

Research center in Switzerland



Published by Holcim Foundation, Zurich, Switzerland

Written by Daniel Wentz, architect, translator, Magden, Switzerland
Photographs by Roger Frei, Zurich, Switzerland

Photo page 64 by Julieta Schildknecht, Zurich, Switzerland

Photos pages 15, 43 and 59 by Jürg Zimmermann, Zurich, Switzerland

Layout by Schadegg Grafik, Zurich-Gockhausen, Switzerland

Printed in Switzerland on FSC paper by Zürichsee Druckereien AG, Stäfa
Stäubli Verlag AG, Zurich, Switzerland

ISBN 978-3-7266-0079-2

Research center in Switzerland

Steps toward sustainability	2
Sustainable construction	8
Quantum change and transferability	10
Ecological quality and energy conservation	12
Ethical standards and social equity	14
Economic performance and compatibility	16
Contextual and aesthetic impact	18
Eawag Forum Chriesbach	20
Site design	24
Building requirements	28
Architectural concept	30
Spatial organization	34
Climate control	38
Energy efficiency	40
Building envelope	42
Mechanical systems	50
Water	52
Research and development	54
Environmental performance	56
Economic performance	58
A building for the future	60
Architect Bob Gysin Sustainability and architecture	64
Technical data	72
Sources and addresses	76
Holcim Foundation Promoting sustainable construction	78
Credits	81

Steps toward sustainability

By Hans-Rudolf Schalcher, Head of the Technical
Competence Center and member of the Management
Board of the Holcim Foundation

Awareness of sustainable construction is rapidly growing among builders, architects, and engineers around the world. However, there is still a substantial need to ponder the question of what sustainability with regard to the built environment truly means. The traditional and well known definition of sustainable development according to the Brundtland Report of 1987 gives valuable indications along the three main axes of economy, society, and ecology, but this very general framework is not stringent enough to effectively guide building professionals as they develop their functional, aesthetic, and technical concepts, choose materials and products, and evaluate construction methods.

The Holcim Foundation for Sustainable Construction was established to foster better understanding of sustainable construction and to act at the forefront of its implementation. The Foundation strives for leadership in this respect by supporting research at renowned universities, providing funding for pilot projects, holding a global competition every three years, and disseminating knowledge through academic forums and publications.

That is why the Foundation has initiated this series of books on outstanding buildings. The quality of the architecture presented in this series is measured by the criteria of sustainable construction – specifically the five target issues jointly defined by the Swiss Federal Institute of Technology (ETH) in Zurich, Massachusetts Institute of Technology (MIT) in Cambridge, USA, and Tongji University in Shanghai. It is obvious that these criteria are of varying relevance in different regions, depending on culture, climate, available technology, and economic context. This series of books intends to

“The best way to demonstrate the potential and possible solutions for sustainable construction is by concrete example.”

illustrate this diversity with regard to local conditions and specific approaches toward a common goal of mankind. The first book in this series presented an administrative building in Costa Rica that applies appropriate local concepts and technologies; this book presents a high-tech research and development center near Zurich, Switzerland.

The building, called Forum Chriesbach, is owned and used by Eawag, the Swiss Federal Institute of Aquatic Science and Technology. It illustrates in a convincing manner that “green” buildings consuming a minimum of energy, water, and other resources need not conflict with either unique ambiance and comfort for the users, or with architectural expression. Although highly processed materials and systems are usually energy intensive, if they save more energy than their production consumes, and if the materials can be recycled at the end of a long service life, then the energy and material balance ultimately supports sustainability.

Economically strong countries such as Switzerland, and their research institutes such as Eawag, being at the leading edge of science and technology, have an implicit responsibility to invest in progressive solutions, sometimes even risky ones, thereby advancing knowledge to be disseminated and adapted worldwide. We hope that this book will become a further milestone on the challenging path toward sustainable development of our planet.



Sustainable construction

Quantum change and transferability
Ecological quality and energy conservation
Ethical standards and social equity
Economic performance and compatibility
Contextual and aesthetic impact

Sustainable development and architecture are inseparably intertwined with other complex issues. To make sustainable construction easier to understand, evaluate, and apply, the Holcim Foundation uses a five-point definition. These five so-called “target issues” serve as a yardstick to measure the degree to which a building contributes to sustainable development. Three of the five target issues align with the primary goals of the Rio Agenda: balanced environmental, social, and economic performance. One target issue applies specifically to building: the creation of good buildings, neighborhoods, towns, and cities. A further target issue recognizes the need for significant advancements that can be applied on a broad scale. These five target issues are explained in detail and illustrated in the first book of this series, *Office Building in Costa Rica – Measuring up to the criteria of sustainable construction*. Following is a summary of the five criteria and how Forum Chriesbach meets them.

Quantum change and transferability

Innovation and multiplication, as a mechanism of progress, go hand in hand as today's innovations, once widely adopted, become tomorrow's standards. Advancements should not remain isolated occurrences; the innovative idea should be copied again and again, thus achieving the greatest benefit at a global scale. Ideas that transfer well are those that are affordable, simple, and broadly applicable.

Forum Chriesbach shows that “green buildings” need not be an exception, but can be mainstream, state-of-the-art, contemporary architecture.

The building proves many conventional, simple, and forward-looking technologies can be affordably integrated to achieve good environmental performance without compromising comfort or quality standards.

The building demonstrates and tests many valuable and practicable water-management techniques and principles that should be widely adopted.

The project underscores the crucial role that the client plays in building responsibly for the future.

The striking, award-winning architecture draws public attention, generates interest, and thereby builds support for sound development practices.



Ecological quality and energy conservation

A fundamental principle of sustainable development is to keep our planet in condition to indefinitely support future generations. This is a great challenge because our global ecosystem is in a state of stress and decline. Finite sources of energy and materials are being depleted, and our environment is being polluted and spoiled. Buildings are one of the world's largest consumers of materials and energy, so the construction industry has great environmental impact and responsibility.

Forum Chriesbach is energy efficient and relies on passive energy sources instead of fossil fuels. It consumes roughly as much heating energy as a normal single-family house although it is forty times larger. It produces a third of its own electrical power needs.

Because the building has no conventional heating and air-conditioning systems, CO₂ emitted by the building itself during operation is near zero.

Gray energy is considered in the design; recycled and recyclable materials are incorporated.

As an infill project on the client's campus, Forum Chriesbach applies the principle of dense development. Urban density reduces energy consumption and emissions caused by longer transportation routes, and serves to conserve green zones.

The building employs total water management, including urine separation, waterless urinals, solar water heating, rainwater treatment and use, and rainwater retention on site.



Ethical standards and social equity

Sustainable construction means cities and buildings that respond to emotional and psychological needs of people by providing stimulating environments, raising awareness of important values, inspiring the human spirit, and bonding societies, communities, and neighborhoods. Many such projects are developed by teams using a collective approach through which stakeholders and users are included in the design process. Sustainable construction includes the good and fair treatment of everyone involved in the design, construction, use, and recycling of buildings.

Forum Chriesbach provides a working environment that promotes social coherence and scientific interaction.

The feeling of openness and transparency in the building is uplifting, contributing to the psychological wellbeing of the occupants.

The client, design team, and building users worked together during the design phase to jointly create a building that embodies a future-oriented philosophy shared by all parties.

The building supports Eawag's progressive research activities in the service of society. It accommodates research, serves as a test object, and stands as evidence that ambitious objectives can be affordable and feasible.



Economic performance and compatibility

Through efficiency of design, construction, maintenance, operation, reuse, and recycling, sustainable architecture provides long-term economic benefits for owners, users, and communities. Such benefits can take many forms besides profits or lower costs, for example: improving productivity and efficiency, strengthening the economic base of a region, or boosting the local economy. Innovative deployment of financial resources, durability, adaptability, lifecycle cost planning, and the use of renewable resources and passive energy sources can work together to make sustainable construction not only financially feasible but the preferred choice and a sound long-term investment in the future.

With an annual primary energy consumption of 64.9 kilowatt hours per m², Forum Chriesbach is four times more efficient than prescribed by Swiss energy conservation law; this helps keep operating costs low.

The construction cost was within the expected range for standard Swiss office buildings of comparable size.

Incorporating high-quality and durable materials, the building promises long service life, central to economic performance. It is designed to be easy to adapt and ultimately to dismantle and recycle.

The location of the building on the client's campus reduces travel time and expenses of the employees, promoting interaction and making operations more economical and productive



Contextual and aesthetic impact

Visual quality and fitness of form are essential traits of architecture and planning that apply at all scales, from land-use planning to urban planning and architectural design. Land-use planning should protect natural areas, ecosystems, and the inherent qualities of the landscape. Besides providing an efficient and functional infrastructure, urban planning should supply spaces and places of cultural significance and social value. Architectural projects should not only meet the owner's requirements, but suit and improve the physical context.

The striking image of Forum Chriesbach gives Eawag a stronger identity and an unmistakable and progressive public image as a scientific research institute.

In its context within the client's campus, the building improves orientation, adds visual hierarchy, and integrates attractive and valuable outdoor recreational space.

The site is landscaped for ecological and aesthetic value, but not as an ornamental park. The entire site design is integrated into Eawag's total-water management concept.

Forum Chriesbach has won several design awards and received widespread recognition as a successful example of energy-efficient architecture.



Eawag Forum Chriesbach

By Daniel Wentz

This building begins with water. More precisely, it is designed for the best possible management of water. That was not only a requirement of the user, Eawag, the Swiss Federal Institute of Aquatic Science and Technology, it is a principle at the very heart of the institute's mission. Eawag is an internationally linked research institute committed to the ecological, economical, and socially responsible management of water. Its mission is to conduct research, teaching, and consulting, to link science and practice, and to disseminate scientific knowledge worldwide – from simple techniques to complex technologies, but always highly useful and beneficial know-how. Eawag is concerned not only with water, but with all natural resources of the global ecosystem. Thus, in the spirit of scientific advancement, the competition brief for Eawag's new head office and academic building called for the exemplary and progressive management of all resources, renewable and non-renewable, both materials and energy. In fact, the client ambitiously and explicitly called for “a visionary concept regarding ecological sustainability.” Thus Forum Chriesbach was destined to test the limits of what is possible technically and architecturally – to break new ground in building for the future.

Eawag is one of four research institutions of the Swiss Federal Institutes of Technology (ETH domain), along with the closely allied Empa, the Swiss materials science and technology research institute. Eawag and Empa are scientific centers of competence that develop long-term solutions for fundamental problems such as the management of water, energy, soil, mobility, and materials. These two institutes worked closely together on the Forum Chriesbach project throughout the five-year period of planning, development, and construction. The two institutes, plus Bauten Forschungsanstalten as an agent, were the client for the project.



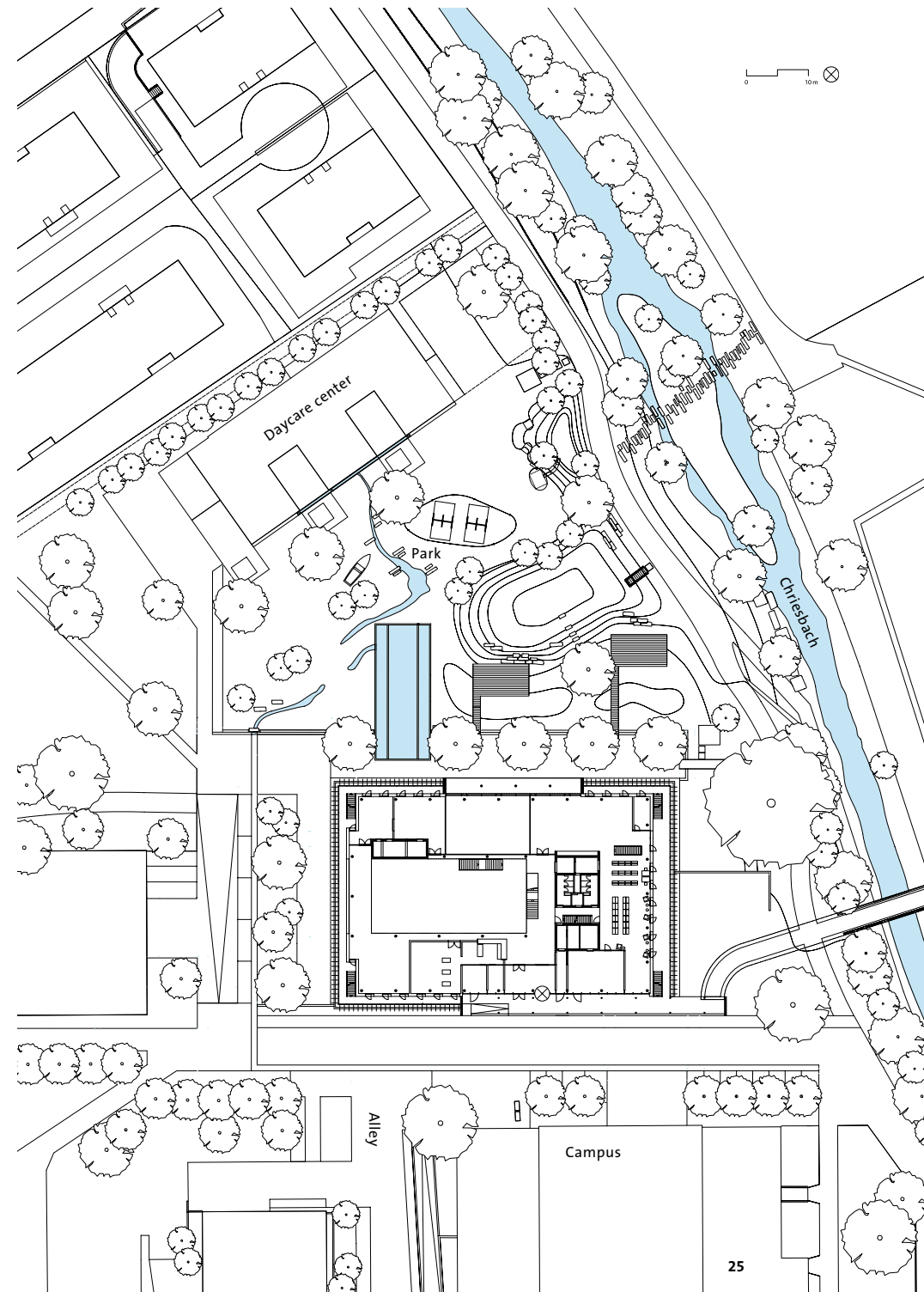
Site design

Forum Chriesbach aligns with the adjacent buildings. The restaurant and many other public spaces of the building enjoy views of the park to the northwest. The entrance area is connected to a covered bridge over the Chriesbach stream leading to other Eawag buildings.

Among the strategic plans of the ETH Board is to consolidate the properties of Eawag and Empa in Dübendorf, a town of 23,000 residents near Zurich. The density thus achieved should enhance efficiency by saving travel time, cutting energy consumption, reducing duplication, and promoting closer interaction between the institutes. Thus Forum Chriesbach was conceived as an infill project that fits into an ETH research campus that has grown over many years. Parking for the building was already available on the campus.

Forum Chriesbach is flanked on the southeast by several rows of Empa buildings – long and low brick industrial structures. It picks up the geometry of these buildings but steps out of line so as to visually terminate a long alley between three buildings. This alley is the main approach to Forum Chriesbach, and the building entrance comes into view as one nears. The entrance is marked by a horizontal red concrete frame that echoes the color of the neighboring buildings and contrasts strikingly with the blue vertical lines of the facade. Rising above the collection of older nondescript structures, the building is a cohesive addition that pulls together the campus, adding hierarchy, and establishing a visual focus.

Directly to the northwest of Forum Chriesbach is a landscaped park – not a docile lawn but tumbling contours of stony earth with hardy natural planting, deciduous trees, and slabs of rock. The employee restaurant looks onto this park, over a terrace with outdoor seating. Two wooden piers extend into the rugged terrain, bridging a sump, leading to sun-washed decks. Alongside the two piers extends an elongated tripartite pond, with not only aesthetic and symbolic value but a technical function. Further beyond is a daycare center for children of Eawag and Empa employees. Thus the park is a recreational space for young and old,



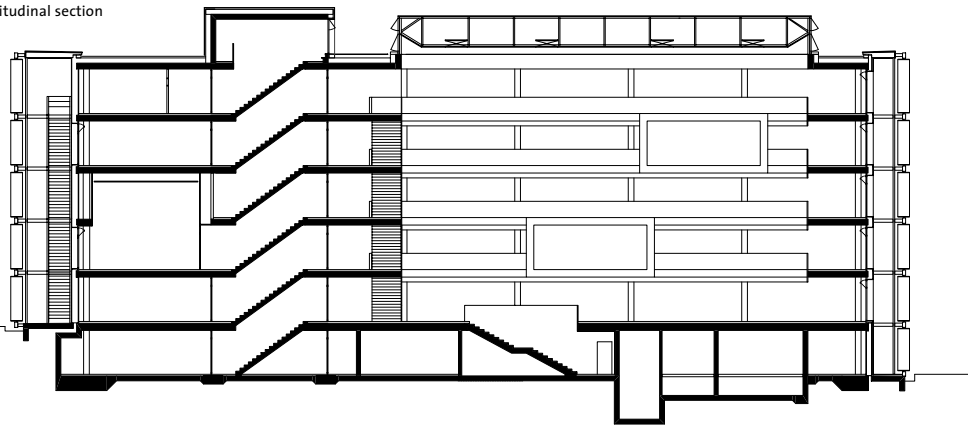
a habitat for local flora and fauna, and an attractive sight from the north-westfacing windows.

The park has yet another function. Surface water on the site is collected in swales and directed to sumps where it seeps into the soil. Practically every surface on the site is porous; this minimizes run off and it helps prevent river flooding. Surface materials are soil, concrete pavers with open joints, gravel, marl, and a few square meters of asphalt at the service court. Plant materials are chiefly indigenous to the region.

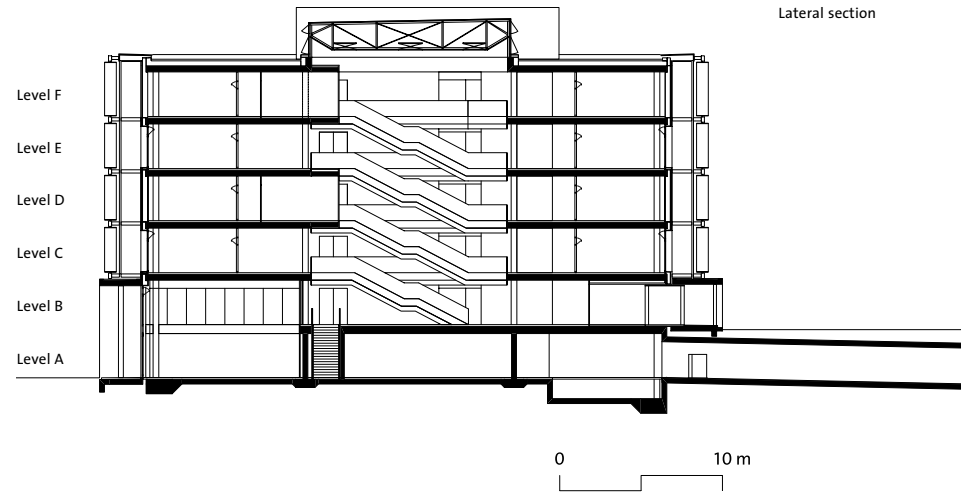
To the north flows the Chriesbach. This stream separates Forum Chriesbach from Eawag's laboratory and office complex; a bridge provides a pedestrian

link. As with streams in many Swiss towns, in the 1970s the natural banks of the Chriesbach were stabilized with concrete retaining walls and the stream turned into a canal, compromising its ecological value. The site plan for Forum Chriesbach calls for the banks to be renaturalized, and the green corridor along the Chriesbach to be made accessible to the public. The Chriesbach thus is to become a landscaping element, an object of study and research, and an ecological resource of greater value. Apropos of the name "Chriesbach" – *bach* is German for brook or stream, and *forum* means a meeting place for discussion; thus the name "Forum Chriesbach" not only signifies the location of the building, it is a fitting name for a knowledge center for water science.

Longitudinal section



Lateral section

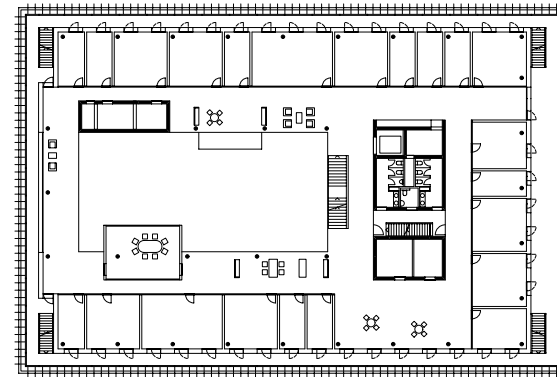


Building requirements

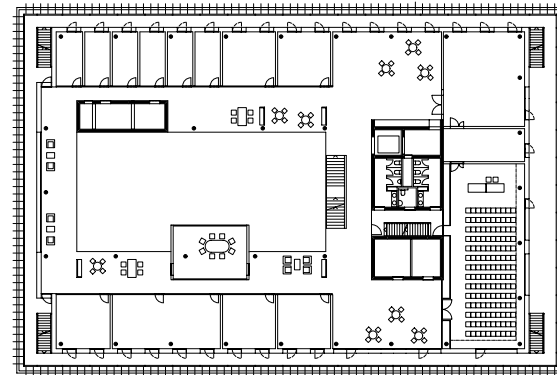
The client intended Forum Chriesbach to be primarily a place for researchers and scientists to learn, study, teach, disseminate knowledge, and above all, to collaborate. According to the room program, the building provides offices for 150 people, a reception and exhibition area, a seminar room for 140 people, two seminar rooms for 40 people each, seven conference rooms for a total of 106 people, informal communication areas on four floors with seating and tables, a multi-media room, a library and restaurant for Eawag and Empa employees, and of course the full range of service spaces and technical rooms.

Besides the room program, the client stipulated a range of special requirements for the design. All resources must be handled frugally – energy, materials, land, and funds. Energy consumed by building operation should be minimized. Renewable energy sources must be utilized. Room temperatures should be 19°C minimum and 26°C maximum. Rainwater must be collected and used. Urine must be collected separately from wastewater with solids. And the site must be landscaped as naturally and appropriately as possible, integrating the Chriesbach.

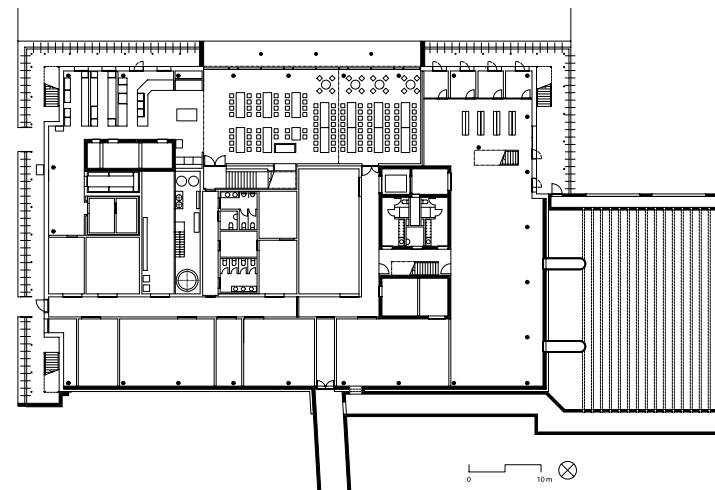
The new structure was to do even more than provide suitable spaces for Eawag's activities, meet the list of technical requirements, and promote interaction between Eawag and Empa. It must integrate progressive approaches to building. The architecture and technology must be innovative and progressive, testing the limits of what is possible. At Forum Chriesbach, users, students, and visitors should study and experience future-oriented technologies. The architects must "find the best possible combination of technologies to optimize the coordination of the individual components of the building." The client sought the best of all possible worlds – at a reasonable cost-benefit ratio.



Level E



Level C



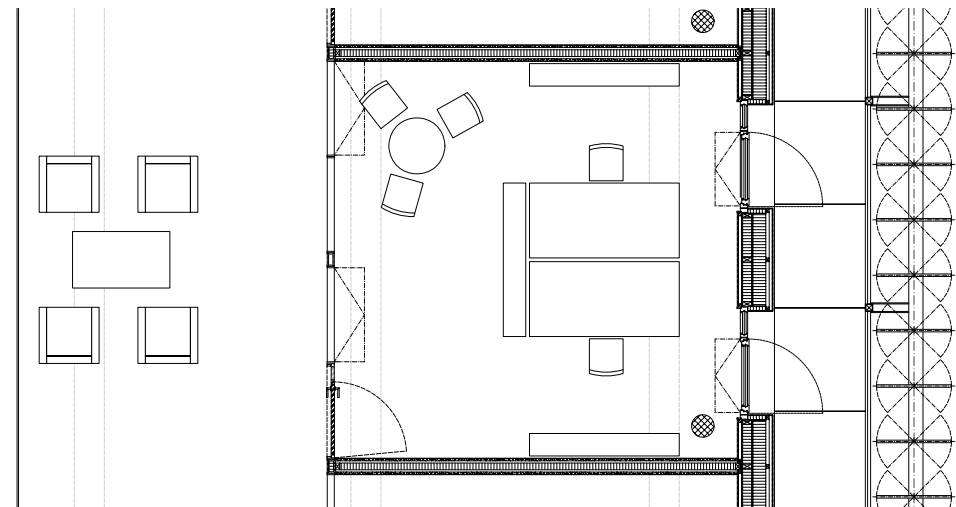
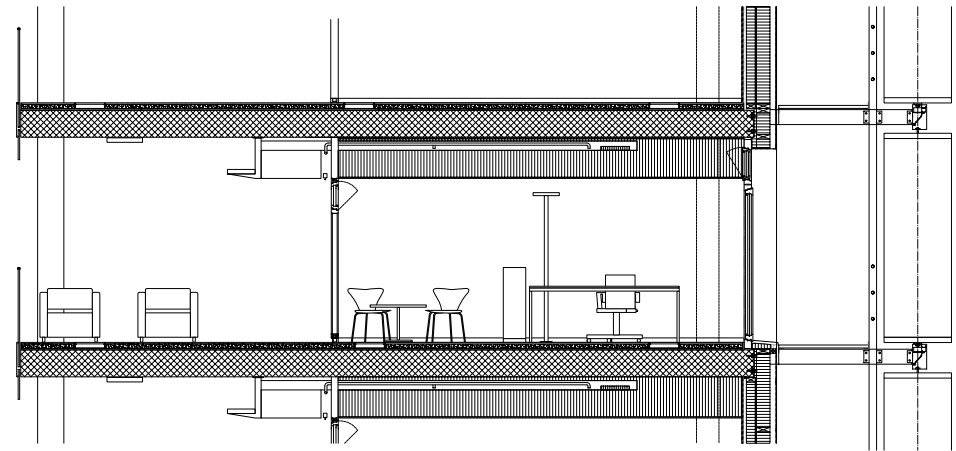
Level A

Architectural concept

Plan and section of office and corridor

The design team led by the architectural firm Bob Gysin + Partner BGP conceived the building as a synergy of systems that are inseparably integrated and serve multiple functions. The three main systems are the building envelope – a multi-layer, super-insulated, light-modulating building envelope that incorporates emergency egress externally, a highly efficient HVAC system that relies on multiple passive energy sources instead of primary sources, and an interior design with a full-height atrium that at once unites the interior, transmits daylight, and helps control the indoor climate, conceived in two zones. These three systems work together with all other building systems – especially those for geothermal energy, thermal storage, active solar collection, heat recovery, and computer control – to achieve energy efficiency, efficient material use, and a functional, comfortable, and inspiring environment.

“Architecture is a synergy of systems” – the statement is somewhat of a cliché. But it applies truly to Forum Chriesbach. The architectural and technical systems merge into an organic whole in which each part shares a range of functions in concert with the others. The transparent atrium provides orientation, passive cooling, daylight, and a sense of openness and unity. The daylighting enhances the interior atmosphere, reduces the electrical load, and taps a primary energy source – solar thermal gain. Transparent partitions admit daylight and promote easy communication, enhancing the work environment. The facade integrates emergency egress, making fire partitions inside the building unnecessary, which makes the highly transparent interior possible in the first place. All these systems are orchestrated by an automatic control system, which adjusts louvers and shades, operates windows and lights, and controls the flow of warm and cool air in response to environmental conditions.



The design is technically effective, but how well does the building function as a place for people, a forum for scientific collaboration? Bob Gysin insists that communication must function optimally in a building that houses a community of researchers and engineers: "That's why we laid out the interior spaces around a large, five-story atrium that functions as a sort of village square where presentations, exhibits, and events can be held. This community space is open, at each floor flanked by glass parapet walls. In fact, a great many partitions throughout the building are in glass, which gives the interior its great transparency. So from the lobby you can see into the offices and meeting rooms, practically through the whole building. Orientation in the lobby is instant, you understand the building immediately. You can see the stairs leading to the corridors leading to the offices around three sides of every floor. You can see who is there and who is not, who is in a meeting room, who is talking together in the corridors. And the corridors are three times as wide as normal corridors – we conceived them as places for communicating. Spontaneous, informal conversations are vital to the activities that go on in this building. The researchers like their informal meetings and they feel comfortable in the building."



Spatial organization

The atrium is the heart of the building. The space rises to the glass ceiling, cascading stairs connect the open floors, and the view expands through transparent partitions into the offices and other spaces, and beyond to the outdoors. Four conference rooms – also known as meeting boxes or aquariums – cantilever dramatically into the atrium, floating in the void. The boxes are thermally and acoustically insulated and the exteriors are clad in sound-swallowing perforated stainless steel panels. The open stair, nearly two meters wide, with glass sides, is the main means of vertical circulation in the building. The elevator and fire stairs are inconspicuously



set back, almost hidden. Around the atrium the offices and rooms aligned along the exterior walls are organized in functional zones in a U-form that opens toward the southwest to admit sunlight. In the corridors between the atrium and the offices are communication zones, multi-functional circulation spaces and seating areas for impromptu exchanges and spontaneous meetings – perfect for the community of researchers.

Bob Gysin explains that “researchers don’t like to work in open-plan offices, so we gave them small offices for a maximum of four people.” The offices



can be flexibly partitioned as required by occupant load, function, and adjacencies. The partitions between offices are wood-framed. The partitions facing the light-bathed atrium are glass; thus the offices receive daylight from two sides. The offices are comfortable and functional, not luxurious. Colors in the offices are neutral and natural, whereas public rooms and spaces are accented with bold colors.

The visitor will find the lobby comfortably warm even on overcast winter days. He will see people talking and moving on every floor. Most of them

use the main stair instead of using the elevator, and very few use the fire stair next to the elevator. People use stairs much more when the stairway is not hidden behind a door. The visitor will see people sitting and talking in the meeting areas along the corridors in front of the offices, and he will likely see a group using one of the conference rooms, a scene set in a frame of silver that imparts a note of dignity to one of the most important activities that occur in the building – the exchange of ideas. The atmosphere is natural, humane, civilized.

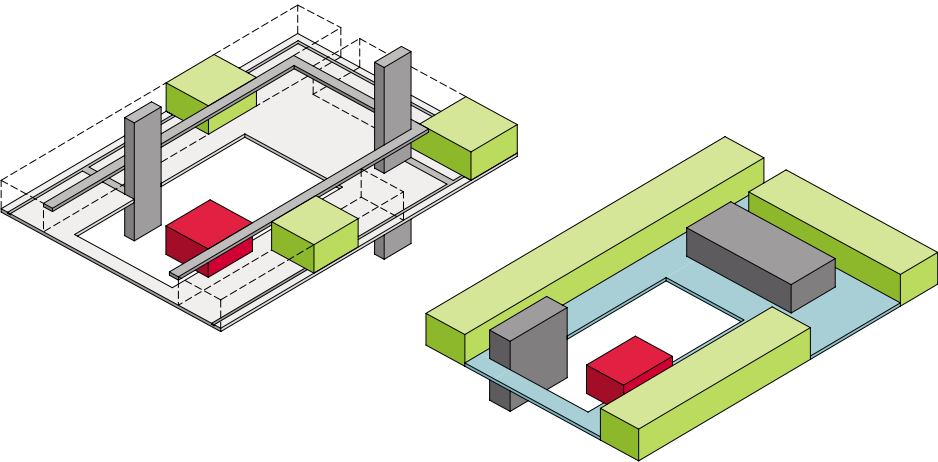


Climate control

- Comfort zone
- Buffer zone
- Comfort zone with cooling ceilings
- Service cores and mech/elec distribution

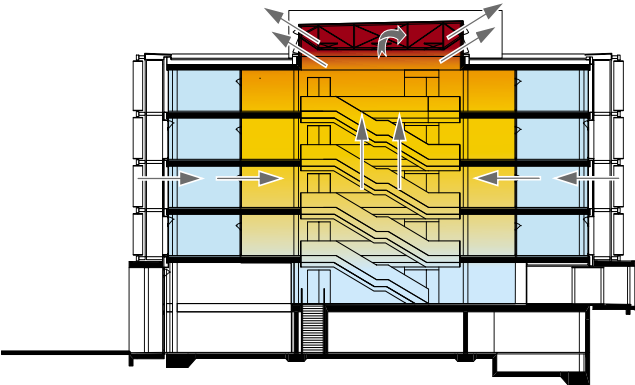
The interior spaces of Forum Chriesbach are divided into two climate zones: the comfort zone and the buffer zone. The comfort zone, comprising offices, meeting rooms, etc., is mechanically ventilated and the temperature is actively maintained at a comfortable level for working. The buffer zone, comprising the atrium as well as the adjacent corridors on each floor, is without permanent ventilation and direct temperature control. The temperature here is allowed greater fluctuation. The two zones are separated by insulating glass partitions. Thus in winter, energy is spent to warm the offices and other permanently used rooms, not the circulation spaces. But the atrium is not cold in winter – it is not only warmed by the sun but well insulated by the comfort zone that wraps around it on three sides.

Heating and ventilation of the rooms in the comfort zone are centrally controlled. Air exchange is continual, slow, silent, and unnoticeable. Warm air in winter and cool air in summer enters by duct. In summer the air is



expelled direct to the outdoors during the day; in winter it passes through a heat exchanger in the basement, to warm the incoming fresh air.

On summer nights the two-zone system works to cool the building in a simple and efficient way. When the outdoor temperature drops, windows in the superstructure of the atrium automatically open, allowing warm air that has risen to the atrium ceiling to exit. These windows on both sides of the superstructure provide cross-ventilation, drawing warm air from the atrium by natural convection. At the same time, motor-operated hopper windows in each space in the comfort zone open – one window to the outdoors and, on the opposite side of the room, a transom window in the partition to the corridor. As the warm air rises through the atrium as in a chimney, fresh cool air is drawn into the offices all night long. The flow removes the warm air in both zones and cools the thermal mass in the building, so the cooling effect lasts throughout the day. The only energy consumed by this cooling system is that which is necessary to run the weather station and the central control system and operate the motor-controlled windows.



Energy efficiency

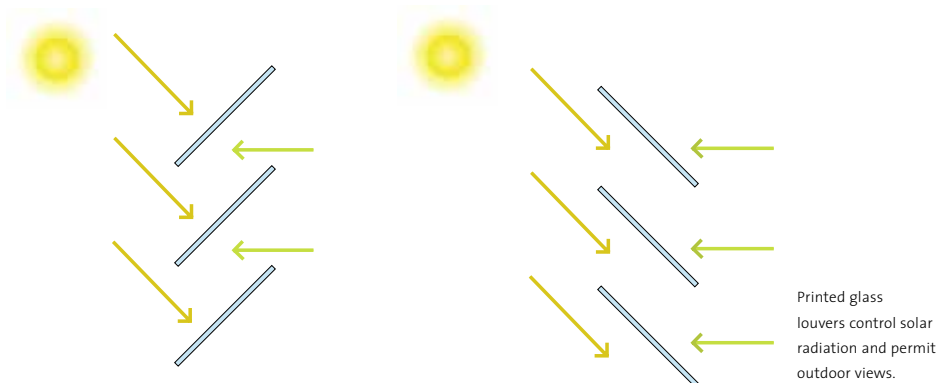
Forum Chriesbach is a low-energy passive building. It has no conventional heating or cooling system. The heat sources are the earth, the sun, people, and equipment in the building such as lights, computers, and kitchen appliances. This heat is sufficient because it can be stored in the building and because the building is highly insulated. Tightly sealed buildings such as this are usually equipped with a ventilation system to provide sufficient air exchange and to recover heat from used air during the cold season.

Practically every part of the building contributes to achieving a comfortable indoor environment while consuming as little energy as possible. The compact building volume has less surface over which heat loss occurs. The roof and facade are highly insulated and airtight. Thermal bridges are minimized. Large glass areas allow significant solar thermal gain. The facade is ventilated to prevent excessive heat gain in summer. Thermal mass in the building moderates temperature swings. Passive cooling is used in summer. The comfort zone is heated, the buffer zone is not. The atrium roof is shaded and ventilated in summer. The louver system automatically tracks the sun to allow sunlight in winter and block it in summer. Daylight reduces the need for electrical lighting. The central control system continuously operates all systems for optimum energy efficiency. Heat is recovered from incidental sources.

The combination of all these measures makes a furnace and conventional air-conditioning system unnecessary at Forum Chriesbach. Bob Gysin relates that in July 2006, just after the building opened, the outdoor temperature rose to 36°C. Inside the building the average temperature was 24°C. The hottest office, in the south corner on the top floor, was 26°C. During the first winter an average of only 100 to 120 people occupied the building – because Eawag's scientists are often out doing field work, lab work,

teaching, or attending conferences – so the heat provided by warm bodies, PCs, and office lighting was much less than planned. (Other building types, such as schools, factories, or offices with constant occupancy, would be better suited for this heating concept.) Nevertheless, the average office temperature was between 20°C and 23°C. Even in offices for four people that were occupied by only one person the temperature remained comfortable.

With an annual primary energy consumption of 64.9 kilowatt hours per square meter, Forum Chriesbach is four times more efficient than required by Swiss energy conservation law. It consumes the amount of energy prescribed by the visionary Swiss standard of the 2000-watt society for the year 2050 – or put in other terms, it uses as much energy as a normal single-family house, although it is forty times larger. The intelligent way to meet energy requirements is not to produce more energy but to consume less. Forum Chriesbach shows that reducing energy demand need not entail compromise in any way.



Building envelope

The third of the three major systems of the architectural concept is the building envelope, the facade and roof. The facade consists of three sub-systems: the wall, “permanent scaffolding,” and the louver system. The wall is 45cm thick, made of prefabricated wood-frame panels with 30cm of mineral wool insulation. The exterior is clad in blue fiber-reinforced concrete board, ventilated for cooling in summer. The wood window units are triple glazed and can be operated manually. But not much of this is seen from the outside, because it is masked by the third layer – the louvers (we will discuss the second layer shortly).

The louvers cloak the building in aqua blue – 1,232 panes of glass, each 2.8 meters high, one meter wide, 24mm thick. The panes are laminated from two sheets of glass, one of which is printed on the inside with a dot-screen pattern in which the field is light blue and the dots are transparent voids. This pattern admits daylight and provides transparency while limiting thermal gain in summer.

The louvers adjust automatically to optimize indoor temperature and lighting conditions and minimize energy consumption for lighting, heating, and cooling. The building’s weather station delivers weather data to the central control center, which adjusts the motor-driven louvers to track the path of the sun. On sunny winter days the louvers typically remain parallel to the sun’s rays, allowing maximum penetration. On sunny summer days the louvers constantly block direct sunlight yet provide daylighting. On sunny spring or fall days the position is determined based on global radiation values. On overcast days the louvers generally stand perpendicular to the facade. An adjustable hysteresis is built into the control system to prevent readjustment with every passing cloud. In extremely windy or cold (-8°C and below) weather, the louvers are set perpendicular to the facade

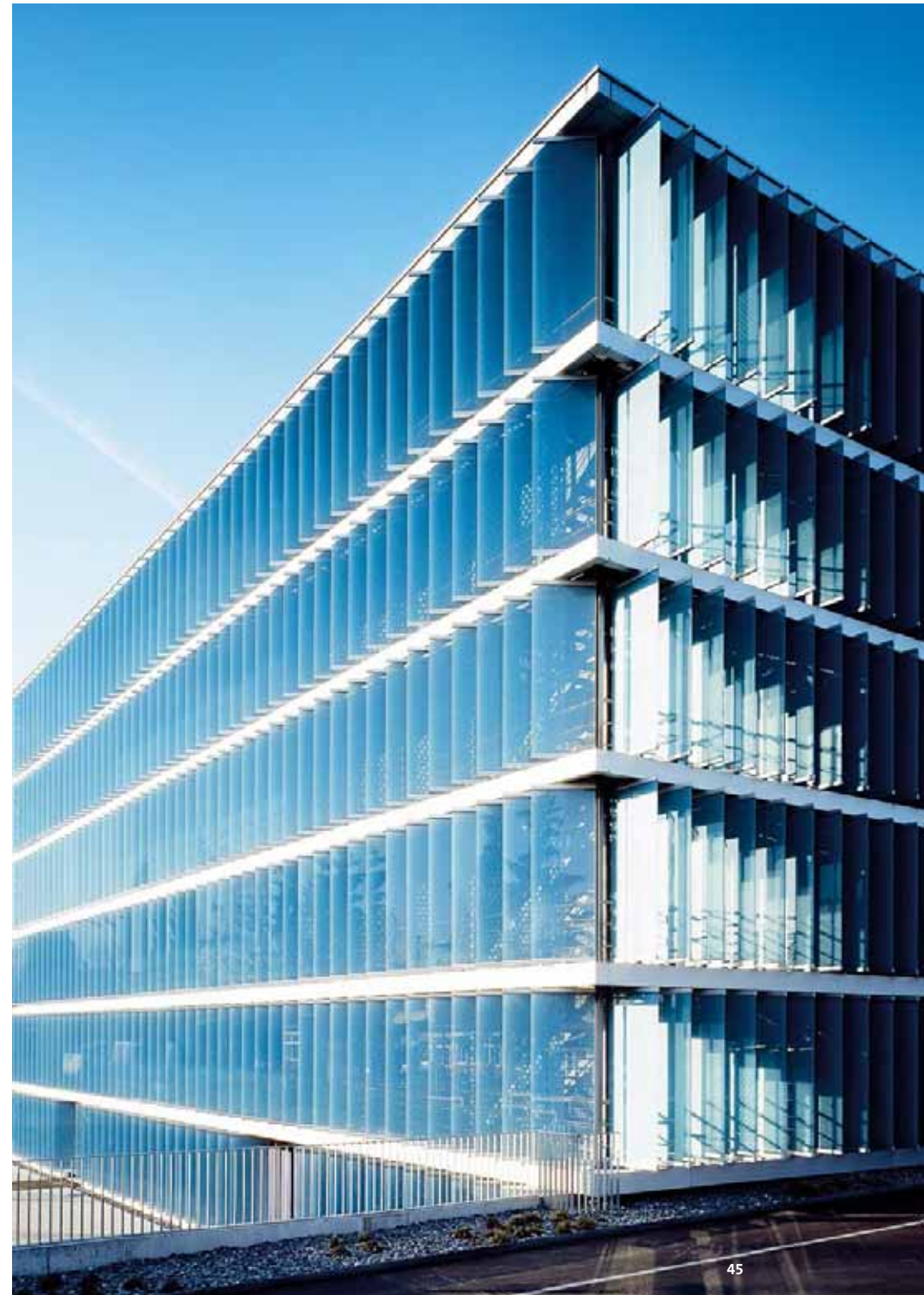


and remain fixed. The louvers can adjust plus or minus 45° from the perpendicular position; they cannot close against each other due to fire regulations.

At 11:40 a.m. on a chilly, overcast morning in March, the louvers were all at 90° – perpendicular to the facade. Suddenly the sky brightened, and at 11:57 all louvers on the southeast and southwest facades simultaneously adjusted to 45°, due south. The motors were audible and the movement lasted about ten seconds. The louvers on the other two facades remained motionless. At 12:02 the southwest louvers adjusted to 15°; the southeast louvers remained at 45°. Each facade reacts separately to the changing light conditions to permit maximum solar penetration.

Intriguing – an entire facade goes into motion en masse. The appearance of the building changes continually. Even when the louvers remain still, the appearance changes as you walk by. Depending on the angle of the louvers and your point of view, you might see into the building or you might see louvers only. The superimposed patterns of adjacent louvers at the corners shift as you approach the building, making the light at the corners “dance” as you walk. Adding to the interest is that glass – a transparent material we think of in facades as window – is used here for shading, and the louvers make the facade look as if all the windows are open. For the first-time visitor the curiosity is great – Is that blue glass? Are all the windows open? What could be going on inside the building behind this machine-like facade?

Between the louver system and the exterior wall of the building is the third sub-system of the building envelope – the scaffolding. This galvanized steel framework wraps every floor of the building, supports and provides



service access to the louver system, houses the louver mechanics, and provides fire egress corridors and a stairway at each corner of the building. On every floor, every office and other space on the building periphery has a door that opens directly onto this corridor.

Placing the fire egress corridors outside is an unconventional move that worked magic for the inside. Gone are the massive partitions between fire zones and around corridors and stairs. This is the coup that made possible the great transparency of the interior – and another example of the interaction among the systems in this building. The exterior corridors were not part of the original design; they were added as the project developed in order to meet fire safety requirements. The projection of grated corridor floors has the drawback that it shades the facades, significantly reducing solar thermal gain.

The iconoclastic facade of Forum Chriesbach is more than a sophisticated mechanism constructed to meet functional and technical requirements – it has become the icon of Forum Chriesbach, if not of Eawag itself. The building might not be to everyone's taste, but it is a powerful and impressive image.

The power of expression is partly due to the terse vocabulary and rigorous composition of the facade. The rows of louvers on each level are identical, and all the rows on a facade are always in line with each other. Every louver is spartanly dressed top and bottom with a metal bracket. Between each row is a plain aluminum-clad channel enclosing motors, cables and levers. Hiding this equipment adds to the elegant simplicity. The aluminum fascia capping the building is practically identical to these strips. Other than the entrance and a few other openings, all four facades consist of these same



few simple elements. This otherworldly facade disturbs some people. The mask is too perfect. Railings, windows, and other objects that give scale are missing. People in the windows are missing. The building seems to be an impersonal non-transparent box.

Behind the matrix of louvers is a non-uniform and non-aligned pattern of windows as well as fire stairs, railings, the scaffolding, and outside the kitchen trash cans, crates of bottles, and the usual service-court hodge-podge. Some of this is visible from certain angles, as the louvers allow views and show the windows, people, and details of life. This duality of character, this tension between opacity and transparency, personal building and impersonal machine, barrier and veil, shielding by day and glowing by night, makes the experience of Forum Chriesbach stimulating and enjoyable. The building constantly changes with one's point of observation, with the time of day, the season, the sky.

The second element of the building envelope is the roof, which, like the facade, is unusually multifunctional. It serves not only to enclose and insulate, but to ventilate, daylight, shade, admit sunlight, collect rainwater, collect solar energy, generate electricity, and support vegetation. The basic roof assembly consists of a reinforced concrete deck, vapor diffusion layer, 30cm rigid foam insulation, polymeric roofing membrane, and a green roof system comprising filter and drainage layer, humus layer, planting, and gravel ballast.

The flat roof is penetrated in the center by the atrium skylight, a super-structure that comprises two insulating glazing layers with an insulating air space in between. The skylight allows daylight and solar radiation to enter the building core. On summer days, fabric shades just below the

top glazing layer close automatically to limit thermal gain, and the air space between the glazing layers is cross-ventilated by windows that open automatically to expel the hot "greenhouse" air.

Covering 50m² of the roof are vacuum tubes for collecting solar thermal energy. High-performance photovoltaic collectors cover 459m² around the perimeter of the roof, providing for a third of the building's power needs. The rest of the roof is constructed as a green roof that supports hearty plant varieties. The humus layer retains rainwater, whereas conventional roofs channel rainwater into sewers and aquifers as directly as possible, which aggravates flooding after storms. The rainwater that escapes the roof of Forum Chriesbach is collected in a pond on the site.



Mechanical systems

Fresh air is drawn in through eighty pipes that reach deep underground to capture geothermal energy. It is cooled in this thermal register, filtered, and distributed through the ductwork. Heat from the server room and kitchen are expelled directly to the outdoors or is used to warm up the air during winter.

In addition, active cooling (cold water pipes in the ceilings) is installed in the server room, conference room, seminar rooms, and meeting rooms. Indoor temperature swings are held in check by the significant thermal mass of the reinforced concrete structure.

Aside from passive heating, the building is heated by an efficient and environmentally friendly forced-air system that uses geothermal, solar, and recovered energy. Fresh air is drawn through a system of eighty 20-meter-long 18.5cm-diameter plastic tubes that extend deep into the subsoil. The earth pre-warms the air in winter. This air is then channeled through the server room, picking up heat while cooling the computers. It then passes through a heat exchanger where heat from spent air is recovered. Additional heat can be added from a highly-insulated 12m³ thermal storage tank which is fed by heat thrown off by the kitchen appliances and by the heat captured by the rooftop vacuum tube collectors. It warms the air to 20°C, which is sufficient because the building is well insulated and also warmed by passive and internal heat sources. The warmed fresh air is filtered and distributed to the rooms through exposed insulated ducts on the corridor ceilings. Thus, not a furnace, but computers, lights, pumps, and fans are the energy consumers in the HVAC system, which requires 10.8 kWh/m²a. The building is connected to Empa's district heating network as a backup. Through this network it can also supply surplus hot water (55°C) from the solar collectors to neighboring buildings.

In addition to the passive cooling systems, the building is actively cooled and ventilated by the same system used for heating, but operating in a different mode. The building is equipped with state-of-the-art computer and technical systems and equipment for continuous and automatic monitoring and control. Servers located in the basement are the nerve center, coordinating the weather station, heating and cooling systems, security systems, emergency lighting, building access control, and fire protection systems. Most lights in the building operate automatically in response to daylight levels and motion sensors. Electrical and electronic cables run under the floors in a pattern that allows flexible partitioning of rooms.



Water

As the administration building of the Swiss Federal Institute of Aquatic Science and Technology, Forum Chriesbach is unusual and progressive in the way it handles water. Drinking water is conserved, rainwater is sensibly controlled and utilized, and urine is carefully collected and used in research.

Urine is collected separately from wastewater with solids throughout this large office building in order to advance this technology for widespread adoption. Waterless urinals and specially designed NoMix toilets are connected to separate lines to keep urine separate from wastewater with solids. Removing urine from sewage streams would significantly reduce loads on wastewater treatment plants, and it would make treatment easier, because concentrated volumes are more efficient to handle and treat. Another advantage is that urine can be valuable substance; practical ways of extracting this value are being studied at Forum Chriesbach. Exploiting common waste as a resource is a mark of sustainable civilization.

Eawag's Novaquatis research project investigates the integration of separate collection and treatment of urine in urban water-management systems. Urine contains significant phosphorous and nitrates that can be processed for use as fertilizer, but it also contains toxins and problematic trace elements such as hormones and pharmaceutical residues, which are unwanted in fertilizers and must be extracted. Eawag is studying urine-handling technologies that can be optimized for widespread use, and uses Forum Chriesbach as a research object – even separately collecting men's and women's urine to study the differences.

The urinals are waterless. To control odors, an infrared sensor detects the presence of a user and opens or closes a valve in the ventilation automatically. This works somewhat; the odor is unmistakable at the urinal.

A range of waterless urinals is installed throughout the building to test them, study the fixture designs, and help develop this emerging technology.

Rainwater is collected from the roof of the building. Such water is not suitable for drinking water because it comes into contact with various construction materials and picks up heavy metals and pesticides, which also are environmentally detrimental. Researchers at Eawag are studying these problems, testing potential improvements and solutions, and investigating the relationships among rainfall, retention, evaporation, and runoff of roof water.

Water collected from the roof of Forum Chriesbach is treated and used to flush toilets. To clarify the rainwater, which is murky after passing through the soil of the green roof system, the water is fed into a pond that is actually a triple-chamber biological treatment plant next to the building. The treated water, still turbid, is taken from the second settlement chamber and piped back into the building. When the pond overflows, the water settles in sumps in the adjacent terrain, and gradually seeps into the soil. Retaining and using rainwater and returning it to the soil on site are simple but important ways of controlling floods, which are becoming more frequent and catastrophic as permeable soil is sealed beneath buildings and pavement.

Research and development

A calotte model of Eawag's favorite molecule at a scale of 1:10^m is suspended from the roof structure and adorns the atrium. The two translucent hydrogen atoms serve as projection screens for beamers mounted inside the oxygen atom.

The project brief called for “development during the design phase” – which would have been necessary anyway for this design because some of the emerging technology used in the building required dynamic simulations and tests to optimize the systems and designs. As a research institute for material science and technology, Empa is well qualified and equipped to conduct tests of building materials and assemblies. During the design phase of Forum Chriesbach, Empa confirmed much of the building performance data and performed some of the technical simulations to study thermal behavior, air flow, shading, lighting, daylighting, smoke evacuation, and other phenomena.

The best example of the testing and development conducted by Empa during the design phase is the facade studies. In 2005 at its solar testing center Empa worked with the facade contractor to build a 1:1 model of the facade assembly (complete, including exterior wall, intermediate scaffolding, and glass louver system) to test and analyze the energy transmission characteristics and daylighting properties. The researchers studied the total energy transmission of the entire assembly as well as the daylighting coefficient as a function of the distance between window and louver. The assembly was optimized to provide 300 lux at the desks farthest from the windows. The density and color of the pattern silkscreened on the louvers were also investigated. Dot-screen patterns in light blue, medium blue, and dark blue at various opacity levels were tested. Tests for g-value gave similar results for all three colors and delivered information about how louver settings influence performance. A louver pattern in light blue with 75% opacity was selected in order to provide optimum daylighting while preventing excessive solar thermal gain.



Environmental performance

Forum Chriesbach was conceived for good environmental performance, specifically regarding energy efficiency, gray energy, CO₂ emissions, and the use of non-hazardous materials. To create a toxin-free indoor environment and to protect the outdoor environment, no solvent-based construction chemicals and no materials or products containing other particularly hazardous substances were used in the building. Few building owners demand such standards; the client not only demanded them but insisted that compliance be monitored on the site. The site supervisor regularly checked materials, collected labels and product data sheets, and had these checked by a specialist. Thus all materials used in the building are listed in a comprehensive document that records all manner of details, for instance the source of the wood used, that 900 m³ of recycled concrete is in the decks, and that the insulating glazing units between the atrium and the offices are free of environmentally hazardous SF₆.

As a means of conserving resources, the design brief stipulated a target value for gray energy, the energy embodied in installed construction materials. Gray energy is seldom mentioned in common design specifications, but in the future specified values could become standard. The development of Forum Chriesbach provided valuable experience designing with gray energy in mind. A limit of 5,000 MJ/m² of gray energy and a maximum annual heating demand of 40 MJ/m² was specified. The ratio between these figures shows the significance of gray energy in buildings, and thus of the lifespan of buildings.

The architects kept gray energy low principally by giving the building a compact volume, using wood for the exterior walls, choosing a relatively simple interior structure, using a wood-fiber cementitious floor finish, using recycled materials, leaving piping and ductwork exposed, and using

wood-framed walls finished with loam plaster for the partitions between offices. This method of constructing the partitions was chosen to demonstrate an alternative to aluminum studs and gypsum board. The main drawback is that the loam plaster chips when nails are driven into it, so the office occupants cannot hang pictures the normal way. A track along the ceiling is installed for hanging pictures. Leaving piping and ductwork exposed is another tradeoff; in some spaces it gives an unfinished impression.

Gray energy and annual energy consumption are in healthy balance at Forum Chriesbach. Gray energy measures 43,000 GJ/12,000 MWh, which equals the total primary energy required to operate the building for about 20 years. The import of this achievement becomes evident when one considers that Forum Chriesbach requires a minimum of primary energy for operation.

Because the building has no furnace, CO₂ emitted by the building itself during operation is near zero.

Economic performance

Economic performance of a building can be assessed chiefly by the construction cost, the costs of operating and maintaining the building throughout its lifespan, the cost of demolishing the building and disposing of the materials at the end of the building's life, and relative value the building adds to the functions for which it is designed. Forum Chriesbach was designed with these life-cycle costs in mind.

The building was constructed at a cost of CHF 29.5 million, which is comparable to the cost of a standard Swiss office building of similar size. The difference is that the operating costs are significantly lower. As energy prices rise this difference will become even more significant. Maintenance costs will be lower than average because the mechanical systems are simple (fans and pumps instead of compressors and furnace), the entire facade is accessible without additional scaffolding or equipment, durable, low-maintenance finish materials are used inside and out, and ductwork, pipes, and cables are exposed for easy access. Forgoing cladding for these installations will also simplify the task of material sorting when the day finally comes to demolish the building.

Forum Chriesbach is designed as a pleasant and functional environment that encourages communication and interaction as much as any building can, thus doing its part to support the productivity and achievements of the staff working in the building. One hopes that in this way the building helps the people working in it to create the maximum value. The building adds unquantifiable but undeniable value to image of Eawag. As a stunning piece of modern architecture and a prototypical example of future-oriented thinking, it reasserts the status of the Swiss research institute as a center of advanced scientific studies, and emphatically expresses Eawag's commitment to sustainable development.



A building for the future

Forum Chriesbach incorporates significant advanced technology and a number of innovations, such as NoMix plumbing and designing for gray-energy efficiency. However, the central architectural concept is nothing new – super-insulated passive solar buildings have existed for decades.

The significant distinction here is how the people behind the project worked together with a shared sense of responsibility, commitment, and purpose. Showing social, environmental, and scientific engagement, the client prescribed standards for the design that go far beyond the norm, beyond any building code, and expressly sought to test the limits of what is possible.

The design team shares the client's philosophy, and delivered the necessary background and know-how, working together with the client, users, and contractors throughout the five-year duration of the project. The integration of diverse building systems into an organic whole testifies to the coordination and skill of the team, which tackled all the relevant issues without significantly compromising any.

The role played by the client in architectural projects can be easily underestimated. Many architects can deliver sustainable architecture, but only if



the client values it and demands it. Success lies just as much in the hands of building owner as in the hands of the architect.

The lessons of Forum Chriesbach have global ramifications. The building proves that by using conventional materials and known transferable technologies, a high level of performance is not only possible, but affordable and practicable. This level of performance is vital to a sustainable future.

This building makes sense in every respect – economically, socially, ecologically, functionally, and aesthetically. In a world in which sustainability is in question, in which better ways of shaping and managing our environment must urgently be adopted, Forum Chriesbach stands as a model of how to build for the future.





Bob Gysin on sustainability and architecture

“Creating a building like Forum Chriesbach is possible only with a team of many specialists and of course a dedicated client. Each player must be qualified because the result is only as good as the weakest link. That’s why one of the project requirements was to form an optimal interdisciplinary design team.”

Bob Gysin, Principal, Bob Gysin + Partner BGP

Bob Gysin, the word “sustainability” plays an important role in your portfolio. Exactly what would you call a sustainable building?

The term “sustainability” has become a bit of a vogue word in recent years. But if you consider it seriously, it would mean that things we make quickly might not necessarily be the best in the long run. That’s why Swiss slowness is not always such a bad thing. A sustainable building is surely one that serves its purpose for a long time. In this age, in which no building type remains unchanged over the centuries, architecture should possess flexibility. Materials should also be used correctly in the sense of sustainability. Materials that are appropriate for a building designed to last a century are different from those for a building designed to last only twenty years. But in either case, the materials must be suitable for recycling, or even better, up-cycling. Next to the Forum Chriesbach site, we built an experimental laboratory six years ago in which basic principles of sustainability are easy to see. The building was explicitly designed to last twenty years. Thus for the structure we selected wood framing, which can be disassembled in twenty years and reused. In the worst case the wood can be burned as fuel. Of course the building is highly energy efficient, partially because of the translucent skin that admits daylight to all areas of the building. The laboratories are inserted as containers into the structure; in twenty years these can be removed and used elsewhere. Thus sustainability involves material selection, energy efficiency, and reversibility.

At Forum Chriesbach you had an ideal situation because the client is committed to energy-efficient building. How can one persuade everyday clients to build energy-efficiently?

The only way is to explain the issues in order to expand awareness. But it's easier to persuade a client when the solution delivers multiple benefits – not solely environmental friendliness, for instance, but perhaps also economic benefits. If I can do this persuasion work, then I can probably convince the client to build sustainably. As an architect, if I am already afraid of losing a commission as soon as I take a definite stance, then I can forget it. I don't have to design a zero-energy building for everyone, but it should be explained to clients that this would be the desirable aim. Aside from ecological aspects, economic aspects will play an increasingly important role in the energy efficiency of buildings in the future. Thus mindsets will change, somewhat automatically. But until then, very much persuading will still be required.

Forum Chriesbach stands out not only due to the energy efficiency but also due to architectural quality. The original architectural concept remained intact until the end. How do you preserve the simplicity of the structure throughout a project?

You are speaking of maintaining a certain degree of control. To ensure this, communication with the client is important. Our philosophy must largely match that of the client, otherwise we can't maintain the consistency until the end. Experience also plays a role here, as well as quality control that is built into our entire process. Building requires constant attention. The three most important players – the client, the design team, and the contractor – must be in balance. Once everybody is talking on the same basis, collaboration is a lot easier.

Forum Chriesbach won four Swiss design awards within six months after the building opened. What do such awards mean to you?

The meaning can be seen on three levels. First, the awards have great importance for the building itself. They are an acknowledgment of the efforts of the project team, and here I include all engineers and contractors and of course the client. If the client and the users are satisfied, then one can speak of a successful result. The awards bring the successful result to the attention of the public. Secondly, the awards publicize the building design. I hope that our way of building will generate imitators in the positive sense. The issue here is not fear of plagiarism, it is efficient knowledge management. The third level is the prize money, and we have openly announced that we will use the money to fund research.

Engineers are very important partners, especially for service buildings. How do you select them?

In 1998 I developed a concept for a virtual office. The aim was to unite the best offices that share ideal interests. The platform was on the Internet, with three to four offices in each discipline. Today the virtual office no longer exists in that form, but we still collaborate with a lot of the offices that were part of the project. It's important to get the engineers and specialists on board as early as possible – best is even in the competition phase. We architects too should make use of the knowledge of others. The more difficult the task, the more I am tempted to accept the challenge.

Is it the challenge that constantly motivates you to think beyond the limits?

Of course, and not only in architecture but in all areas of life. But one can also think about limits philosophically. Actually, there are no limits; at the most there are limit ranges. In geography, the transition from mountains to steppe to desert is fluid. On my first trip to Italy when I was sixteen I looked intently out the train window to notice the change between Switzerland and Italy, but everything looked exactly the same on both sides of the border. Limits are artificially defined. This room might have clearly defined limits but as soon as we are outside this building we talk about intermediate spaces and if we look up toward the heavens, space has no limits. We set our own limits ourselves.

Interview by Anita Simeon in "Bau & Architektur", March 2007



Technical data

Volume and areas	Building volume: 38,615 m ³ Atrium volume (volume beneath lower glass layer): 4,788 m ³ Exterior surface area: 5,174 m ² Main usable floor area: 5,012 m ² Floor area: 8,533 m ² Roof area (building footprint): 1,886 m ² Energy reference area: 8,270 m ² Energy reference area (weighted for room heights): 11,170 m ²	Construction cost 29.544 million Swiss francs (including sitework)
Building utilities	Photovoltaic panel area: 459 m ² Evacuated heat pipe solar collectors: 50 m ² Thermal storage tank: 12 m ³ Rainwater storage tank: 4 m ³ Rainwater storage pond: 80 m ³ Drinking water consumption: 811 m ³ /a	Awards Swiss Solar Prize 2006, category "Buildings," Swiss Solar Agency Innovation Prize 2006, Swisspor Watt d'Or 2007, Swiss Federal Office of Energy Daylight Award 2007, Velux Foundation
Energy (design values)	Heat capacity demand: 8.0 W/m ² Thermal heat demand: 52.0 MJ /m ² a Heat drawn from Empa network: 23.6 MWh/a Cooling drawn from Empa network: 12.0 MWh/a Heat supply to Empa network (potential capacity): 5.7 MWh/a Vacuum pipe collectors: 24.0 MWh/a Power demand (without server): 181.0 MWh/a Photovoltaic power generation: 60.0 MWh/a Power drawn from public grid: 121.0 MWh/a Gray energy including excavation and mech/elec systems: 12,000 MWh Expected average service life: 37.6 years	



Acknowledgments The author thanks the following people for their help with this book: Franz Aeschbach for fact checking, Professor Dr. Marc Angéilil for his critical advice, Christopher Barbour for English editing, Dr. Herbert Güttinger for fact checking, Bob Gysin for explaining the building, Daniel Leuthold for giving me a tour of the building, Professor Dr. Hans-Rudolf Schalcher for his critical advice, and Edward Schwarz for coordinating the publication. *Daniel Wentz*

Sources BAU info, October 2006, pages 35 – 42
Bau & Architektur, March 2007, pages 4 – 8
Cash, 25 January 2007, page 43
Eawag Forum Chriesbach, Eawag 2006
Eawag news 62d/e/f, December 2006/April 2007, pages 30 – 31
Energietechnologien, 2007, page 4
Fassade, 2007, pages 4 – 11
NZZ am Sonntag, 15 October 2006, page 33
NZZ am Sonntag, 10 December 2006, page 51
Swiss Solar Prize 2006 report, Swiss Solar Agency

Addresses www.forumchriesbach.eawag.ch

Client

Eawag, Überlandstrasse 133, CH-8600 Dübendorf, www.eawag.ch

Empa, Überlandstrasse 129, CH-8600 Dübendorf, www.empa.ch

Client's agent

BaFA Bauten Forschungsanstalten, Kriesbachstrasse 42, CH-8600 Dübendorf

Architect

Bob Gysin + Partner BGP, Architekten ETH SIA BSA, Ausstellungsstrasse 24, CH-8005 Zurich, admin@bgp.ch, www.bgp.ch

General contractor

Implenia Generalunternehmung AG, Industriestrasse 24, CH-8305 Dietlikon, www.implenia.com

Design team

Architecture: Bob Gysin + Partner BGP, Zurich

Energy and mechanical engineering: 3-Plan Haustechnik AG, Winterthur

Architecture and energy engineering: EK Energiekonzepte AG, Zurich

Engineering and design: Henauer Gugler AG, Zurich

Electrical engineering: Büchler + Partner AG, Zurich

Acoustics, building physics, simulations: Kopitsis Bauphysik, Wohlen

Steel building engineering: Mebatech AG, Baden

Ecology and sustainability: Prof. Hansruedi Preisig, Zurich

Environmental chemical engineering: Ueli Kasser, Zurich

Landscape architecture: asp Landschaftsarchitekten AG, Zurich

Landscape architecture (design competition): Vetsch Nipkow Partner, Zurich

Holcim Foundation

The Holcim Foundation for Sustainable Construction promotes innovative approaches to sustainable construction. The objective of the Holcim Foundation is to encourage sustainable responses to the technological, environmental, socioeconomic and cultural issues affecting building and construction, regionally as well as globally – through a range of initiatives, including Holcim Awards, Holcim Forum, and Holcim Projects.

* The partner universities of the Holcim Foundation are the Swiss Federal Institute of Technology (ETH Zurich), Switzerland; Massachusetts Institute of Technology (MIT), Cambridge, USA; Tongji University, Shanghai, China; Universidad Iberoamericana (UIA), Mexico City, Mexico; and University of the Witwatersrand, Johannesburg, South Africa. The Universidade de São Paulo (USP), Brazil, is an associated university of the Holcim Foundation.



An international competition for future-oriented and tangible sustainable construction projects.

The Holcim Awards recognize any contribution to sustainable construction – irrespective of scale – in architecture, landscape and urban design, civil and mechanical engineering and related disciplines.

Prize money of USD 2 million per three-year competition cycle encourages and inspires achievements that go beyond convention, explore new ways and means, and draw attention to and identify excellence.

The Awards competition is conducted in partnership with some of the world's leading technical universities* who evaluate entries according to the target issues for sustainable construction, and lead the independent competition juries.

www.holcimawards.org



A series of symposiums for academia and practitioners to encourage discourse on the future of the built environment. The Holcim Forum supports sustainable construction in the scientific field, among experts in the construction sector, business and society.

In addition to renowned specialists from around the world, promising international students from leading technical universities are invited, to represent the next generation and to share their visions.

The first Holcim Forum was held at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland, in 2004 under the theme “Basic Needs.” The second Holcim Forum was held in 2007 at Tongji University in Shanghai, China, under the theme “Urban_Trans_Formation.”

www.holcimforum.org



Seed funding for building initiatives and grants for research projects to accelerate progress and promote sustainable construction.

Within the framework of Holcim Projects the Holcim Foundation provides USD 1 million per three-year cycle to support research in sustainable construction and the implementation of building projects. Projects nominated for seed funding are evaluated according to the target issues for sustainable construction, and must be endorsed by a local Holcim Group company.

The Holcim Foundation acts as an enabler for both research projects and building initiatives so that, whatever their origin, exciting and important new ideas can be more widely implemented and tested by a broader audience of specialists.

www.holcimprojects.org



Holcim Foundation for Sustainable Construction

Hagenholzstrasse 85

CH-8050 Zurich, Switzerland

Phone +41 58 858 82 92

Fax +41 58 858 82 99

info@holcimfoundation.org

This publication can be downloaded as a PDF file at

www.holcimfoundation.org