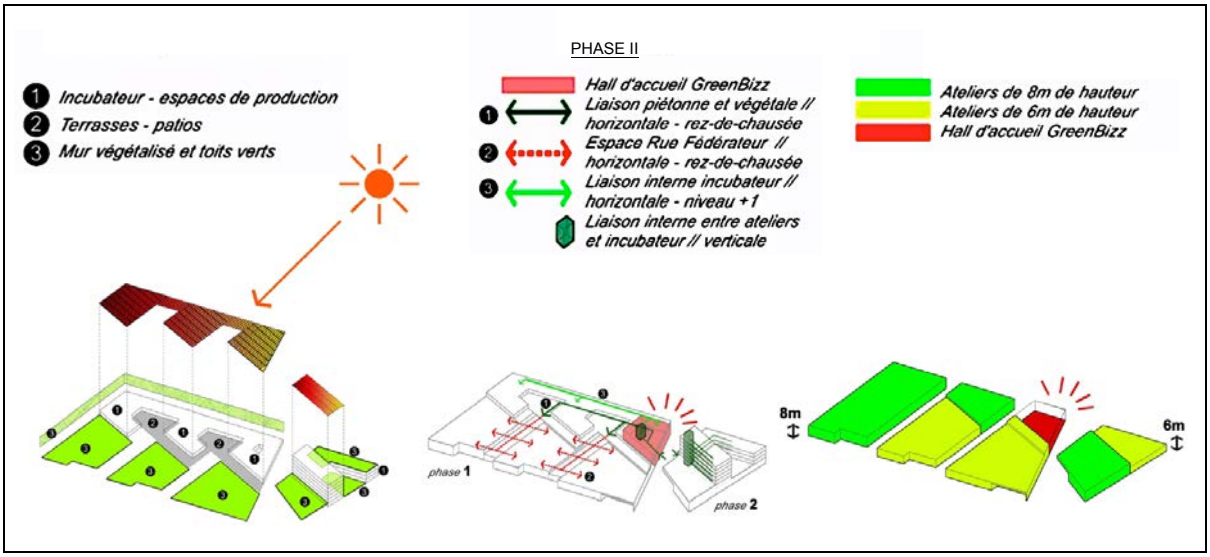
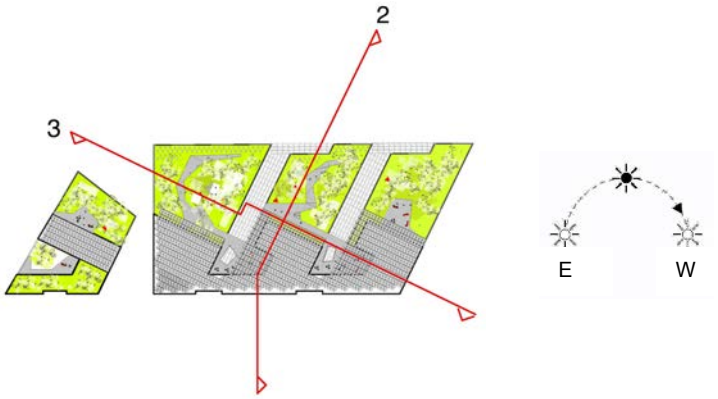


FIG VI: INTRODUCTION PHASE II

To conclude, the most influential design quest during genesis has been identity.
How should the given function, ie the workplace, express itself here?
The built and unbuilt forms of GREENBIZZ do not embody the end result of any particular workplace inside however sustainable its production might be … they seethe and embody instead the federating experience going on inside that workplace, the collective effort, the emulation, the bustling exchange. Work is expressed as something lively, something tempting, something to share, something permeable, something responsible and especially something accessible to all especially to the children playing ball on that plaza or sitting around watching the ballet of carts in those open-air streets.

3. BUILT AND UNBUILT SPACE



Section 22

Section 33

South Elevation

North Elevation

FIG VII: PLANS, SECTIONS & STREET ELEVATIONS

4. IMPACT OF CONSTRUCTION PRINCIPLES DURING GENESIS

Skeleton

Workshops are strictly functionnal, rythmed by a modular skeleton made up of concrete T-portiques aligned on a repetitive east-west 9m x 9,25m grid. This grid is strictly respected thru-out the site, except north along the Tivoli quartier where it pivots in order to follow street alignment. This gesture and what it means is paramount: GREENBIZZ deforms itself in order to comply to and thereby welcome the Tivoli housing front, offering an open-edged fringe expressing again permeability.
The straight-forward structure supports a hollow core slab at 6m or 8m clearance height, topped off with either similarily pre-fabricated incubator/offices OR a green roof (FIG VIII.).
Prefabrication and cost-control have been the most influential structural factors during genesis.

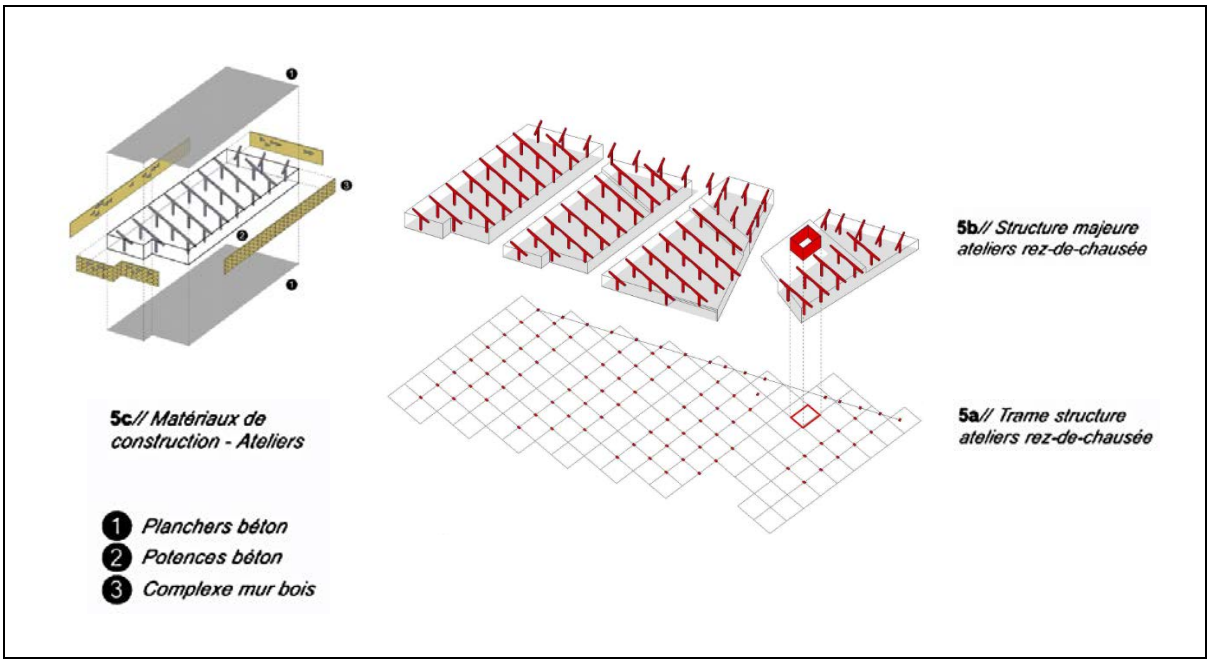


FIG VIII: SKELETON

Skin : precepts

As in any passive or near-passive project, GREENBIZZ's skin offers excellent thermal and air-tightness performance. Its particularities lie elsewhere: in its 100% préfabricated nature (offering as such unique quality control at a large-scale), ecological material sourcing (leading to alternative choices like timber), low maintenance (highly resistant skins inside and out), and multi-tasking (offering excellent acoustic performance for example, or humidity control thanks to its lazured finish).
Design work during genesis remained very independent here compared to earlier projects (Aeropolis, Elia) where design&build with the prospective façade cladder had more impact.
This desired independance will hopefully stimulate the façade-cladding market, pushing competant cladders to put their R&D departments to work and propose something both technically and economically viable. The timber frame-cladding proposed is not rocket-science … opening up the market seems therefore technically feasable … but especially strategically critical in order to create an open and thereby healthy, fair, and sustainable market capable of producing the right product at the right price.
GREENBIZZ is currently under tender: results will speak for themselves.

Skin : workshops

Vertically proportionned timber frames ± 225cm wide, ± 900cm high, and 36cm thick include:
- 2cm of Naturspan sheet on the inside,
- 20cm cellulose insulation, and
- 2cm of Celit sheet on the outside.

These frames are clad in KERTO (pressure-treated laminated timber panels).
Cladding on a triangular grid integrates all necessary constituants: opaque elements, glazing, ventilation louvers, etc. Windows made of timber frames and double pane thermal protective glass (U.1.1 watt/m2K) are positionned both as high as possible (letting maximum sunlight in as far inside

as possible, but without getting in the way of structural components nor party walls between workshops) AND as low as possible (allowing children to get an easy glimpse in, but without comprimising security), giving rise to a seemingly random window topography. External sun-shading is not necessary in order to meet the low-energy standard aimed at here.
The triangular grid is itself a direct result of the photovoltaïc grid above (FIG IX.).

Skin : offices and incubator
Horizontally proportionned timber frames ± 1080cm wide, ± 350cm high, but 40cm thick include:
- 2cm acoustic backing
- 3cm acoustique insulation
- 2cm of Naturspan sheet on the inside,
- 20cm cellulose insulation,
- 6cm of Celit sheet on the outside.

These frames are finished externally with industrial ribbed natural aluminium cladding (Kalzip, or other).
Wide triple-glazd timber/aluminium windows on a strict 135cm grid offer optimum flexibility to partitionnable workspaces inside. Automatically controled folding exterior sunscreens necessary in order to meet the passive standards aimed at here are composed of identical ribbed aluminium but perforated, animating all facades except those receiving sun-protection from the over-hanging photovoltaïc canopy.

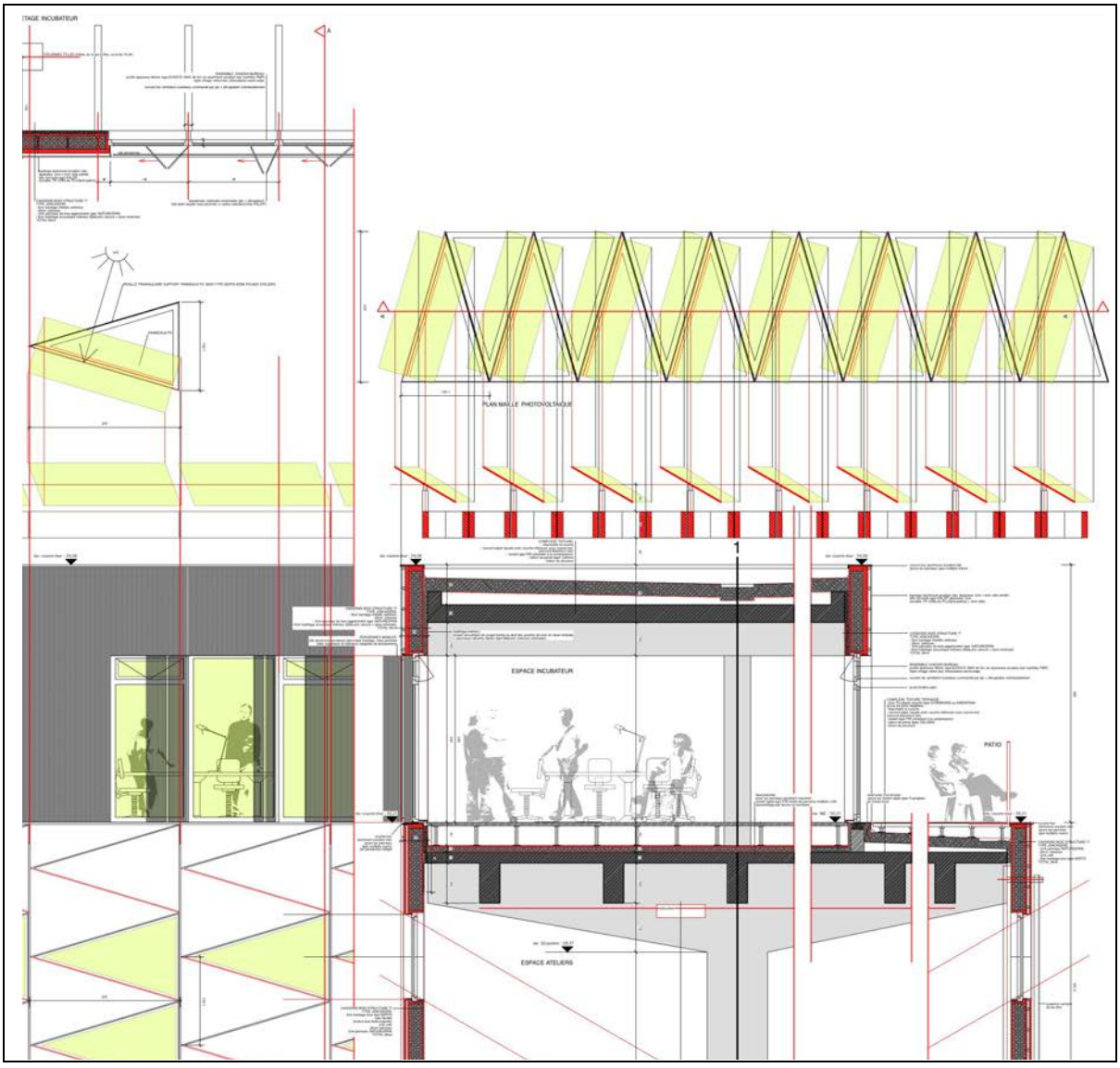


FIG IX: SKIN

5. IMPACT OF ENVIRONMENTAL CRITERIA DURING GENESIS

If sustainability is considered in broad terms as it should be … that is embracing social, contextual, economic, and temporal modes … then any antagonistic, insensitive, over-budget, and stick-in-the-mud project is a sustainable flop however nzeb it may be. It is within this mental framework that GREENBIZZ is designed.
That said, environmentally responsible choices Integrated as natural reflexes at every stage of the work process and especially during genesis, supported by energy-efficient solutions, careful material sourcing, and industrial techniques (such as extensive prefabrication), bestow an innovative and exemplary character on GREENBIZZ confirming its fundamentally responsible identity.

Methodology includes:
- considering first and foremost sustainable techniques and materials AND their sustainable implementation, taking into account long-term repercussions,
- systematically taking a global cost-effective approach considering these sustainable techniques and materials, thus tending toward economic viability capable of offering a model for the future (shunning one-shots),
- avoiding choices mortgaging possible evolution, pushing instead modular and flexible solutions capable of morphing in order to adapt to that future.

In GREENBIZZ, impact is differentiated following phase and domain. For example:

First steps: massing
As explained in 2. GENESIS, at this stage attention is not specifically focused on environmental criteria, limiting their impact on design.
Orientation is nevertheless decisive, pushing for example the incubator north alongside Tivoli thus freeing sunny south-facing rooftops for planting … even though this solution was then validated mostly because massing along Tivoli was a way of acknowlodging (being in deference to) the Tivoli inhabitants.
Compactness guides, but not blindly. Workshops for example are indeed compact (simplifying heating and cooling), but they ended up that way first and foremost in order to make room for the plaza. Offices topping phase II. are compact but mostly because it was the only way to fit in the competition brief (which called for 2500sqm of offices). And lastly, the incubator is no way near compact preferring a loosely fitted low-lying sprawl around federating patios. Extra efforts have therefore been made here (extra insulation for example), implying an economic effort, but considered worthwhile in light of the pertinence of the built form.

Next : defining construction principles
Although militarily conditionned by budget control, environmental criteria start to play a more influential role at this point.
On one hand **structural options** are still mostly influenced by cost-efficiency, although thermal inertia and pre-fabrication are of course decisive when considering concrete.
On the other hand **skin design and more globally material choice** are clearly influenced by sustainable considerations, nonetheless framed by economic considerations: creating a healthy workplace, optimizing life-cycle, limiting transport, or reducing site-impact. Timber for example, originating from european forests, is used extensively for façade frames and cladding. Inside wood finish is lazure, not varnish, creating natural humidity regulation. Robinia (said to be the only north-european timber suitable for outdoor use) is used for terraces. At street level, recycled plastic sheet is used for siding. Aluminium is anodised, never painted (makes recycling much easier). All facades are assembled off-site, ensuring high-level quality control and therefore low maintenace.
Large scale pre-fabrication is systematically imagined for facades, for the load-bearing frame as mentionned, and even for smaller elements such as metal works or the glass canopy covering the open-air streets.

Finally : meeting energy performances
Meeting these heavily impact design on GREENBIZZ.
Slab-cooling, air-tightness and insulation, MVHR, or adiabatic cooling all presuppose consequential repercussions on how finishes are chosen and implemented, on how the façade works and looks, on how on how technical rooms are positionned then connected, and on detailing (avoiding thermal bridges), etc.

Incubator (phase I.): passive according to PMP guidelines. PHPP calculations show:
- heating demand: 11,9 kWh/m².year,
- cooling demand: 4 kWh/m².year,
- primary energy demand: 77 kWh/m².year (photovoltaïc canopy excluded).

Workshops (phase I.): low-energy according to Brussels Environment guidelines (prime énergie B10). PHPP calculations show:
- atelier A: 22 kWh/m².year,
- atelier B: 43,1 kWh/m².year,
- atelier C: 37 kWh/m².year.

Specifications concerning the photovoltaïque canopy impose minimum 168 kWp, which is actually well over what will be needed for lighting, ventilation, heating, etc.

6. CONCLUSION

GREENBIZZ will be on site before end 2013.

Embracing a myriad of intertwining criteria, the inherent complexity of the issue of sustainable thinking has been welcomed and integrated during genesis, the design process obviously taking its cue from Aeropolis and Elia but with one fundamental shift prompted from day one by the SDRB's competition brief : GREENBIZZ's key challenge is not just about energy, it is about triggering positive social and economic outcomes in a part of town simmering with potential … it is about bringing to light, fostering, and harvesting that **human energy**, taking into account the global nature of the social, contextual, economic and temporal aspects concerned, visible only through the all encompassing lens of empathy.

" Les découpages conduisent nécessairement à des actions mutilantes …
l'hyper simplification est réductrice (comme la segmentation ou la spécialisation) … elle rend aveugle à la complexité du réel. " [1]

FIG X: VIEW SOUTH ELEVATION

REFERENCES

1. Michel, P. and Cantin R. (2010), Complexité du bâtiment durable. In *Actes du Colloque international francophone "Complexité 2010"* : p. 7.