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I Sustainable building in France: Review of the various stages and actors	7
1.1 Initial research and design of the HQE® approach	7
1.2 Mobilization of field actors and regional involvement in the promotion of HQE® approach dissemination	9
1.3 France's role on the international scene (actors and partnerships).....	10
II Acknowledgment of sustainable building by the real estate investment community	12
2.1 Evolution in the regulatory framework	12
2.2 Investor positioning	13
2.3 Expanding the notion of Socially-Responsible Investment (SRI) to the real Estate.	14
III Education, training and sustainable development: Status report	15
3.1 Training programs designed for architects.....	15
• France's Architecture Schools	
• Continuing education intended for architects	
3.2 Engineering schools	18
3.3 University subject majors and research programs	19
• Sustainable development in a university setting	
• Research program on sustainable development	
IV Adoption of new techniques and technologies in the sustainable building sector: The contribution from Research	22
4.1 From 2002 to 2005: Implementation of the program to "Prepare the Building of the Year 2010"	22
4.2 The 2005 launch of PREBAT: Research and Experimental Program on Energy in Buildings (2005-2009)	23
4.3 2008 and the sequel to Grenelle: Defining the contours of a new PREBAT	25
V Introduction to building quality ratings	26
5.1 The HQE Association and HQE® Approach	27
5.2 The QUALITEL Association and its certifications	29
5.2.1 The QUALITEL - QUALITEL Group Certification	30
5.2.2 The Habitat & Environnement Certification - QUALITEL Group.....	32
5.2.3 The NF Logement Certification and its HQE® approach Option - QUALITEL Group.....	33
5.2.4 The "Bilan Patrimoine Habitat", "Patrimoine Habitat" and "Patrimoine Habitat & Environnement" certifications - QUALITEL Group	35
5.3 CEQUAMI and the NF Maison Individuelle certification, plus its HQE® Approach option	36
5.4 CERTIVEA and the NF Bâtiments Tertiaires - HQE® Approach certification	37
VI Presentation authors	41

INTRODUCTION

Over the past few years, sustainable development has become one of French society's great concerns. Ministries, local authorities and all corporate segments have been making this topic central to their strategic decisions. The initiatives undertaken to ensure a "greener" world have spanned all directions, and it can now be unabashedly declared that France [following years of lip service] is indeed aware of the stakes involved, as evidenced by the adoption of increasingly stringent environmental protection measures, in association with an ambitious set of objectives.

The construction and housing sectors have been lumped into this dynamic. In response to these new demands, all actors participating in such sectors, be they real estate developers, social landlords or housing corporations, investors, architects, construction companies or local authorities, have been challenging their practices and production models, which for the most part were inspired during a period when economic growth went hand in hand with environmental degradation. Regulatory changes in terms of urban planning and the application of new building standards now require all actors to the development process to more closely scrutinize the means employed to assess project impacts on the environment.

Along these lines, discussions held on the topic of sustainable development have mainly focused on two schools of thought. The first approaches the context from its economic and social vantage point in addition to incorporating the environmental perspective. This school expands emphasis to the architectural and use attributes of the project, introducing non-polluting materials, pursuing social harmony goals, respecting biodiversity or addressing the life cycle, to cite just a few indicators... The second, so-called "energy" school tends to route the sustainable development concept towards issues related to energy, considered as the primary variable in play to fulfill objectives specific to greenhouse gas emission reductions. A recent draft law written subsequent to the Grenelle Environment Roundtable (see insert below) seems to demonstrate that for at least the construction industry, this "energy" discourse is now moving into position as the dominant paradigm. Even though the new law has not yet been ratified by Parliament, one of its articles actually calls for all public and tertiary buildings developed as of 2010 to be designed in compliance with specifications for the "Low Consumption Building" (LCB) label (known as BBC, in France).

In terms of benchmarks, France tends to prefer associating qualitative and quantitative indicators. A French approach entitled "High Environmental Quality" (ascribed the trademark SB08 – Sustainable Building in France: Progress Report

HQE®) begins by laying out a global conceptual matrix that differs markedly from the Anglo-Saxon benchmarks such as the American LEED or English BREEAM, both of which are aimed at achieving a set of quantifiable objectives. The "French style" educational system and mindset has produced multicriteria conceptual models, perceived as more holistic tools, while other countries are pursuing pragmatism as a mode for shaping their initial strategies. The difference with the French approach also lies in the organizational pattern among actors, given France's tendency to disperse its skill base across entities, as opposed to the Anglo-Saxon model where firms concentrate a wide array of skill sets within individual entities.

Written for the occasion of the Melbourne SB '08 conference, this paper is intended to provide a status report on France's strategic evaluation, concerns and actions engaged in the area of sustainable buildings. Following a brief presentation of the Grenelle Environment Roundtable (the French "Grenelle de l'Environnement"), the paper will discuss performance targets along with the measures (taxes, regulations) implemented to meet these targets. We will then turn attention to the ongoing debates within the real estate investment community before exposing the set of actions undertaken in the realm of education. Over the near future, training aspects will become critical since the human resources necessary to design tomorrow's sustainable buildings have not yet been produced. The exponential growth in "green" projects over the short term in response to the latest round of regulations would at this point suggest a shortage of qualified labor. We will close the presentation with a glimpse at some of the R&D actions underway to help stimulate new sustainable building techniques and technologies, followed by a recap of the principal benchmarks and environmental quality labels and certifications.

What exactly is the "Grenelle Environment Roundtable"?

This roundtable event refers to a whole series of policy debates held in October 2007 under the aegis of the Ministry of Ecology, Energy, Sustainable Development and Regional Planning (MEEDDAT); it served to assemble local and regional authorities, professional organizations and trade unions, NGOs and assorted public figures in the aim of making long-term decisions regarding the environment and sustainable development. These gatherings were intended to give rise to a body of legislative measures.

The Grenelle Roundtable established two chief objectives: divide by four the amount of greenhouse gas emissions between 1990 and 2050 and earn for France the distinction of being the European Union's most efficient carbon economy by the year 2020, by means of incorporating the impact of greenhouse gas emissions into the price of goods and services. Over the short run, the government is targeting a 40% drop in energy consumption and 50% fewer greenhouse gas emissions within a ten-year time frame.

The draft law debated before Parliament has set forth some bold objectives for the construction industry. Article 4 stipulates that "all public and tertiary buildings will be designed in compliance with the 'low consumption' label as of the end of 2010, bringing down the average primary energy consumption to less than 50 kWh per square meter per year. By the end of 2012, every type of building permit issued will require satisfying the conditions associated with the 'low consumption building' label, while no later than 2020 all new construction will need to comply with the 'Positive Energy Building' specifications. The property ownership subsidies in place should also, on a case-by-case basis, be conditional upon or modulated by building energy performance."

As for existing building stock, the draft law has set the objective of reducing energy consumption 38% by 2020. All buildings owned by the national government and affiliated public agencies will undergo an energy audit by 2010, with renovation works scheduled for 2012 at the latest.

This law also allocates for the remodeling of 120 million m² in building space, to be financed by public-private partnership (PPP) contracts and energy performance contracts. In order to effectively monitor all these future guidelines, an annual report will be delivered to Parliament on both the efforts underway and results obtained beginning in 2010. An energy-SB08 – Sustainable Building in France: Progress Report

based rehabilitation of the nation's entire stock of subsidized housing units, starting with the 800,000 units whose consumption exceeds 230 kWh per m², has been scheduled in addition to a final consumption objective between 90 and 150 kWh/m².

Significant gains should also be underscored for urban planning projects, given that the draft law has invited all regions and municipalities of over 50,000 population to develop territorial climate control plans before 2012. As of now, planning law will be required to encompass objectives relative to the battle against climate change and energy conservation. Local authorities are requested to present quantitative objectives for combating the loss of agricultural and natural land area, as well as for maintaining biodiversity through conservation, preservation or establishment of ecological continuity. A report recently submitted to the French President favors the creation of ten or so "eco-districts" called *Ecopolis* to serve as a full-scale showcase of what the sustainable city of tomorrow could resemble.

I) Sustainable building in France: Review of the various stages and actors

In France, the 1970's represented a turning point in the area of housing construction, with the end of the quantitative era and the beginning of the quest for qualitative improvements. The QUALITEL Association, created in 1974, was assigned the mission of devising a label to serve as a basis for judging housing quality. It was at this time that certification processes first started to be implemented.

1.1 Initial research and design of the HQE® approach

Research activities focusing on the environmental quality side of buildings began in earnest as of the 1990's. Efforts undertaken by both the ADEME (Environment and Energy Management Agency) and the PUCA (Construction and Architecture Advisory Group) led, between 1993 and 1998, to crafting the HQE® approach and its 14 targets, via a series of Workshops dedicated to the Environmental Quality Evaluation of Buildings (ATEQUE). At the present time, discussions are being held to expand the approach to the other components of sustainable development, to specific categories of structures and to the urban scale.

Furthermore, research work has generated two environmental quality evaluation tools specifically for structures: EQUER, still used to this day by consultants working in the field of eco-design, and ESCALE. Yet the application of both tools has been hindered by a lack of data, and especially by the products required for full tool implementation. Just this year, the CSTB research organization developed a tool called ELODIE, which links to data from the Environmental and Sanitary Declaration Files (FDES, French acronym for EPD – Environmental Declaration of Product) contained in the INIES database, intended to calculate the role of products in the environmental impact of a structure.

The HQE association was founded in 1996 in the aim of pursuing ATEQUE's work program and promoting the HQE® approach from an operational standpoint, with the ambition to more heavily involve the range of actors in the field, encompassing project architect and project owner, and not overlooking contractors and industrial partners. These actors are represented in the association by their professional organizations. HQE has been set up around working groups, whose input helps shape association activities.

During this decade, the gradual introduction of a **certification** process has been championed by a number of actors (ADEME, Ministry, CSTB, QUALITEL), in collaboration with the HQE association, as an expression of encouragement for a scale change along with official recognition of construction projects that meet high environmental quality criteria. High schools

were the first segment treated thanks to the impetus of regional councils. This certification dynamic, launched in 2004, also offers project owners the opportunity to have the environmental quality of their approach and development acknowledged by an independent external body. The "NF Bâtiments Tertiaires, démarche HQE[®]" certification process is handled by CERTIVEA, a CSTB subsidiary. Specifically for houses and residential buildings, CERQUAL, a QUALITEL subsidiary, proposes the "Habitat and Environment" certification and the "NF Logement - démarche HQE[®]" label for real estate developers. Residential buildings rehabilitation projects can also see their environmental quality assessed and certified by CERQUAL PATRIMOINE (QUALITEL group). Single-family dwellings are also singled out with the "NF Maison Individuelle - démarche HQE[®]" (Single-Family Dwelling) distinction awarded by CEQUAMI, a CSTB and QUALITEL subsidiary. Over time, the fields of application have been extended and new benchmarks created to include other categories of structures under the supervision of certifying bodies, for subsequent validation by the HQE association.

The environmental statement on products has been responsible for leading national **standardization** efforts. Standard NF P01-010, which defines the content of the already mentioned Environmental and Sanitary Data Files (FDES), is the result of this effort and has since been coordinated with a verification program. Beyond this level, the AFNOR P01E Commission entitled "Environmental quality of construction and building products" has expanded its scope of works to include evaluations of structural environmental quality; moreover, Standard NF P01-020, which comprises 3 parts (2 of which are published), is nearly ready for release. The P01E Commission also serves as the French mirror group of the ISO and CEN Committees, as discussed further below.

All affected **construction sector actors** (public authorities, industrial firms, architects, design consultants, environmental assessment assistants, tradesmen, contractors, project owners, developers, etc.) are active within national bodies via their professional organizations, whose role consists of piloting or partnering research projects and stimulating proposals on benchmarks and standards. Yet a number of large public or private project owners (housing corporations, financial establishments, regional or departmental councils, municipal government, etc.) are also extremely active, and in some cases in a more pragmatic setting, when it comes to developing specific charters or benchmarks.

As indicated above, the **Grenelle Environment Roundtable** constitutes a major accomplishment of the MEEDDAT Ministry. Among the proposals issued by the New Buildings Operating Committee, attention should be paid both to the one concerning evolution in the HQE[®]

approach favoring a point-tracking tool for evaluating environmental quality, based on a set of quantifiable indicators, and to the product environmental and sanitary labeling project.

1.2 Mobilization of field actors and regional involvement in the promotion of HQE[®] approach dissemination

The HQE[®] approach has been crafted from experimental campaigns conducted within the scope of a research program (REX HQE) that took place during the 1990's on subsidized housing and examined a number of specific topics (water, energy, waste). Its application started to gain momentum at the regional level, as regional councils dedicated the initial HQE projects to renovating local high schools. The Paris Region (Ile-de-France) holds the distinction for launching the very first operation at the Maximilien Perret High School in the close suburb of Alfortville in 1996, with the services of architect Massimiliano Fuksas; this undertaking was noteworthy for having established the scope of intervention around the now-famous 14 HQE[®] targets, and more specifically for implementation of the so-called "clean" worksite as part of Target 3: low-nuisance building site management. The country's Nord-Pas-de-Calais northern region initiated works in 1998 and then 2000 on the two emblematic structures of Calais and Caudry High Schools. Once these projects were underway, the movement was eagerly adopted by other local authorities, jurisdictions for their middle schools, municipalities for their public works or individual schools, prior to a more systematic dissemination including not only social landlords for housing construction but private development projects as well.

The present success of this approach is due, among other things, to the mobilization of all building industry professions, with heavy participation from actors in the field, particularly at the regional level, as exemplified by resource centers, **association networks** along the lines of the Environmental Quality Cluster in Champagne-Ardenne, VAD in Rhone-Alps, Ecobat-Méditerranée in the Provence-Alpes-Côte d'Azur region, and the network of regional environmental agencies such as ARENE Ile-de-France in the Paris Region. At the national level, the ADEME (Environment and Energy Conservation) Agency launched an initiative to coordinate all these individual resource centers spread throughout the territory in order to consolidate the assistance and accompanying services they provide to actors, by means of discussion forums, expert guidance and information availability, local events (gatherings, site visits, conferences), or even the identification and evaluation of pertinent projects already in progress. Consumer associations were corralled into the process through the Grenelle Environment Roundtable.

Over time, the exemplary projects ascribed pilot status grew in number and became more widespread thanks to an expanded level of awareness on the part of local actors, as well as by the introduction of support measures at the regional scale: subsidy and grant systems proposed nationally by ADEME and then distributed by regional councils within the framework of energy or environmental policies focusing on high-efficiency techniques/facilities or on innovative design, e.g. "HQE"-fashioned building project assistance.

France's regional level is known to possess territorial interfacing agencies that establish a productive contact with local professional networks and generate increased interest and demand. With closer ties to the field, these agencies also help convey a local culture specific to treating bioclimatic issues or implementing "green" material policies; as such, they are in a position to suggest innovative solutions with a regional bent, which in turn enriches the diversity of this movement at the national level.

1.3 France's role on the international scene (actors and partnerships)

This section will offer a view of the French contribution to a framework for research, and to the standardization efforts conducted at both the European and international levels.

France participated in the very first European-financed **research & development** partnership projects on the topic of sustainable development through the 4th, 5th and 6th framework programs sponsored by the "Research" Directorate General (DG) between 1994 and 2006. The French contribution has also been substantial in more recent projects, financed at times by other directorates (Environment, Transport and Energy, Enterprise), which on the whole have significantly advanced this extremely broad notion of 'environmental quality in construction'. From the Brite-Euram 1470 project, defining a scope for Life Cycle Analysis (LCA) applications to building products, to the SMART-ECO assignment of establishing a "*sustainable eco-building*" vision for horizon 2030, the myriad of consortia that include French partners has successively elaborated: environmental evaluation tools (REGENER), indicators (CRISP), practical guidelines (PRESCO), and a series of environmental, economic and social indicator specifications aimed at creating a "sustainable buildings" label (LENSE). Other project work has involved health issues, economic strategies, long-term forecasting, the mix of new/rehabilitated buildings, and contributions to projects such as SUREURO, TISSUE, SHE and ECO-CAMPS. A comprehensive inventory of results from these actions would be difficult to assemble, but the opportunity to

participate has led to constituting European networks of researchers and practitioners, who subsequently collaborate in efforts to implement new labels and standards.

On the standardization field, France jumped in 2003 upon the opportunity of valuing its early efforts through AFNOR by seizing the chair and assuming the Secretariat of ISO/TC59/SC17, a new sub-committee on “sustainability in building construction” created within the technical committee dealing with “building construction”. In 2008, two standards have been published: one introduces the “general principles of sustainability in building construction” while the other one covers the EPD’s for building products. In addition, two technical reports have to be mentioned on sustainability indicators and on environmental assessment of buildings. Finally, a new working group on civil engineering works has been established last year.

In the aim of generating a standardized environmental quality evaluation tool for construction materials and products, the European Union's Enterprise DG launched a procedure **within the CEN** (the standardization body for Europe) to commission work, for which technical committee CEN/TC350 is now assigned responsibility. This committee, which has considerably extended the scope to encompass the "Sustainability of Construction Works", is chaired by Finland, with France's AFNOR standardization group acting in the capacity of secretary. The Working Group on Environmental Quality of building works, coordinated by a French member, has made strides with input from many participants towards issuing a document that contains greater precision than the ISO document, yet progress is slow-going. Despite the broad and ambitious title adopted by TC350, the current focus lies on environmental and quantitative aspects. Social considerations have for the time being been relegated to general comfort and health issues, while work on the economics side has remained limited to the global cost approach (also in mainly general terms).

As regards France's contribution to **international networks**, like those stemming from the International Energy Agency (IEA) and International Building Council (CIB), efforts have been directed once again at providing scientific matter for advancing the adoption of labels and standards. Mention should also be made of the international network iiSBE, supervised by Nils Larsson and presided by an Italian Andrea Moro, who favors among other things developing a generic international framework for evaluating environmental quality with applicability to buildings and then more broadly to the urban scale. The iiSBE, whose General Secretariat functions are handled by France's CSTB Building Research Center, currently enjoys a presence in over 30 countries via national "chapters" that combine key actors from both academia and the construction world.

Given the growing interest shown by **project developers and investors**, research sponsors have all been seeking to widen the field of application for their tools to more diverse structures. The majority of these entities have also expressed international intentions since multinationals are looking to qualify their structures with worldwide visibility. To satisfy such requests, France (via CSTB) and England (BRE) in addition to other French and foreign entities have recently created an international consortium called SB ALLIANCE, which includes iiSBE under its umbrella. This Alliance has been set up as an international scientific and technical network devoted to the environmental quality evaluation of buildings, with an organizational layout inspired by the Sky Team airline alliance model. Beyond providing a forum for members to share experiences and actions, this network is intended to rally actors around an international platform, showcasing sustainable buildings and regions, exchanging and furthering the mutual recognition of practices at the international level, and encouraging the development of new tools for buildings and regions. By April 2008, a total of 22 countries had agreed to inaugurate this alliance in Paris.

II) Acknowledgment of sustainable building by the real estate investment community

2.1 Evolution in the regulatory framework

The legislative and regulatory framework for stimulating "green" projects has been gradually taking shape at the French and European scales. The primary obstacle to implementing these regulations in the field pertains to procuring financing for works designed to enhance building "sustainability", particularly for existing building stock, which represents the main source of energy savings (given that the rate of property renewal nationwide remains rather low, 1% a year).

Tax credits on building materials (in France) or a value-added tax (VAT) discount on equipment (UK) serve as important levers, yet other effective initiatives at the local level can be cited as well, such as property tax waivers (offered to public housing corporations in France for energy conservation building work) or the inclusion of energy criteria in the building permit award process. For new residential construction, a decree relative to the recently-enacted Energy Policy Orientation Program (or POPE) authorizes exceeding the building coverage ratio by up to 20%, provided all other local planning rules have been respected, for construction that

either fulfills a number of energy performance criteria or introduces renewable energy production equipment.

2.2 Investor positioning

Motivated by an increasingly stringent legislative context, French real estate investors have regularly taken steps to embrace the sustainable building concept. The *Caisse des Dépôts et des Consignations* public-sector bank, one of France's leading investors and responsible for financing the nation's social housing stock, now incorporates sustainable development objectives into all its projects by means of a triple performance evaluation: economic, social and environmental.

As an institutional investor, *Caisse des Dépôts et des Consignations* operates using a long-term profitability horizon, which proves to be a prerequisite for sustainable development. The bank has in fact created a Sustainable Development Department to coordinate and drive its action through adopting a three-pronged approach, targeting:

- 1) investor responsibility,
- 2) the role of a sustainable building and city in the development process, and
- 3) implementation of carbon financing as a tool to combat climate change.

Despite the proliferation of environmental quality certification benchmarks for construction in France (e.g. Habitat & Environnement [H&E] (residential buildings), "NF Logement - démarche HQE[®]" (detached houses), "NF Maison Individuelle – démarche HQE[®]" (Single-Family Dwelling/ houses), "Patrimoine Habitat & Environnement (rehabilitated residential buildings), "NF Bâtiments Tertiaires - démarche HQE[®]" (Tertiary Buildings), the recompense for a project owner's lofty ambitions is not always consistent and sometimes falls short. The whole issue of energy performance measurement has been given consideration by the French national government, which defined performance levels via a range of "High Energy Performance" (or HPE) labels (HPE, HPE EnR, THPE, THPE EnR and LCB Effinergie); these labels are awarded with the individual certification logos on the back. Local and regional authorities, social landlords or housing corporations, who retain ownership rights and actually manage the properties, are obviously much more sensitive to this concern than real estate developers or investors, who simply sell the property upon completion of construction. Developers however are showing increased sensitivity, as evidenced by the application

submitted by some of them to receive the Habitat & Environnement certification for all their Housing operations.

2.3 Expanding the notion of Socially-Responsible Investment (SRI) to the real estate sector...

Socially-Responsible Investment (SRI) includes non-financial criteria in the composition of asset portfolios managed by banks, investment funds, insurance companies or other pension funds. With each market player establishing its own fund management methodology, SRI has come to represent a rather multifaceted reality: non-financial criteria, whether they be oriented towards sectoral exclusion or the authorization of asset selection on the basis of performance other than return on investment, are not cohesive or standardized. Asset managers aware of this risk are seeking to define a common set of core criteria mandatory for qualifying an SRI fund. This standardization step has become even more pressing given that the array of SRI funds available continues to expand.

According to the survey conducted by NovéthiC, Amadeis and BNP Paribas, French institutional investors have been won over by SRI: by the end of 2006, SRI had grown to represent 8.4 billion in assets under management (with 77% on the equity side), 137 SRI funds and 45 management companies¹.

Extension of SRI vehicles to the real estate sector offers a number of advantages:

- diversifying investor asset portfolios,
- reducing the risk of derelict property,
- providing incentive for innovative technical solutions, notably in the energy field (by systematizing environmental planning prescriptions),
- anticipating regulatory constraints (strengthening technical rules every 5 years),
- raising investor awareness.

The application of SRI practices to real estate assets nonetheless raises a number of issues that are currently being examined at the international level. Within the scope of the PRI (Principles for Responsible Investment) approach devised by the United Nations Environment Program Finance Initiative, a working group called "Responsible Real Estate Investor" was launched by the *Prudential* and *Caisse des Dépôts* institutions at the beginning of 2006. The

¹ Annual activity report, 2006, NovéthiC.

stakes at hand for private and institutional investors encompass financial profitability from investments, rating methods for real estate asset managers, and asset rating methods.

III) Education, training and sustainable development: Status report

France's top weekly devoted to architecture, construction and public works (*Le Moniteur*) stated in a column this past February: "*Sustainable development is now present in all training-related plans and discussions*". The article went on to conclude that the world of instruction has also been swept up in the trend whereby the sustainable development issue lies squarely at the heart of all concerns. Aware of the need to train tomorrow's leaders in sustainable development strategies and craft initiatives to be undertaken in all directions, the national government decided, subsequent to the "Grenelle Environment Roundtable", to create a joint ministerial working group to generate proposals for "strengthening the educative aspects within a comprehensive sustainable development policy". And with it, sustainable development education has become very much a French concern.

While all schools of architecture, and even engineering, as well as university research and education centers now emphasize this topic in their training curricula, considerable heterogeneity is still found in the way the topic is addressed and treated. At present, a majority of programs have opted for a module-style format to build awareness of specific themes, such as materials, waste treatment or impact-free worksites. Just a handful of engineering schools have taken the lead and actually propose courses entirely devoted to the subject, through introducing an integrated approach designed around cross-discipline exchanges with other specializations. Architecture schools, on the other hand, are in a position of playing catch-up but have recently adapted their course offerings accordingly.

This presentation is not intended to draw up an exhaustive list of the nation's various instruction packages encompassing sustainable development, but instead to present the educational impetus through the kinds of degrees awarded (by universities or engineering schools), through the discipline (architecture vs. engineering), and through the continuing education programs designed specially for degreed architects.

Presentation of France's higher education system: The French higher education system is composed of Universities and a select group of specialized schools (known as "*Grandes*

Ecoles"). French universities are public institutions of higher learning and research. After the so-called "**LMD**" or "**LIMADO**" reform, fashioned after the Anglo-Saxon university hierarchy, the French university system² now offers the following degrees: "**Licence**", 3 years of university-level study ("*Bac+3*")³; **Master**, 5 years of university study (or *Bac+5*); and **Doctorate**, three additional years of study after receipt of the Master's degree, for a total of 8 years of university-level study (*Bac+8*). For students preferring a shorter academic career, universities are also empowered to award 2-year technological proficiency degrees ("*Diplômes Universitaires de Technologie*", or DUT), devoted to technical specializations (*Bac+2*). The second piece of France's higher education system, composed of the "*Grande Ecole*" establishments, focuses primarily on engineering studies and produces Master and Doctorate graduates.

It should also be pointed out that architecture instruction in France is not provided at the university, but instead in designated Architecture Schools, which fall under the supervision of the Ministry of Culture and Communication and not the Ministry of Higher Education and Research, as is the case with all other disciplines.

3.1 Training programs designed for architects

France's Architecture Schools

A petition circulated in 2006 upon the initiative of the Nancy (eastern France) Architecture School, entitled "Teaching architecture and urban planning in the sustainable development era", served to raise awareness of this key issue among the country's architecture schools. Since then, all schools have incorporated the topic into their curriculum, yet to varying degrees. In the words of petition authors: "The environmental approach constitutes the participatory response of the building and planning world to this challenge. It has shaped new attitudes, methods and solutions for laying out cities and creating the human environment. To allow space for designers to enter this dynamic, a responsible approach calls upon professionals (architects, planners, landscape architects, engineers, contractors, industrial firms) to take a bold stance and rethink the knowledge content inherent in their discipline". The petitioners also expressed their desire "for all instruction, whether theoretical or applied, devoted to training in architecture, urban planning and landscaping, to integrate, in accordance with each discipline's own set of procedures, the principles of a sustainable and equitable development... and for topics related

² With the exception of training programs offered in the health field.

³ "*Bac+3*" signifies 3 years of study following high school, which concludes with the receipt of the "*Baccalauréat*" diploma. *Bac + 5* would then correspond to 5 years of post-*Baccalauréat* study.

to environmental quality to be taught in all academic programs, both pre-professional ("Licence", "Master", "Doctorate") and continuing education".

In 2007, professors interested in the teaching of sustainable development once again assembled for the purpose of advancing their strategy and organizing resource sharing via a universally-accessible network. The idea was floated that "sustainable development is neither an option, nor a university discipline, nor a department, but rather a brand new context, both professional and intellectual, for spurring action and knowledge". In the years to come, sustainable development should be given greater emphasis within academic curricula, in conjunction with the development of degree programs devoted to this specialization.

Continuing education intended for architects

The Division of Architecture and Heritage (DAPA) within the Ministry of Culture and Communication has since 2000 offered continuing education courses on the topic of sustainable development designed for architects. While only four "High Environmental Quality" courses were taught in 2000, since then interest has grown appreciably with a total of 38 programs listed for 2008. The "sustainable development" courses are of variable lengths: from 2-5 days for the awareness-building sequence to 20-30 days for the longest and most comprehensive.

These programs may be oriented for generalists or highly specialized, as indicated by the following sample of course titles: "The sustainable single-family home", "Architectural design and energy", "Energy and heritage", "Earthquake-resistant construction", and "Wooden architecture and sustainable development". The longest courses may give rise to a student evaluation, with thesis defense and report submission before a jury or committee composed of specialists. While the programs are intended first and foremost for architects, they may also be attended by project owners, engineers or representatives of local and regional authorities.

Some of France's regions are especially strong in their continuing education offerings (Midi-Pyrénées, Loire Valley, Languedoc-Roussillon, Provence-Alps-Côte d'Azur, Rhone-Alps and all of the eastern provinces - known as the "Grand Est"). The national network of Architecture Schools (Ecoles Nationales Supérieures d'Architecture) tend quite often to drive this policy. An interregional steering committee consisting of national and international actors heavily involved in sustainable development issues throughout the eastern provinces meets on a regular basis in order to offer a coherent response to the evolution taking place in the building

profession and to propose a coordinated and relevant source of training. The QEOP'S eastern regional association focusing on Operational Environmental Quality was founded towards the end of 2006 in the aim of consolidating the collaborative work undertaken at the interregional level, in addition to capitalizing on the knowledge and experience of individual actors, thereby creating some real synergy. The association was also assigned the objective of pooling all of the various training approaches in place, along with the studies, strategic reflections and initiatives from throughout the five regions comprising the "Grand Est".

Training offered on sustainable development also constitutes one of the main priorities for the Council for the National Order of Architects (CNOA), which has underwritten several publications on the subject, including the "green book", "*A Manifesto for sustainable and compact cities*", plus a booklet entitled "*Sustainable development and responsible architecture: Commitments and feedback*", which provides a synopsis of the best sustainable practices, both in France and abroad. The CNOA Council also regularly publishes a *Newsletter* intended to enhance awareness among the profession of the critical stakes tied with sustainable development. The objective of this publication is to incite all French architects to seek training in sustainable development within the next two years. Along these lines, all those able to declare having received 20 hours of training will be awarded an official certificate that serves as a "vital tool for communicating and reinforcing the credibility of architects with respect to the profession's new requirements"⁴.

Moreover, as part of France's current role presiding over the European Union (July-December 2008), the European Architectural Policy Forum⁵ will be held in Bordeaux on October 9th and 10th of this year. Its ambition is for the Council of European Culture Ministers to formally adopt the set of conclusions aimed at: "1) acknowledging the creative force and element of synthesis in architecture and its positive role in encouraging sustainable development; 2) championing and ensuring the promotion of architecture as a vital source of sustainable development among the general public and project owners in particular; and 3) providing the architect, for all urban development projects, with the guarantee of a coordinated procedure, including the use of only the most effective materials and processes from the standpoint of achieving the sustainability objective"⁶.

⁴ CNOA, *Cahiers de la profession*, No. 31, 1st quarter 2008, p. 3.

⁵ The European Architectural Policy Forum encompasses, through its three pillars, architectural agencies, cultural institutes and professional organizations for all 27 Member States. France is represented by the Ministry of Culture and Communication (DAPA/DAI), the CNOA Council and the "Cit  de l'architecture et du patrimoine" (Architecture and Heritage Institute).

⁶ CNOA, *Cahiers de la profession*, No. 31, 1st quarter 2008, p. 31.

3.2 Engineering schools

Engineering schools, which prepare students for the Masters degree, offer a more systemic teaching approach to sustainable development, yet treatment of the topic still differs widely from one school to the next. The majority of engineering schools tend to frame the subject more simply within their Building and Public Works Departments in the form of modules (energy, water, materials, waste treatment, overall cost, the philosophy of precaution, etc.). Only a few establishments currently offer a *bona fide* multidisciplinary education with sustainable development as the central theme.

Paris' *Ecole Polytechnique* went this route by creating as of 2003 a Sustainable Development Chair; since then, this initiative has been replicated by several other engineering schools. The *Ecole des Mines* in Paris also set up an Education and Research Chair dedicated to "New energy strategies" with research topics listed as "The future of energy biomass" and "Development of carbon savings tools". The *Ecole Nationale des Ponts et Chaussées* school proposes training programs with majors in "Transport and sustainable development" and "The economics of sustainable development, the environment and energy". It is important that this inventory, which is far from being exhaustive, also contains programs provided in some of the provincial centers, such as the course entitled "Energy and environment in the construction process" at the Aquitaine (southwestern France) Higher Institute of Building and Public Works (ISA-BTP), which offers 130 hours of classroom time devoted to the subject, or an identical format at the Lille engineering school (*Ecole des Hautes Etudes d'Ingénieurs*) in the country's northern region.

The instruction made available within this type of truly multidisciplinary setting purposely lies at the crossroads between engineering sciences and human and social sciences. It is more heavily specialized and in-depth than the highly generalized and introductory education offered up until quite recently. Some schools have adopted the strategy of entering into partnerships with other European establishments featuring complementary instruction and research programs. In this vein, INSA-Strasbourg has set up partnerships with Swiss and German schools.

3.3 University subject majors and research programs

Sustainable development in a university setting

Sustainable development is not perceived as a distinct subject by French students prior to attending university. In high school, it is merely introduced to build awareness, in accordance with a predominantly environmental perspective. Just a few general notions are presented at this stage to students, who must wait until their university years for the opportunity to appreciate a real structured approach to learning about the topic. Several IUT Technology Institutes have taken the initiative to offer courses on sustainable development, and they are mainly coordinated by Civil Engineering and Environmental Science Departments. Initial discussions focus for the most part on technical aspects, with instruction modules built for example around water, insulation and renewable energies. Courses on materials offering the best thermal and acoustic insulation qualities are also popular and taught quite often. Also at the level of technical instruction, professional "Licence" degrees (i.e. Bac+3) include basically the same type of coursework as that available in IUT curricula, yet the material is covered in greater depth.

The sizable number of programs proposed within the IUT context are intended to train technician-level staff capable of deriving technical solutions that satisfy regulatory prescriptions aimed at protecting the environment. Local authorities and contractors have, as of the 1990's, been required through these prescriptions to recruit technicians specifically for the purpose of meeting conditions set forth in the Environmental Code and in water or noise laws. As is often the case in France, imposition of a regulatory framework and the obligation to comply with a new set of standards serves to structure an entire profession.

Sustainable development is also a fixture in the Masters and Doctorate programs, primarily in urban and regional planning, regarding the fields of interest herein. While more theoretical at this level, the approach is nonetheless oriented towards environmental aspects, with research programs focusing on topics like "Cities and environment: Management of natural objects and the environment within urban territories" or "Urban planning, regional planning, environmental planning". Just a few universities, like Aix-Marseille with its Master's program entitled "Planning, territorial projects and sustainable development", actually incorporate the term 'sustainable development' into the degree title. Like with IUT offerings, the predominance of an environmental dimension can be justified by the numerous regulatory texts promulgated in the area of urban planning. A series of planning documents, which include the Territorial Spatial Development Plan (SCOT) and Local Land Use Plan (PLU), have mandated local authorities to perform an environmental diagnostic and produce a Sustainable Development Plan (PADD), wherein lies the necessity of training high-level specialists to handle and respond to such requests.

Research program on sustainable development

The scientific community formed by the country's 20 professional architecture schools constitutes a body of skills, assembled within a group of research units recognized and certified by the Ministry of Culture and Communication. With over 40 such units operating at present, in addition to 6 theme-based scientific networks (whose scope in some instances extends well beyond the European setting), sustainable development appears to lie at the heart of a good number of research programs. Both the actions and output of the teams and laboratories involved in these topics must remain consistent with the scientific policy of the individual academic institutions. Knowledge acquisition regularly gives rise to publications and scientific results are systematically evaluated.

Research in architecture, urban planning and landscape architecture is positioned at the intersection of the three disciplines of human and social sciences, engineering sciences, and information and communication technologies; as such, research missions mobilize a diverse set of scientific skills held by architects, engineers, planners, historians, geographers, sociologists, etc.

While sustainable development issues regarding spatial occupation now involve a large number of research units, it would be fitting herein to acknowledge the units that have been tackling these very issues for a long time, in some instances dating back over 20 years.

With respect to issues of energy efficiency, materials, quality of space and comfort, we can cite the contributions of several laboratories: ABC in Marseille, Cerma in Nantes, CRAI in Nancy, Craterre and Cresson in Grenoble, and Grecau in Toulouse and Bordeaux. A wide array of laboratories, each with its own study targets (habitat, public space, city, territory, etc.) and postulates, have integrated into their work an examination of how best to marry environmental control and architectural quality through proposing concepts, analytical tools and simulation exercises.

Regarding the philosophical and human science issues related to sustainable development, two laboratories have occupied a premier position for quite some time: the laboratory Gerphau in Paris-La Villette, particularly for its work on the city-nature relationship; and the laboratory IPRAUS in Paris-Belleville through developing a socio-anthropological approach to the production of places and their uses.

Recent calls for incentive-based research proposals, first in "Art, architecture and landscapes" then "Large-scale architecture", issued by the Office for Architectural, Planning and

Landscape Research jointly with the Ministry of Ecology, Energy, Sustainable Development and Regional Planning, have led to selecting many projects focusing on the stakes of sustainable development, especially at the scale of urban and landscaping projects.

Lastly, the *Grands Ateliers* public-sector initiative set up in l'Isle d'Abeau (Isère Department) is intended to assemble artists, architects and engineers for the purpose of jointly designing, creating and developing training modules, research projects and programs to disseminate knowledge and expertise in the area of materials, construction and living space quality (<http://www.lesgrandsateliers.fr>).

IV. Adoption of new techniques and technologies in the sustainable building sector: The contribution from Research

Generally speaking, research actions in the sustainable building sector were given little visibility during the period prior to 2002, given their perceived low-priority status in this particular sector.

4.1 From 2002 to 2005: Implementation of the program to "Prepare the Building of the Year 2010"

The ADEME Agency, in partnership with PUCA, set up a program entitled "Preparing for the Building of the Year 2010" structured around three features: an annual call for multi-topic proposals; the organization of annual meetings to assess technological progress and pertinent policy issues relative to program orientation among other things; and lastly, the planning of Technical Seminars during which results from research undertaken on each assigned topic can be presented together. This Program relies on input from a roughly 30-member Steering Committee, which represents not only public authorities, but also the main actors from the building industry and participants connected with the world of research. Specific program topics focus on high-performance building envelopes, energy-efficient facilities, the integration of Renewable Energies (French acronym: EnR), socioeconomic considerations and cross-disciplinary studies.

For ADEME and its partners, implementation of this program fulfills a new and pressing need in the area of R&D. The National Plan to Combat Climate Change has instituted the principle of moving towards strengthening regulatory requirements on new buildings while highlighting the importance of R&D in anticipation of future steps. The goal then consists of adopting an R&D policy capable of mobilizing all actors in order to reach a 10% gain every 5 years on all new building stock. Moreover, this sector is expected to benefit from the momentum generated by R&D results derived on new buildings.

4.2 The 2005 launch of PREBAT: Research and Experimental Program on Energy in Buildings (2005-2009)

PREBAT is a national research and experimental program dedicated to buildings and introduced as part of the Climate Plan framework. **Between 2005 and 2007**, this multi-partner program associated all existing entities involved with the subject, an effort that gave rise to a memorandum of understanding involving: the Ministry of Housing, Ministry of Industry, Ministry of Research, plus the ADEME, ANR, OSEO and ANAH agencies.

The overall objectives set were as follows:

- for existing buildings (renovation), lowering heating-related consumption to less than 50 kWh/m²/year in 2010 and generalizing renovation/retrofitting work to achieve consumption levels of below 80 kWh/m²/year for all uses combined in 2015-2020;
- for new buildings, developing zero-energy demonstration buildings in 2010 and then broadening construction practices to achieve consumption levels of below 50 kWh/m² for all uses in 2015-2020;
- for both new and existing building stock, producing positive-energy buildings as quickly as possible.

PREBAT has also been set up to accommodate a multi-topic format, in the spirit of the "Building 2010" initiative, and is obviously aligned with the same principle. The term technology is once again present (along with a distinct technology group), and in 2005 it made reference to a set of topics related to the building envelope, efficient facilities, EnR integration and a preference for cross-disciplinary studies, along with the 2006 addition of modeling, simulation and tools. This group's progress has relied on holding annual consultations (calls for proposals).

The socioeconomic aspect, given its strong cross-disciplinary nature, has been assigned a specific working group and will also give rise to several consultations over the program period.

The major innovation found in this program pertains to the bold objectives set for building experimentation, with the stated intention of quickly making available a large number of high-performance, perfectly-instrumented buildings, so-called "demonstration" structures, whose close monitoring will provide feedback for PREBAT group analysis. These steps necessitate the presence of two distinct working groups, devoted to "new buildings" and "existing buildings" respectively.

Furthermore, PREBAT has clearly expressed a strong priority regarding the existing stock, as assessments have decisively shown that existing buildings offer a far greater source of energy savings. This revised program was based on the observation that previous actions aimed at new buildings coming on line (presumed to generate collateral effects on existing stock) did not yield sufficient impact with respect to the objectives adopted.

From a governance standpoint, the various working groups cited above are overseen by a first-level body, called COSA, the French acronym for Strategic Orientation and Coordination Committee. In addition to working group coordination, COSA is responsible for producing joint strategy proposals and proposals to guide upcoming actions. Moreover, a decision-making body is introduced; known as COSI for Signatory Committee, this entity is in fact composed of the potential financiers and sponsors of actions proposed by COSA.

The year 2005 also marked the inauguration of ANR, France's National Research Agency. Given the critical issues in play within the building sector and in order to consolidate ongoing actions, ANR has become a signatory to the PREBAT memorandum of agreement. In a spirit of continuity with the previous "Building 2010" program, the specifications associated with the new consultations have led to a steady increase in the number of topics and subjects proposed. To ensure strong compatibility with available resources, ADEME and ANR teamed up to initiate "technology" consultations in 2005, 2006 and 2007.

All these actions complement one another, as ANR is well positioned on the upstream R&D side ("from knowledge acquisition through pre-industrialization research"), while ADEME occupies the downstream post ("from industrial research through pre-market competition research").

4.3 2008 and the sequel to Grenelle: Defining the contours of a new PREBAT

The context has taken a radical turn in 2008, as reflected by an alignment shift either underway or planned for actors involved in the various programs mentioned above. PREBAT is very likely to evolve as a program by the end of 2009 (expiration date of the memorandum of agreement), and year 2008 is being allocated to preparing for these upcoming changes.

In 2008, the sequel to the Grenelle Environment Roundtable and the very ambitious energy performance objectives for both new and existing buildings will serve to reshape PREBAT. A Research Operations Committee has been convened with PREBAT discussion items placed on its agenda. A report signed by Alain Maugard, CSTB President, has proposed a number of changes, with respect to both the scope of PREBAT actions and its governance mission. The suggestion to split the program in two merits attention, with a first program conducted by ANR to establish objectives over the longer-term, and a second one driven by ADEME to emphasize more operational, short- and medium-term objectives. In addition, ANR has sought to modify its research organization, as manifested by combining into a single program, called HABISOL, the individual PREBAT TECHNOLOGY and PREBAT PHOTOVOLTAIC resources.

The Grenelle objectives aimed at systematizing low-consumption buildings and then producing positive-energy buildings has, from a work calendar perspective, led to the solid integration of previously-addressed topics.

The vision of the building envelope gets altered when acknowledging the coupling and increasingly strong ties taking place with component characteristics of opaque walls and window panes, in addition to new functional features. Integrating a more stringent EnR imposes, in many cases, that EnR building envelope components and facilities be construed as unique and individual. It is also necessary to adapt the performance of a building's energy production facilities to the needs generated by these highly-efficient envelopes, and this subject has since become a key issue for R&D [interest in reducing the size and power of hot and cold production and distribution equipment, integrating these systems into the ventilation network, a systematic inclusion of specific electricity uses (lighting, electrical appliances, office machines, etc.)].

The incorporation of specific electricity uses underscores the importance of user behavior and modes for operating heating and air conditioning equipment, which are also critical and reveal that the responses required must not remain solely technical in nature. The performance of a building depends as well on its occupants, how well informed they are on building operations, the incentives offered for contribution via their attitude towards reaching the objective of low consumption or emissions, and this dependency stresses the need to associate building occupants with all energy-related projects.

Such a process could only be envisaged within the framework of a quality control approach, which entails both quality management, in particular of the HQE[®] type (which may offer a favorable context for seeking performance), and implementation quality in recognizing that the slightest flaw may be detrimental to overall performance. It should also be pointed out that research programs must anticipate and accompany the issues raised concerning training and certification of actors.

This brief presentation of the stakes associated with R&D in France in no way foretells future relationships between the organizations involved, nor does it offer suggestions regarding the content or implementation of the various work programs laid out as part of practical strategies adopted subsequent to Grenelle. We're perfectly aware that the task at hand has just gotten underway and recognize the fact that all actors are now motivated to optimize available resources and maximize the visibility of actions in progress with the goal of speeding up their duplication. 2008 and the years that follow will undoubtedly witness a greater number of actions and the adoption of new organizational configurations to capitalize in the future from successful past efforts.

V) Introduction to building quality ratings

Building quality and performance have emerged over these past few years in France as a priority both for actors in the building process and for public policy figures, with government officials leading the way. Quality ratings may be interpreted as signals to accompany communications on a product, service, individual or company, in the aim of infusing confidence and facilitating decision-making. In France, quality labels are awarded by third-party and independent entities (including laboratories, certification organizations, inspection bodies) and, in many instances, submitted to the French Accreditation Committee (COFRAC) for final authorization.

Among the major quality labels applicable to the building industry, let's note:

- construction product certification (trademarks: NF, CSTBat, ACERMI, A2P)
- service certification (NF Service, APSAD, Qualivail, CSTBat Service)
- Building certification (Qualitel, Habitat & Environnement, Patrimoine Habitat , "Patrimoine" Habitat & Environnement, Promotelec, etc.)
- certification for buildings and associated services: NF Logement - HQE[®] approach, NF Maison Individuelle - HQE[®] approach, and NF Bâtiments Tertiaires - HQE[®] approach
- management system certification (according to international standards or benchmarks, e.g. ISO 9001, ISO 14001, OHSAS 18001, or professional benchmarks, especially Qualiprom or Qualibat)
- certification of individuals (and their acquired skills), such as AFAQ AFNOR Competence and ICA.

In France, the certification process is governed by conditions stipulated in Law No. 94-442 enacted on June 3, 1994 and in the Consumer Code relative to the certification of industrial products and services.

5.1 The HQE Association and HQE[®] Approach



Created in 1996, **the HQE Association works to federate** public sector or institutional organizations that represent **the full range of actors involved in the construction process for the purpose of developing environmentally-friendly, healthy and comfortable buildings**. Its 82 members are segmented into five colleges: project sponsoring, project management, contractors and industries, expertise, advice and support.

Granted the status as a public utility organization since January 2004, **the HQE Association has undertaken two vital missions: enhance the HQE[®] approach**, by providing stakeholders with benchmarks and operational methods; and **oversee the promotion and renown of the HQE[®] approach**, in particular through training, certification and resource centers.

This approach, as currently promoted, is intended to produce healthy and comfortable buildings whose environmental impacts measured over their entire life cycle are as well

mitigated as possible. It **features two indissociable components**, defined within two distinct reference frames that are accessible free of charge on the Association's Website:

- "**Explicit definition of Environmental Quality**" (EDEQ), which serves to generate, improve or maintain the environmental quality of buildings, as influenced by construction projects, adaptations or management.

- "**Environmental Management System**" (EMS), which serves to coordinate building operations so as to optimize the QE effort among all actors concerned.

The approach is set forth using common language (i.e. the 14 targets), which accurately describe a building's environmental characteristics and thereby allow jointly adopting the set of objectives shared by all actors.

The EMS reference frame is closely tied to the format of standard ISO 14001. The HQE Association has devised the EMS benchmark thanks to the diligent work of all professionals involved in the HQE[®] approach. This benchmark, associated with the Explicit Definition of Environmental Quality (EDEQ) of targets, is designed to guide project owners through implementation of an HQE[®] approach. EMS is the operational and descriptive aspect related to the environmental management of one or multiple projects; its purpose includes developing a certification system.

As for this Explicit Definition of the HQE[®] approach, the associated 14 targets are presented below:

IMPACT MITIGATION ON THE EXTERNAL ENVIRONMENT	CREATION OF A SATISFACTORY INTERNAL ENVIRONMENT
<i>Eco-CONSTRUCTION</i>	<i>COMFORT</i>
1 – Relationship between buildings and their immediate environment	8 – Temperature and humidity comfort
2 – Integrated choice of products, systems and construction processes	9 – Acoustic comfort
3 – Low-impact worksites	10 – Visual comfort
	11 – Olfactory comfort
<i>Eco-MANAGEMENT</i>	<i>HEALTH</i>
4 – Energy management	12 – Healthy living spaces
5 – Water management	13 – Healthy air
6 – Industrial waste management	14 – Healthy water
7 – Maintenance and facility repair management	

The HQE® approach may be conducted either along the lines of a voluntary process or be integrated into an evaluation system, like a certification system.

At the outset, these 14 targets did not make reference to performance levels. For this reason, construction industry actors were very quick to press for the introduction of value indicators for each target, thereby making it possible to quantify and qualify performance on the basis of a set of ground rules shared among all actors. The HQE® approach is not a standard, but instead an initiative, which itself doesn't issue a certificate.

Because of that, in the aim of proposing a certified approach, the certifications listed below have been developed: Habitat & Environnement, Patrimoine Habitat & Environnement, "NF Logement- demarche HQE® " (with these 3 developed for Housing, by CERQUAL, subsidiary of the QUALITEL Association), "NF Maison Individuelle - demarche HQE® "(Single-Family Home) (developed by CEQUAMI, joint subsidiary of QUALITEL and CSTB), and "NF Bâtiment Tertiaire - demarche HQE® " (Tertiary Buildings) (by CertiVeA, CSTB subsidiary). The organizations CERQUAL, CEQUAMI and CERTIVEA have all been authorized by the Certification arm of the AFNOR French standardization body to deliver these certifications with the NF title..

5.2 The QUALITEL Association and its certifications



The QUALITEL Association, a precursor organization in the area of certification, is a non for profit organization created in 1974 with the stated mission of promoting, improving and demonstrating housing quality. The operational evaluations of certifications issued are performed by its subsidiary entities CERQUAL (for new houses and new residential buildings) and CERQUAL PATRIMOINE (for rehabilitation projects of residential construction). This Association, owner of the certification marks, approves and disseminates the certification guidelines (référentiels), given that its public interest mission is primarily devoted to informing the general public. Moreover, QUALITEL has set up a series of observatories in the housing certification field to monitor each of its certification labels and housing construction best practices.

The QUALITEL Association Board is organized in a unique fashion, composed of four major families of actors: **a)** consumer associations, representing the users of housing resources; **b)** actors on the supply side (Federations of real estate builders and developers, the

Housing Trade Union, *Caisse des Dépôts* financial institution, etc.); **c**) professionals in the art of building (French Building Trades Federation, National Council of the Order of Architects, Construction Materials Industry Association, Confederation of Independent Prevention, Control and Inspection Bodies, etc.); and **d**) public authorities and public interest organizations (Ministry of Housing, Ministry of Ecology, Energy, Sustainable Development and Regional Planning, the CSTB Building Research Center, The National Housing Improvement Agency, the ADEME Agency for the Environment and Energy Conservation, AFNOR Certification, etc.).

Eager to promote advances in both the technical and environmental quality of the nation's housing stock, QUALITEL is also a member of:

- The HQE[®] Association (with a seat on its panel of technical experts);
- The EFFINERGIE Association, whose purpose is to promote low-energy consumption construction, in new as well as existing stock, and to develop for France as a whole an energy performance benchmark for buildings, with the objective of reducing by a factor of 4 the quantity of greenhouse gas emissions.

QUALITEL has been accredited by the French Accreditation Committee, a recognition that attests to the pertinence of its certification process and action campaigns. Over 1,500,000 housing units have been evaluated in 34 years, including more than 125,000 dwellings in 2007 alone. As for new housing, multi-family and single-family combined, it is observed that 27% of all dwellings built in France has requested QUALITEL's certification, and nearly 1 in every 2 new dwellings in Paris Region (Île de France) is certified by QUALITEL for its quality and/or environmental features.

QUALITEL Association subsidiaries are empowered to deliver the following certifications: **a**) Qualitel; **b**) Habitat & Environment; **c**) NF Logement, along with its HQE[®] Approach environmental option; **d**) NF Maison Individuelle and its HQE[®] option (delivered by CEQUAMI, joint subsidiary with CSTB); **e**) Patrimoine Habitat; and **f**) "Patrimoine Habitat & Environnement.

QUALITEL Group certifications are assigned subsequent to an audit and a series of strict and detailed evaluations of the technical attributes of the construction or rehabilitation program/project. More in-depth verifications are also conducted over the course of the actual construction or rehabilitation, during the final works phase.

QUALITEL Group certification benchmarks are associated with their year of establishment in anticipation of new upcoming regulations and, moreover, stem from a consensus forged among all the association members.

5.2.1 The Qualitel Certification - QUALITEL Group



A fixture on the market for new housing construction since 1986, the Qualitel certification is the outcome of a desire expressed by housing project owners and users alike to develop a tool capable of highlighting the types of operations that offer substantial levels of technical performance. The Qualitel Certification assesses the actual technical quality and control over charges generated from new housing construction (multi-/single-family), homes for the elderly and student residences. This certification is awarded on a project-by-project basis, upon completion of the design phase and only after an exhaustive evaluation that entails a site verification after construction.

The Qualitel certification process comprises 7 technical headings (themes), all of which must be respected by the project owner. They take into account aspects like acoustic comfort (both interior and exterior), the certified quality of sanitary and plumbing fixtures, durability of the building envelope (shell), accessibility and adaptation of the dwelling to aging people, amenities and comfort in the common areas, level of conventional energy consumption (wintertime heating), summer usage (thermal properties), and even the design of kitchens and space layout relative to household appliances. Qualitel still certifies efficient design, by considering energy charges generated by cold water consumption, heating, hot water, the provision of collective electricity, property cleaning activities, household waste collection and treatment, and facility maintenance. The thermal comfort aspect is certified in conjunction with the possibility of awarding specific energy-efficiency labels, including HPE, HPE EnR, THPE, THPE EnR and BBC Effinergie (LBC).

The Qualitel certification headings (themes) are scored on a 1 to 5 scale: a minimum score of 3 is required in all categories for all housing units in order to obtain the certification.

Over 1,300,000 units have been inspected with nearly 700,000 being certified up until now. In 2007, the Qualitel certification application process was initiated on more than 55,000 units.

5.2.2 The Habitat & Environnement Certification - QUALITEL Group



Launched in 2003, the Habitat & Environnement (H&E) certification corresponds to a protocol adopted in coordination with the HQE Association's efforts (through reliance upon the experience acquired by QUALITEL), applied more specifically to the field of housing. The H&E label certifies the environmental quality of new units (whether multi-family residential buildings or detached houses developments), on a project-by-project basis, and is awarded by the QUALITEL's subsidiary CERQUAL. This certification is intended to acknowledge the project's environmental preservation attributes throughout the whole life cycle of the built unit.

The H&E benchmark encompasses 7 environmental themes, which themselves comprise over 20 individual technical aspects. These themes are broken down as follows:

- **2** are organizational and design-related (Environmental Project Management; and the Clean Building Site),
- **4** are technical (Energy and Reduction of the Greenhouse Effect; the Construction Industry and Choice of Materials; Water; and Comfort and Health), and
- **1** is informational (Green Habits/Actions).

The evaluation of these themes takes place by means of a simple rating scale, with a score of 3 generally denoting the fulfillment of basic requirements. To be granted certification, the project owner must achieve a score of at least 3 for six of the seven themes, under the proviso that three of these themes remain mandatory. Depending on the themes selected, a variable A-to-E profile is assigned to the particular project. The H&E certification process considers thermal comfort, as evidenced by the possibility of receiving several energy efficiency labels; these would include HPE, THPE, HPE Enr, THPE Enr and BBC Effinergie (LBC).

As specifically regards housing, the H&E certification has made allocations for anticipated measures adopted within the framework of the Grenelle Environment Roundtable, especially as regards energy performance, acoustic comfort and the health-related qualities of units.

Since April 2003, a total of 3,000 projects representing some 100,000 units have undertaken the H&E certification process. In recognition of the value-added effect associated with the H&E certification for its environmental quality assessment and verification, 450 project owners are actively seeking this certification. Local authorities have also formalized their

commitments to recognize H&E as a *bona fide* tool for evaluating and reporting on housing units built within their jurisdictions.

5.2.3 The NF Logement Certification and its HQE[®] Approach option - Group QUALITEL

NF Logement and its environmental "HQE[®] Approach" option are certifications applicable to all new housing (once again residential buildings and detached houses) produced by an individual developer. Use rights of the label are assigned for a 3-year period and extend to all of the developer's projects. CERQUAL, the QUALITEL subsidiary, has been officially designated by AFNOR Certification to grant both the NF Logement and NF Logement - HQE[®] Approach marks.

The NF Housing Certification:



The NF Logement Certification, created in 2004, focuses on the project's technical attributes (and thus on the actual units built) as well as on the quality of services provided by the developer to the buyer; it takes into account the developer's management system and organizational aspects. The granting of this certificate is subject to fulfilling the three commitments set forth below:

- **1) Introduction of a quality management system** designed on the basis of the QUALIPROM benchmark, which applies to a developer's project organization from the time of initiation and extending until expiration of the performance bond. Other NF Logement certification requirements include production of a technical model (with a demonstration dwelling) and limitation of the option release period. This commitment, in other words, pertains to the quality of the organization and its internal procedures.
- **2) Technical and Product-related requirements:** The technical benchmark for the NF Logement certification is a composite of 6 main aspects: acoustic comfort, thermal comfort and ventilation (air quality), safety against intrusion, building durability, dwelling adaptations

to aging people, and kitchen configurations and preliminary measures with respect to household appliances. For each of these measures, 3 technical performance levels have been defined to assign the project a technical quality profile: Excellent **(A)**, Highly satisfactory **(B)** or Satisfactory **(C)**.

- **3) Quality of Service:** A real estate developer applying for the NF Logement certification must provide homebuyers with quality service, from the initial marketing stage until termination of the performance bond year period. This service includes the fulfillment of information and communication commitments, the obligation to offer buyers an external guarantee, the promise to handle all requests with very short turnaround, the requirement to conduct satisfaction surveys among all buyers of the developer's units, etc.

Since its launch, over 14,000 units have received the NF Logement certification. The 38 developers displaying the trademark represent an annual housing production on the order of 17,000 units. It should also be noted that this NF Logement certification is acknowledged by property insurers in their decision to offer premium discounts on insurance (Dommage-Ouvrage) policies underwritten for developers.

The NF Logement - HQE® Approach Option Certification



In 2007, the “NF Logement-HQE®” certification was introduced as a logical extension of the NF Logement certification, with the additional concern over integrating environmental quality.

The technical benchmark used herein is based on the 14 targets set forth in the HQE approach as well as on service requirements consistent with findings from research conducted by the HQE Association, with the Habitat & Environnement certification, the NF Logement benchmark and guidelines (referential), and the “NF Bâtiment tertiaire – demarche HQE®”. To earn the certification, all 14 targets (presented in the table above) must be addressed with an assessment of at least 3 targets at the *Highly-Efficient* level, a minimum of 4 evaluated as *Efficient*, and at most 7 considered at the *Basic* level.

5.2.4 The "Patrimoine Habitat" assessment and "Patrimoine Habitat"/"Patrimoine Habitat & Environment" certifications - QUALITEL Group



Launched in 2005 and issued by the QUALITEL subsidiary CERQUAL PATRIMOINE, the "Patrimoine Habitat" and "Patrimoine Habitat & Environnement" certifications correspond to a technical and documentary assessment along with a validation of improvements contributed by project owners, social landlords / housing corporations, real estate developers and coop managers, regarding their rehabilitated building stock. These certifications are intended for rehabilitation work conducted on multi-family buildings aged of more than 10 years old. The "Bilan Patrimoine Habitat" (BPH) assessment of housing quality takes the form of a simple and straightforward rating of the state of preservation of the physical building and technical functions provided; it is presented as a summary report.



The "Patrimoine Habitat & Environnement" certification offers the opportunity to showcase a rehabilitation program by setting target performance levels and environmental objectives. The benchmark for these certifications regarding existing housing stock incorporates 11 themes that address a total of 20 technical issues, related to aspects like fire safety, sanitary quality of the dwellings, accessibility and amenity of uses, indoor and outdoor acoustic comfort, onsite facilities, amenities and comfort found in the common areas, enclosed and covered areas, electricity and controls placed on electrical consumption, household waste handling, and choice of materials. The "Patrimoine Habitat & Environnement" certification in fact extends beyond the scope of the "Patrimoine Habitat" label in terms of attention paid to environmental and sustainable development concerns, through integrating an evaluation of parameters related to project management, worksite cleanliness, green habits (resident information campaigns) and energy efficiency.

Since their launching in 2006, more than 36,000 housing units are undergoing processing for the "Patrimoine Habitat" or "Patrimoine Habitat & Environment" certification (with the latter accounting for 60% of the total number of projects), while 1,500 units have already received one of these two certifications.

5.3 CEQUAMI and the “NF Maison Individuelle” certification (Single-Family Home), plus its HQE® Approach option



Founded in 1999, CEQUAMI is the joint subsidiary of the QUALITEL Association and CSTB Center; it performs the function of certification body in the sector of single-family homebuilding with an assigned mission of certifying single-family houses across the gamut of construction types. CEQUAMI has been empowered by the French Standardization Association (AFNOR), which owns the "NF" trademark, to award, manage and promote the NF Maison Individuelle certification and its HQE® Approach option.

In conjunction with representatives from single-family homebuilders, consumer protection associations and expert panels, CEQUAMI has developed an HQE® Approach certification system specifically applicable to single-family homes (detached houses). This approach strengthens the requirements associated with the “NF Maison Individuelle – HQE®” approach option certification, based on the organizational quality exhibited by the builder, the quality of services provided and the technical attributes of the homes themselves.

The “NF Maison Individuelle - HQE®” approach certification is tied with those builders already engaged in the “NF Maison Individuelle” certification process seeking to integrate the environmental dimension into their future strategy, through a series of requirements dealing with:

- information communicated to the Project Owner by the Builder encouraging adoption of environmentally-friendly behavior;
- implementation by the Builder of an environmental management system and requirements for low-nuisance construction sites;
- adaptation of the project within its immediate environment, field and site analysis, obligation to meet the 14 HQE® targets;
- reduction of environmental impacts and repeated application of highly-efficient responses in the area of energy and water management; and
- repeated applications of efficient responses to targets related to comfort, health and product choice, systems and construction processes.

As for the evaluation step, each criterion is associated with a 3-level assessment of requirements: *Basic*, *Efficient* and *Highly-Efficient*. As for the HQE® Approach option, the project must score a minimum of 30 points at the *highly-efficient* level with a minimum threshold score imposed on the "Low-nuisance sites", "Energy management" and "Water management" targets.

During the 3-year validity of the corresponding "NF" Certificate, the Builder is subject to permanent monitoring by CEQUAMI, and this oversight includes: onsite inspections, observation of the Builder's organization through conducting periodic audits (at 6 then 18 months), complaint handling, and emphasis given to the degree of satisfaction among all clients using the services of this "NF" builder.

130 builders can now proudly display the "NF Maison Individuelle certification, 47 of whom also carry the HQE® Approach option, first made available in May 2006. These awards cover more than 15,200 houses a year and 70,000 since this certification was created in 2000.

5.4 CertiVeA and the “NF Batiments Tertiaires - demarche HQE® “ certification



CertiVeA is a subsidiary of the CSTB Building Research Center, which assesses the environmental quality approaches employed during the certification process for tertiary buildings (via the designated NF Bâtiments Tertiaires - HQE® Approach option), in addition to operational processes engaged by architects, developers-builders and owners of rental properties.

CertiVeA has been accredited by the French Accreditation Committee and, as such, is empowered to award within the scope of a certified project the applicable regulatory labels associated with energy performance as well as the Effinergie trademark.

As regards the evaluation component, the technical benchmark associated with the certification “NF Batiments Tertiaires - HQE®” approach option, specifies for each target a corresponding performance using the 3-level categorization: *Basic* (common practice/regulation), *Efficient* (good practice), and *Highly-Efficient* (best practice). The NF Bâtiments Tertiaires - HQE® Approach certification benchmark is composed of 4 parts:

- 1) **Introduction**, which presents the key considerations behind an HQE[®] approach, along with its principles and scope of application;
- 2) **Project Management System**, which describes requirements in terms of organization, commitment from construction process actors and project steering (specific procedures and practices);
- 3) Expectations from an HQE[®] approach: **Building Environmental Quality**, i.e. the structure's intrinsic performance is defined according to the 14 targets;
- 4) **Terminology**, which offers a common language to enhance communication among all process actors.

The “NF Batiments Tertiaires – HQE[®]” approach certification enables distinguishing buildings whose environmental performance corresponds to the best current practices; this concerns the phases of project scheduling, design and execution. The process will in the near future span the phase of tertiary building operations as well. The certification is awarded upon the completion of audits focusing on the Project Management System and Building Environmental Quality, with each of these audits involving a technical benchmark and giving rise to a profile definition.

Audits must also be conducted in order to obtain the certification; they are to take place at three points in time during the project sequence: scheduling, design, and execution. The auditor is responsible for verifying that management system specifications are effectively being applied and that environmental quality of the tertiary building, first targeted then achieved, is indeed pertinent within the project context by meeting the minimum profile requirements.

As for the advantages of holding a certification, the following aspects merit mention:

- Upon certification, the project owner benefits from trademark use rights and can make this claim in its communication materials.
- Partners offer special conditions for new construction projects initiated within the scope of a certification approach.
- The “NF Batiments Tertiaires – HQE[®]” approach certification could serve as a prerequisite for obtaining access to certain parcels or procuring certain kinds of financing.

By the end of April 2008, a total of 150 projects were carrying the “NF Batiments Tertiaires - HQE[®] approach” certification, accounting for over 2 million m² of living space. At the present time, more than 6 million m² of units are undergoing certification.

These French building certifications offer a toolset for evaluating and measuring overall housing quality; they emphasize building performance to the consumer's benefit. Moreover, they participate in enhancing the technical and environmental quality of buildings by raising awareness of an environmental approach among actors in the construction process and among building users.

How will benchmarks evolve?

The "NF Bâtiments Tertiaires - HQE® approach" certification benchmarks - Exploring new fields of application:

During 2008, the "NF Bâtiments Tertiaires – HQE® approach" (Tertiary Buildings) certification **will be adapted to the following domains:**

- **Retail** (shopping centers and districts, business district commercial space, neighborhood retail)
- **Hotel industry** (Hotels and tourist residences, youth hostels, tourism villages and leisure complexes)
- **Health facilities** (hospitals, teaching hospitals, clinics, comprehensive polyclinics, care centers)
- **Logistics** (logistics buildings, centralized logistics platform and relay facilities)

Tertiary building operations - Another certification benchmark:

The real life of a building begins upon delivery after construction with its users and occupants; it is thus imperative that operations enable achieving the expected level of performance. The new benchmark for the "NF Bâtiments Tertiaires - HQE® option" will offer the possibility for owners, operators or users to exhibit having attained environmental quality and performance.

Extension of the "NF Maison Individuelle - HQE® Approach" certification benchmark:

The "NF Maison Individuelle - HQE® approach" certification will initiate work on **adapting the benchmark to houses designed by architects and built by tradesmen.**

A draft certification is also being prepared for the improvement of existing houses.

Three new principles for certification benchmarks

To remain as efficient as possible, certification benchmarks must undergo regular review as part of a continuous improvement process. Over the course of this year, three new principles will be integrated into this process:

- **The energy target associated with certification benchmarks** will now be directly correlated with the five levels of the "high energy efficiency" label and will **necessitate, as a minimum threshold, the level of the HPE[®] (High Energy Performance) label**. The high-performance rating will thus correspond with the "basic" level, very high performance then moves to the "efficient" range, and BBC Effinergie (LBC) becomes equivalent to the "highly efficient" level.
- The set of **environmental indicators** proposed in NF Standard P01 020 (consumption of non-renewable energy resources, climate change, water pollution, quantity of wastes produced, etc.) **will gradually be calculated and displayed** on the certificates.
- **The "highly efficient" level for targets will be evaluated using a point system, like for the certification of single-family homes**. Nonetheless, the points assigned within each target category will not, under any circumstances, be displayed when issuing an overall project grade.

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