

Design&Construction of Sustainable Schools

Volume 01 Lessons From School Buildings In Norway And Germany

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Preface

This publication is part of a series of work sponsored by the Scottish Executive to encourage the design and construction of sustainable schools in Scotland. It follows on from previous guidance on School Design (2003) and Sustainability (2004), published in support of the joint Scottish Executive and the Convention of Scottish Local Authorities (COSLA) school estate strategy *Building our Future: Scotland's School Estate*.

Sustainability, in its widest sense, is at the heart of the strategy's vision for new and refurbished schools which support learning and teaching, and are an integral part of the community, both today and for coming decades.

Good school design has an important role to play in delivering this vision, not just in physically creating the healthy and ecologically-sensitive environments in which learning and teaching can take place but also in demonstrating and imbuing in pupils an awareness of the need for us all to develop more sustainable ways of living in general.

Since the launch of the strategy the Scottish Executive has, in partnership with others, been promoting the sharing of good practice in school design through national conferences, workshops, guidance publications and other projects. An important element of this work has been to seek out lessons and take inspiration from as many sources as possible, including examples of school buildings internationally.

In this context, *Design&Construction of Sustainable Schools* looks at some examples of recent sustainable school buildings in Norway and Germany, with a view to informing the development of our school estate in Scotland. The book will be of interest to everyone involved in school design.

This publication has grown from a project that started in May 2003 when the Gaia Group undertook a study tour of schools designed by it's Norwegian colleagues plus some sustainable schools by others. The tour party comprised Gaia staff, a number of public and private sector architects and engineers, and local authority education officials.

The initial focus of the tour was on passive design techniques and, in particular, on natural ventilation methods. It was discovered that even with a design temperature of minus 20°C in winter, a number of the schools visited were achieving very low energy use targets - achieved through an approach combining energy conservation and the use of passive heat gains.

Whilst the tour was very instructive on the technical aspects of environmental design, it also gave an insight into the involvement of schools with their wider communities and an approach to education, both of which differed to those prevalent in Scotland.

Following very positive feedback from the Norwegian tour, Gaia decided that a second tour to look at sustainable schools in Germany would build on the lessons learned from Norway. The German tour took place in October 2004, with equally positive feedback. Again, the tour party comprised Gaia staff, public and private sector architects and engineers, local authority officials and representatives of the Scottish Executive.

Recognising the importance of the lessons emerging from the study trips, it was felt that there would be benefit in sharing the case studies with a much wider audience and so the partnership between Gaia, SUST. The Lighthouse on Sustainability and the Scottish Executive to disseminate the material began.

In this first volume of two, the intention is primarily to engage the interest of the reader in the projects visited and highlight the aspects which were of interest to the group. The Norwegian visit started from an interest in energy conservation, ventilation and indoor climate, but expanded into many other areas. The German visit started from an interest in materials and health and also diversified into issues of significance to those procuring schools in Scotland.

The themes (which establish a consistent design approach within the project descriptions) emerged empirically from the feedback of the participants and reflect the items which were of interest to them.

The second volume will pick up on these and other themes in more depth. Given that the schools were of varying merit in terms of the elements the group were wishing to learn about, it is clearly sensible to be selective in the second volume and use the most appropriate examples from the range of projects in order to showcase the selected specific aspects.



Plus + bauplanung - Teacher with three pupils - Kirchheim: Little School

Norwegian Schools

The word drifted over the North Sea that Gaia Architects in Norway - and others - were designing schools that were heated primarily by a combination of the body heat of the occupants and casual gains from equipment. Furthermore, this was being achieved in a climate with a winter design-temperature below minus 20°C.

This information was the trigger for a study tour organised by Gaia Research in May 2003, during the course of which it was established that the reality was much more complex, and even more interesting, than the mere technical aspects that had sparked the initiative.

In the first instance, it became clear to the touring group (which included architects, engineers, educationalists and school clients) that high levels of insulation and airtight construction were not enough on their own to deliver energy efficient schools. Most of the projects visited also had culverts or basements through which incoming fresh air was being preheated as it absorbed the temperature of the ground, through contact with the duct walls. In a country where it makes sense to build buildings with a basement (deep foundations below frost line) it is an opportunistic benefit to use this area for other purposes. It was quickly decided that whilst there was a more limited potential for this technique in Scotland - without such a ubiquitous basement tradition, nevertheless there were many other aspects of the passive design approach, which were readily transferable. The culvert system can also be used to pre-cool incoming air during warm weather.

As the tour progressed, it also became clear that the pedagogy and the community involvement in the school design process were of great interest, and the group began to focus as much on the way in which the buildings were used, the Norwegian teaching methods and the extent of parental involvement in

the schools, as on the buildings construction methods and the associated technical systems.

However, there was a third impression, which was stamped on the collective memory - that of the power of high quality design - the pride and joy aspect of good architecture. The high point was experienced in the visit to the school at Farsund, where despite a lack of what would be considered high levels of environmentally conscious and healthy building design practice, nevertheless the quality of the architecture was seen as a significant factor in the longevity, and therefore partly, the sustainability of the institution. It will see pupils and teachers, (and even educational practice and effective management), come and go; however, as a structure both internally and in its relationship with the town centre it is likely to be 'a joy forever'.

A scoring system was developed during the tour (red, amber, green). Assessments were made between visits and at evening feedback sessions, to seek to identify the extent to which various aspects of the buildings visited were transferable to Scotland.

"Fresh air is a human right"

Nearly all of the schools made some use of a basement or culvert for their air intake. Most had hybrid systems, with a large variation in both their effectiveness and the extent of their environmental credentials.

The Kjeldas school used primarily stack effect (a natural chimney) for its regular operation with a back up fan, used only in times of very still weather or during high levels of room occupancy.

Meanwhile, the Kvadraturen school used merely a token amount of culvert and was primarily mechanically ventilated. The conversion of the senior school at Vanse made as

much use as it could of the redundant nineteenth century chimneys at the core of the building while still relying on more conventional supplementary systems.

Perhaps the biggest impression was made at the Borhaug nursery school where the culvert system was coupled with a passive system, whereby a ceiling delivered fresh air via a "Pore Ventilation" system (also known as Dynamic Insulation), which had turned out to be so effective via the roof mounted air intake, that the culvert was redundant. The subjective sense of freshness experienced by everyone in this building and the fact that the culvert had never been needed was a critical moment and perhaps a point of mental dismissal, by many of the group, of the ground based intake method. It must be remembered however, that due to its coastal location, this school would never reach the extremes of low temperature experienced by the schools located further inland, and also that as a coastal school it experienced on average less than six or seven days a year without wind.

The Oserød school at Nøtterøy provided an ideal learning opportunity for the group. It utilised the need for long culverts as a positive design generator whereby the teaching wings were splayed (to accommodate the culvert), within which sheltered play took place.

Pedagogy/community

The design of the V-shape school was also responsive to an original pedagogic approach - self-directed learning in which pupils were given their daily tasks and then, as they progressed through the school, were given ever increasing amounts of freedom to sit in the area where they felt most comfortable for working - be it the classroom, the library or the central meeting area with its range of break-out spaces.

Three of the schools (Farsund, Vanse, Oserød) impressed the group through the presentations of their head teachers - who seemed to have created a distinct sense of school community and an atmosphere of learning. Three schools equally disappointed on this basis Kvadraturen, Oddemarka and Vanse.

Other aspects of interest included the way in which children played with good quality outdoor landscaping - use of hillocks and ground modelling, adventurous, (even risky) play

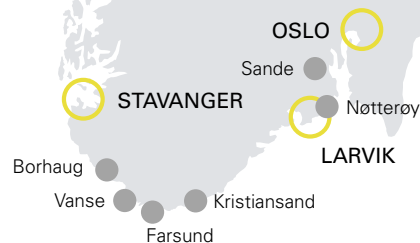
equipment, out in the open in all weathers (no such thing as bad weather - only inappropriate clothing). The catering arrangements were also different from those found here, (e.g. Kjeldås, where pupils made sandwiches and saved milk cartons for recycling etc), and there was also a distinct lack of soft drinks in cans, and snacks such as sweets and crisps in evidence.

Design/procurement

Those schools with the greatest amount of community involvement tended to be the most successful in operation. High levels of involvement were evident in Kjeldås, Oserød, Vanse Phase 1, and Borhaug.

The approach taken in Kvadraturen, Oddemarka and Vanse Phase 2 was more "detached" with little or no community input. This resulted in schools that were not user friendly in practice. Vanse Phase 2 went to competition against parental wishes.

Farsund was an exception in that it was a competition but the community had clearly been involved in both the writing of the brief and the delivery from the point of identifying the winner.



German Schools

Following the successful study tour of Norwegian schools in 2003 it was decided that a second trip to southern Germany would be worthwhile. Gaia Architects arranged the tour in October 2004 and a range of architects, engineers and education building clients took part in a very intensive exercise, which looked at a range of exemplar sustainable development projects including a number of schools, which have been selected for exposition in this publication.

The focus was on the work of three architects with a reputation for producing innovative and ecologically sound schools: Günter Behnisch, Peter Hübner and Gaia colleague Joachim Eble. During the course of the tour feedback sheets were completed by all participants and collated. A follow up workshop was held after returning to Scotland and the assessments in this publication are drawn from these discussions plus other information from source (i.e. architects and clients of the visited projects).

The core interest of the group followed from the first tour - an interest in healthy and environmentally sound construction, plus a grasp of some of the teaching methods and an understanding of mechanisms for procurement.

The group formed a distinct consensus on their most and least favourite projects (Waldorf school and Hechinger Eck school respectively), and it was reassuring to note that the design quality of these went hand in hand with their credentials for environmental performance and enlightened procurement methods. However, whilst this was the general summary view, there was much interest in the detail: in technical, pedagogic and in management terms.

Technology/efficiency

The perception of the construction methods of the German schools was one of high quality workmanship and good value for money. The building industry in Germany is based on traditional skills and it has not gone as far into offsite construction as the Swiss, Austrian or Dutch industries. Nevertheless, high skill levels throughout the trades were evident, showcasing an industry with longer and more rigorous apprenticeships and training than is currently the case in the UK.

The most innovative of the schools was at Pfennigacker where a mass timber construction system (called Brettstapel), had been introduced and also, a specialist colour consultant had been employed to raise the quality of both the internal and external surfaces of the buildings.

The school which the group felt dealt most effectively with daylight, was the Waldorf school, at Kirchheim, which managed to create both external and internal spaces of interest and character within a very tight site perimeter.

Two of the schools visited in Südstadt, Tübingen were opportunist on the back of visits focusing on housing development, but they did provide a few discussion points of value. Both projects were parts of buildings, which had other functions (offices, housing). In one case it showed that flexibility in design to cater for uses other than educational can undermine the effectiveness of design for teaching purposes. In the other, it made for a difficult division both internally and externally between the school and neighbouring activities.

Pedagogy/community

The perception of the group, in all cases, was of a relaxed attitude with regard to the accessibility by all the community into the school grounds, (lack of fencing or any perimeter separation).

Design/procurement

The aesthetic quality of most of the schools was high - and apart from Pleizhausen and Mont Cernis the same projects were also very environmentally sound.



Norway

Green for go! Amber for consider Red for no!

Scoring the projects

During the Norwegian study tour there was sufficient distance between projects to allow a mobile feedback session to be undertaken on the bus. There was even enough time for feedback sheets to be recorded on a laptop between visits.

At the end of each day there was a discussion session, and it was decided then that issues could be identified as: those things that could be transferred readily to the UK (Green for go!); those that would be more of a challenge (Amber for consider) and those that would be difficult or even unwelcome (Red for no!). The scoring was done by a collection of generalised points rather than on a school by school assessment. The emphasis varied day by day - for example, day 1 had a very technical focus; day 2 had a much more social one; and by day 3 the group were looking for a more rounded overall assessment.

Green for go!

Technical Qualities

- Use of natural ventilation in some form
- Dynamic insulation on single storey spaces/ sports halls/ pools
- Wind driven natural ventilation
- Small scale culverts through service ducts in building underground
- Allowing the introduction of fresh air at the outdoor temperature even if as low as 8°C
- Night time mechanical extract
- Reducing cooling and heating requirements through design, layout and orientation
- Geothermal heating
- Heat reclaim/ recovery
- Reduction in building services requirements
- Regulation changes to assist in better indoor air quality and better daylight

Health Qualities

- Better understanding of the contribution materials and cleaning make to air quality
- Creation of improved internal environments
- Use of natural materials
- Use of 'healthy' materials (low odour/ non toxic)
- Hygroscopic materials for control of humidity
- Checking how materials can be cleaned before they are specified (thinking ahead)

Design Qualities

- Exciting design solutions
- Nursery concept - homely atmosphere
- Different teaching ethos - more relaxed
- Sense of ownership and (resultant) lack of vandalism
- Great outdoor play areas

Recycling

- Consideration to allow for deconstruction of building elements for reuse and flexibility
- Recycling incentives (e.g. milk cartons)

Community Qualities

- Synthesis of school/ staircase/ café/ theatre/ assembly (Farsund)
- Community school function (library/ sports hall)
- Social sharing/ community identity/ communal rules
- Teacher/ parent/ user/ community involvement in design

Procurement Issues

- Provide guidance sample brief on Sustainable Development for PPP contracts?
- Dissemination to the broadest audience - can you do something like this in Scotland without incurring cost penalties?
- Knowledge - should the Scottish Executive issue a two page guide for PPP output specifications as a specific measurable?

Amber for consider

Technical Qualities

- Projects demonstrate a better understanding of outdoor microclimate/ comfort
- Dynamic insulation in top floors in multi-storey schools
- Wind cowls (Oserød school)
- Good fresh air in buildings in winter
- Passive ventilation using stack effect and culvert
- Existing culvert vent systems such as voids under floors
- Culverts in existing school if space in redundant facilities
- Passive/ hybrid ventilation - need to assess life cycle cost
- Solar collectors
- Culvert heating and cooling/ geothermal heating - what is running cost/ payback?
- Design attitudes - Do we need hybrid architects/ engineers to deliver such buildings?
- Timber linings (is spread of flame an issue?)

Health Qualities

- Indoor air quality good @ 1000ppm CO₂
- Humidity regulation achieved through use of hygroscopic materials/ dynamic insulation - are we ready for this?
- Low VOC finishes throughout
- Cleaning regimes
- Slippers at school - wet rooms for outdoor clothes on bad days
- Client-side specifications that deliver - good indoor air quality and natural light
- Avoid over-sealing to maintain good indoor air quality

Design Qualities

- Quantifiable eco-performance standards in brief and design assessments
- Outdoor play facilities which would require a change in attitude if implemented in Scotland
- Challenging (biodiverse) landscapes taking on health and safety issues

Procurement Issues

- Educate clients/ councillors/ funders on benefits of sustainable development
- Crucial role/ responsibility of designers in achieving this
- Finding the critical extra funding (if required). Should there be extra allowance for incorporating sustainability?
- Supply chain - sourcing materials (and raising awareness).
- Issues with availability locally
- Provision of business facilities (teleconferencing and meeting rooms)

Community Qualities

- Multi use daylight - shared facilities for life long learning factored into cost and design
- A genuine culture of citizenship in schools

Red for no!

Technical Issues

- Empty culverts
- Full height culverts (on cost grounds)
- Double facades - too technical and unnecessary (cooling is a more significant problem)

Procurement Issues

- Transferring the Norwegian school system and Norwegian space standards to Scotland

Design issues

- Good external play with a touch of danger/ risk

Community Issues

- More open attitude to the layout and security of schools
- A genuine culture of citizenship in schools

Conclusions

All of the buildings gave an impression of trying to contribute to the community, some more explicitly than others. There also seemed to be a sense of a society that had strong values which were communicated through the schools. In terms of design for the future, this was apparent in the provision of flexible spaces and a flexible curriculum, as well as teaching and learning. And with regard to the provision of schools as a resource for the community, this was apparent through the provision of facilities to promote culture and social skills. It is clear that learning is treated as an adventure. Environmentally there was a high emphasis on good indoor air quality and healthy living.

A Note:

Sustainable Construction & the Regulatory Framework

The Norwegian Regulations are particularly interesting.

Highlighted below are just a few points of note.

- Norwegian building regulations are more attentive to implementation issues throughout the construction period and beyond than our existing regulations.
- They are more focused on health aspects inside buildings.
- There is a requirement that ventilation systems are cleaned prior to use and are cleanable and maintainable in use.
- There is a predisposition for the use of low-embodied energy materials.
- Ventilation requirements specify maximum carbon dioxide levels of 1500ppm and require feedback, notwithstanding the fact that moderate levels carbon dioxide alone is not a good control sensor for good indoor air quality.
- Ventilation requirements can be reduced if low emission materials are specified.

GERMANY

Green for go! Amber for consider Red for no!

Scoring the projects

During the German study tour there was insufficient distance between projects to allow the mobile feedback session to be properly undertaken on the bus. The group did manage to complete feedback forms on the first day, but on the second day, with projects very close together, even this became difficult to arrange.

The feedback notes were recorded only on return to the UK, and three of the schools, where there was no formal feedback, had to be done retrospectively at a specially convened workshop. The evening seminars which had been a feature of the Norwegian tour proved impossible to run in the same manner. To retain some level of consistency, the feedback sheets from the individual German schools have been aggregated, as with the Norwegian schools. Those issues that could be transferred readily to the UK are in **Green for go**, those that would be more of a challenge are in **Amber for consider**, and those that would be difficult or even unwelcome are in **Red for no**. The scoring, therefore, is a collection of generalised points rather than a school by school assessment.

Green for go!

Technical Qualities

- Internal/ External relationships and responsibilities (e.g. for garden space)
- Well day-lit, airy internal courtyards
- Use of natural materials (predominantly)
- Use of natural ventilation
- Culvert ventilation to pre-heat/ cool incoming air
- Use of timber finishes - especially mass timber (brettstapel)
- Rainwater harvesting
- Use of borrowed light for deep-plan classrooms.

Health Qualities

- Use of daylight and natural ventilation

Community Qualities

- Mixed use and sharing space with neighbours

Procurement Issues

- Providing guidance
- Sample brief on Sustainable Development for PPP contracts

Design Qualities

- Buildings with sense of presence and genius loci
- Use of space, light and natural timber finishes
- Tactile materials
- Classroom blocks having their own identity
- Good internal landscape
- Internal/ external use of water
- Structural expression

- Use of circulation as activity space
- Good but not excessive detailing
- Child scale WCs and window heights
- Use of colour
- 'House' style/ domestic scale classrooms
- Informal areas in classrooms

Recycling

- Consideration to allow for deconstruction of building elements for reuse and flexibility

Amber for consider

Technical Qualities

- A better understanding of outdoor microclimate/ comfort
- Use of timber and fire regulations
- Colour stained wood and use of colour
- Extensive use of photovoltaics (making a significant energy contribution)
- Greater consideration of the use of thermal mass

Health Qualities

- Indoor air quality
- Should we use wireless systems or keep IT in separate classrooms (electro-smog issues)?

Procurement Issues

- Electro-smog discussion regarding IT provision

Community Qualities

- Openness of campus and apparent lack of security
- Extent of supervision (more relaxed than Scotland)
- Extent of community use of school (more than Scotland)

Design Qualities

- Use of water in internal and external landscaping (Health and Safety Issue?)
- Each class with their own garden, cared for by the children
- Flexibility for long term change
- Integration of playground into landscape
- Direct access from classroom into landscape
- Some buildings were iconic but it was concluded that this was not necessarily appropriate for a school

Red for no!

Technical Issues

- External timber boarding is still considered to be a fire risk, there is a need to look more closely at timber engineering issues
- Poor internal acoustics due to hard surface finishes
- Poorly controlled natural ventilation
- Too much use of glass and then need for shading

Procurement Issues

- Transferring
- No brettstapel manufacturer in UK

Design issues

- Lack of disability access to classroom mezzanines and in some cases to the schools
- Lack of child scale in 'flexible' schools
- Large areas of glass facing onto playgrounds
- Continuing use of a single layout concept over 20 years
- Quite often a lot of gratuitous, unused space

Community Issues

- More open attitude to the layout and security of schools, not possible in Scotland at present
- Four year olds doing own cooking/ preparing lunch
- Risk of arson with external wood finishes?
- Some schools were remote from their communities

Conclusions

There was some very creative procurement, especially in the Hübner schools, where huge amounts of pupil and community involvement were evident. There also seemed to be a much more relaxed attitude towards security with open access for the local people to the school and its grounds. Design for disability was not thought to be an issue at the schools visited as, in Germany, those with disabilities are segregated into special schools. Use of natural materials and natural ventilation were much in evidence. As was the creative use of colour and good landscape quality, indoors and out, which was well connected between spaces and buildings.



01

Kjeldås Primary School

Introduction

The focus of the visit to the primary school at Kjeldås was the new extension to an existing school. The brief was written with a strong emphasis on the quality of the indoor climate, the delivery of this without the use of mechanical ventilation systems and paying close attention to the avoidance of both chemical and biological sources of pollution.

This was the first of a series of school visits and as such, the attention of the group initially remained focused on the technical aspects of the design. However, as this was also an introductory experience to the style of education, conversations expanded into this area towards the end of the visit, setting in train a discussion, which lasted, and indeed expanded throughout the tour.

Background

Kjeldås school is located in Sande and deals with 300 pupils in the age range of 6 to 13. The driving force for the healthy school concept was the parent body, together with a sympathetic architect and engineer who were keen to become involved in the healthy schools approach.

The building which emerged was one with conventional classrooms with high ceilings and high insulation levels. Less conventionally, however, it is constructed from healthy and vetted building materials, a culvert based ventilation pre-heat system, and ground source heat pumps provide a renewable supply of energy for heating.

In terms of the social aspects of the school, there were a few interesting factors:

- the playground had been carried out as a positive contoured landscape for adventurous play;

- lunch was based on healthy eating and was also organised by the pupils themselves making use of an open school kitchen and dining area; and
- a novel Milk Carton Recycling initiative was also running at the school whereby Norwegian milk cartons are designed to be recycled, with nine flattened cartons fitting inside one open one. Each pack of ten gives one entry ticket into a National Lottery. The cartons are then burned as paper logs in a municipality district heating scheme.

Location Sande, Norway

Type of School Primary

Completion Date 2001

Client Sande Council

Design Team

Architect

Arkitektkompaniet A.S

Heating, Ventilation Drainage

Dagfinn H. Jørgensen AS

Landscape design

Asbjørn Flemmen

Area 1500m²

Cost 30 million Nkr

Number of pupils 300 (age range 6 - 13)

Choice of Site Brownfield (extension of existing school)

Construction Untreated timber and masonry



Brian Hemming

Design ethos

The school extension is located along the south side of the site - an advantage in winter when solar gains can be useful, but a potential problem in summer due to the risk of overheating. This is resolved by the use of brise soleil (sun shading), aimed at excluding direct solar gains in the summer, whilst allowing the lower angled winter sun to penetrate. The use of a high level rooflight in each classroom captures diffuse light, thus introducing very effective daylighting to the heart of the classroom. It also doubles as a natural chimney forming an extract at the end of the ventilation infrastructure. The long, thin plan form allows for sufficient culvert surface area in the undercroft to ensure that incoming air can take advantage of the fact that the ground temperature varies little - remaining somewhere between 10 - 12°C over the year. This means that the culvert, at an almost constant temperature, can be used in winter (for preheating the air) and in summer (for cooling the air). The intake for the outdoor air is through a conical tower of about 2m in height (sited well above any interference at low level). This region of Norway is not one with a constant and reliable wind regime (unlike, for example, Vansjø in the south west), so the culvert has an in-line fan which can be used to assist the natural "stack" (chimney) effect on calmer days. Most of the schools visited had such a back-up. This defines the installation as a hybrid ventilation system (natural with mechanical assistance).



Materials specified for the building are classed as low (pollution) emission materials - such as brick, untreated timber, linoleum, clay tiled flooring and water based paints. Under the Norwegian Building Regulations such an approach to materials specification merits a 20% reduction in the required fresh air change rate.

Materials avoided are:

- carpets (source of dust mites and emission from backing materials);
- Oriented Strand Board (OSB); and
- particle board due to formaldehyde content.

Norwegian contractors can be held responsible for correcting any errors of their making. In this school, during the course of construction, the internal brick finish developed severe discoloration and the contractor was required to 'make good' by providing a paint wash over the brick, which was considered by common consent to be a more attractive finish than the original bare brick.

The culvert in the undercroft was big enough to walk around in and to allow for regular cleaning. At the other end of the system, temperature controlled roof-lights helped to create the necessary stack effect and to bring natural daylight into the centre of the classrooms providing a more even spread of light than by using side windows only and reducing the need for artificial lighting during the day.

All classrooms have Carbon Dioxide monitoring with a design level set for not more than 1500 ppm.

In winter, the culvert temperature of around 10 to 12°C provides a preheat for incoming air, but there is still a requirement for additional heating, and this is provided from a geothermal source connected to a heat pump. It is worth noting that electricity in Norway is primarily from a renewable source (hydro power) and is also relatively inexpensive which makes this technology more viable than it might be in Scotland, although interest in such systems is growing, and some local authorities where electricity is the main source of fuel for heating are leading the way on this.

Landscape

The playground provides a positive, contoured landscape using material excavated from the building process to create an environment that encourages adventurous play, including a mini ski hill and a play mound. The playground equipment itself was adventurous - promoting what might even be described as 'risk based' play. This set in motion a debate, which carried on throughout the tour, as the group was regularly confronted by such examples and discussion revolved around the possibility of this approach being transferable to Scotland. A further development of the discussion was in noting that the children were involved in the school's social activity more than would be the case in Scotland.

Impression of the Scottish visitors

It was felt that the subjective experience of being in the classrooms in Kjeldås school was one of comfort, both in terms of temperature and fresh air. At this stage, all were interested in and accepting of, the culvert system. The materials were well received and together with a fairly muted colour scheme and good daylighting were felt to add to a pleasant ambience. The ventilation system had been subject in its early days to acoustic problems - with some cross-talk between classrooms transferred through the culvert and its ducts. Some mitigation had been put in place and this had improved, but was still an issue.

The entire group was excited by the play provision and its underlying ethos. The impression of significant community involvement through all the age groups was also evident and formed part of an evolving debate.



02

Oserød Primary School

Introduction

This primary school was a new build project procured through PFI and designed and delivered in a single year. Both teachers and parents had been significantly involved in the design process, and it was reported that this had helped greatly in terms of retaining the sense of shared ownership of a community school. The detailed design is a response to a child-centred approach to education in this school, an approach that was also evident in some of the projects visited subsequently on the tour.

The layout was very clear, especially the point of arrival, and the landscaping provision and playground design were the subject of much debate.

The extent to which the delivery of the indoor climatic design was effective and consistent was also a discussion topic.

Background

Oserød school is located in Nøtterøy and has 400 pupils in the age range of 6 to 13 years old. The teaching philosophy at this school is based on child-centred learning - with classrooms for the later years acting as base units, but with an option for pupils to carry out their work wherever in the school they feel most comfortable. There is a sense of curriculum progression, with the classrooms for the youngest pupils being very domestic in feel and the later years being more formal. The classrooms act as a home base for a particular age group, but each has a distinctive atmosphere relevant to the age range it serves.

Location Nøtterøy, Norway

Type of School Primary

Completion Date 2004

Client Nøtterøy Council

Design Team

Architect

Lille Frøen

Area 6350m²

Cost 19.8 million Nkr

Number of pupils 400 (in the age range 6 - 13)

Procurement Route PFI

Construction

Masonry and timber externally with “demountable” prefabricated interior walls.



Design ethos

The first impression was of a school with a highly legible plan form - two wings meeting at a focal point, which comprised the entrance, school hall and informal dining and break-out areas. The wings widen out towards the ends and form a very interesting south facing creative play courtyard - with a sand 'river' running through its centre.

To the front of the school is a very hard landscaped area (almost completely tarmacadam) which is mounded to provide a skateboard park. The school lacked fencing and was readily accessible by the general public.

The ventilation cowls, which had been purpose designed for the project, acted as a very distinctive iconic element, and the architect clearly wished to advertise the building's environmental credentials

Materials and services

The choice of materials lacked the consistency of approach found at Kjeldås (the school visited previously). Materials that seem to have been selected for their positive environmental credentials are mixed with materials that have none to speak of. Some of the finishes could be described as 'challenging', notably for example, the use of exposed OSB (Oriented Strand Board) elements, which seemed to be a contradictory selection, given their high VOC (Volatile Organic Compound) content and off-gassing characteristics.

A strong emphasis is placed on the potential for future replacement and de-construction, and this is evidenced by the use of prefabricated panelling. The standing seam roof was also highlighted as a readily recyclable element.

The primary form of ventilation for the classroom wings is via culvert ventilation ducts running the length of the two wings. Despite significant effort in the design of special cowls on the roof ridge, with a view to improving the stack effect and delivering exhaust air downstream of the prevailing wind, it was felt necessary to support this system by fan-assisted back-up, due to the unreliable wind regime in this area.

Additional heating is provided via a ground source heat pump. The group were bemused to discover that (uniquely) the administration wing in this school is air-conditioned.

A limited amount of south facing glazing is incorporated, with some degree of shading for the summer.

Throughout the school, daylighting is at an acceptable level and the sports hall also benefits from good natural light.



Landscape

The playground areas are split into two distinct types.

Opposite the school entrance area there is a tarmac area which is clearly meant to be for robust use such as skateboarding and roller blading. The idea of a steep hillock made from tarmac is a challenging one for transferability to a Scottish school context.

The inner courtyard acts as a sun-trap and is an altogether different space with more soft landscaping and a distinctive, large sandpit in the form of a stream running through the centre of the playground.

Impression of the Scottish visitors

Educationalists amongst the group thought the building looked unfinished, especially internally. Although the central play area was much admired, there was discussion about the school's lack of fencing which made it readily accessible by the general public. The situation in Scotland, post-Dunblane, is non conducive to such a strategy.

All of the visitors were impressed by the variation in the fit-out of the classrooms, and the way in which these changed for each age group as pupils progressed through the school. There was however, much debate about the benefits of the concept of pupil-based learning, with concern expressed that it might only really work well with good parental support at home.



Flinn Stevenson - Rooftop ventilation cowls

03

Oddemarka Primary School

Introduction

This school was a very good example of the way in which the green agenda can be lost between the architect's intent and the project eventually delivered, as a result of a novation to the contractor at tender stage.

The original design included provision for healthy building materials and a natural ventilation approach. However, the final material specification became conventional and the natural ventilation was reduced to the extent that the back-up fans became a major element.

Background

Oddemarka School is situated in Kristiansand and caters for just over 500 pupils in the age range 6 to 13. The part of the school under scrutiny was an extension to an existing school - involving a doubling of the classroom provision and a similar plan form to the original classroom wing. The junction between the two has been exploited effectively as a shared atrium, dining and informal auditorium area.

The project was procured by a PFI-type route, and was designed and constructed in one year without significant stakeholder input.

Location Kristiansand, Norway

Type of School Primary

Completion Date 2002

Client Vest-Agder Council

Design Team

Architect

Ole Dolva AS

Heating, Ventilation, Drainage

Løyning AS

Area 4500m²

Cost 56.25 million Nkr

Number of pupils 515 (in the age range 6 - 13)

Choice of Site

Brownfield (extension to existing school)

Procurement Route PFI

Construction

Steel frame, masonry walls with lightweight panels on concrete internal walls.





Chris Butters

Design Ethos

The design is based on providing dedicated areas for each year, with interesting spaces and curriculum challenges. The convention in Norway is for the pupils to move and the teachers to remain in dedicated classrooms, the converse of the convention in the UK.

The layout comprises conventional classrooms on two storeys. The staircase to the upper level is deliberately wide and doubles as raked seating, opening out onto an area that is used for meetings, having lunches and occasionally for assembly and performance.

Although the classroom section on the upper floor would have benefited from roof lights, this opportunity was not exploited.



Brian Hemming - Central/ social space

Materials and services

A rudimentary approach to indoor climate included the use of woodwool slabs to help deal with indoor humidity levels. However, an opportunity for further moisture control was lost, in that the majority of the panelling comprises very thin, pre-finished (and non-permeable) birch veneer on plasterboard backing, screwed directly to the concrete block walls.

In general, a heavy emphasis was placed on prefabricated panelling, purportedly for the purposes of ease of replacement and de-construction in the future. However, the group were unconvinced that the heavy self-finished concrete elements were readily demountable.

The indoor specification did not include much at all in the way of healthy materials other than those described above.

Opportunities for daylight were not fully exploited and there was a reliance on artificial lighting, which seemed to be in use continuously throughout the day.

The culvert ventilation was significantly supported by back-up fan power, with resultant duct noise caused by the use of dampers to control airflow rates.



Ian Cameron

Landscape

The site was very tight and there was little opportunity for the architect to indulge in ambitious landscape provision. A combination of tarmac and artificial grass was used, suggesting evidence of high-density use.

Impression of the Scottish visitors

On the positive side, teaching in small groups to support self-learning programmes impressed the visitors and seemed an effective method of teaching. On the other hand, the group picked up on an apparent lack of a cooperative culture outside the classroom - although this could easily be attributed to the age group of the pupils.

Low impact, healthy lunching was in evidence here as elsewhere, with a complete absence of fried/ fast foods or anything drinkable coming from an aluminium can.

It was apparent that early aspirations with regard to design quality, particularly in terms of the indoor finishes, had been lost as a result of the novation, and the culvert ventilation system was also not operating optimally.



Florn Stevenson

04

Kvadraturen High School

Introduction

Kvadraturen is a Senior School and Technical College and it was the only urban, high-density school on the study tour. It is very distinctive architecturally and was the outcome of a competition, but the fact that it remained so distinctive while being procured through a private finance route is also noteworthy. Such an architectonic expression would have been difficult to get across to (and gain the approval of) non-architects.

Background

Kvadraturen School is situated in Kristiansand and caters for 1200 pupils in the age range 13 - 18 years.

The decision to demolish part of the school and build anew was the outcome of a life-cycle costing exercise. The resultant new building wing came with an explicit environmental agenda. On the eve of the Scottish delegation's visit, the group attended a presentation by design consultants which raised the expectations for the next day's visit.

Location Kristiansand, Norway

Type of School High

Completion Date 2004

Client Vest - Agder County Council

Design Team

Architect

Arkitektgruppen Cubus AS

Heating, Ventilation Drainage

UNICO AS

Area 19.3m²/person, newbuild:12600m², renovation: 3600m²

Cost 260 million Nkr

Number of pupils 1200 (in the age range 13 - 18 years)

Choice of Site Brownfield, urban

Procurement Route PFI

Construction

Concrete frame with light weight partitions and timber cladding.



Florn Stevenson

Materials and services

The approach to the building of the new wing was adopted on the basis of a stated policy of achieving a 98% recycling strategy. The key technical component of the building (as presented by the consultants) was a double façade and although the outer skin had still to be installed at the time of the visit, the design principle was clear from drawings made available for study by the group.

Ventilation is based on a fan-powered mini-culvert hybrid system with extract heat recovery. On the top floor, the ducts are transparent as a means of expressing this element to the users.

Landscape

The site for this school is very tight and it is close to the street with little frontage. This, and the fact that the site had not yet been handed over, which meant that the landscaping was incomplete at the time of the visit, combine to make comment on the landscape superfluous. However, there is an inner courtyard space, which acts as a core and a link between the old and new buildings and this space houses a successful and busy cafeteria.



Impression of the Scottish visitors

The evening before the visit to the Kvadraturen school the visiting group were given a seminar on the principles behind the project, which outlined a sophisticated design methodology and a long list of aspirational environmental criteria. At this point, the group was very optimistic about what they would see the following day. It may have been because of the high expectations resulting from the seminar prior to the visit, or perhaps the group did not appreciate the building architecturally, but this was ultimately regarded as the least successful of the projects visited.

The interior was felt to be dark, bleak and gothic. The detailing of windows, railings and controls was felt to be weak. It was unclear to the group why there were vertical solar panels on the north elevation and the other façades appeared to be overshadowed for much of the year. Generally, it was concluded that the environmental agenda had been approached via a checklist rather than a holistic design approach. However, even in its own terms, it was considered that the school did not fulfill in reality what it had set out to achieve, and that as such, much of the checklist remained 'unticked'.



Brian Hemming

05

Eilert Sundt Secondary School

Introduction

Eilert Sundt Community School at Farsund is a significant example of architectural design quality. Not only is the building stunning inside and out and a good example of urban design, but the ethos of community integration is superbly delivered.

Strong leadership was evident from the school principal, both within the school and as a member of the local community.

As well as having library and meeting room spaces that are open to the public, the school also provides business facilities for the local community. The community also has controlled access to the school sports facilities from 8am to 10pm. The school neither set out to, nor did it deliver a particularly strong environmental agenda. But, the fact that it could have readily done so, is simultaneously frustrating and reassuring.

Background

At the point of writing the initial brief for the building, a decision had to be made as to whether to re-locate the school to a new site on the town periphery or to extend within the tight space available in the existing town centre. The architectural competition which was established for the school decided to adopt the latter approach.

The town of Farsund occupies a number of steep hills and the new building is an extension to an existing nineteenth century building on top of one of these hills. The building has links at ground floor level to the top floor of the extension, which then falls through three levels to a lower urban shopping street.

Location Farsund, Norway

Type of School Secondary

Completion Date 1999

Client Vest-Agder Council

Design Team

Architect

Biong Arkitekter AS

Heating, Ventilation, Drainage

Lindeberg AS

Area 4000m²

Number of pupils 300 (in the age range 13 - 18)

Choice of Site

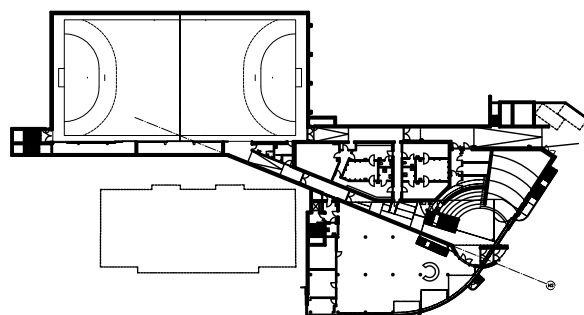
Brownfield (extension of existing school)

Procurement Route

Design competition

Construction

Steel frame and masonry







Chris Butters - Central/ social space

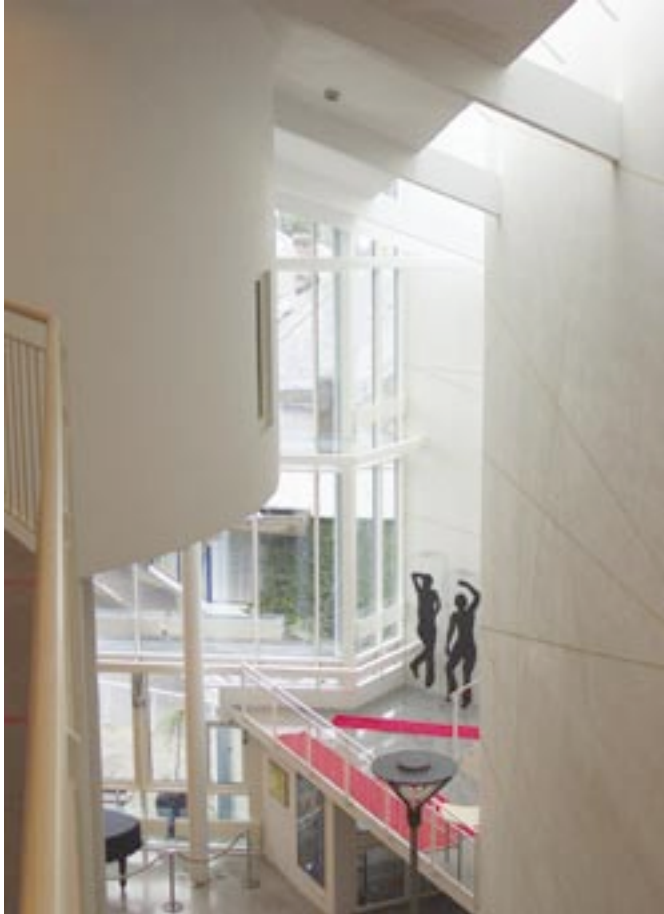
Design ethos

A strong architectural concept was required in order to address the challenges of the steep hill, however the difficult terrain was used to advantage within the design. This is evident in the creative use of space under an existing car park for the community sports hall, for example. The junction of the existing school and the new extension generates a new entrance for the car park via the sports hall roof.

At the lower/ street level, the vertical circulation space doubles up as a gathering area and acts as a linking point between town and gown.

Materials and services

The whole building is bright and well lit and this contributes to conservation in artificial lighting requirement. A comfortable indoor climate is achieved via conventional mechanical means, using displacement ventilation, and in that sense this building was less environmentally sound than many of the other examples visited. The reason for this is that the brief did not set out an environmentally sound specification and so, this was not part of the expectation of the client. The finishes, however, were generally of a high quality.



Chris Butters

Landscape

The site was tight and within an existing urban framework, however, the extent as which the building was totally integrated into the town fabric could in itself be regarded as a piece of landscaping.



Flonn Stevenson - Existing School at back/new school linking with urban setting



Flonn Stevenson

Impression of the Scottish visitors

The whole group was completely smitten by this building. If ever anyone needed to be convinced of the value of good quality architecture as a contributor to the sustainability of an institution, they would be convinced by this school.

What is especially interesting is that this project probably ticked the fewest boxes on the environmental checklist of any of the schools visited and yet it had a subjective impact far greater than some which scored higher technically, or came from an ambitious green brief, but which seemed less convincing in overall terms.

06

Vanse Primary School

Introduction

Vanse is an isthmus on the south-west tip of Norway, projecting into the North Sea, halfway between Stavanger and Kristiansand. The school council of Vanse, including parents, had previously commissioned a new block of classrooms based on state-of-the-art ecological design principles. The parents wished to continue this policy into the next, second phase, however, the education authority procurement rules had changed to PFI and they neither got their wish nor indeed a second healthy building.

Background

Vanse school has a capacity of 120 children of age range 6 to 13. The school council had specifically commissioned a local architect with a national reputation to undertake the delivery of their state-of-the-art healthy school, (Dag Roalkvam of Gaia – a specialist in healthy indoor climate design). The visit to this school took place on a Saturday and therefore it was more difficult to make a snapshot judgement as to the effectiveness of the building than was the case at the previous schools. The only local guide was the architect and uniquely, at this location the group did not meet teachers or pupils.

Location Vanse, Norway

Client Farsund Council

Type of School Primary

Completion Date 1998

Design Team

Architect

Gaia Llista AS

Structural engineer

Asplan Viak Sør

Heating, Ventilation, Drainage

Løyning AS, Øystein Bekkevoll

Electrical engineer EI team AS

Area 500m²

Cost 8 million Nkr

Number of pupils 120 (in the age range 6 - 13 years)

Choice of Site

Brownfield, (extension to existing school)

Procurement Route PFI

Construction Timber



Gaia Lista

Design ethos

The design for the first (environmentally sound) phase, was a partnership brief between parents, teachers and the design team and is based on passive design principles. The key defining elements of this are natural ventilation, minimal heating and healthy materials. Exposed ducting was used and a rustic approach to the interior.



Galia Architects

The passive design principles for this school included:

- Avoidance of underfloor heating for all but the early morning arrival time. In Norway, with hydro-power as a primary energy source, the use of electricity for heating does not lead to major CO₂ emissions and it is common, as was the case in this instance, for the back-up heating to be based on a heat pump.
- Natural ventilation, using a combined approach of an underground culvert, with opening windows as an option for overriding control if needed. A small back-up fan offered a back-up to the natural stack (chimney) effect, operating the culvert system.
- Local, manual and visible controls were based on the occupants (both teachers and children) being aware of their own environment.
- Moisture transfusive (breathing) wall construction is used throughout as a means of moisture management. This is a significant element in maintaining a healthy indoor climate by avoiding the occurrence of conditions in which mould and mites can thrive.
- Materials were selected for two main criteria: (1) that they had no harmful emissions and (2) that they were hygroscopic (capable of absorbing and releasing moisture).
- Due to the trade-off between high levels of glazing and natural lighting against resultant heat loss, the decision was made to opt for 'medium to good' daylighting, rather than adopting an approach whereby daylighting was a dominant factor.



Ian Cameron

Landscape

This site was another demonstration of adventurous play provision. Close to the school there are hard surfaced areas where there is the greatest foot traffic. Meanwhile, in a separate area further away and available to the whole school, provision is made for a full playground – with soft surfaces and challenging play equipment. As with all other Norwegian schools, the policy is of playtime always being outdoors. The principle is that there is no such thing as bad weather, just 'different' weather, with a resultant need for appropriate clothing.

Impression of the Scottish visitors

Whilst being convinced of the effectiveness of the design principles being delivered, the group raised questions about the cleanliness and regular care of the buildings after hand-over. The visit was indeed on a Saturday and it may have been that cleaning took place on Monday morning, but the general feeling was that the after-care and regular maintenance of such a highly principled building could have been better.



Brian Hemmings

07

Borhaug Nursery School

Introduction

The new nursery in Borhaug is adjacent to the senior school but totally independent and in its own site. The building was described as a 'kindergarten dream' by one of the visitors and was probably viewed as the most successful project across the board, based on all the criteria that the group was looking for. It is very well sited in its landscape, is architecturally interesting, is child friendly and has a very healthy indoor climate. In addition, the school is run in a child-centred way, which impressed everyone.

Background

The nursery caters for 38 children in the age range of 0 to 6. Its provision allowed the staff and children to move out of a congested, converted house into a bespoke building, designed and fit for purpose. The brief was developed jointly by the parents, staff and design team, and the main concern was for an ecologically sound building with a healthy indoor climate. There was continuous, close and ongoing communication between all the partners right through the project.

The ethos of the school is set down in a set of explicit principles which were derived together with the children and which are displayed on the wall in large letters at the entrance.

Location 4563 Borhaug

Type of School Nursery

Completion Date 1999

Client Farsund Council

Design Team

Architects

Gaia Lista AS

Structural engineer

Asplan Viak Sør

Heating, Ventilation, Drainage

Løyning AS, Sørlandets Klimateknikk AS

Electrical Engineer

Egerhei AS

Area 196 m²

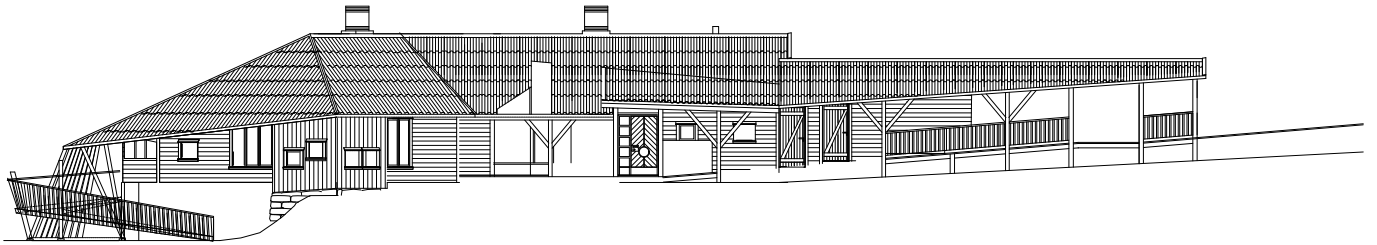
Cost 3.9 million Nkr

Number of pupils 38 (in the age range 0 - 6 years)

Construction

Timber and natural stone





Florn Steverson

Design ethos

The building relates on all its façades to the outdoor climate, creating sheltered areas to the leeward side and turning its back to the prevailing wind. The outdoor areas are also varied, so that different parts of the playground will be optimal according to the weather.

The front corner of the building is shaped like a ship's prow, but built at child-scale and from it is the main view over the harbour and out to sea, relating to the maritime setting and promoting aspiration. The design is simple and has a flexible layout internally. The whole approach of the design is that it is orientated towards the child and is effectively a large playhouse, with windows at a 3 year-old child's eye level.



Florn Stevenson

Materials and services

The subjective response of the visitors was of a sense of fresh air, and all were convinced of the effectiveness of the ventilation strategy. The micro-climatic design includes both outdoor and indoor comfort whilst delivering a building with a low energy demand. The design incorporates both a culvert ventilation pre-heat system and ceilings with dynamic insulation whereby the incoming air is delivered through the insulation in the roof and is introduced into the room through a completely perforated ceiling finish.

The dynamic insulation proved to be so efficient that the culvert has not been needed. There is extensive use of natural materials, from the dry-stone walls and untreated external timber through to the non-toxic materials and finishes internally. The wall construction is also moisture transfusive (a breathing wall), by virtue of its untreated finishes and environmentally sound components.



Brian Hemming

Landscape

The exterior areas have been given an equal amount of detailed attention as the indoor areas. There are at least three different kinds of 'place' within the small field in which the building sits and each comes into effect as the weather changes. The connection of the school grounds to its neighbouring landscape is seamless.

Impression of the Scottish visitors

The group was impressed from the point of entry to the site and again at the point of entry to the building. The site has a distinct genius loci from the outset and further exploration makes the site even more convincing. The explicit values inside the nursery entrance set the tone for a child-centred school, where the feeling is almost one of invading the children's territory.

The indoor space was described as 'stunning' by many of the party and yet it is simple. It was also agreed that the project was very successful in its delivery of the indoor climate objectives set out in the brief.



Chris Butters

08

Borhaug Senior School

Introduction

The new secondary school in Borhaug comprises an original, traditional, three storey building, built as a school in the nineteenth century, with an additional wing added in the seventies. The whole school was refurbished with a view to creating a healthy indoor climate, similar in objective to the new-build nursery next door.

Background

The school caters for 137 pupils aged between 13 and 18. It also contains a community library and has a curriculum for mature students as well as school children. The impression given here, as in many of the other schools, was of strong leadership from the head teacher, with a clear pedagogic philosophy and a determination to link strongly with the parents and the rest of the community.

The building sits in the centre of the village and looks out over the harbour and sea beyond. It is, therefore, well placed geographically to fulfil its community role.

Location Borhaug, Norway

Type of School Secondary

Completion Date 2001

Client Farsund Council

Design Team

Architect

Gaia Lista and Siv. Ark. MNAL Odd Aanensen

Heating, Ventilation, Drainage

Løyning AS

Area 1000m²

Number of pupils 137 (aged between 13 and 18)

Choice of Site

Brownfield. Refurbishment of, and extension to the existing school.

Construction

Existing building refurbished with natural low/ no toxic materials



Chris Butters

Design Ethos

The building brief for the senior school came from a similar school, parent and design team partnership to the nursery, but in this case the objectives were more constrained in terms of what could be achieved, as the senior school started from an existing group of buildings and a limited budget for internal upgrading. The major objective was, therefore, for a green refurbishment.

It was decided from the outset to retain the original timber detailing in the old school wing, especially in the classrooms. Further, making an ingenious use of original features meant that natural ventilation could be introduced into the core of the building.

Materials and services

The quality of the original joiner-work detailing was a notable feature of the building. All of the finishes were stripped back to the original material and natural non-toxic finishes applied. New timber and other materials were selected, based on their environmental credentials.

Natural ventilation was introduced into the core of the building, taking up a space which had previously been a duplicate corridor. This was then connected to the existing, disused chimney-stacks, which were cored and re-lined, thus creating a culvert-type effect with its own natural stack. However, because of the restricted surface area and volume available for preheating incoming air, the system required additional heating and fan-power to operate for the whole school. A significant achievement was the natural ventilation of the computer room.

Landscape

The building sits end on to the main village street and is restricted by its main entrance frontage which is onto the side street. It was decided to use the intake points for the culvert ventilation as gatepost markers and this is effective in drawing the eye towards the entrance from the corner of the main and side streets.

Impression of the Scottish visitors

The visitors commented on the strong leadership and regarded this as a theme going back through all the visits. There seemed to be almost a direct connection between the quality of the teaching staff, notably the heads, and the quality of the buildings they procured.

This school is a good demonstration of how much can be done on a limited budget, and acts as an exemplar in terms of respecting good quality in old buildings. The indoor climate appeared to be good, despite the architect's reservation at being constrained technically.



Ian Cameron



Ian Cameron



Ian Cameron



Ian Cameron



Chris Butters

09

Hechinger Eck Primary School

Introduction + Background

When the French armed forces left Tübingen in 1991 the local authority seized the opportunity to develop an area of the city that had previously been inaccessible, separated from the city centre by a dual carriageway and train lines as well as natural barriers formed by the river Neckar.

Tübingen City, together with Büro Lehen from Stuttgart who were employed as a result of a competition, devised a supportive framework for the redevelopment of the area, which aims to create an urban, small-plotted and mixed-use structure with a high density of social facilities and services. The City was able to buy the area from the government at preferential rates and from sales of plots for other uses was able to invest the profit made in nurseries, day-care facilities, schools and other community facilities, which formed an important part of the overall redevelopment framework.

In the case of the school at Hechinger Eck, additional funding for the building was achieved by providing a building that was larger than required for the school and incorporating a number of commercial spaces. It was the intention that these could be bought back at a later stage when and if the school needed to expand.

Location Tübingen, Germany

Type of School Primary

Completion Date June 1999

Client Tübingen Council & Housing Association GWG

Design Team

Architect

Hochbauamt Stadt Tübingen

Structure

Ing Büro Schneck- Schall- Braun

Heating, Ventilation, Drainage, Electrical

Ing Büro SRM

Area

4,530 m² in total

School: 1,593 m²

Commercial: 477 m²

Flats: 1145 m²

Communal: 1,315 m²

(underground car park, storage, stairs, lifts)

Cost 5.4million €

Number of pupils 270 in 12 classes (age range 6-13)

Choice of Site

Brownfield, former French garrison

Procurement Route

Traditional tender construction

Construction

External blockwork walls and reinforced concrete ceilings and floors



Ian Cameron

Design ethos

One of the main design aspects of the school was to cater for the changing demographic profile and the increasing number of pupils expected over the coming years due to the expansion and redevelopment of the area. The mixed-use building was, therefore, designed so that the adjacent offices accessible via a separate stair, could easily be converted to classrooms accessed from the school's own circulation if required at a future date.

As with the Loretto Nursery (see case study 10), the aim was to avoid physical barriers and to integrate the building into the surrounding development and public areas.

Materials and services

Tübingen Council's architectural design service takes particular care to avoid materials known and/ or suspected to present a health risk in the indoor environment or which are known to be harmful to the environment. Whilst generally using conventional building methods (external block walls and reinforced concrete ceilings and floors), the nursery was built following the council's guidelines which forbid the use of timber preservatives (apart from boric salts), solvent-based adhesives, PVC, materials containing CFCs, tropical timber and mineral fibrous insulating materials. The building services were also designed in line with the council's requirement to achieve low energy standards and reuse of grey water.



Ian Cameron

Impressions of the Scottish visitors

The generous circulation which centred on the main stair together with compact layout and positioning of the classrooms around the central area, avoided corridors.

The design for expansion, although a good idea in theory, presented problems in practice. The concept of purchasing back commercially used rooms in order to reintegrate them into the school had proved more difficult than anticipated and necessitated court action, highlighting the need to amend the purchasing/ leasing agreements to suit the school's potential needs. The design of the school around this concept also led to the school looking like a commercial building, which, while well integrated with the neighbouring properties, did not seem appropriate for the school itself.



Ian Cameron



Ian Cameron



Ian Cameron

10

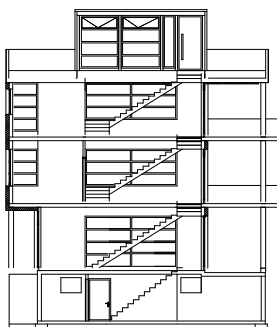
Loretto Nursery

Introduction

Loretto Nursery in Tübingen forms part of the urban regeneration of an area formerly occupied by the French army. An important part of the planning process was cooperation with the future neighbours, particularly for the planned communal spaces. The aim was to integrate the nursery into the overall development and to provide a building that could change in line with the demographic profile, i.e. it should be suitable for use as a youth centre or centre for the elderly at a later date. In order to achieve maximum flexibility in its layout, the building was designed with a central sanitary core which forms the only internal structural element.

Background

The nursery is situated in the redeveloped area 'Stuttgarter Strasse/ French Quarter', an area which used to house French soldiers. Redevelopment started in 1993 and aims to provide 2,000 jobs and living space for 6,500 people. The masterplan for the Loretto area included provision for a nursery, which was to meet the same criteria as other buildings, i.e. to provide high-density urban buildings with internal courtyards, accessed by traffic-calmed 'play-streets'.



Location Tübingen, Germany

Type of School Nursery

Completion Date September 2003

Client Tübingen Council

Design Team

Architect

Tübingen Council

Structural Engineer

Ing Büro Ströbel

Heating, Ventilation, Drainage

Ing Büro Sailer

Electrical

Ing Büro Zeeb & Frisch

Landscape

Landschaftsarchitekten Stötzer & Neher

Area 668.2m²

Cost 850,000

Number of pupils

65 children aged between 1 and 6 years.

Choice of Site

Brownfield, former French garrison

Procurement Route Traditional tender

Construction

Block walls and reinforced concrete floors with demountable, lightweight (mainly timber) internal finishes.



Foto: Grafikatelier

Design ethos

The nursery provides facilities for three playgroups over three storeys and is divided into two main areas on each floor: a south-orientated, open area for activities around the central core, literally allowing the children to satisfy their need for exercise and run around, and on the north side separate, quiet rooms for relaxation and concentration. Each group has a centre point in the form of a living room/ kitchen, where children are involved in preparing their own lunches. The open circulation areas and stairwell were designed as transparent communal spaces and have recesses for playing, reading groups and fish tanks. Views through the stairwell to the playgroups connect the internal with the external spaces. The concept of transparency and openness is supported by the light coloured finishes (birch doors and fitted furniture) throughout and the use of extensive glazing to allow daylight to flow from one space to another.

Materials and services

The Hochbauamt Stadt Tübingen Council takes particular care to avoid materials known and/ or suspected to present a health risk in the indoor environment or are harmful to the environment. Whilst generally using conventional building methods (external block walls and reinforced concrete ceilings/floors), the nursery was built following the council's guidelines, which forbid the use of timber preservatives (apart from boric salts), solvent-based adhesives, PVC, materials containing CFCs, tropical timber and mineral fibrous insulating materials. The building services were also designed in line with the council's requirement to achieve low energy standards and reuse grey water.



Foto-Grafikatelier - Roof top internal and external play areas

Landscape

Despite being in an urban setting the nursery has access to a number of external play areas. This has been achieved largely by the client convincing their insurers that boundaries are a matter of rules and regulations rather than fences. This allowed the use of the adjacent public square for outdoor play as well as the incorporation of the communal courtyard and roof terrace, both of which are shared with, and were part-financed by, the neighbours.



Foto-Grafikatelier - External play area shared with neighbours

Impressions of the Scottish visitors

The nursery is well integrated into the surrounding development and landscape. The lack of physical boundaries, together with the shared external spaces and cooperation with the neighbours during the planning phase to ensure 'seamless' landscaping, enhances the integration. There were, however, concerns that in the present climate in Britain, open boundaries may be problematic.

The creative use of circulation areas as activity spaces and the provision of outdoor play areas on the roof makes the most of the space available and provides interest.

The design for flexibility was considered to be advantageous and well conceived.



Foto-Grafikatelier

11

Pliezhausen Nursery

Introduction and Background

The nursery in Pliezhausen is the result of a competition for the design of a state-funded nursery for the Protestant Church on the rural site of a small orchard situated within a residential area.

The scale of architects D'Inka and Scheible's design is similar to that of the surrounding village development, which consists of mainly 1.5 to 2.5-storey single houses. Each of the three nursery groups has its own 2-storey house, linked to the other group-houses by double height communal areas. The houses protrude into the orchard, interlocking with the landscape. A physical connection is provided via external timber terraces leading into the garden and located between the houses forming an extension of the internal shared play areas between the groups; large glazed areas provide a visual connection from the group rooms and play areas.

Location Pliezhausen-Gniebel, Germany

Type of School Nursery

Completion Date 1998

Client

Pliezhausen Council for the Protestant Church

Design Team

Architect

D'Inka + Scheible, Freie Architekten BDA,

Structure

H. Siewert

Heating, Ventilation, Drainage, Electrical

Fromm/Schmid (E-Office)

Area 593m² , 2,861m³

Cost 1 million

Number of pupils

45 Children under the age of 6

Choice of Site

Greenfield, orchard

Procurement Route

Design Competition

Construction

Timber frame construction

Laminated timber veneer cladding internally

Larch cladding externally



Chris Morgan

Design ethos

The architects designed the nursery using timber for the construction as well as for most of the internal finishes with the aim of achieving a warm, cosy feel. Large glazed, double-height areas link the building with the landscape and provide light and airy spaces. Mezzanines in the group houses provide more intimate spaces for the children to retreat to (even sleep in), whilst shared spaces between the groups, which double up as circulation, encourage interaction between children in different age groups.

The layout of the building is designed to maximise solar gain and minimise heat-loss with the group rooms and play areas orientated to the south and ancillary rooms (stores, plant, WCs and wash rooms) providing a buffer to the north.

Materials and services

The aim to use non-toxic, recyclable and renewable materials led to a timber construction with mainly timber walls and ceilings and linoleum floor finishes. The only deviation from the norm is the wet areas (kitchen, WCs, paint sinks) where walls and floors are tiled. The use of timber in the construction enabled pre-fabrication, which reduced the construction time to 6 months, thereby reducing capital costs.

Services were designed to utilise renewable resources: water is pre-heated using thermal solar systems, photovoltaics provide some of the electricity, fresh air is provided draft-free and pre-heated via the double façade to the south and rainwater is collected and recycled.





Landscape

The character of the original orchard has been retained as far as possible, with some of the fruit trees still in place. The garden is naturally divided into two areas by a small stream that runs almost parallel to the south façade, with the area between the building and the stream left free of trees and play equipment to allow the children to run around. The areas accessed via small bridges over the stream provide a more structured play area with slides, swings, climbing frames and sandpits between the trees.



Impressions of the Scottish visitors.

The high level of daylighting, extensive views to the garden and provision of draft-free fresh air to the group rooms created a light and airy feel. This was, however, compromised in the hall area, which did not have a double façade and was found to overheat in summer.

The group liked the simple plan with the doubling up of circulation space as play areas. Both were thought to be principles that could readily be adopted in Scotland.

The limited palette of internal surfaces, which were generally finished in the same timber, lacked contrast and visual interest. The high level of hard surfaces was furthermore felt to provide acoustic problems, heightened by the lack of acoustic separation between the group rooms and circulation spaces, and in particular between the mezzanines and other areas. Display of children's work was made difficult by the ply finishes, which were too hard for tacks and too smooth for tape or 'bluetack' to adhere to.

It was felt that whilst a number of spaces were tailored to the children (low height windows, sleeping areas, low level wash hand basins and WCs), the double-height circulation spaces were over-scaled for a nursery and did not relate sufficiently to the children.

12

Steiner School at Kirchheim Teck

Introduction

The school at Kirchheim Unter Teck is one of around 200 Waldorf schools in Germany. The schools are independent and are run by the teaching staff based on the teaching methods pioneered by Rudolf Steiner (1861 – 1925). The Steiner philosophy allows each pupil to develop at his or her own speed and emphasises an integrated approach to learning about oneself and one's relationship with, and responsibility to others and the surrounding environment.

A key feature of this philosophy is 'learning by doing' and arts and crafts, music, drama and caring for the school garden play a central role in this. Architecturally, this is expressed by the prominence of the school theatre/ performance space, which can be used for formal performances and street theatre by the pupils. The Steiner philosophy was also carried through into the design, with the architects working with sixth and seventh year pupils on classroom design through developmental models and lessons in structural timber design.

Background

The decision to establish this new school was taken in 1990, following over-subscription to the nearest Steiner school in Nürtingen. The school ran with only one class in a rented space in its first year and grew from there. In Germany, state funding for private schools is available, based on a 'per pupil' basis, but only after schools have become established by operating independently for three years. The decision to build a new school building was taken around the end of 1996 and a site was found and co-funded by the local authority. Peter Hübner was asked to design the building.

The site is a flat wasteground in an industrial area, with the

school entrance on the main access to the estate and a banking with a public footpath at the back. There are two schools on the site 'the little school' (completed in 1998), and 'the big school' (completed in 2002).

Location Kirchheim Unter Teck, Germany

Type of School Steiner

Completion Date

Phase 1 (The little school): 1998

Phase 2 (The big school): 2002

Client Cooperative comprising school staff, pupils and parents

Design Team

Architect

Plus + bauplanung Gmbh, Hübner - Forster - Hübner, Freie Architekten

Structural Engineer

Dipl.-Ing. Roland Riebl

Heating, Ventilation, Drainage

piv , Planungsing. Versorgungstechnik GmbH,

Electrical TGF, Technische Gebäudeausrüstung,

Solar Transsolar, Ingenieur-Gesellschaft mbH,

Area 3,600 m²

Cost 850,000 €

Number of pupils 372 (in the age range 6 - 18)

Choice of Site Industrial Estate

Procurement Route

Privately funded with support from the Local Authority

Construction

Lightweight timber on insulated concrete foundations, with a zinc roof



Plus + bauplanung - Entrance canopy with view to central play area

Design ethos:

Little school

The little school is built on a hexagonal plan with an internal courtyard at the centre. This arrangement provides classrooms with daylight on two sides despite an extremely compact plan whereby classrooms are entered from the central space. The top lit, hexagonal hall serves as gathering space and is occasionally used for dance and eurhythmmy classes. It has a span of 8 metres, with internal columns supporting the roof, thus allowing for a lighter structure for the roof than would have been the case otherwise. The use of higher percentage glazing in the upper floor than on the lower load bearing floor below, gives the roof a floating appearance. The building looks expensive, but savings were made by teachers and parents finishing off the interior and what started as a project that was meant to evolve slowly, was completed in a year due to fundraising on the part of the school board/ committee.



Peter Blundell-Jones - View from formal to informal theatre

Big school

Two years later, as pupils moved through the school and more pupils enrolled, work began on a larger, second phase of the school. This was undertaken through the same participative process with staff, parent, and pupil involvement. The completed new building has thirteen classrooms, specialist arts and crafts spaces and a theatre which has one stage area but can operate as either a traditional proscenium arch arrangement or as a less formal street theatre (see figure 1). This is achieved by placing the stage in the centre with flexibility to open on both sides. This worked well due to the number of classrooms required and these wrap around the central, less formal hall on two levels. The classrooms themselves, in accordance with Steiner philosophy, are irregular in shape, each having its own character.

The central internal courtyard and large windows on the upper floor introduce high levels of daylight, giving the building a light and airy feel, belying what is actually a fairly deep plan. The arrangement also reduces the need for corridors. This extends to the fact that the building appears smaller and less dense than is actually the case. An inner external courtyard on the west side is shared by both phases of the school.

Materials and services

The building has concrete foundations supporting a complex but lightweight timber frame designed and sized by computer and a slightly sloping zinc roof supported on a variety of forms of timber column – from round pole to post and beam and tree-like structures. Externally and internally walls are smooth rendered/ plastered mainly in shades of yellow and ochre. Steiner philosophy has theories on use of colour, and so this was coordinated by the users. There is also extensive use of exposed timber in particular in the structure, window frames and the ceiling finish. The building is well daylit and naturally ventilated throughout, although the stage area has passive stacks to assist this if required during high occupancy. Heating requirements are minimised by high insulation levels. The 'street' temperature is allowed to fluctuate and the space acts as a thermal buffer for the adjacent spaces. Here, a degree of thermal mass is provided by a polished concrete floor and an internal pond (with fish) provides passive air conditioning.

Landscape

As expected, the holistic design approach extends to the surroundings and outside there is a focus on playgrounds, sports facilities, ecological planting and educational gardens.

Impressions of the Scottish visitors

Internal finishes are natural and benign which combined with use of daylight and natural ventilation create a bright and airy environment. The extensive use of internal timber (which appeared to be untreated) was impressive and the spaces smelt fresh - of timber and not timber treatments. Overall the atmosphere is lively and creative.



Plus + bauplanung - Central 'street'/theatre space

Peter Blundell-Jones

13

Schäfersfeld Grammar School

Introduction

The Schäfersfeld school complex is situated on a hill with impressive views over the town of Lorch, the Rems valley and the neighbouring monastery. The light, brightly coloured school building extension built in 1999 has extensive glazed areas, making the most of these views and linking the internal spaces with the landscape. A generous central circulation space doubles as a performance space.

Background

In 1999, in order to cope with increasing pupil numbers and to accommodate the newly founded grammar school, the town considered a second extension to the existing 1973 secondary school, which already housed some of the grammar school classes. The decision was soon made, however, to provide the grammar school with a new, separate, building. This would enable the grammar school to expand to accommodate all years whilst providing the adjacent secondary school with additional space.

Location Lorch, Germany

Type of School Grammar

Completion Date July 2003

Client Lorch Council

Design Team

Architect

Behnisch, Behnisch & Partner, Stuttgart

Landscape

Stephan Eurich, Wendlingen

Area 3, 600 m²

Cost 6.9 million

Number of pupils 350 - 400 (age range 13-18)

Choice of Site

Adjacent to two existing schools on same parkland site

Procurement Route

Traditional tender

Construction

Steel frame on concrete foundations, with heavyweight concrete block walls internally



Design ethos

The new grammar school building was to follow the general concept of the existing complex of school buildings, loosely placed within the landscape.

In accordance with the two other schools on the site, the grammar school has a circular plan, with the classrooms elevated and arranged around a central circulation space which is also used for theatre and music performances. Covered by a glazed roof, this hall has an open and inviting appearance, affording unobstructed views of the surroundings from the adjacent classrooms in all directions. The top lit space also brings light into the lower storeys, which contain specialist classrooms like biology, chemistry and physics and which are built into the hillside. The arts and music classrooms, library and administration and reception areas are accommodated on the entrance level above.



Materials and services

As with many of Behnisch's buildings, there is an emphasis on economical use of materials in order to achieve a design that meets the client's needs and follows the required design ethos within a tight budget. Colour is used in favour of a variety of materials and/or expensive finishes.

The building is heavyweight with exposed mass to provide free cooling. This allows the spaces to be naturally ventilated (achieved in the main via openable windows operated by the users) and avoids the need for mechanical ventilation systems. Heating is via a traditional boiler and radiator system.



Landscape

The new building is situated to the north-east of the existing buildings, harmoniously embedded in the landscaped environment. The central free space is enclosed by the three school buildings and assumes the function of a linking element and meeting place.

The buildings are all beautifully but differently incorporated into a gently rolling and hilly landscape. The feeling is of a fairly natural environment with minimal intervention other than careful planting of trees and bushes, which line the pathways between the buildings and around the periphery within the 'playground'. The fact that the site is well maintained and manicured also gives the impression of a 'park' location. It is difficult to discern where the school grounds end and the surrounding housing estate takes over as the recreation space for one seems to flow into the other, with no physical boundaries in evidence. The relationship between the buildings and the landscape is one of the key features of this complex, with each building in its own way nestling into its environment.



Impressions of the Scottish visitors

The new school is well integrated into the landscape providing frequent visual links to the outside. The generous central circulation space and classrooms are well lit, avoiding the need for excessive artificial lighting, helped by the light borrowed from the central communal space. The avoidance of access corridors, high levels of daylighting and a strong relationship with the landscape are aspects that could be considered in Scotland. However, as with most of the other schools, while the lack of physical boundaries was applauded by the visitors, it was thought to be difficult to achieve in Britain in the current climate.



14

Pfennigäcker Nursery

Introduction

The Pfennigäcker Nursery is situated in Sillenbuch, a residential area in Stuttgart. Each nursery group or class, has its own 2-storey building, all of which are connected via communal spaces in line with the nursery's concept of providing the children with their own identity in their group/ house, which also forms part of a larger community. The open foyer and multi-purpose room serve as meeting areas for children of all ages and are used for internal parties as well as community events. The 2-storey development provides interest and variety through the provision of group and play areas as well as quiet rooms for concentrated work.

Background

In 1994 the city of Stuttgart inherited the entire fortune of two local brothers, Rudolf and Hermann Schmid, who made their money dealing in books and magazines. It was their wish that the money should be used for projects that would benefit the community such as homes for the elderly, schools and community halls. Money from the trust fund formed with this inheritance enabled the construction of the Pfennigäcker Nursery which provides day care for children from 1 to 6 years of age and after school care for children up to the age of 14 in mixed-age groups.



Location Sillenbach, Stuttgart

Type of School Nursery and after school centre

Completion Date 1998

Client Stadt Stuttgart, Hochbauamt

Design Team

Architect

Joachim Eble Architektur

Structural engineer

Schneck & Schaal,

Heating, Ventilation, Drainage

Ebök

Electrical engineer

Gackstatter & Partner Gmbh

Physics

BP Hofman-Müller

Landscape design

Arge Kroll & Weilacher

Colour

Barbara Eble-Graebener

Area 1,100 m²

Cost 2.9 million € (building only: 1.97 million €)

Number of pupils 160 in 7 groups (age range 1-14)

Choice of Site

Brownfield, built on the site of the original nursery, which was too small and not suited for expansion

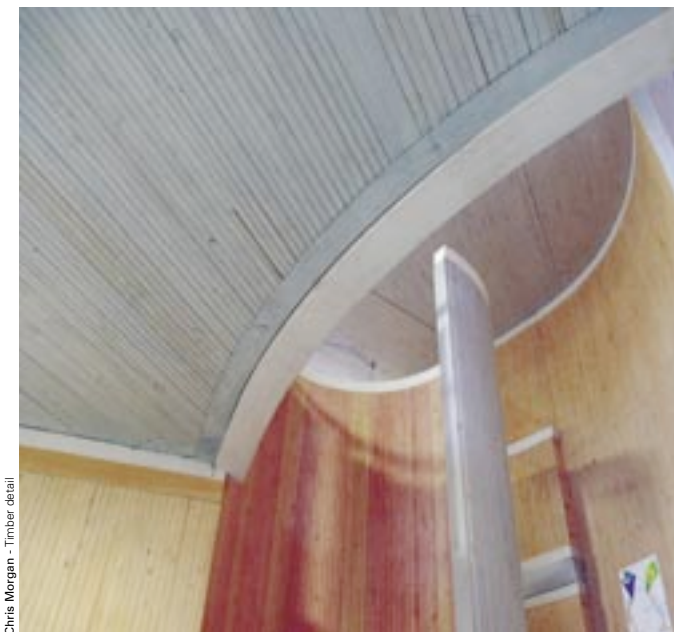
Procurement Route Traditional tender

Construction

Solid timber construction system (Brettstapel)



Chris Morgan



Chris Morgan - Timber detail

Design ethos

The design was developed in close cooperation with the client and follows both their, and the architect's aim - to achieve a higher than average ecological standard and to conform to the principles of 'building biology' which advocates buildings that contribute to the occupants', health of spirit, mind and body and have a low impact on the environment. The building meets the German low-energy standard and was constructed using only benign and, as far as possible, renewable materials.

The colour concept supports the architecture, using blue tones on the towers and roofs that reach to the sky, red and yellow tones on the 'earth-bound' buildings. Colour is used throughout the building as an orientation aid, to provide sensory experience, to carry energy and generally as a symbol of 'Lebensfreude'. The stronger external colours are taken through to the internal circulation spaces where they become progressively lighter as one approaches the play group rooms where the colours are 'quiet' and retreating in order to give way to the importance of the children's personalities.



Chris Morgan

Materials and services

Pfennigäcker Nursery is a pilot project in the use of 'Brettstapel', a solid timber construction system that utilises otherwise sub-standard timber. The system is economical and was used for ceilings, walls and floors, this allowed a high percentage of pre-fabrication reducing construction costs. The timber panels are machined to achieve a finished timber surface, only requiring to be painted (if desired) and significantly reducing the finishing work required. The result was a build-cost lower than any other new-build nursery in the area.

Mechanical services have been avoided as far as possible, in favour of natural ventilation and benign building materials that naturally regulate the indoor climate. The building also employs solar thermal systems and rainwater recycling.



Joachim Eble Architektur

Landscape

The building is placed close to the site's north and west boundaries to maximise the area of south-facing garden, fanning out into a lively and structured play area. Each playgroup has its own timber play terrace, which also provides access to the garden areas. Planting and landscaping offer various 'play-hills' and paths, lined with opportunities to play, exercise or just activate the senses. Children can explore the 'rock-valley'; wade through the 'grass-sea'; prowl through the 'jungle'; crawl through the willow tunnel; sow and reap in the nursery garden; play on the 'building-site' or partake in ball games or table-tennis in designated areas. The varying requirements of different age groups are taken account of by the division into three areas within the garden: a sunken area to the west for small children, a hill to the south for older children and a further area for teenagers in the community.



Chris Morgan - Window detail

Impressions of the Scottish visitors

The chosen construction system (Brettstapel) with its pre-finished surfaces merely enhanced by subtle, carefully chosen, colouring has worn particularly well in the 6 years that the nursery has been operating and appears to provide a far superior surface finish to plasterboard. Whilst extensive timber surfaces were found to cause acoustic problems in another school visited, they gave no cause for concern in the Pfennigäcker Nursery and are something that could be considered in Scotland.

Circulation areas doubling up as meeting and teaching spaces avoided the creation of dull corridors, generally giving a feeling of liveliness and enhancing the sense of community experienced throughout the nursery.

Natural colours, a scale suited to children and the house style, all contributed to an overall sense of 'home' and security.

15

Further Education College in Herne

Introduction

In 1991 architects Jourda & Perraudin, from Lyon, won a 2-stage architectural competition, organised by the IBA (international building exhibition) Emscher Park and the area of North Rhein-Westphalia, for the design of a government further education centre incorporating seminar facilities, meeting rooms, hotel accommodation, restaurant, gymnasium, community library, leisure facilities and outdoor sports fields on the site.

The impressive glass envelope has a striking and imposing presence in an industrial area in decline, that used to be dominated by a sense of depression. Forming the focal point of an, as yet to be completed, public park, the building envelope contains a number of public buildings as well as the education centre grouped around communal spaces with the intention of increasing social interaction. The internal buildings, built like the structure of the glass envelope, mainly using timber, have been positioned to relate to the internal landscaping and the external park.

Background

Situated in the centre of the Ruhr area and the area dedicated to the IBA Emscher Park, the site of the former mine of Mont Cernis was to be developed and given a new purpose. The proposed design by Jourda and Perraudin was to provide a weatherproof glass box, which would act as a climate modifier for a series of pavilions located inside. In 1993 as part of a research project carried out for the EU Directorate General XII, thermodynamic modelling was used to evaluate the benefits of this microclimatic envelope, to fine-tune the design and to verify the viability of the Mont Cernis project which was destined to be one of the flagship projects in the final presentation of the IBA.

Location Herne, Germany

Type of School College for Further Education

Completion Date 2000

Client

Entwicklungsgesellschaft Mont Cernis GmbH/Land Nordrhein-Westfalen

Internationale Bauausstellung Emscher Park GmbH/Stadt Herne/Stadtwerke Herne AG

Design Team

Architect

Jourda + Perraudin & Hegger Hegger Schleiff HHS Planer + Architekten

Structural Engineer

Schlaich, Bergermann & Partner with Ove Arup

Heating, Ventilation, Drainage HL-Technik, Frankfurt

Thermal Modelling Arup, London

Area

15,527m in total (college = 5,095m², glass 'envelope' = 4,377m²)

Cost 42.85million

Number of students

Varies throughout the year. Seminars and conferences provide training for 10,000 civil servants each year.

Choice of Site Brownfield, site of former mine.

Construction

Greenhouse: timber

Internal buildings: steel frame, timber, stone, concrete



Chris Morgan

Design ethos

The education centre was to be constructed on the site of a demolished mine which had been the heart of the surrounding town and had to be both a beacon project for the regeneration of the region and a generator of the transformation of the area. The Mont Cernis development aimed to transform the depressed image of the contaminated mine site and its surroundings, an area of high unemployment resulting from the mine closures, by improving quality of life through a positive transformation of the environment.

In order to enable the local community to spend more time 'outdoors' the extensive micro-climatic envelope creates a public semi-outdoor area that has a temperate climate and is protected from wind and rain. It also allows the internal buildings to be of simple lightweight construction without weatherproofing.



Materials and services

10 000m² of photovoltaic panels on the roof provide more than the building's energy requirement, feeding electricity back into the main grid and doubling up as shading and protection against glare. Gas from the former mine heads is used to produce electricity through a combined heat and power (CHP) engine, some of which is fed back into the main grid. Spin-off heat produced is used for the academy, the surrounding housing and the local hospital.

Rainwater on the roof is collected using a syphonic rainwater collection system which reduces the downpipe diameter. The collected rainwater, stored in an underground cistern, is used for the automatic cleaning system for both the transparent skin and the photovoltaic roof as well as for watering and maintenance of the plants within the glasshouse. Ventilation is generally natural with the option to employ mechanical systems via a culvert system under the building as and when required.

Building materials were chosen for their environmental credentials and limited to mainly local timber, glass, stone and concrete (used as a thermal mass in the floor). The photovoltaic panels were manufactured locally.



Landscape

The landscaping is as yet largely unfinished, apart from the main public space between the two rows of internal buildings. Timber terraces provide circulation and areas for cafes along a pool which adds interest and passive humidification and cooling. The areas between the buildings and the glass envelope are generally not directly accessible. The intention is that these will be planted to merge visually with the external landscape.



Impressions of the Scottish visitors

The scale and construction of the outer building created an impressive (iconic) presence and a delightful, light and airy public space (albeit somewhat chilly on a sunny October morning). The building materials demonstrated the use of timber on a massive scale, currently not possible in Scotland from local timber sources. The relationships between materials in terms of the use of raw timber, stone, steel and concrete, displayed the same confidence in terms of craftsmanship and knowledge of materials that had been observed elsewhere on the trip.

The unfinished landscaping, coupled with the fact that this particular building was visited during the autumn school holidays, gave the impression of emptiness and overscaling which may change once the overall park development is complete. On this visit it was difficult to appreciate how the building would relate to the surrounding housing in the future, in both a physical sense and in terms of the potential for the public to interact with the building which did not appear 'open' or 'welcoming'.



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Comprehensive School in Gelsenkirchen

Introduction

The school at Gelsenkirchen-Bismark forms part of a competition winning entry for a school with ecological housing (100 units) on an adjacent site, designed by Peter Hübner and his office Plus + bauplanung GmbH. A key aspect of the design is an emphasis on ecological issues and the involvement of community, staff and pupils in the design process. The vision was of an evolving education centre, with a variety of building types and new buildings being added as and when required in response to local needs, thus adding richness to the final development, rather than working to a fixed masterplan. The result is a school laid out in a village arrangement, with buildings clustering round a central covered street with a public square at the entrance.

Background

Gelsenkirchen-Bismark is a former industrial suburb in the Ruhr Valley and the school is located on the site of a former coal mine which closed in the 1980s, resulting in mass unemployment for the area's mine workers - a mix of Germans and Turkish immigrants. The Protestant Church (Evangelische Kirche von Westfalen) became concerned about the issue of high unemployment and the plight of the children of both communities, who struggled to escape the poverty trap, exacerbated by the closure of the mine. The idea of a multi faith ecological school was devised as a cultural centre and catalyst for regeneration by the Church in collaboration with visionary educationalist Fritz Sundermeier.

Location Gelsenkirchen, Bismark, Germany

Type of School Comprehensive

Completion Date

Main Building Jan 2000

Class House 1 Sep 1999 **Class House 2** Sep 2000

Class House 3 Sep 2001 **Class House 4** Sep 2002

Class House 5 Sep 2003 **Class House 6** Sep 2004

Client

Evangelische Schule in Westfalen (Protestant school, Westfalen)

Design Team

Architect

Plus + bauplanung GmbH, Hübner – Forster – Hübner

Structural engineer

Main building & class houses 1-5 Weischede & Partner

Class house 6 Dr. Ing Adrian Pocanschi

Heating, Ventilation, Drainage Ingenieurbüro INCO

Electrical engineer Wetzstein GmbH

Climate and ventilation strategy

Transolar Energietechnik GmbH

Colour Heiner Nienhaus

Landscape design Christof Harms

Area 16,179 m²; 75.983 m³

Cost 19,9 million in total; separate class houses 1 to 6 ranging from 665,330 to 846,279

Number of pupils 1100 (6 - 18 year olds)

Choice of Site Brownfield, former colliery site

Construction

Lightweight timber construction on insulated concrete foundations





Plus + Bauplanung

Design ethos

The school is being built in phases alongside the existing 1960s building with classes moving across each year as the building complex grows, until it reaches the full school roll of 1100 pupils.

The main building incorporates a library, cinema, chemist, cinema, theatre, a few classrooms and a large radial workshop at the end of the 'street'. This main complex (including the adjacent sports facilities) is available to both pupils and the wider community. The main classroom blocks are the phased element of the project, being added in the form of individual wings which look like terraces of housing, complete with their own gardens. The design ideas of the children are encouraged and incorporated in the gardens and buildings and pupils, teachers and parents are involved in the fit-out. With reference to the severe social problems of the area, there is an emphasis on creating a stable environment whereby students occupy the same classroom for six years, led by the same teachers. This is felt to provide a sense of continuity which may be lacking at home. Classrooms also have quiet zones, located on mezzanines which can be used for a variety of purposes from allowing disruptive pupils space and time to "cool down" to storytelling in a domestic type environment. There is also an emphasis on 'learning by doing'. For the wider community use of the available facilities is encouraged at all times.



Materials and services

Peter Hübner's architecture is identifiable in terms of form and materials: insulated concrete foundations supporting a lightweight timber frame, designed and sized by computer and a flat or slightly sloping green roof. Walls are generally clad externally in timber with thick insulation and care in the locating of windows results in a thermally efficient, well day lit building. Heating requirements are kept to a minimum and most spaces, other than large volumes with specific needs – such as the theatre and sports hall – are naturally ventilated. Where special treatment is required, this is done passively as far as possible. In this case, the sports hall and internal street have a culvert of long underground ducts to pre-warm air in winter and pre-cool air in summer, assisted by solar chimneys and roof vents. The street temperature is allowed to fluctuate and the space acts as a thermal buffer for the adjacent spaces. Internal finishes are, as far as possible, natural and benign which combined with use of daylight and natural ventilation, create a bright and airy environment.



Plus + Bauplanning - Internal 'street'

Landscape

As might be expected, the holistic design approach extends to the surroundings. Landscape architect Christof Harms has incorporated classroom gardens and general landscaping that teaches pupils about nature by involving them in growing fruit, flowers and vegetables that attract wildlife and insects. While classroom gardens are distinct, encouraging children to take responsibility for their own space, the general landscape is free, open-ended and constantly evolving, encouraging the children to interact with nature responsibly (e.g. there are areas incorporating exotic plants and expanses of water which extend to the building edge). Thus children learn about human intervention and interaction with nature and the landscape.



Plus + Bauplanning

Impressions of the Scottish visitors

The school is integrated into the landscape and seems to sit in a park rather than the external areas being like space around buildings. This, together with the modest scale of the buildings, works well given the large school role (1100 pupils).

Classroom blocks having their own identity through elevational treatment together with dedicated outside areas (like gardens) contributed to sense of ownership, responsibility and custodianship. This, combined with the controlled incremental development of the classroom blocks has added interest and variety within a limited palette of materials and is something that could be considered here.

The experience was enhanced by the relationships between the building and the landscape with framed views combining with use of colour to create attractive inside/outside spatial relationships. Involvement of the children in managing their classroom gardens and taking responsibility for their own space enhanced this experience.

Credits

Author and originator: Gaia Architects (Germany Tour) and
Gaia Research (Norway Tour)
www.gaiagroup.org

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www.scotland.gov.uk

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Text the authors

Images the listed bodies

Tour participants Norway

KEN ALLAN PPP Projects Officer, Education, Culture And Sport Service, Highland Council

ROBERT JOHN LESLIE ANDERSON Architect, Dundee City Council

ROBIN BAKER Principal Architect, Gaia Architects, Aberfeldy

CALUM BENNETT Chartered Structural Engineer, Sinclair Knight Merz

ALAN BROCK Territorial Architect, DfES

IAN CAMERON Architecture and Design Manager, Perth and Kinross Council

JANE CLARKE Head of Support Services, Education Division, Midlothian Council

ANDREW FORD Director, Fulcrum Consulting

SANDY HALLIDAY Principal, Gaia Research, Edinburgh

BRIAN HEMMING Resources Manager, Education, Culture And Sport Service, Highland Council

HOWARD LIDDELL Principal Architect, Gaia Architects, Edinburgh

BRIAN MARK Director, Fulcrum Consulting

GILLIAN ROSS POND Depute Director of Education/ PPP Project Director, Dundee City Council

MIKE PORTER Architecture Manager, Aberdeenshire Council

FIONN STEVENSON Reader, School of Architecture, University of Dundee

MALCOLM TAIT Partner, KJ Tait Consulting (Building Services) Engineers

Tour participants Germany

KAREN ANDERSON Architect, Anderson Bell Christie, Glasgow

LESLEY BUNTAIN Architect, Keppie Design

IAN CAMERON Architecture and Design Manager, Perth & Kinross Council

LEANNE CAMPBELL Architectural Technologist, Gaia Architects, Edinburgh

BARBARA CHAPMAN Architect, Gaia Architects, Edinburgh

PAULA VAN DEE Architect, Keppie Design

JENNY FAUSSET Policy Officer, Edinburgh City Council

JOHN KELLY Landscape Architect, Gaia Architects, Edinburgh

DOUG KING Environmental Systems Engineer, Kingshaw

LORI MCELROY Sustainability Development Manager, Sust. The Lighthouse

MICHAEL MCGOWAN Education Design Officer (Architect), Falkirk Council

CHRIS MORGAN Architect, Locate Architects

JOHN ROBSON Sinclair Knight Merz

JAMES ROWE Structural Engineer, King Shaw

BOB SENIOR Engineer, KJ Tait Consulting (Building Services) Engineers

MALCOLM TAIT Partner, KJ Tait Consulting (Building Services) Engineers

KEITH THOMSON School Estate Branch, Schools Division, Scottish Executive

PAUL WOODVILLE Architectural Assistant, Gaia Architects, Edinburgh