International Specialised Skills Institute

PRATT FOUNDATION

SUSTAINABLE WORKPLACE DESIGN

Alisa Moss

The Pratt Foundation/ISS Institute Overseas Fellowship

Fellowship supported by The Pratt Foundation

ISS Institute Inc

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Executive Summary

Alisa Moss has been the recipient of two international Fellowships, an A.V. Jennings Churchill Fellowship in 2007–2008 and the Pratt Foundation/ISS Institute Overseas Fellowship in 2009–2010. The most striking outcome in both international Fellowships was the universal willingness to share ideas experienced with all those Moss visited.

This Pratt foundation/ISS Institute Overseas Fellowship was awarded to Moss to enable her to examine six sustainable commercial workplaces, with particular emphasis on the following factors:

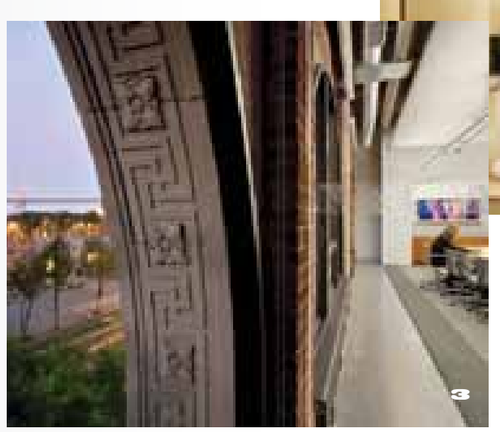
1. To identify materials and products being used in commercial workplaces that are detrimental to the natural environment or the occupants' health, and possible alternative sustainable materials and products.
2. To identify successful design models that reduce energy consumption, and concurrently increase the amenity of the workplace for the occupants.
3. Preparation of case studies on the following buildings/workplaces:
   – Energy Foundation
   – Autodesk
   – ClimateWorks Foundation
   – San Francisco Federal Building
   – 901 Cherry Avenue/YouTube Corporate Headquarters
   – Heifer International

The case studies all demonstrated a shift in thinking regarding how a building could/should be finished or fitted out. The trend now is to use the building structure as the finish. This is in contrast to the conventional method of lining the building structure with finishes such as plasterboard, timber, or ceiling tiles. This trend leaves the building structure visible rather than covering it up.

The mantra is 'less is more'. The consequence of this trend is that less materials are being used in building fit outs; therefore, the building structure is required to be completed to a much higher level of finish. This approach to the finish of a commercial workplace has, therefore, become raw and includes less refined and potentially toxic finishing linings.

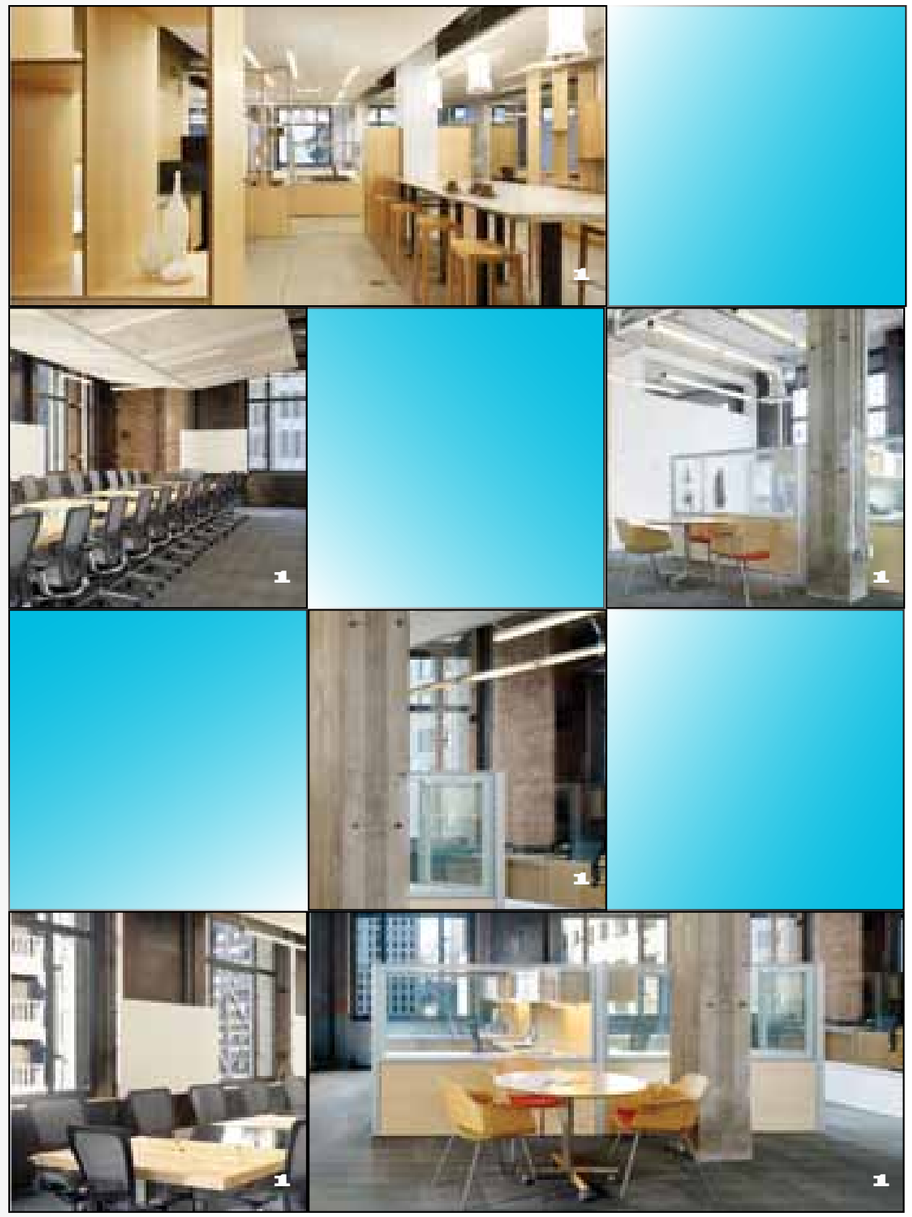
The findings from each case study are included in 'The International Experience' section of this report. This report can be used as a how-to guide to design a more sustainable workplace, outlining what to avoid and some possible sustainable alternatives. The knowledge contained within this report can be used by all disciplines when designing, building or planning a positive workplace environment.

Story Board



CASE STUDY

PHOTOGRAPHIC STORYBOARD



CASE STUDY 01

PHOTOGRAPHIC STORYBOARD:
The Energy Foundation

CASE STUDY 02

PHOTOGRAPHIC STORYBOARD:
Autodesk

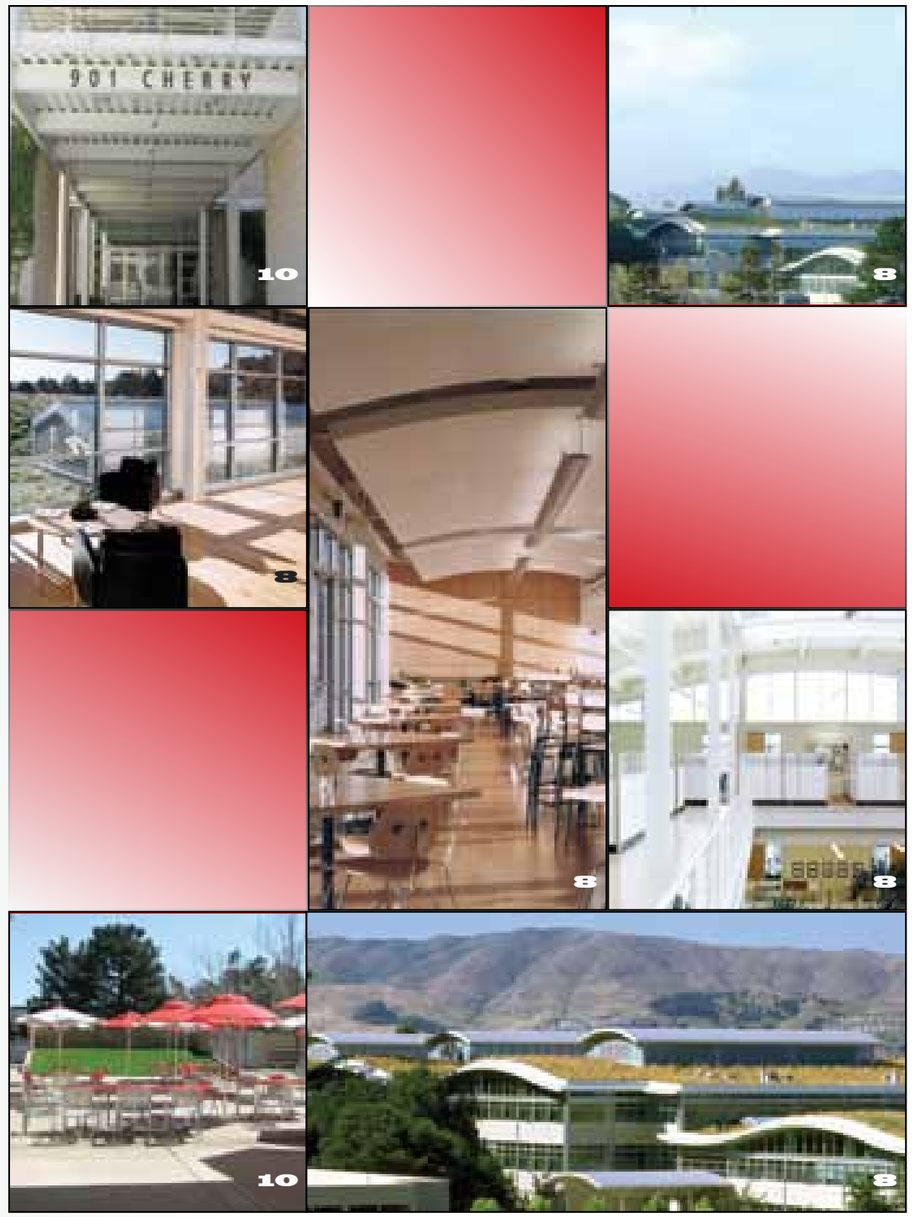
CASE STUDY 03

PHOTOGRAPHIC STORYBOARD:
ClimateWorks Foundation

CASE STUDY 04

PHOTOGRAPHIC STORYBOARD:
San Francisco Federal Building

Story Board



CASE STUDY 05

PHOTOGRAPHIC STORYBOARD:
901 Cherry / YouTube Corporate Headquarters

Story Board

CASE STUDY 06

PHOTOGRAPHIC STORYBOARD:
Heifer International

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Abbreviations/Acronyms

AQF	Australian Qualification Framework
BPA	Bisphenol A
CPVC	Chlorinated Polyvinyl Chloride
DIA	Design Institute of Australia
DJAS	Daryl Jackson Alastair Swayn Pty Ltd
E0 MDF	Low Formaldehyde Emitting Medium Density Fibreboard
FSC	Forest Stewardship Council
GBCA	Green Building Council of Australia
GECA	Good Environmental Choice Australia Ltd
GFC	Global Financial Crisis
GSA	US General Services Administration
HVAC	Heating, Ventilation and Air-conditioning
IEQ	Indoor Environmental Quality
ISS Institute	International Specialised Skills Institute
LEED	Leadership in Energy and Environmental Design. The LEED rating system is an environmental rating system developed by the Green Building Council (USA). This is a system similar to Australia's Green Star rating system developed by the Green Building Council of Australia.
LED	Light Emitting Diode
MDF	Medium Density Fibreboard
NABERS	National Australian Built Environment Rating System
NTIS	National Training Information Service
PVC	Polyvinyl Chloride
RMIT	Royal Melbourne Institute of Technology
SVOC	Semi-Volatile Organic Compound
SFFB	San Francisco Federal Building
TAFE	Technical and Further Education
UK	United Kingdom
USA	United States of America
USGBC	US Green Building Council
VOC	Volatile Organic Compound

Definitions

A.V. Jennings Churchill Fellowship

The Churchill Trust was established in 1965 to honour the memory of Sir Winston Churchill by awarding overseas research Fellowships known as ‘Churchill Fellowships’.

Reference: Winston Churchill Memorial Trust website – www.churchilltrust.com.au

Design

Design is problem setting and problem solving.

Design is a fundamental economic and business tool. It is embedded in every aspect of commerce and industry and adds high value to any service or product—in business, government, education and training, and the community in general.

Reference: ‘Sustainable Policies for a Dynamic Future’, Carolynne Bourne AM, ISS Institute 2007.

Forest Stewardship Council (FSC)

The Forest Stewardship Council (FSC) is an international non-profit, multi-stakeholder organization established in 1993 to promote responsible management of the world’s forests. Its main tools for achieving this are standard setting, independent certification and labeling of forest products. This offers customers around the world the ability to choose products from socially and environmentally responsible forestry.

Forest management according to FSC’s internationally recognized standards delivers environmental services to local and global communities, including clean air and water, and contributes to mitigating impacts of climate change. FSC directly or indirectly addresses issues such as illegal logging, deforestation and global warming and has positive impacts on economic development, environmental conservation, poverty alleviation and social and political empowerment.

Reference: http://encyclopedia.thefreedictionary.com/Forest+Stewardship+Council

Green Star Rating System

Green Star is a comprehensive, national, voluntary environmental rating system that evaluates the environmental design and construction of buildings and, with 11 per cent of Australia’s CBD commercial office buildings Green Star certified, building green is now a business imperative.

Green Star was developed for the property industry in order to:

- Establish a common language;
- Set a standard of measurement for green buildings;
- Promote integrated, whole-building design;
- Recognise environmental leadership;
- Identify building life-cycle impacts; and
- Raise awareness of green building benefits.

Reference: Green Building Council of Australia website – http://www.gbca.org.au/green-star/green-star-overview/

Green Wash

A false or misleading picture of environmental friendliness used to conceal or obscure damaging activities.

Reference: http://en.wiktionary.org/wiki/greenwash

Definitions

HOK

A global provider of planning, design and delivery solutions for the built environment.

Innovation

Creating and meeting new needs with new technical and design styles. (New realities of lifestyle).

Reference: 'Sustainable Policies for a Dynamic Future', Carolynne Bourne AM, ISS Institute 2007.

Skill deficiency

A skill deficiency is where a demand for labour has not been recognised and training is unavailable in Australian education institutions. This arises where skills are acquired on-the-job, gleaned from published material or from working and/or studying overseas.

Reference: 'Directory of Opportunities. Specialised Courses with Italy. Part 1: Veneto Region', ISS Institute, 1991.

There may be individuals or individual firms that have these capabilities. However, individuals in the main do not share their capabilities, but rather keep the intellectual property to themselves. Over time these individuals retire and pass away. Firms likewise come and go.

Sustainability

The ISS Institute follows the United Nations for Non-Governmental Organisations' definition on sustainability: *"Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".*

Reference: http://www.unngosustainability.org/CSD_Definitions%20SD.htm

Acknowledgements

Alisa Moss would like to thank the following individuals and organisations who gave generously of their time and their expertise to assist, advise and guide her throughout the Fellowship program.

Awarding Body – International Specialised Skills Institute (ISS Institute)

The International Specialised Skills Institute Inc is an independent, national organisation that for over two decades has worked with Australian governments, industry and education institutions to enable individuals to gain enhanced skills and experience in traditional trades, professions and leading-edge technologies.

At the heart of the Institute are our Fellows. Under the **Overseas Applied Research Fellowship Program** the Fellows travel overseas. Upon their return, they are required to pass on what they have learnt by:

1. Preparing a detailed report for distribution to government departments, industry and educational institutions.
2. Recommending improvements to accredited educational courses.
3. Delivering training activities including workshops, conferences and forums.

Over 180 Australians have received Fellowships, across many industry sectors. In addition, recognised experts from overseas conduct training activities and events. To date, 22 leaders in their field have shared their expertise in Australia.

According to Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010':

> Australia requires a highly skilled population to maintain and improve our economic position in the face of increasing global competition, and to have the skills to adapt to the introduction of new technology and rapid change.
>
> International and Australian research indicates we need a deeper level of skills than currently exists in the Australian labour market to lift productivity. We need a workforce in which more people have skills, but also multiple and higher level skills and qualifications. Deepening skills across all occupations is crucial to achieving long-term productivity growth. It also reflects the recent trend for jobs to become more complex and the consequent increased demand for higher level skills. This trend is projected to continue regardless of whether we experience strong or weak economic growth in the future. Future environmental challenges will also create demand for more sustainability related skills across a range of industries and occupations.[1]

In this context, the Institute works with Fellows, industry and government to identify specific skills in Australia that require enhancing, where accredited courses are not available through Australian higher education institutions or other Registered Training Organisations. The Fellows' overseas experience sees them broadening and deepening their own professional practice, which they then share with their peers, industry and government upon their return. This is the focus of the Institute's work.

For further information on our Fellows and our work see www.issinstitute.org.au.

[1] Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010', pp. 1-2 http://www.skillsaustralia.gov.au/PDFs_RTFs/WWF_strategy.pdf

Fellowship Supporter

The Pratt Foundation was established in 1978 by Richard and Jeanne Pratt with the shared vision of supporting charitable enterprises and adding value to philanthropy. The Foundation is now one of the largest private sources of philanthropy in Australia. In the words of its mission statement, it aims *"to enrich the lives of our community"* and, in the words of Jeremiah, it works to fulfil this aim in a spirit of *"kindness, justice and equity"*. Moss would like to thank them for providing funding support for this Fellowship.

Supporters

- Carolynne Bourne, former CEO, ISS Institute
- Ken Greenhill, Fellowship Report Co-ordinator, ISS Institute
- Paul Sumner, Skills Victoria Fellowship Co-ordinator, ISS Institute
- Cox Group
- Daryl Jackson Alastair Swayn (DJAS)
- DEGW, a strategic business consultancy
- Green Building Council of Australia
- Healthy Buildings International
- The Canberra Capital Airport Group
- Viridis E3
- The Fellow wishes to acknowledge the generous and essential support received from her family, Christopher and Thomas Tarbuck, parents Christina and Rodney Moss, and sister Penelope Moss—enabling her to travel with her three-month-old son and concentrate on the investigation and findings of the Fellowship. The success of this Fellowship would have been virtually impossible without this support.

The universal willingness to share ideas was the most striking outcome of the Fellow's research into sustainable workplace design in the USA.

Without exception, everyone whom the Fellow met in Los Angeles, San Francisco, Chicago and Little Rock was extremely generous with their time and knowledge.

Those Involved in the Development of the Overseas Program

Australia

- Chris Alcock, DEGW
- James Andrews, DJAS
- Stephen Byron, Capital Airport Group
- Jonathan Dalton, Viridis E3
- Lisa Dartnall, Publisher
- Alex Garrett, Cox Group
- Jaimie Moffitt, DJAS
- Rodney Moss, Cox Group
- Warren Overton, Viridis E3

- Courtney Sherman, DEGW
- Ian Smith, Cox Group
- Alastair Swayn, DJAS

United States of America

- Catherine Bahar, Sidemark Corporate Furniture
- Gail Boettcher, Autodesk
- Vanessa Eng, William McDonough + Partners
- Marc Flax, HOK
- Adam M Franch, Leddy Maytum Stacy
- Anthony Garrett, HOK
- Kira Gould, William McDonough + Partners
- Jean M. Hansen, HDR
- David Hecht, Tannerhecht Architects
- Sabrina Morelli, US Green Building Council
- Margie O'Driscoll, American Institute of Architects
- Victor Olgyay, Rocky Mountain Institute
- Kevin Powell, US General Services Administration (GSA)
- Anthony Ravitz, Google
- Bryant Rice, DEGW
- Reese Rowland, Polk Stanley Wilcox
- Nanci Scoular, Sidemark Corporate Furniture
- Ed Sergeant, Polk Stanley Wilcox (and the Friday nighters)
- Alex Spilger, BCCI Construction Company
- Jan D Stensland, Inside Matters
- Bill Worthen, Simon & Associates

Those Involved in the Fellowship Submission

- Stephen Byron, Capital Airport Group

  Stephen Byron is Managing Director of the Capital Airport Group. The Capital Airport Group strives to stay on the forefront of sustainable design with the commitment to managing and developing an environmentally sustainable business park, Brindabella Business Park. The business park features sustainable attributes such as tri-generation, a 5 Star Green Star Green Building Council of Australia (GBCA) certified building and a 4 Star Green Star fit out and water and energy efficient buildings.

- Jonathan Dalton, Viridis E3

  Jonathan Dalton is a director of Viridis E3 a specialist green building and Green Star consultancy firm. Jonathan has a wealth of knowledge and direct experience in the design, construction and operation of environmentally sustainable commercial buildings and fit outs.

Acknowledgements

- Alastair Swayn, Daryl Jackson Alastair Swayn

  Alastair Swayn is Principal Director of Daryl Jackson Alastair Swayn Pty Ltd (DJAS). DJAS was established in 1989 and, as a company, is continuing on the path to sustainability. DJAS has been responsible for a number of environmentally sustainable buildings and fit outs in Canberra, including the first 5 Star Green Star building in Australia and the master planning and design of Brindabella Business Park.

Australian Organisations in the Commercial Architecture and Design Industry Impacted by this Fellowship

Most of us spend at least 90% of our lives indoors[1] and most of us have worked or spent time in a commercial office building. Poor environmentally sustainable buildings and workplace environments will impact on most Australians by being either detrimental to our health or our natural environment.

Australian organisations in the commercial architecture and design industry impacted by this Fellowship encompass the Commonwealth and Federal Government, associated industries, professional associations, education and training and the community as a whole.

About the Fellow

Name: Alisa Moss

Employment

- Senior Interior Designer, DJAS

Qualifications

- Advanced Diploma in Photography, Ultimo College, 2001
- Advanced Diploma in Interior Design, Enmore Design Centre, 2003
- Level one Yoga Instructor, Insync Institute, 2004
- Accredited professional, Australian Green Building Council, 2006
- A.V. Jennings Churchill Fellow, 2007

Memberships

- Member, Australian Design Institute, 2007
- Member and committee member, ACT Churchill Fellows Association, 2008
- Committee Member, Property Council of Australia, ACT: Sustainable Development Committee, 2010

Alisa Moss joined Jackson Architecture at DJAS in 2003 as an Interior Designer, after working and studying in Sydney, Australia. She currently heads the practice's interiors section as the Senior Interior Designer.

Throughout Moss' ten-year career working in commercial interior design with design firms in Sydney and Jackson Architecture in Canberra, she has been an advocate for environmentally sustainable design.

In 2005, Moss was the project designer for the Australian Research Council, one of the first two fit outs in Australia to be accredited under the Green Star rating system by the GBCA.

In 2007, Moss was awarded the A.V. Jennings Churchill Fellowship, a national Fellowship, which provided her the opportunity to spend a number of months in the USA, UK, Denmark and Germany researching design aspects related to indoor environmental quality (IEQ) and healthy buildings.

Moss' design work has been recognised by the Australian Institute of Architects and her work has appeared in a number of design publications over the past five years.

She is active in the Canberra design community and has been the guest speaker and/or presenter for numerous design events held in Canberra. Moss strongly believes in the importance of using a multi-disciplinary approach to effect long-term changes in sustainable design. She believes the more we openly share our ideas and research, the quicker we can start to make successful changes to the Australian design community.

Aims of the Fellowship Program

The aim of this Fellowship was to explore, in detail, a range of successful leading of environmentally sustainable commercial buildings and fit outs examples in the USA. The Fellow visited six organisations as the basis of her research, to generate the case studies included in this report. These visits enabled Moss to:

1. Highlight innovations in building materials and solutions.
2. Identify deficiencies in current practice to enable the skills and knowledge of Australian design and building professionals to be updated.

While the design industry is becoming more familiar with environmentally sustainable building design, it has still not fully embraced the benefits of environmentally sustainable commercial office environments.

The six organisations, in California and Arkansas, were selected because they are in a similar climatic zone to South Eastern Australia. Buildings in a similar climate will enable the design industry to learn directly from the successful and unsuccessful design attributes of each of the case studies.

The information collected will be disseminated to the Australian design industry, construction industries and associated sectors.

The information was researched, collated and analysed through a three-step process:

Part A Identifying materials and products being used in commercial workplaces that are detrimental to the natural environment or occupants' health, and possible alternative sustainable materials and products.

Part B Identifying successful design models that reduce energy consumption and increase the amenity of the workplace for the occupants.

Part C Preparation of case studies based on visits to the following buildings/workplaces:

- The Energy Foundation
- Autodesk
- ClimateWorks Foundation
- San Francisco Federal Building
- 901 Cherry Avenue/YouTube Corporate Headquarters
- Heifer International

All information and findings from these case studies was then used to prepare the recommendations included in this report.

The Australian Context

A Description of the Industry

We should all be mindful of the quality of the indoor environment as most of us spend at least 90% of our lives indoors[1]. Indoor air pollutions, or poor indoor environmental quality (IEQ), are considered a significant threat to human health and our natural environment.

While the Australian design community and construction industry generally interprets the IEQ recommendations for commercial office workspaces to be relating mainly to the air conditioning or lighting systems, the IEQ is, in fact, concerned with five main areas:

1. The quality and quantity of fresh air available in the space.
2. The quality and quantity of natural and artificial light available in the space.
3. Individual and thermal comfort.
4. The minimisation of materials detrimental to the natural environment and to the occupants' health.
5. Effective floor plate designs that maximise office efficiency and reduce the building footprint.

These five factors, so essential for achieving a healthier and more sustainable interior workplace, are still not being readily applied in the majority of Australian commercial workplaces.

1. The Quality and Quantity of Fresh Air Available in the Workspace

The quality of air in the internal environment is a major contributor to IEQ and the health of our buildings. The amount of fresh air in an internal environment has a direct influence on how building occupants will feel and, hence, on their productivity levels. A common problem is poor air quality, caused by poorly maintained heating, ventilation and air-conditioning (HVAC) systems and poor design. Studies have also linked ozone emissions to adverse effects on health and to illnesses such as headaches, asthma and other respiratory related conditions[2].

An Australian trend in environmentally sustainable buildings is to investigate the use of natural or passive mode ventilation systems to reduce energy consumption and improve IEQ.

2. The Quality and Quantity of Natural and Artificial Light Available in the Workspace

The benefits of natural daylight and external views in commercial buildings are becoming more widely accepted. Natural daylight is known to improve the building occupants' sense of wellbeing and to improve productivity levels. It is considered so important in Germany that it is now a statutory requirement that occupants' in a commercial building are within eight metres of natural light. While not yet legally enforced in Australia, it is now considered good practice—receiving maximum Australian Green Building Council Green Star points—if over 90% of work stations are within eight metres of natural light and external views.

Inefficient artificial lighting produces considerably more heat in an internal space than natural daylight illumination[3]. It also creates light flicker not found with daylight illumination. The introduction of an individual task light with a sensor and a highly efficient, low energy lamp to each work point provides an optimum lighting level at working plane. This allows the reduction of the overhead lighting levels and can result in a noticeable reduction in energy consumption[4].

3. Individual and Thermal Comfort

It is generally recognised that in a commercial workplace environment the physical design and the IEQ are factors that influence building occupants' sense of satisfaction, health and wellbeing.

The primary factors most likely to influence the sense of wellbeing in a commercial office environment are thermal comfort, privacy, noise control, spatial comfort, building noise control, and air quality.

Individual comfort and acoustic comfort are the two primary factors that cause the most reported dissatisfaction. Studies also suggest a relationship between the quality of the indoor environment and short-term sick leave and performance[5].

4. The Minimisation of Materials that are Detrimental to the Occupants' Health and the Natural Environment

Internal materials can also affect the quality of the indoor environment by emitting emissions and toxins, with some materials being detrimental to human health and the environment. Material is a broad term, which covers a spectrum of finishes from floor, wall and ceiling to everything in between.

A large percentage of materials used in commercial office environments in Australia are not yet recognised as materials that can harm. Countless international studies are taking place in the USA and Europe to develop a greater understanding of materials that either harm the natural environment and/or human health. Through research undertaken during the Fellow's previous A.V. Jennings Churchill Fellowship, the Fellow believes that our standard fibre ceiling tiles used in most commercial offices have the potential to absorb harmful emissions and remit secondary harmful emissions for the life of the product. They also contain formaldehyde in the tile backing substance. Formaldehyde is targeted as the next asbestos in the Australian market.

5. Effective Floor Plate Designs that Maximise Office Efficiency and Reduce the Building Footprint

The other issue that affects energy consumption is the space allocated to each occupant of a commercial building. If Australian designers can reduce the space per person from 15–18 square metres per person to 10–12 square metres per person, then buildings could be smaller and more effective. This will require a workplace design with smart workstations and limited built zones that embrace a flexible, interchangeable and modular design. The Australian Government is currently targeting all government departments occupying usable office space greater than 500 square metres and aiming to reduce the area per occupant to 16 square metres per person[6]. Some government departments currently lease space up to 25–30 square metres per person.

Buildings and commercial fit outs have a significant impact on the environment with commercial office buildings and hospitals being the two largest emitting building types. The building industry is responsible for consuming 32% of the world's resources, including 12% of its water, 40% of its energy and producing 40% of the waste going to landfill and 40% of all air emissions[7].

As an industry we are becoming more aware of the need for buildings that are less energy and resource intensive, although we have not yet embraced the need to improve our commercial office workplaces.

The recent devastating floods experienced in northern Australia and fires experienced in southern Australia are a testament to the extreme climatic conditions that can assail this country and the need for appropriate environmental principles in our building industry.

The energy consumed in running a commercial building during its useable life is far in excess of the energy required to construct the building. The 'whole of life' costs of a building must be more seriously considered if we are to be concerned about energy and water consumption. Air conditioning and lighting account for the majority of energy and water consumption in a building. Potable water is used in most cooling towers and electricity is used to drive the pump condensers and heat exchangers. Employing design trends in passive systems, such as cross and stack ventilation, use of thermal mass, narrow floor plates and access to natural light in two directions, is a method of reducing energy use.

These principles are being employed in some buildings in Australia. However, some other western world countries have advanced these ideas to a level worth exploring. Sustainability implies long-term viability.

Sustainability involves reducing the impact on our natural resources, reducing the impact on our atmosphere, earth and sea and allowing for rejuvenation. Sustainability can be applied to most areas of our life including urban development, culture and lifestyle.

"Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." [8]

The more we talk and learn about the issues, the more we have the ability for informed action. Making changes or making a difference is a collaborative activity. In commercial buildings, all disciplines must be involved: the developer, the client, the engineers, the designers or architects, the facility management and the occupants. Not one discipline can truly determine long-term change without a holistic team approach. The substantive purpose of this Fellowship will be to extend this collaborative dialogue to a wider, global level, looking at recognised and good examples of workplace design and discussing with overseas colleagues the current trends and ideas in an area that effects us all.

SWOT Analysis

Strengths

- The importance of designing buildings and internal environments to reduce Australia's overall energy consumption.
- The importance of buildings and internal environments that are designed to reduce landfill and emissions.
- The importance of environmentally sustainable buildings and the niche market which creates an increased opportunity for securing tenants and increased rent capacity.
- Continuing research and development into materials that are less harmful to humans and the environment.
- The Australian trend to reduce the overall footprint of commercial buildings in order to create higher city density.
- The importance of government legislation to set benchmarks for sustainable design, such as the five star National Australian Built Environment Rating System (NABERS) for new building energy ratings.
- The Increase in industry communication, thinking and education in sustainable building techniques and principles.
- The importance of 'green' buildings and the positive benefits to occupants' health, productivity and general wellbeing.
- The importance of industry awareness, the increase in products being certified through Good Environment Choice Australia (GECA) and the increasing numbers of GBCA and Green Star Accredited Professionals.

Weaknesses

- 'Green Wash' —the Australian market flooded with false environmentally sustainable building and aesthetic materials and equipment.
- Additional design and capital costs.
- Industry reliance on having to import materials and products that meet international best practice for environmentally sustainable building and construction.
- Australia is a relatively small market; therefore it does not have the demand and response of larger markets. For example, one carpet supplier reports that the same amount of carpet manufactured in one day in the USA equals the same amount manufactured in one year in Australia.

- The Australian market does not have the demand and response to establish recycling plants for streamlining commercial products.
- The Australian industry does not readily recognise the importance of re-use and the importance of products and materials with longevity due to cost implications.
- Lack of appropriate nationally accredited courses for high-level trades capabilities.
- Lack of encompassing a holistic approach along the supply chain.
- Lack of collaboration.
- A lack of client understanding of the costs and resources required in achieving a certified environmentally sustainable building or workplace.
- The threat of the Australian Government to withdraw funding for rebates, due to government debt and industry demand.
- Alternative energy measures are not always aesthetically pleasing and often not as efficient as mainstream energy sources.
- The intense storage requirements needed for alternative energy sources, such as wind power.
- Australian industry rejection of alternative energy sources, such as wind and solar, due to a lack of education and understanding in the area, as well as cost implications.
- Various understandings and misunderstandings of sustainability.

Opportunities

- The development of a strong Australian mainstream market for environmentally sustainable materials and alternative construction methods. This would reduce the overall material capital costs and lead time.
- The development of alternative design trends for commercial buildings and workplace environments to reduce overall footprint.
- Changes in Commonwealth and Federal Government design guidelines and accommodation requirements.
- Changes in government legislations to promote green building.
- The development of a re-use or recycled market for building materials and furniture.
- Foster a ‘whole of life’ perspective which seeks a synergy between social, environmental and economic factors.
- Introduction of continuing and further government rebates.
- The development of materials and products with longevity and a strong lifecycle analysis.

Threats

- The industry perception of the additional time and effort required to design and construct environmentally sustainable buildings and workplaces, as well as increasing building material costs and consultants fees.
- The lasting impact of the Global Financial Crisis (GFC) and economic downturn is more likely to reduce industry demand. Additional money and allocation of resources is less likely to be spent on designing and constructing an environmentally sustainable building or workplace. Banks are also less likely to lend the additional required funding.

Identifying the Skills Deficiencies

Skill deficiency in an industry is where there is a demand for labour that has not been recognised or addressed.

Environmentally sustainable design has been recognised in the Australian industry through organisations such as the Green Building Council of Australia, Good Environmental Choice Label and by the Commonwealth and Federal Government with high profile advocates, such as Peter Garrett, Minister for the Environment, Heritage and the Arts.

The Australian industry, however, has not yet completely recognised or accepted the importance of healthy commercial workplace environments and good IEQ. The Australian industry has also not addressed methods and means of achieving positive workplace environments in a cost effective manner that provides a desirable outcome for the private and government accommodation needs and guidelines.

The main skills and knowledge deficiencies in improving the IEQ through material/product selection and design include:

1. Materials

- Distinguish and analyse materials and products which produce environmentally sustainable workplace spaces.
- Identify and evaluate alternative fixing and construction techniques, and the materials and product selection for a commercial workplace environment.
- Identify and evaluate materials, such as paints and surface finishes, metals and timbers, natural and man-made fibres and flooring finishes used in commercial workplace spaces which are not detrimental to the natural environment and occupants’ health.
- Determine the effective use of materials that will maintain a commercial standard fit out and reduce the chemical output.

Aim: To gain skills and knowledge related to the appropriate selection of materials and products for constructing environmentally sustainable workplace spaces.

2. Fresh Air

- Identify the appropriate materials and products to ensure acceptable fresh air quality for commercial office buildings.
- Identify the use of various materials and products that influence the quality of fresh air in a commercial office building.
- Identify the successful design models that reduce the energy consumption of commercial buildings.
- Identify and evaluate internationally tested, effective, alternative energy sources.

Aim: To gain skills and knowledge related to identifying and selecting appropriate energy and monitoring systems and products to ensure acceptable fresh air quality.

3. Natural and Artificial Light

- Identify the key issues relating to designing lighting systems that take into account the wellbeing and productivity of those working in existing commercial environments or new builds, and the associated energy requirements.
- Identify, analyse and evaluate various materials and products, such as external glazing techniques, which can enhance the availability of natural light in a commercial workplace environment.
- Evaluate and appraise international best practice in reducing the energy consumption of lighting.

- Consider more effective light sources and/or alternative lighting models.
- Evaluate and appraise effective means of introducing natural lighting methods.

Aim: To gain skills and knowledge related to the selection and use of appropriate lighting systems and related energy sources.

3. Thermal Comfort

- Identify thermal factors which impact on the productivity of those working in commercial spaces.
- Analyse and evaluate effective design models to improve the occupants' productivity in a commercial office environment.
- Identify and evaluate international best practice of effective and tested acceptable commercial workplace temperature range.

Aim: To gain skills and knowledge related to determining appropriate thermal systems and related energy sources.

4. Design

- Distinguish and analyse the approach in the USA of design elements relating to development of successful floor plates.
- Identify and evaluate international trends of furniture, joinery design and material and production selection.
- Identify successful floor plate models that maximise space and flexibility. Identify the efficient design mobiles with maximum space and occupant fit out efficiency that still maximise natural light and external views.
- Identify the effective square metres required per person related to productivity and personal wellbeing.

Aim: To gain skills and knowledge related to understanding and using appropriate floor space dimensions related to productivity and personal wellbeing.

Why it Needs to be Addressed

Environmentally sustainable design goes further than just selecting aesthetically pleasing products and materials that are not damaging to human health or the natural environment. It goes further than designing for the most effective floor plate to maximise thermal comfort, natural light, external views and fresh air and designing for emissions and toxins reductions. It is designing to protect our natural environment for the future generations.

If we are not thinking about the environmental and health consequences of our design decisions, we are not doing our job as designers.

The International Experience

Objectives

To examine six sustainable commercial workplaces, with particular emphasis on the following factors:

Part A: Identifying materials and products being used in commercial workplaces that are detrimental to the natural environment or occupants' health, and the possible alternative sustainable materials and products.

- Chemicals
- Flooring
- Internal Partitions
- Wall Surfaces
- Work Surfaces
- Fabrics
- Ceilings

Part B: Identifying successful design models that reduce energy consumption and increase the amenity of the workplace for the occupants.

- Fresh Air
- Natural and Artificial Light
- Thermal Comfort
- Design

Part C: Description of case studies on the following building/workplaces:

- The Energy Foundation
- Autodesk
- ClimateWorks Foundation
- San Francisco Federal Building
- 901 Cherry Avenue/YouTube Corporate Headquarters
- Heifer International

The information collected will be used to assist in addressing the skills deficiencies outlined previously in this report.

The Destinations

The places visited and people who underpinned this study were as follows. Project details of each visit/case can be found in the 'Case Studies' section following 'The International Experience' section:

Destinations in San Francisco, California, USA

Case Study 1: The Energy Foundation

- David Hecht, Director, TannerHecht Architecture
  A design firm for The Energy Foundation
- Alex Spilger, Sustainability Manager, BCCI Construction Company
  A sustainable building company
- Bill Worthen, Vice President, Simon & Associates
  An expert green building consultant for The Energy Foundation

Case Study 2: Autodesk

- Gail Boettcher, Senior Manager, Global Projects
  Corporate Real Estate and Facilities for Autodesk
- Anthony Garrett, Vice President, Director of Interior Design, HOK Architects
  Design for Autodesk

Case Study 3: ClimateWorks Foundation

- Catherine Bahar and Nanci Scoular, SideMark Corporation
  Furniture/Workstation consultants for ClimateWorks Foundation.
- Adam Franch, Architect, Leddy Maytum Stacy Architects
  A design firm for ClimateWorks Foundation

Case Study 4: San Francisco Federal Building

- Kevin Powell, Director of Research, Strategic Business Planning Division
  US General Services Administration (GSA)
  Government client for the San Francisco Federal Building.

Case Study 5: 901 Cherry Avenue/YouTube Corporate Headquarters

- Vanessa Eng, Designer, William McDonough + Partners
  Design firm for 901 Cherry Avenue building
- Anthony Ravitz, Real Estate and Workplace Services, Google Corporation
  Client for the YouTube Corporate Headquarters.

Destination in Little Rock, Arkansas, USA

Case Study 6: Heifer International

- Reese Rowland, Principal, and Ed Sergeant, Architect, Polk Stanley Wilcox Architects
  Design firm for Heifer International.

Further Information

Material Research

- Jean Hansen, Sustainable Interiors Manager, HDR Architecture, San Francisco
- Jan D Stensland, Founding Principal, Inside Matters, San Francisco

Workplace Strategies

- Bryant Rice, Strategic Consultant, DEGW Architects, San Francisco

Part A: Materials and Products

Introduction

The case studies resulting from these visits demonstrated a shift in thinking about how a building is finished or fitted out. The trend now is to use the building structure as the finish. This is in contrast to the conventional method of lining the building structure with finishes like plasterboard, timber, or ceiling tiles.

The mantra becoming more and more popular is ‘less is more’. The consequences of this trend are that less materials are being used in building fit outs, therefore the building structure is required to be completed to a much higher level of finish. This results in the finish to a commercial workplace becoming raw and including less refined and potentially toxic finishing linings.

Organisations such as the Healthy Building Network and the International Living Building Challenge have noted that despite this trend, a range of toxic chemicals are still being used in the design of commercial workplaces.

Chemicals That Should be Avoided in Workplace Design

Chlorinated Plastics

Through the manufacture and disposal of chlorinated plastic products, the chlorine content has the potential to produce dioxins.

“Dioxins are an unavoidable by-product of the manufacture, combustion, and disposal of materials containing chorine, which can create dioxins both when the product is manufactured and when they burn in structural fires or at the end of their useful life in incinerators or landfill fires. Dioxins include some of the most potent carcinogens known to humankind. One of the most toxic of these dioxin compounds is not only a carcinogen, but also a reproductive and developmental toxicant and alters the immune and endocrine system.” [9]

- Polyvinyl chlorides (PVC) commonly know as vinyl. The building industry is responsible for more than 75% of manufactured PVC used[10].
- Phthalates are used to soften PVC for interior applications such as wallpaper and flooring. Phthalates do not permanently bind to PVC and can become air borne and therefore absorbed by building occupants. Phthalates are known as reproductive and development toxicants and can cause respiratory problems such as asthma[11].
- Chlorinated Polyethylene and Chlorosulfonated Polyethylene are the plastics used to make geomembranes, wire and cabling jacketing, roof membranes and electrical connectors.
- Chlorinated polyvinyl chloride (CPVC), PVC with extra chorine added, used to make pipes.
- Chloroprene, also known as Neoprene, is used in geomembranes, weather stripping, expansion joint filler, water sealers, and other gaskets and adhesives.

Formaldehyde

Formaldehyde is a chemical compound, which is a colourless flammable gas and is used in a number of building products. Formaldehyde is a known carcinogen and is also known to trigger asthma in sensitive people and cause eye, nose and respiratory irritations[12].

Formaldehyde can be found in many building products but with different levels of off gases. Formaldehyde is found in a number of forms and can also occur naturally in small amounts in humans, some building materials, such as wood and paper, and other organisms, such as bananas. Therefore the market tends to use the term No added Formaldehyde and avoids the term Formaldehyde free.

The industry recognises the health concerns using urea formaldehyde. Phenol formaldehyde is often used as a replacement to urea formaldehyde, although still presents a number of health concerns.

Ideally, materials and products used in workplace environments should not include any of the formaldehydes noted below[13].

- Urea Formaldehyde: is used as a binder in composite wood products, including particleboard, MDF and plywood, and can also be found in carpet[12].

- Phenol Formaldehyde: is often used as a binder in fibreglass batt insulation, water-resistant composite wood products and can also be found in paper-based bench top finishes[12].
- Melamine Formaldehyde (Resin): is found in laminates, glues and fabrics and can be used as an alternative to urea formaldehyde and phenol formaldehyde for composite wood products[12].
- Methylene diphenyl diisocyanate: is often used as a binder in composite wood products and found in the production of polyurethane[12].

Halogenated Flame Retardants

The most common flame retardant used in the USA is Halogenated Flame Retardant. This is a highly toxic-based chemical compound that is showing up in alarming levels in humans, particularly in mother's breast milk.

Stringent fire regulations necessitate the adding of Halogenated Flame Retardants to petrochemical-based plastics and synthetic materials to reduce flammability.

These chemicals are often applied either to a finished product/material or through the manufacturing process. For example, in the production of fabrics, flame retardant chemicals can be either added to the finished cloth product/piece or can be added to the individual fibres through the production process.

Both processes cause health concerns, although chemicals added to the finished cloth are of greater concern because they can separate from the cloth and be absorbed by our largest organ, the skin.

Lead and Mercury

For a number of years now, lead and mercury have been identified as highly toxic neurotoxicants that are potentially damaging to brain development.

Mercury is still found in most fluorescent light fixtures, light switches and thermostats.

Bisphenol A (BPA)

BPA is found in a number of building materials, including high performance coatings, such as paints, floor sealers, and other protective coatings and adhesives and fillers, such as caulk, grout, mortar and putty. BPA is also found in baby bottles and feeding equipment, and in food can liners and water bottles made from polycarbonate plastics.

BPA has been linked with prostate and breast cancers. It has a long life span and often lives in fatty tissues, such as breast tissue, presenting added concerns for mothers when breast feeding infants[14]. BPA has also been identified as a chemical with no safe exposure levels[15].

Cadmium

Cadmium is a possible human carcinogen and is found in a range of interior and exterior paints.

Flooring Products and Materials That Should be Avoided in Workplace Design

Vinyl Flooring

The universal agreement amongst all those met on case study visits was that the material to be most avoided in commercial office environments is vinyl.

Vinyl is a major dioxin source and there are no safe levels of exposure to dioxin. Dioxin is the most potent synthetic carcinogen ever tested in laboratory animals and is a known human carcinogen[16].

Carpet Tiles or Broadloom with PVC Backing or Antimicrobials

Carpet tiles were still the most commonly used floor finish in the case studies visited. The carpet tiles were commonly offset with an exposed concrete floor to the reception/breakout and circulation areas.

Antimicrobials can be added to carpet, as well as many other building materials to prevent the growth of bacteria. This treatment can be marketed as a 'green' incentive. Antimicrobials have their purpose in the marketplace, although with the overuse of this technology, humans are becoming resistant to antibiotics causing greater health concerns.

Carpet Adhesives that Contain VOCs and Formaldehyde

Alternative fixings methods to adhesives are available on the market including TacTiles by InterfaceFLOR and also stud fixings.

Alternative Sustainable Flooring Products and Materials for Workplace Design

- Exposed raw building materials such as polished concrete.
- Exposed raw building products such as raised access floor with a wax finish.
- FSC certified timber flooring (salvaged from the construction site).
- Locally sourced stone.
- Cork and Bamboo flooring.

Internal Partition Products and Materials That Should be Avoided in Workplace Design

Plasterboard with Added Formaldehyde

Dry wall construction is still the most commonly used wall type in workplace design. Some commercial plasterboard products can contain added formaldehyde.

Fibreglass Insulation

Fibreglass insulation is the most readily used interior insulation in the current Australian market. Phenol Formaldehyde, a known carcinogenic, is commonly used as the binder to glue the fibreglass fibres together in fibreglass batt insulation. Phenol Formaldehyde is a chemical that needs to be avoided in workplace design.

Alternative Sustainable Internal Partition Products and Materials for Workplace Design

Fibreglass Insulation with No Added Formaldehyde

A limited number of suppliers can manufacture fibreglass insulation without any added formaldehyde.

Demountable Partitions

Demountable partitions should be the preferred option for sustainable design because of the advantages they offer in workplace flexibility and the reduction of waste to landfill. Because of their cost and poor aesthetic appeal, they are not commonly specified.

In recent years, however, as demountable partitions are becoming both more aesthetically pleasing as well as more cost neutral with dry wall construction, they are being regarded as a viable option. The most popular demountable partition used in the case studies was a product from Dirtt Environmental Solutions <www.dirtt.net>.

Plasterboard with Recycled Content

Some of the case studies visited used plasterboard with recycled content and partially recycled internal steel studs.

Alternative Internal Insulation Derived from Natural Materials

Products derived from soybean, cotton or recycled denim.

Wall Surface Products and Materials That Should be Avoided in Workplace Design

Paints that Contain BPA, Cadmium and VOCs

Paint is one of the most commonly applied surface finishes in workplace design and is a material which can host a number of toxic chemicals.

Toxic VOCs are commonly found in the solvent, which is a liquid that helps bind the pigment to the paint and helps the paint to be applied smoothly to the wall. VOCs are also found in the pigment which colours/tints the paint.

PVC Decorative Wallpaper

Derived from PVC, a human carcinogen.

PVC Film Applied to Internal Glazing

Derived from PVC, a human carcinogen.

Alternatives Sustainable Wall Surface Products and Materials for Workplace Design

- Paints with a vegetable based pigment/tint and paints with no added solvent.
- Low VOC paint with low VOC pigment.
- Exposed raw building materials that do not need to be painted, such as structural steel and solid timber internal and external window frames.

Work Surface Products and Materials that should be avoided in Workplace Design

Laminate or Melamine Surface Finishes

Laminate and melamine finishes dominate the Australian and American industry. Laminate is less than ideal as the primary surface finish in a commercial workplace environment.

Plastic laminate and substrate can host a spectrum of formaldehydes, and is a product that is less likely to be recycled or re-used at the end of its life span.

Surface-applied finishes derived from plastics and petrochemicals, such as two-pac polyurethane are not a desirable product selection when designing for a positive IEQ.

Alternative Sustainable Work Surface Products and Materials for Workplace Design

There are a number of alternative materials becoming available in the American market. Some materials seem to be a promising alternative to laminate, although a more detailed analysis by the industry would need to be undertaken. Some of there alternatives are:

- Linoleum with acrylic or self edging.
- Paperstone: a solid core product derived from recycled paper (no edging required).
- EcoTop: a solid core product derived from recycled paper and bamboo (no edging required).
- FSC certified timber veneer.
- Coloured E0 MDF (no edging required).
- Powder coated E0 MDF.

Fabric Products and Materials That Should be Avoided in Workplace Design

Man-made Fabrics Derived from Plastic-Based Materials (Such as Soft Drink/Water Bottles)

Upholstered surfaces make up only a small percentage of materials used in an environmentally sustainable workplace. Fabric is a material worth specifying correctly as it is often against our largest organ, the skin.

Man-made fibres are often derived from petrochemical-based materials, which can be a highly toxic process when the gas or oil is refined to produce the plastic-based materials. Man-made upholstery can be made from recycled bottles or plastic products, which also contain an array of toxic chemicals including PVC and BPA, which are not suitable to be placed against human skin.

Synthetic man-made fibres also require added toxic flame retardants to counteract the petrochemical properties of the fabric.

Alternative Sustainable Fabric Products and Materials for Workplace Design

Fabrics Derived from Natural Materials, Such as Wool, Cotton, Silk and Bamboo

Fabrics were originally sourced using three natural fibres, wool, cotton and silk. Wool-based upholstery is available in the Australian market, its advantages are that it has natural flame resistance, can absorb airborne emissions and is less likely to remit primary or secondary emissions. The disadvantages include wool's roughness on the skin and its shrinking properties.

Ceiling Products and Materials That Should be Avoided in Workplace Design

Fibre Ceiling Tiles with Added Formaldehyde

Fibre ceiling tiles are still the most popular surface finish in a commercial office environment. These tiles can absorb primary emissions and remit secondary emissions that are harmful to those exposed to them.

Alternative Sustainable Ceiling Products and Materials for Workplace Design

Expose the Raw Building Material and Limit the Use of Ceiling Materials to Working Areas Only

A typical design feature used within the case studies was exposing the raw building material as the finished ceiling surface and minimising the ceiling services with a raised access floor. This design feature not only allows for the reduction of materials, but also increases the opportunity for lighting enhancements, such as light shelves, direct/indirect artificial light sources, and positive cross ventilation opportunities.

Mineral Wool Fibre Ceiling Tiles

A product made from recycled mineral wool and newspaper print and can contain between 20–85% recycled content.

FSC-Certified Timber Panels

Reconstructed timber veneer panels certified the Forest Stewardship Council (FSC).

Perlite

Perlite is a substrate material made from ceramic clay and a liquid glass binder. Ceiling products with a high content of perlite are less likely to absorb emissions and remit secondary emissions.

Aspen Wood Fibres

A ceiling tile product made from aspen wood fibres in an inorganic hydraulic clement binder is biodegradable. This product does not have as high acoustic properties as a fibre ceiling tile.

Perforated Metal Ceiling Tiles

Perforated metal ceiling panels can be used for acoustical applications, designs, stairwells, and more.

Part B: Energy Consumption and Workplace Amenity – Fresh Air

Introduction

At least three of the buildings visited demonstrated versatility in their use of natural ventilation.

The San Francisco Federal Building, an 18-floor commercial government building, was impressive with its use of natural ventilation through a three-phase ventilation system from the sixth floor (due to building security measures).

The ClimateWorks Foundation housed in a multi tenanted heritage/landmark building used a mixed mode ventilation system, with the use of ceiling fans to aid with the internal air movement.

The 901 Cherry Avenue/YouTube Corporate Headquarters building also incorporated a mixed mode ventilation system of natural cross ventilation, and an underfloor air distribution system both designed to operate simultaneously.

Natural Ventilation Systems: Successful Applications

Operable Windows

A mix mode ventilation system was the preferred method used in these case study buildings, with a combination of natural ventilation via operable windows and an underfloor air distribution system.

Ceiling Fans

The use of ceiling fans in enclosed offices and operable internal windows above office doors was used in the ClimateWorks Foundation workplace.

Curved Ceiling

A curved ceiling can enhance cross ventilation, a method successfully integrated into the San Francisco Federal Building.

Natural Ventilation Systems: Limitations

100% Naturally Ventilated Buildings

100% naturally ventilated buildings are hard to achieve in most Australian climates. Dust, flies, noise, building security and temperature extremes are all issues to be resolved.

Direct Air Flow to the Occupants' Working Surfaces

A simple solution to this issue demonstrated in a number of case studies was a metal bracket fixed to the lower windowsill. This would direct the airflow upwards away from the seated occupants and working surface.

Mechanical Ventilation Systems – Successful Applications

Underfloor Air Distribution System

A feature in a number of the case study buildings was the use of a raised access floor, with an underfloor air distribution system. An underfloor air distribution system benefits the IEQ in two primary ways:

First, the system reduces the overall energy consumption by controlling the room temperature from floor level to the occupants' standing height.

Second, designing for an underfloor air distribution system allows a greater opportunity to expose the finished ceiling, creating a sense of volume and space within a workplace and increasing the opportunities for daylight enhancement techniques such as light shelves.

Mechanical Ventilation Systems – Limitations

Additional Cost

Underfloor air distribution systems will incur additional costs over the traditional ventilation systems. A slab-to-slab height of approximately four meters is required for the successful installation of a raised access floor.

Part B: Energy Consumption and Workplace Amenity – Natural and Artificial Light

Introduction

Natural and artificial lighting techniques demonstrated in the case studies were of an equal standard to Australia's current best practice. The use of daylight control sensors, occupant sensors and zoned lighting techniques could be seen in each of the case studies.

Natural Light – Successful Applications

Light Shelves

Internal and/or external light shelves are often used to enhance access to daylight in commercial workplaces. This technique was used in the Heifer International Building.

Reflective Materials

Reflective surface finishes can be used to enhance daylight penetration within the workplace. The Energy Foundation painted all exposed concrete ceilings with a vibrant white to encourage a deeper reflection of daylight into the workplace environment.

Heifer International exposed the construction steel decking, a reflective material, as the finished ceiling. This technique in conjunction with internal and external light shelves successfully enhanced the natural lighting levels in the workplace environment.

Artificial Light – Successful Applications

Direct/Indirect Lighting

Direct/indirect lighting, using light fittings combining an upward and downward light source was used in most of the case studies. The use of direct/indirect lighting is reported to be the preferable lighting technique in a commercial workplace environment, reducing glare on computer screens and producing an evenly diffused light level.

Task Lighting

The reduction of overhead lighting levels with the use of desk task lighting was featured in a number of the case studies. The ClimateWorks Foundation was particularly impressive, with the introduction of occupant sensor LED task lights.

Part B: Energy Consumption and Workplace Amenity – Thermal Comfort

Introduction

The case study buildings all used building mass as a means of managing climate control. Some of the fit outs visited were housed in heritage/landmark buildings built with solid materials such as stone and concrete. Other fit outs were housed in recently constructed buildings, like the 901 Cherry/YouTube Corporate Headquarters, which featured a grass roof over a two story building, and the San Francisco Federal Building, which was constructed primarily from concrete.

Individual comfort is a very important factor in building design. The introduction of natural ventilation, with the ability to open a window or turn up and down the heating/cooling system, can also provide the user with a sense of control.

Thermal Materials – Successful Applications

Grass Roof

901 Cherry, designed by William McDonough + Partners featured a grass roof for its thermal and acoustic properties. The building was designed as a two story building to enhance the grass roof thermal properties.

Concrete

Concrete is a material with high thermal mass. Concrete can be mixed with fly ash, which can increase the recycled content in the material and reduce weight.

Thermal Glass

The selection of the external perimeter glass can impact the thermal comfort within a space. Heifer International featured a double glazed facade, using glass with an 86% recycled content and argon gas between glass panels to enhance the buildings thermal capabilities. 901 Cherry/YouTube Corporate Headquarters featured E glass, a single glazed thermal insulated glass product.

Thermal Materials – Limitations

Grass Roof

Green roofs are best suited to areas where there is a reasonable rainfall and a climate with lower variations in temperature between day and night. Canberra has periods of extended low rainfall and a very high diurnal temperature range.

Structures are prone to expand and contract and waterproof membranes are prone to fail.

Also, water irrigation will be required to maintain the green roofs during periods of low rainfall. This will put a strain on any stormwater retention system.

Insulation of roofs can be easily achieved through more conventional means.

Fly Ash

When using concrete, fly ash can be a contaminant and should be avoided in workplace and building design.

Individual Thermal Comfort – Successful Applications

Building Control

Google offices throughout the world employ a simple yet effective technique of allowing the building occupants a sense of control when heating and cooling the building. Occupants have an option to push ‘Hotter’ or ‘Colder’ on the centralised thermostats, which will either heat or cool their work area and not affect the overall heating/cooling of the building.

Desktop Control

Autodesk provide desktop individual comfort control systems to over 50% of their occupants. The individual desktop system by Hayworth will either blow warm or cool air.

Part B: Energy Consumption and Workplace Amenity – Design

Introduction

William McDonough + Partners encapsulated design with their words:

“Imagine if buildings were alive. What if our homes and workplaces were like trees, living organisms participating productively in their surroundings? Imagine a building, enmeshed in the landscape that harvests the energy of the sun, sequesters carbon, and makes oxygen. Imagine on-site wetlands and botanical gardens recovering nutrients from circulating water. Fresh air, flowering plants, and daylight everywhere. Beauty and comfort for every inhabitant. A roof covered in soil and sedum to absorb the falling rain. Birds nesting and feeding in the buildings verdant footprint. In short, a life-support system in harmony with energy flows, human souls, and other living things…

…This is not science fiction. Buildings like trees, though few in number, already exist.”

A building designed like trees is how the industry is responding to the pressing environment challenge. The USA has introduced a new rating system named The Living Building Challenge. This rating system challenges us to design a building like a tree, creating a healthy non-toxic environment: a challenge that exceeds the USA Green Building Platinum LEED certification (equivalent to GBCA, 6 Star Green Star certification).

Floor Plate Design

Narrow Floor Plate

Narrow floor plates (approximately 13 metres to 16 metres) are common practice in Northern Europe. A narrow floor plate allows for maximum exposure to natural light, provides positive design options for a limited number of enclosed offices at the window line, and enhances opportunities for cross ventilation. It also provides an option for limited or no internal structure, in order to maximise workplace flexibility.

Narrow floor plates have a potentially higher construction cost and create long walking distances, therefore, discouraging the sense of community in a workplace. They can also limit design options for workplace planning.

Medium Floor Plate

Medium floor (approximately 25 metres) plates are common practice in parts of Australia. Medium floor plates allow good daylight access to approximately two thirds of the floor plate, allow for a variety of community working styles, such as central meeting hubs and breakout areas and enhance opportunities for planning flexibility and workplace churn.

Medium floor plates limit ‘build zones’ to the centre of the floor plate with limited access to daylight and external views, and the office designs are often dictated by the column grid.

Large Floor Plate

Large floor plates (exceeding 30 metres) without a central atrium are not the preferred design option for an environmentally sustainable commercial building. Large floor plates without a central atrium allow maximum accommodation opportunities and they give limited access to daylight and external views, which can create dark and unsuitable environments for current workplace standards.

In conclusion, a positive sustainable design solution can be sought using either a narrow or medium floor plate.

Sustainable Building Design Features

Community

The San Francisco Federal Building, an 18-floor commercial USA Government building, incorporates two design features that support the sense of community and connectivity within the workplace.

First, a central Sky Garden is located on the 11th floor, providing an open air, three-floor volume space that is accessible for both building occupants and the public.

Second, the intelligent use of elevators and circulation stairs. The elevator stops intermittently at every third floor, with the use of circulation stairs between floors. This allows occupants to still meet between office floors and also provides nice opportunities for formal and informal meeting areas in the void of the elevator lobbies.

Building Bones

A design feature that serves as a motto for most international sustainable design architects, such as Ken Yang, Rodney Moss and William McDonough, is to maintain the ‘bones’ of the building on the external face. This allows flexibility in the workplace by providing open floor space, free of building cores.

Another design feature popular with sustainable design architects is to link natural sustainable properties, such as green roofs, thermal mass and operable windows with technical sustainable properties, such as sun solar panels, wind power.

Sustainable Workplace Design Features

Energy Efficient Workstation

Commercial buildings are like large engines. The building occupants put large demands on the supply of energy for provisions such as air conditioning, lighting and information technology.

The BCCI Construction Company introduced a clever energy saving technique into their commercial fit outs. Building occupants are known for their forgetfulness to turn off computers, monitors, printers and other work point electronic and electrical hardware. A clever solution is to have the workstation linked to a user sensor, which will automatically turn off all electrical hardware devices after a set period of time.

Workstation Flexibility

Wireless technology has transformed the way we can work within the office environment. We are no longer pinned to our workstations. Breakout spaces, cafes and even external spaces can become alternative environments for working effectively and comfortably.

Part C: Case Studies Based on Visits Made

Introduction

The case studies included on the following pages demonstrate a trend to use sustainable alternative materials and products, and building and design techniques mentioned previously in this report.

It is the Fellow’s belief that some of the case studies are excellent examples of what can be done, while other case studies still highlight limitations of sustainable design. These case studies give an indication to all interested parties as to what may well become the building requirements of the future.

Case Study Catalogue

- The Energy Foundation
- Autodesk
- ClimateWorks Foundation
- San Francisco Federal Building
- 901 Cherry Avenue/YouTube Corporate Headquarters
- Heifer International

The Case Studies

CASE STUDY 01

BUILDING NAME:
The Energy Foundation

BUILDING ADDRESS:
301 Battery Street, San Francisco

PROJECT TEAM

CLIENT
The Energy Foundation
PROJECT MANAGER
Terrasset Management Group
ARCHITECT
Tannerhecht Architecture
ENGINEER
CB Engineers
SUSTAINABLE CONSULTANT
Simon & Associates
CONSTRUCTION MANAGER / BUILDER
BCCI Constructions


Reception lounge

BUILDING INFORMATION

COMPLETION DATE:
2007.
BUILDING SIZE:
17,600 Sqft / Approx 1,635 Sqm.
SQM / SQFT PER PERSON:
24 Sqm per person.
FLOOR PLATE WIDTH:
Approx 60 Feet / Approx 18 Meters.
FLOOR TO FLOOR HEIGHT:
Approx 14 Feet / Approx 4.7 Meters.
FLOOR TO FINISHED CEILING HEIGHT:
Ceiling height varies throughout workplace with suspended acoustic ceiling panels and exposed services.
BUILDING ORIENTATION:
North south axis.
CONSTRUCTION TYPE:
Steel framed structure.

BUILDING SITE

SITE CONSTRAINTS:
Heritage / Landmark, multi-tenanted building.
URBAN / CULTURAL INFLUENCES:
The Bently Reserve Building, built in the early 1850's is in the heart of San Francisco's financial district.

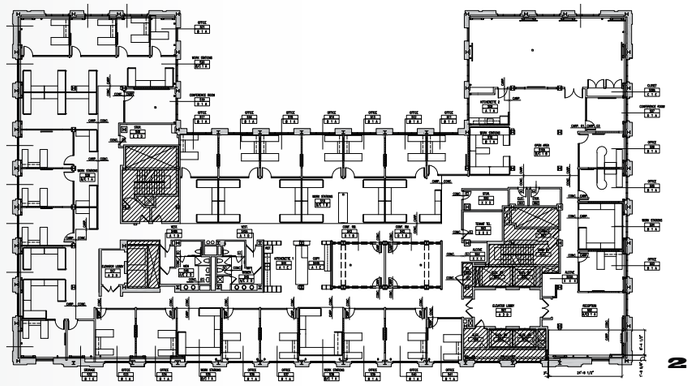
The building was chosen by The Energy Foundation for it's unique historic interior and exterior charter and the base building sustainable design attributes.

The fit out design architect, David Hecht adopted the design philosophy of "Don't Hide the Bones". Hecht designed a remarkable space which respects the heritage base building, contrasting new materials with the existing rustic steel, exposed brick and concrete textures.

The design features the base building exposed perimeter brick work, concrete ceilings and walls. This design decision reduced the labour and energy resources involved in the manufacture of materials, as well as, overall building material maintenance.

The base building and fit out have each achieved a LEED Platinum Certification, equilivent to GBCA 6 Star Green Star.

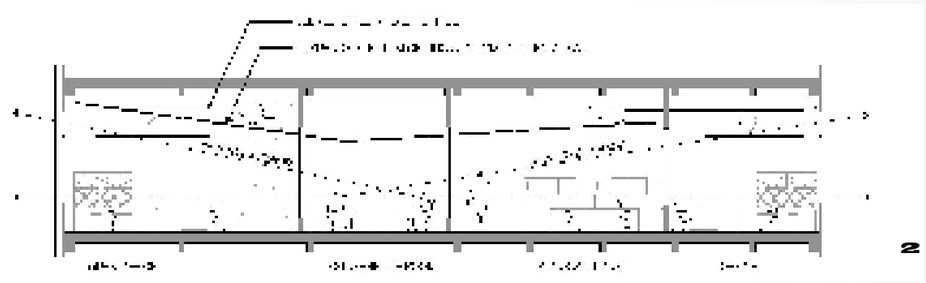

Image showing exposed structure service ducts and concrete floor


Floor plan

INTERNAL MATERIALS

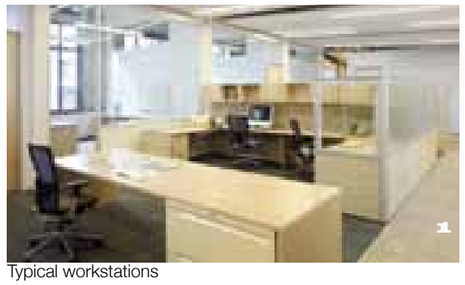
SURFACE FLOOR AND SUBSTRATE FINISH TO:
WORKPLACE:
Carpet tiles made with partially recycled content, backing made from 100% recycled content and an end of life take back scheme.
FOYERS:
Foyer & Reception area: Exposed polished concrete and carpet tiles made with partially recycled content, backing made from 100% recycle content and end of life take back scheme.
COMMON AREAS:
Breakout Area / Tea Point: Exposed polished concrete.
CIRCULATION:
Exposed polished concrete.

INTERNAL WALL SURFACE AND SUBSTRATE FINISH TO:
DRY WALL PARTITIONS:
Plasterboard partitions with recycled content and low VOC glues. Internal steel wall studs made with recycled content. Internal acoustic insulation made from recycled denim.
OTHER:
Base building brick work, exposed and untreated.
CEILING SURFACE AND SUBSTRATE FINISH TO:
ACOUSTIC CEILINGS:
Ceiling panels, suspended on an angle made from FSC certified thin wood strands of aspen (wood excelsior). Ceiling panels are biodegradable and wood fibres are bound with inorganic hydraulic cement.
The ceiling product contain no VOC's, no toxic binders and no added formaldehyde.
OTHER:
Offices: Exposed concrete slab painted vibrant white to reflect natural daylight.



Typical section

WORK POINTS
BENCHTOP SURFACE AND SUBSTRATE FINISH:
90 degree workstation, bench top made with EO MDF and applied FSC certified timber veneer.
WORKSTATION SCREEN SURFACE AND SUBSTRATE FINISH:
Workstation panels made with E0 MDF with applied FSC certified timber veneer. Glazed workstation panels above desk height to enhance access to daylight and external views.
TASK CHAIR UPHOLSTERY COMPOSITION:
Typical upholstery used throughout fit out, made from manmade recycled content.



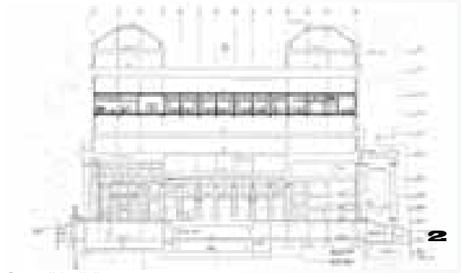
Typical workstations

JOINERY
JOINERY SURFACE AND SUBSTRATE FINISH:
Joinery surface and substrate finishes used throughout fit out includes;
1. Appleply, a high quality substrate finish.
Appleply was used throughout The Energy Foundation fit out as the surface finish material. This reduced the overall amount of materials used in the project.
2.The 26 person conference table was made from recycled salvaged solid timber and five decommissioned photovoltaics. The table was designed to represent The Energy Foundation's body of work.
3.Industrial zinc with no additional substrate was used in the tea point and breakout area.
FIXINGS:
Traditional joinery fixing methods, using low VOC adhesives.

Break out area and tea point

EXTERNAL MATERIALS

EXTERNAL GLAZING:
The external glazing is part of heritage building. Glass type equivalent to starfire glass (clear glass) and operable windows to all enclosed offices on building perimeter.


Overall building form

NATURAL AND ARTIFICIAL LIGHT

OVERHEAD LIGHTING SYSTEM:
The space utilizes a state of the art lighting system that uses high efficacy fluorescent lamps with dimmable electronic ballasts connected to a daylight harvesting system. Each individual light ballast can be controlled by the building management system.

From August 2008 through to January 2009, the artificial light output was 33% with a maximum of 64.4% output and a low of 13.5%. This has represented a significant energy saving for The Energy Foundation and successful outcome from the daylight harvesting system.

ZONED LIGHTING CONTROL:
Yes.

MOVEMENT SENSOR LIGHTING CONTROL:
Yes.

DAYLIGHT SENSOR LIGHTING SYSTEM CONTROL:
Yes.

INTERNAL LIGHT SHELVES:
No.

Alternative daylight enhancement methods used, including suspended angled ceiling panels and an exposed concrete ceiling painted vibrant white to enhance daylight reflectivity.

EXTERNAL LIGHT SHELVES:
No.

OTHER:
Co2 sensors are located in all meeting rooms which automatically increase the air flow when required.

WORKSTATION LIGHTING SYSTEM
Task lighting incorporated into workstation joinery.

AIR AND SERVICES

ACTIVE
TYPE OF VENTILATION SYSTEM USED:
The fit out utilizes the base building heating, ventilation and air conditioning (HVAC) system. This system operates using low air velocity and a chilled water system.

Thermally powered air diffuser or Thermafusers (www.acutherm.com) are used throughout the space. This reduces the buildings energy requirements by providing the exact air flow required for each office or workstation zone. Individual thermostats are provided in all enclosed offices, enclosed / semi closed spaces and workstation zones which allows the system to provide optimal individual thermal comfort.

The Bently Reserve Building and The Energy Foundation also participate in an energy savings scheme for San Francisco by reducing the building energy consumption on request, therefore reducing the energy demand on the grid.

FLOOR VENTS:
No.

CEILING VENTS:
Yes.

PERCENTAGE OF FRESH AIR USED IN VENTILATION SYSTEM:
HVAC can be set to use 100% outside air depending the outdoor ambient temperature.

PASSIVE
TYPE OF VENTILATION SYSTEM USED:
Operable external windows.

CROSS VENTILATION:
No.

FACADE
DOUBLE:
No.

SINGLE:
Yes.

EXTERNAL SHADES:
No.

USE OF ALTERNATIVE ENERGY SOURCES:
100% purchased green power.

SERVICES

RAISED ACCESS FLOOR:
No.
CABLE RETICULATION THROUGH ACCESS FLOOR:
No.
CABLE RETICULATION THROUGH UNDERSIDE OF OVERHEAD SLAB:
Cable reticulation to underside of slab. Visible with exposed ceiling.

THERMAL AND INDIVIDUAL COMFORT

INTERNAL TEMPERATURE
ACCEPTED MIN:
21 degrees.
ACCEPTED MAX:
24 degrees.
ACOUSTIC TREATMENT TO WORKPLACE:
Carpet tiles to offices and work areas, acoustic ceiling tiles and cotton acoustic wall panels to enclosed office and workstation areas as required.
ACOUSTIC TREATMENT TO SHARED / CIRCULATION AREA:
Acoustic ceiling panels and carpet tiles to select areas.
INTERNAL WINDOW TREATMENT:
Manual roller blinds to building perimeter and automatic roller / block out blinds to conference room.
To enhance daylight availability to workstation areas, there are no internal window treatment or applied film to enclosed offices on perimeter window line.
INDIVIDUAL AIR AND TEMPERATURE CONTROL:
Co2 sensors are located in all meeting rooms which will automatically adjust the air flow to allow additional fresh air.
MATERIALS USED TO ENHANCE THERMAL MASS:
Base building core materials optimised to enhance thermal mass.

CASE STUDY 02

BUILDING NAME:
Autodesk

BUILDING ADDRESS:
One Market Street, San Francisco

PROJECT TEAM

CLIENT
Autodesk
ARCHITECT
HOK

BUILDING INFORMATION

COMPLETION DATE:
August 2008.
BUILDING SIZE:
25,000 Sqft / Approx 2,320 Sqm.
SQM / SQFT PER PERSON:
Approx 17 Sqm per person.
FLOOR PLATE WIDTH:
Approx 64 Meters.
FLOOR PLATE LENGTH:
Approx 84 Meters.
FLOOR TO FLOOR HEIGHT:
Approx 4.6 Meters.
FLOOR TO FINISHED CEILING HEIGHT:
Height Varies - 2.7 Meters to 4.6 Meters.
COLUMN GRID (OFFICE):
Column grid varies - 4.9 Meters to 6.7 Meters.
BUILDING ORIENTATION:
South west axis.
CONSTRUCTION TYPE:
Brick construction.

Street view

BUILDING SITE

SITE CONSTRAINTS:

Heritage / Landmark, multi - tenanted building with fixed building constraints within the internal building envelope.

Autodesk is located on level two, the floor plate is anchored to the central building atrium, which has been closed off by the base building. Thereforee there is limited access to daylight, with the tea point / breakout area
and a select few meeting rooms having no natural daylight or external views.

URBAN / CULTURAL INFLUENCES:

The Autodesk office and gallery is located at One Market Street, San Francisco, an iconic heritage building located in the heart of San Francisco.

Autodesk, One Market, showcases a new gallery and office space which has achieved a LEED Platinum Certification, equivalent to GBCA, 6 Star Green Star.

The Autodesk fit out touches the heritage / landmark building envelope lightly with a sophisticated colour palette of whites, off set with earth toned colours.

Street view

INTERNAL MATERIALS

SURFACE FLOOR AND SUBSTRATE FINISH TO:
WORKPLACE:

Carpet tiles, sourced locally with partially recycled content.

RECEPTION:

Exposed polished concrete.

COMMON AREAS:

Breakout Area / Tea Point: Exposed polished concrete.

CIRCULATION:

Carpet tiles, sources locally with partially recycled content.

INTERNAL WALL SURFACE AND SUBSTRATE FINISH TO:
DEMOUNTABLE PARTITIONS:

Glazed demountable partition to meeting and office fronts. Demountable partition by Dirrt Environmental Solutions.

DRY WALL PARTITIONS:

Slab to slab plasterboard partitions with partially recycled content and low VOC Paint.

OTHER:

Exposed internal brickwork to building envelope with no treatment.

CEILING SURFACE AND SUBSTRATE FINISH TO:
WORKPLACE ACOUSTIC CEILINGS:

Acoustic fibre ceiling tiles with partially recycled content and no added formaldehyde.

RECEPTION:

Fabric wrapped ceiling boxes at various heights.

WORK POINTS
BENCHTOP SURFACE AND SUBSTRATE FINISH:

Workstation system by Haworth. System contains 40% recycled content with a FSC certified EO MDF bench top with applied laminate and low VOC glues.

WORKSTATION SCREEN SURFACE AND SUBSTRATE FINISH:

Fabric wrapped workstation panels with 100% recycled polyester upholstery.

TASK CHAIR UPHOLSTERY COMPOSITION:

Typical upholstery used throughout fit out made from 100% recycled polyester.

Break Out and Tea Point area

Meeting room

JOINERY
JOINERY SURFACE AND SUBSTRATE FINISH:
Joinery surface and substrate finishes used throughout fit out includes;
1. Stone bench tops with 90% recycled content using a FSC certified E0 MDF substrate.
2. FSC certified E0 MDF with applied FSC certified timber veneer.
3. Locally salvaged solid timber, used as the break out area bench top.
FIXINGS:
Traditional joinery fixing methods, using low VOC adhesives.


Workstations

EXTERNAL MATERIALS

GLAZING
EXTERNAL GLAZING:
The external glazing is part of the heritage building. External windows operable to gallery but not the workplace areas.

NATURAL AND ARTIFICIAL LIGHT

OVERHEAD LIGHTING SYSTEM:
T5 lighting system with direct / indirect light source.
ZONED LIGHTING CONTROL:
Yes.
MOVEMENT SENSOR LIGHTING CONTROL:
Yes.
DAYLIGHT SENSOR LIGHTING SYSTEM CONTROL:
Yes.
INTERNAL LIGHT SHELVES:
No.
EXTERNAL LIGHT SHELVES:
No.
WORKSTATION LIGHTING SYSTEM
Task lights to workstations.


External facade and meeting room

AIR AND SERVICES

ACTIVE
TYPE OF VENTILATION SYSTEM USED:
Traditional VAV system.
FLOOR VENTS:
No.
CEILING VENTS:
Yes.
PERCENTAGE OF FRESH AIR USED IN VENTILATION SYSTEM:
93% outside air.

PASSIVE
CROSS VENTILATION:
No.

FACADE
DOUBLE:
No.
SINGLE:
Yes.
EXTERNAL SHADES:
No.

USE OF ALTERNATIVE ENERGY SOURCES:
100% purchased green power.


Internal offices and meeting rooms

SERVICES

RAISED ACCESS FLOOR:
No.
CABLE RETICULATION THROUGH ACCESS FLOOR:
No.
CABLE RETICULATION THROUGH UNDERSIDE OF OVERHEAD SLAB:
Yes.

THERMAL AND INDIVIDUAL COMFORT

ACOUSTIC TREATMENT TO WORKPLACE:
Carpet tiles, fabric wrapped workstation panels and white noise to open workplan.
Carpet tiles, acoustic ceiling tiles and slab to slab plasterboard partition construction to offices and meeting rooms.
ACOUSTIC TREATMENT TO SHARED / CIRCULATION AREA:
Carpet tiles and acoustic ceiling tiles to some areas.
INTERNAL WINDOW TREATMENT:
Roller blinds.
INDIVIDUAL AIR AND TEMPERATURE CONTROL
50% of all work points have a free standing, desk mounted, individual air comfort control system.

WATER

WATER EFFICIENT FIXTURES AND FITTING:
All bathroom fixtures and fittings set as low flow systems.

One Market

CASE STUDY 03

BUILDING NAME:
ClimateWorks Foundation

BUILDING ADDRESS:
235 Montgomery Street,
San Francisco

PROJECT TEAM

CLIENT
ClimateWorks Foundation
ARCHITECT
Leddy Maytum Stacy Architects
WORKSTATION SUPPLIER
SideMark

BUILDING INFORMATION

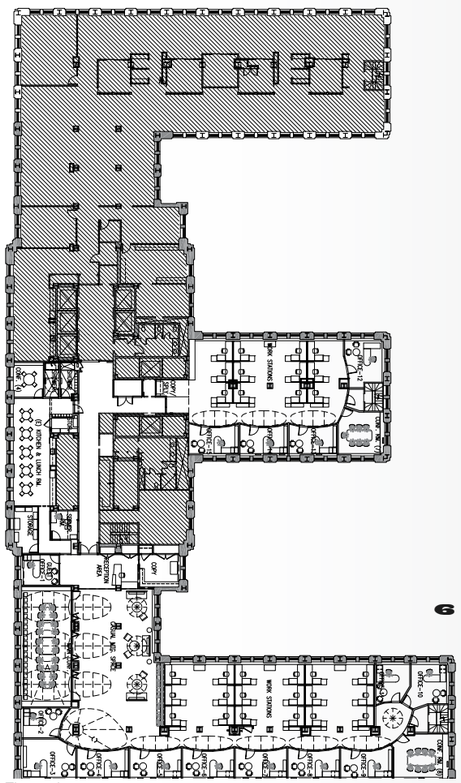
COMPLETION DATE:
April 2009.
BUILDING SIZE:
13,166 Sqft / Approx 4,000 Sqm.
SQM / SQFT PER PERSON:
Approx 30 sqm per person.
FLOOR PLATE WIDTH:
45 Feet/ Approx 13.7 Meters.
FLOOR PLATE LENGTH:
Approx 156 Feet / 45.5 Meters.
FLOOR TO FLOOR HEIGHT:
12.1 Feet / 3.7 Meters.
FLOOR TO FINISHED CEILING HEIGHT:
12.1 Feet / 3.7 Meters.
COLUMN GRID OFFICE:
12 x 24 Feet / 3.6 x 7.3 Meters.
BUILDING ORIENTATION:
North south axis.
CONSTRUCTION TYPE:
Steel frame structure, with concrete, brick masonry and a terra cotta facade.

BUILDING SITE

SITE CONSTRAINTS:
Heritage / Landmark, multi- tenanted historic building.
URBAN / CULTURAL INFLUENCES:
ClimateWorks Foundation is located in the historic Russ Building, built in 1927, in the heart of San Francisco's financial district. The Russ Building is a 31 floor heritage / landmark building.

The workplace design is a light and airy environment, a successfully applied design to a heritage application.


Common space / Enclosed offices


Floor plan

INTERNAL MATERIALS

SURFACE FLOOR AND SUBSTRATE FINISH TO:
WORKPLACE:
Broadloom carpet.
FOYERS:
Entry Foyer and Reception: Cork floor tiles.
COMMON AREAS:
Cork floor tiles.
CIRCULATION:
Broadloom carpet.

INTERNAL WALL SURFACE AND SUBSTRATE FINISH TO:
DRY WALL PARTITIONS:
Plasterboard partitions with partially recycled content and low VOC paint.
Internal acoustic insulation, cotton batt insulation by 'UltraTouch' (bondedlogic.com).
CEILING SURFACE AND SUBSTRATE FINISH TO:
WORKPLACE ACOUSTIC CEILINGS:
Acoustic fiber ceiling tiles with partially recycled content (sand and recycled glass) and no added formaldehyde.
FOYER AND COMMON AREA:
Exposed concrete ceiling with suspended light clouds (soft lighting feature) and / or FSC certified timber panelling.

WORK POINTS
BENCHTOP SURFACE AND SUBSTRATE FINISH:
90 degree workstation, bench top made with EcoTop. A solid core product derived from recycled paper and bamboo.
WORKSTATION SCREEN SURFACE AND SUBSTRATE FINISH:
Fabric wrapped workstation panels. Fabric made from manmade recycled fibres.


Reception

TASK CHAIR UPHOLSTERY COMPOSITION:
Typical upholstery used throughout fit out made from manmade recycled fibers.

JOINERY
JOINERY SURFACE AND SUBSTRATE FINISH:
Joinery surface and substrate finishes used throughout fit out includes;
1. EcoTop, a solid surface (no substrate required) formed from 50/50 blend of FSC certified post consumer recycled paper and rapidly renewable bamboo fiber, bound with a 100% water based adhesive.
2. Paperstone, a solid surface (no substrate required) formed from 100% post consumer recycled office paper.
3. FSC certificated E0 MDF with applied laminate.

FIXINGS:
Traditional joinery fixing methods, using low VOC adhesives.

EXTERNAL MATERIALS

EXTERNAL GLAZING:
Glazing is part of the heritage base building. Operable windows to the building perimeter and all external windows feature air directional plates fixed to lower window sill to direct outdoor air flow away from building occupants and desktop surfaces.

NATURAL AND ARTIFICIAL LIGHT

OVERHEAD LIGHTING SYSTEM:
Direct / indirect T5 lighting system, dimmable ballasts and daylight harvesting.

ZONED LIGHTING CONTROL:
Yes.

MOVEMENT SENSOR LIGHTING CONTROL:
Yes.

DAYLIGHT SENSOR LIGHTING SYSTEM CONTROL:
Yes.

INTERNAL LIGHT SHELVES:
Included in project scope, but not delivered.

EXTERNAL LIGHT SHELVES:
No.

OTHER:
Exposed concrete slab painted vibrant white to reflect natural and artificial light source.

WORKSTATION LIGHTING SYSTEM
LED user sensor task lights.


Typical workstation


Typical workstation / LCD task light

AIR AND SERVICES

ACTIVE
TYPE OF VENTILATION SYSTEM USED:
A combination of an active and passive ventilation system was used in the ClimateWorks Foundation workplace.

A ducted ventilation system is used in all areas of the fit out that are not within code defined areas, such as the 30+ person meeting room, server room and some internal circulation corridors.

An ‘Airside’ HVAC system was used, which is designed for providing both mechanical ventilation for the above areas, as well as, increasing the amount of ventilated air, as per the LEED increased ventilation credit. This dictates a 30% increase in the ASHRAE 62.1 standard ventilation rate.

FLOOR VENTS:
No.

CEILING VENTS:
Yes.

PERCENTAGE OF FRESH AIR USED IN VENTILATION SYSTEM:
100% outdoor air.

PASSIVE
TYPE OF VENTILATION SYSTEM USED:
Operable external perimeter windows and operable internal windows above all office doors to enclosed offices on perimeter window line. Ceiling fans in the general office area to help with cross ventilation and air flow.

CROSS VENTILATION:
Yes.

PERCENTAGE OF BUILDING WITH CROSS VENTILATION:
90%.


Indoor planting / water feature

FACADE
DOUBLE:
No.
EXTERNAL SHADES:
No.
USE OF ALTERNATIVE ENERGY SOURCES:
100% of electricity for the space is provided by renewable energy sources via carbon offsets purchased from Bonneville Environmental Foundation.

SERVICES

RAISED ACCESS FLOOR:
No.
CABLE RETICULATION THROUGH ACCESS FLOOR:
No.
CABLE RETICULATION THROUGH UNDERSIDE OF OVERHEAD SLAB:
Exposed concrete ceiling with cables visible in cable trays. Cable reticulation to open work place via built out columns and drywall partitions.

THERMAL AND INDIVIDUAL COMFORT

ACOUSTIC TREATMENT TO WORKPLACE:
Carpet tiles and acoustic ceiling tiles fixed directly to underside of concrete slab (not suspended) in offices and open work plan.
ACOUSTIC TREATMENT TO SHARED / CIRCULATION AREA:
Carpet tiles and/or cork floor tiles, with feature cloth lighting clouds.
INTERNAL WINDOW TREATMENT:
Combination of manual roller blinds and venetian blinds.
MATERIALS USED TO ENHANCE THERMAL MASS:
Optimal use of base building, core materials.

WATER

BUILDING ENVELOPE LANDSCAPING
INTERNAL VERTICAL GARDEN:
Indoor plants, plant specie positive for indoor environment quality and water feature.
WATER EFFICIENT FIXTURES AND FITTING:
Low flow fixtures and fittings used in wet areas. Indoor water feature.

Reception / Break out space

CASE STUDY 04

BUILDING NAME:
San Francisco Federal Building

BUILDING ADDRESS:
90 7th Street, San Francisco

PROJECT TEAM

CLIENT
US General Services Administration (GSA)
ARCHITECT
Morphosis Architects
ENGINEER
Aurp

BUILDING INFORMATION

COMPLETION DATE:
2007.
BUILDING SIZE:
605,000 Sqft / 56,205 Sqm.
FLOOR PLATE WIDTH:
Approx 18 Meters.
FLOOR PLATE LENGTH:
Approx 108 Meters.
FLOOR TO FLOOR HEIGHT:
Approx 13 Feet / 4 Meters.
FLOOR TO FINISHED CEILING HEIGHT:
Exposed concrete curved ceiling approx 4 meters.
BUILDING ORIENTATION:
East west axis.
CONSTRUCTION TYPE:
Steel frame and off form concrete facade.

BUILDING SITE

SITE CONSTRAINTS:
The San Francisco Federal Building (SFFB) is located in downtown San Francisco, a lower demographic area. The site was originally a national bus station and a cable cart manufacturing plant. The soil on the site was considered toxic and all materials had to be removed off site through the construction period.

The design of the building has successfully applied building security principles, with the use of a secure entrance and external sculptures, light fittings, concrete outdoor furniture, landscaping and separate standing cafe, all which act as safety barriers.


The public square and separate standing cafe

The building was successfully built (excluding fit out) for $242 a square foot (total cost US 144 million).

URBAN / CULTURAL INFLUENCES:
The San Francisco Federal Building was first conceived by architect Thom Mayne in 1997. The building was originally designed to be 100% naturally ventilated. Following 9/11 and the introduction of more stringent security measures to US Government buildings, the design was adjusted to meet today's security requirements. The building is now naturally ventilated from the 6th floor and above.

The building holds a strong presence on the San Francisco sky line. As part of the San Francisco 'art in architecture',the building features external sculptures and is part of a nightly light show.

The building offers a number of features to encourage staff communication and interaction, which include an open floor plan, a sky garden located on the 11th floor (18 floor building). A three story void in the middle of the building acts as a garden retreat for staff and the public. The building elevators are also designed to stop at every third floor with a circulation stair connecting the floors. This design feature allow the staff to meet between levels and allows the introduction of shared meeting rooms and breakout areas in the lift foyer voids.


Building entrance


Three storey sky garden

INTERNAL MATERIALS

SURFACE FLOOR AND SUBSTRATE FINISH TO:
WORKPLACE:
Carpet tiles with partially recycled content.
FOYERS:
Exposed polished concrete.
COMMON AREAS:
Exposed polished concrete.
BUILDING CIRCULATION:
Exposed polished concrete.
WORKPLACE CIRCULATION:
Exposed raised access floor with a wax finish.

INTERNAL WALL SURFACE AND SUBSTRATE FINISH TO:
DRY WALL PARTITIONS:
Plasterboard partitions with low VOC glues.
OTHER:
Exposed base building concrete walls and columns.
CEILING SURFACE AND SUBSTRATE FINISH TO:
WORKPLACE ACOUSTIC CEILINGS:
Off formed exposed concrete in a wave pattern with limited services.
ENTRY FOYER / BREAKOUT AREAS:
Perforated timber acoustic panels and exposed concrete.
SKYGARDEN:
Aluminium woven mesh 600 x 600 tiles (allows air flow) and exposed concrete.

WORK POINTS
BENCHTOP SURFACE AND SUBSTRATE FINISH:
E0 MDF with FSC certified timber veneer bench tops
WORKSTATION SCREEN SURFACE AND SUBSTRATE FINISH:
Traditional 90 degree workstation with fabric wrapped panels. 1300mm screen height to aid in cross ventilation and daylight harvesting.


Internal entrance foyer


Typical workstations

JOINERY
JOINERY SURFACE AND SUBSTRATE FINISH:
Joinery surface and substrate finishes used throughout fit out includes;
1. EO MDF with applied laminate.
2. EO MDF with applied timber veneer.
FIXINGS:
Traditional joinery fixing methods, using low VOC adhesives.

EXTERNAL MATERIALS

FACADE
EXTERNAL FACADE:
South east - Glass curtain wall with a stainless steel perforated operable screen.
North west - full height aluminium framed windows with fixed glazed vertical sunshades.
OTHER:
Solid coloured fiber board cladding, unfinished.

GLAZING
EXTERNAL GLAZING:
Aluminium framed operable windows. Full height.

NATURAL AND ARTIFICIAL LIGHT

OVERHEAD LIGHTING SYSTEM:
The lighting system has been designed to enhance the thermal comfort of the building by reducing the overhead lighting levels. The building has been designed for 80% of the workplace to be illuminated by natural light.

Limited artificial overhead lighting is operated via occupant movement sensors.
ZONED LIGHTING CONTROL:
Yes.
MOVEMENT SENSOR LIGHTING CONTROL:
Yes.
DAYLIGHT SENSOR LIGHTING SYSTEM CONTROL:


External facade

No.

INTERNAL LIGHT SHELVES:

No.

EXTERNAL LIGHT SHELVES:

No.

WORKSTATION LIGHTING SYSTEM

Task lighting available on occupant request.

AIR AND SERVICES

ACTIVE

TYPE OF VENTILATION SYSTEM USED:

The building has been designed to be 70% naturally ventilated. Post occupancy, enclosed office have been built in the centre of the floor plate which require an active HVAC ceiling based system, which was retrofitted post occupancy. The enclosed offices have been built below the wave formed ceiling to allow cross ventilation.

The 5th floor and below are not naturally ventilated due to the building security and operated with an under floor air distribution system.

FLOOR VENTS:

Yes.

CEILING VENTS:

Yes in enclosed offices.

PERCENTAGE OF FRESH AIR USED IN VENTILATION SYSTEM:

100%.

PASSIVE

TYPE OF VENTILATION SYSTEM USED:

The 6th to the 18th floors of the SFFB are naturally ventilated, using a four mode natural ventilated system.

1. User operable windows with metal angled plates fixed to window sill to direct air flow away from occupants' and work benches.
2. Air vents on the external window line at floor level which filters 100% outdoor air.
3. Ceiling height operable windows, operated via building automated system (BAS), which will open and close according to the indoor temperature. The wave form ceiling helps in the air circulation within the building.
   The BAS also operates the perforated metal screen.
4. Night purging. The ceiling height windows will open during the night to allow the cool night air to cool the buildings concrete interior.

CROSS VENTILATION:

Yes.

PERCENTAGE OF BUILDING WITH CROSS VENTILATION:

Cross ventilation is the primary passive ventilation system used in the building. Air is admitted through the north west side of the building and vented through the southeast facade. The perforated metal facade and glass curtain wall creates a chimney effect, channeling the hot air upward away from the building.

FACADE

DOUBLE:

The 'living skin' on the south east facade (stainless steel perforated metal screen) The screen provides glare management and heat control in the building interior and also acts as a strong asthetic to the building.

SINGLE:

Single facade to north west face.

EXTERNAL SHADES:

Fixed vertical external sun shades to north west facade.

SERVICES

RAISED ACCESS FLOOR:

Yes.

CABLE RETICULATION THROUGH ACCESS FLOOR:

Yes.

CABLE RETICULATION THROUGH UNDERSIDE OF OVERHEAD SLAB:

No.

THERMAL AND INDIVIDUAL COMFORT

ACOUSTIC TREATMENT TO WORKPLACE:

Carpet tiles, fabric wrapped workstation panels and the introduction of a sound masking system (white noise).

ACOUSTIC TREATMENT TO SHARED / CIRCULATION AREA:

Perforated acoustic ceiling and wall timber panelling.

INTERNAL WINDOW TREATMENT:

Manual roller blinds.

MATERIALS USED TO ENHANCE THERMAL MASS:

The building has been designed with enhanced thermal mass materials to compliment the building's natural ventilation properties. The building has exposed concrete walls, floors and ceilings, with reduced heating loads for light fixtures and fittings.

Facade includes a living skin

WATER

GREY WATER RECYCLING WITHIN BUILDING ENVELOPE:
Rainwater is harvested from winter / sky garden.
BUILDING ENVELOPE LANDSCAPING
EXTERNAL VERTICAL GARDEN:
Vines / plants introduced to the buildings exterior to soften the concrete structure.
WINTER GARDEN:
Skygarden located on the 11th floor, a three story void accessible for both building occupants and the public. Skygarden also acts as a circulation corridor within the building.
WATER EFFICIENT FIXTURES AND FITTING:
Low flow water fixtures and fittings to the wet areas.


Childcare centre


Childcare centre

CASE STUDY 05

BUILDING NAME:
901 Cherry / YouTube Corporate Headquarters
BUILDING ADDRESS:
901 Cherry Street, San Bruno

PROJECT TEAM

CLIENT
Google
ARCHITECT
William McDonough + Partners
ENGINEER
Aurp
CONSTRUCTION MANAGER / BUILDER
Webcor Builders

BUILDING INFORMATION

COMPLETION DATE:
1997.
BUILDING SIZE:
195,000 Sqft / Approx 59,400 Sqm.
SQM / SQFT PER PERSON:
Building not at full capacity.
FLOOR PLATE WIDTH:
Approx 60 Feet / Approx 18 Meters.
BUILDING ORIENTATION:
East west orientation in order to maximise southern sun.
CONSTRUCTION TYPE:
Steel frame with green roof.

Front entrance of building

BUILDING SITE

SITE CONSTRAINTS:
901 Cherry Street is in close proximity to the San Francisco airport and flight paths.
The designer paid close attention to the acoustic properties of the building, limiting the height of the building to two floors and introducing a green roof.
URBAN / CULTURAL INFLUENCES:
William McDonough's idea for the design of 901 Cherry was 'if a bird flew over the building it would not know that anything had changed'. The building has been designed as three separate office spaces, each area designed around a central atrium and connected with a shared undulating grass roof. The central atrium assists with daylighting and exhausts the heated air.

The designers have put careful consideration into the whole of life cycle of this building and it has been designed to be retrofitted into residential apartments, if required in the future, and features a covered swimming pool.

Site plan

INTERNAL MATERIALS

SURFACE FLOOR AND SUBSTRATE FINISH TO:
WORKPLACE:
Combination of existing (1997) carpet tiles and new feature coloured carpet tiles both, with no PVC backing and an end of life take back scheme.
FOYERS:
Reception and Atrium: Slat tiles.
BREAKOUT AREAS:
Marmoleum floor finish.
WORKPLACE CIRCULATION:
FSC certified timber flooring and carpet tiles.
BUILDING CIRCULATION:
FSC certified timber flooring and slat tiles.


Central atrium

INTERNAL WALL SURFACE AND SUBSTRATE FINISH TO:
DRY WALL PARTITIONS:
Plasterboard with partially recycled content and low VOC paint.
OTHER:
FSC certified timber cladding to foyer and circulation areas.
CEILING FINISH, SUBSTRATE AND FIXING TO:
ACOUSTIC CEILINGS:
Perforated metal ceiling tiles.
RECEPTION:
Perforated metal ceiling tiles.
BREAKOUT:
Fibre ceiling tiles with no added formaldehyde.


Break out space / Cafe

WORK POINTS
BENCHTOP SURFACE AND SUBSTRATE FINISH:
YouTube Corporate Headquarters have reused workstations from the previous tenant, GAP Clothing Brand. All workstations are E0 MDF with FSC certified timber veneer.
WORKSTATION SCREEN SURFACE AND SUBSTRATE FINISH:
Traditional workstation system with fabric wrapped panels.

JOINERY
JOINERY SURFACE AND SUBSTRATE FINISH:
Joinery surface and substrate finishes used throughout fit out includes;
1. E0 MDF with applied laminate.
2. FSC certified timber veneer on E0 MDF.
3. Concrete cafe counter top (no substrate needed) and tables and benches made from eucalyptus timber salvaged from site during construction of the building.

FIXINGS:
Traditional joinery fixing methods, using low VOC adhesives.

EXTERNAL MATERIALS

FACADE
EXTERNAL FACADE:
Combination of stone, glass and metal cladding with an external louver system which allows the building to breath.

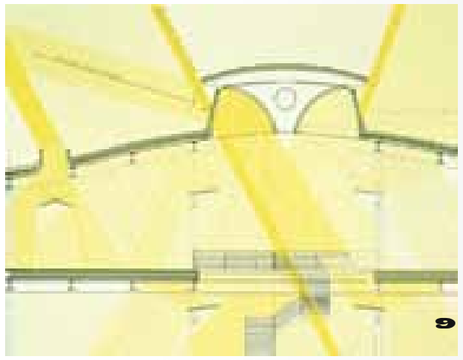
EXTERNAL GLAZING:
High performance glass was used on all external windows which allowed 70% daylight penetration and only 30% solar infrared penetration. Windows are operable.


Grass rooves

NATURAL AND ARTIFICIAL LIGHT

OVERHEAD LIGHTING SYSTEM:
Direct / indirect T5 lighting system which has daylight sensors and will dim / turn off in accordance with natural daylight levels.
ZONED LIGHTING CONTROL:
Yes.
MOVEMENT SENSOR LIGHTING CONTROL:
Yes.
DAYLIGHT SENSOR LIGHTING SYSTEM CONTROL:
Yes.
INTERNAL LIGHT SHELVES:
No.
EXTERNAL LIGHT SHELVES:
No.
OTHER:
The internal ceiling to the central atriums are designed on an angle to capture and enhance daylight for the general office area.
WORKSTATION LIGHTING SYSTEM
TASK LIGHTING:
Task lighting available.

Central atrium



How the natural light is controlled

AIR AND SERVICES

ACTIVE
TYPE OF VENTILATION SYSTEM USED:
A mixed mode strategy was used with a concurrent system of operable windows and an under floor air distribution system (UFAD). The system has been zoned so parts of the building can operate via a naturally ventilated strategy. Operable external windows and other parts of the building are controlled via the under floor UFAD system.
Both air sources are brought in at a lower level and exhausted through a higher level to reduce the conflict of both systems.
FLOOR VENTS:
Yes.
CEILING VENTS:
No.
PERCENTAGE OF FRESH AIR USED IN VENTILATION SYSTEM:
100% fresh air.

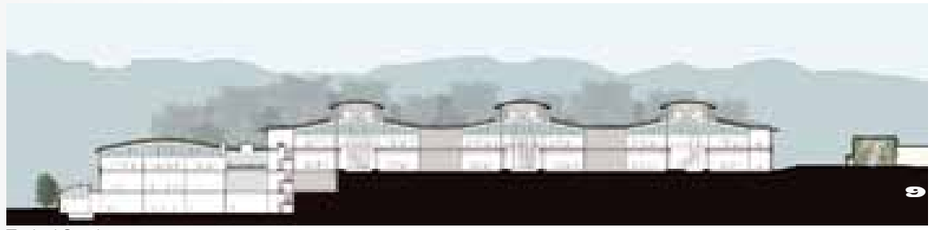
PASSIVE
TYPE OF VENTILATION SYSTEM USED:
The building has been designed to be naturally ventilated at building occupants discretion. Fresh air is drawn in through perimeter operable windows, and facilitated by the effect of warm air buoyancy, is then drawn out through vents at the narrow ends of the atrium roof.

YouTube Corporate Headquarters also participate in an energy savings scheme for San Francisco and the surrounding towns. YouTube and Google Headquarters reduce the building energy consumption by reducing the air conditioning demand
for the buildings, thereby reducing the energy demand on the grid.
CROSS VENTILATION:
Yes.
PERCENTAGE OF BUILDING WITH CROSS VENTILATION:
90% (on user's request).

FACADE
DOUBLE:
No.
SINGLE:
Yes.

SERVICES

RAISED ACCESS FLOOR:
Yes.
CABLE RETICULATION THROUGH ACCESS FLOOR:
Yes.
CABLE RETICULATION THROUGH UNDERSIDE OF OVERHEAD SLAB:
No.



Typical Section

THERMAL AND INDIVIDUAL COMFORT

INTERNAL TEMPERATURE
ACCEPTED MIN:
21 degrees celsius.
(The building has been designed for no heating or cooling to be used outside the acceptable minimum and maximum indoor temperature)
ACCEPTED MAX:
24 degrees celsius.
ACOUSTIC TREATMENT TO WORKPLACE:
The building has been designed with a green roof to acoustic and thermal mass properties.
The workplace features perforated metal ceiling tiles, fabric wrapped workstation panels and carpet tiles.
ACOUSTIC TREATMENT TO SHARED / CIRCULATION AREA:
In additional to the green roof, acoustic treatment to shared / circulation areas consist of perforated metal ceiling tiles.
INTERNAL WINDOW TREATMENT:
Manual roller blinds.
INDIVIDUAL AIR AND TEMPERATURE CONTROL:
Air vents have been designed at floor level to improve air flow and individual thermal comfort.
MATERIALS USED TO ENHANCE THERMAL MASS:
The building has been designed with sound thermal mass principles with the introduction of a grass roof and materials, such as concrete.

The building also employs night purging for temperature control, through an under floor plenum.


Looking out onto a grass roof

CASE STUDY 06

BUILDING NAME:
Heifer International

BUILDING ADDRESS:
One World Avenue, Little Rock

PROJECT TEAM

CLIENT
Heifer International
ARCHITECT
Polk Stanley Wilcox Architects

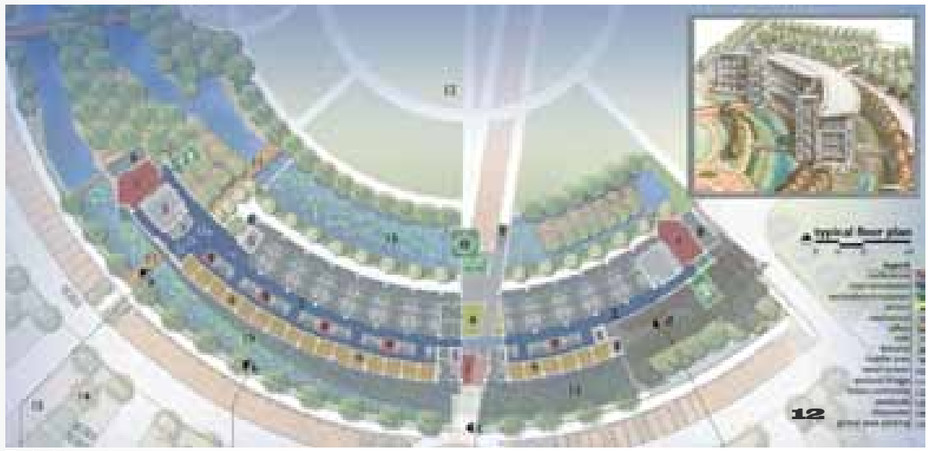
BUILDING INFORMATION

COMPLETION DATE:
2005.
BUILDING SIZE:
94,000 Sqft / 8,730 Sqm.
SQM / SQFT PER PERSON:
Approx 18 Sqm per person.
FLOOR PLATE WIDTH:
62 Feet / Approx 19 Meters.
FLOOR PLATE LENGTH:
401 Feet / Approx 122 Meters.
FLOOR TO FLOOR HEIGHT:
14 Feet / 4.3 Meters.
FLOOR TO FINISHED CEILING HEIGHT:
12 Feet / 3.7 Meters.
COLUMN GRID (OFFICE):
29 feet / 8.4 Meters.
BUILDING ORIENTATION:
East west axis with direct northern and southern light.
CONSTRUCTION TYPE:
Steel frame construction.

BUILDING SITE

SITE CONSTRAINTS:
The site was originally reclaimed wetland, filled in to create an industrial area. A furniture factory was built on the site contaminating the land with chemicals from the manufacturing process. The area was the largest brown field site in Arkansas. 75,000 tones of soil was removed from site throughout construction and the existing concrete and brick buildings were crushed and used as the sites foundation.
URBAN / CULTURAL INFLUENCES:
The building was built and designed to sit comfortably with the Heifer foundation's philosophy of sustainability, sharing the knowledge and community. The building is anchored under a timber ceiling which represents all being under one roof and surrounded by a moat for a sense of security. The design is a series of circles to reflect a stone being dropped into a pool of water and the rippling effect. A rippling of ideas.

The building achieved a LEED Platinum Certification through the US Green Building council and was part of the American Institute of Architects nominated top ten green projects for 2007.



Typical floor plan

INTERNAL MATERIALS

SURFACE FLOOR AND SUBSTRATE FINISH TO:
WORKPLACE:
Carpet tiles with partially recycled content and an end of life take back scheme.
FOYERS:
Combination of bamboo flooring and locally sourced limestone tiles.
COMMON AREAS:
Cork flooring used in breakout areas.
WORKPLACE CIRCULATION:
Carpet tiles.
BUILDING CIRCULATION:
Bamboo flooring.


Reception and entry foyer

INTERNAL WALL SURFACE AND SUBSTRATE FINISH TO:
DRY WALL PARTITIONS:
Plasterboard partitions with partially recycled content and low VOC paints. Internal insulation was a combination of 40% soybean derived insulation by BioBased Systems and 'UltraTouch' thermal batt insulation composed of denim and cotton fibre materials.
OTHER:
Locally sources bluestone tile wall.
CEILING SURFACE AND SUBSTRATE FINISH TO:
WORKPLACE ACOUSTIC CEILINGS:
Ceiling finish to the workplace area was either exposed structural steel decking (floors Ground - Level 3)or delta pine timber panelled ceiling (Level 4).
RECEPTION:
Suspended floating delta pine timber panel ceiling.


Typical circulation spaces

WORK POINTS
BENCHTOP SURFACE AND SUBSTRATE FINISH:
Select laminate on E0 MDF with low VOC adhesives.
WORKSTATION SCREEN SURFACE AND SUBSTRATE FINISH:
Fabric wrapped workstation panels using Designtex, 100% recycled polyester.
TASK CHAIR UPHOLSTERY COMPOSITION:
Typical upholstery used throughout fit out was made from recycled manmade fibres.

JOINERY
JOINERY SURFACE AND SUBSTRATE FINISH:
Joinery surface and substrate finishes used throughout fit out includes;
1. FSC certified E0 MDF with applied laminate using low VOC glues.
2. Board derived from sunflower seeds, no substrate required.
3. Bench and counter tops made with crushed glass, no substrate required.
FIXINGS:
Typical joinery fixing methods, using low VOC adhesives.


Workstation layout, level four.

EXTERNAL MATERIALS

FACADE
EXTERNAL FACADE:
Brick and bluestone as building foundation with corrugated and flat metal cladding.

OTHER:
Locally sourced bluestone tiled external walls and glass bricks with partial recycled content (main light source for wet areas).

EXTERNAL GLAZING:
86% recycled external glazing, double glazed and thermally insulated using Argon gas.


External facade

NATURAL AND ARTIFICIAL LIGHT

OVERHEAD LIGHTING SYSTEM:
Suspended direct / indirect type fixtures with T5 fluorescent lamps and dimmable ballasts.
The lighting will dim or turn off depending on the natural light levels. The workplace also features exposed steel structural metal decking on some floors, which also acts as a reflective material to enhance the artificial and natural daylight. LED lighting is also used in building circulation track lighting system.
ZONED LIGHTING CONTROL:
Yes.
MOVEMENT SENSOR LIGHTING CONTROL:
Yes.
DAYLIGHT SENSOR LIGHTING SYSTEM CONTROL:
Yes.
INTERNAL LIGHT SHELVES:
Yes (To southern face only).
EXTERNAL LIGHT SHELVES:
Yes (To southern face only).
WORKSTATION LIGHTING SYSTEM:
Task lights to workstations.


Workstation layout, level three

AIR AND SERVICES

ACTIVE
TYPE OF VENTILATION SYSTEM USED:
The building runs off two dedicated ventilation systems, which channel air through the raised access floor. The systems utilise the collected rain water to operate and will operated in accordance with the dedicated CO2 levels in the space.
FLOOR VENTS:
Yes.
CEILING VENTS:
Return air only.

PASSIVE
TYPE OF VENTILATION SYSTEM USED:
Ventilation system operates in accordance with CO2 levels detected in the space. All circulation stairs are non heated or cooled environments.
CROSS VENTILATION:
No.

FACADE
DOUBLE:
No.

SINGLE:
Yes.
EXTERNAL SHADES:
Fixed vertical sunshades to southern facade only.

USE OF ALTERNATIVE ENERGY SOURCES:
100% purchased green power.

SERVICES

RAISED ACCESS FLOOR:
Yes (18 inch / 45.7cm).
CABLE RETICULATION THROUGH ACCESS FLOOR:
Yes.
CABLE RETICULATION THROUGH UNDERSIDE OF OVERHEAD SLAB:
No.
OTHER:
All services excluding fire sprinklers located under access floor.

THERMAL AND INDIVIDUAL COMFORT

ACOUSTIC TREATMENT TO WORKPLACE:
Carpet, fabric wrapped workstation panels and soft furnishings.
ACOUSTIC TREATMENT TO SHARED / CIRCULATION AREA:
Suspended fabric panels (internationally commissioned artwork).
INTERNAL WINDOW TREATMENT:
Nil on building hand over.
INDIVIDUAL AIR AND TEMPERATURE CONTROL
Carefully positioned floor vents.
MATERIALS USED TO ENHANCE THERMAL MASS:
Workplace is a temperature controlled environment and does not rely on thermal materials.


Typical sections

WATER

GREY WATER RECYCLING WITHIN BUILDING ENVELOPE:

One of the main sustainable principles of the project is the ability for the building to be self reliant with its water usage. The building has been designed to collect water from the 30,000 sqft roof and 100+ space external car parks.

MAIN USE OF RECYCLED WATER:

The whole building, excluding drinking water and water used in the fire sprinkler system, depends on self collected rain water which is stored onsite.

BUILDING ENVELOPE LANDSCAPING

EXTERNAL VERTICAL GARDEN:

External gardens plants are native and have been selected to with stand swamp conditions, should the building site ever return to these original conditions.

ON SITE WATER STORAGE FACILITIES:

Rainwater is collected in a three phase storage system. The main water storage system is water collected via the 30,000 sqft roof into an above ground 27,000 gallon water tank located in the circulation / fire stair glass enclosure. The rain water is also collected off the external car parking and is stored either in the moat surrounding the building or water retention pond, located on the side of the building. The building can access town water if the water storage should became too low (to date town water has not been required). Four species of fish have been introduced into the surrounding moat to counteract mosquitos.

WATER EFFICIENT FIXTURES AND FITTING:

Low flow water fixtures have been used in the bathrooms, including waterless urinals.
All landscape irrigation uses collected rain water.

The building was constructed in a reclaimed wetland

Knowledge Transfer: Applying the Outcomes

The journey to sustainability is not a singular pathway and no one discipline can make the necessary changes to the building industry. All disciplines need to be involved to promote positive workplace environments, from the designers and clients to the facility managers and all building tradespeople.

This report has been prepared as a how-to document, outlining what to avoid and some possible sustainable alternatives when designing a more sustainable workplace.

This knowledge can be used by all disciplines when designing, building or planning a positive workplace environment.

The Fellow plans to disseminate the information and knowledge gained through this Fellowship with this report and the case studies provided, and through public presentations.

The Fellow has been invited to make, and in some cases has commenced making, presentations at industry functions, professional institutions and design offices, with the intention of contributing to the ongoing debate in Australia regarding current international ideas and trends in good sustainable practice for our environment.

Recommendations

Government

A number of positive changes have been implemented in the Federal and Commonwealth Government accommodation guidelines, such as leasing of buildings with a NABERS base building star rating requirement and setting targets to standardise the area per person allocation in government leased buildings.

Accommodation guidelines within all Federal and Commonwealth Government departments should also be amended to include stringent guidelines to improve IEQ in commercial office buildings, such as air monitoring and the reduction of materials with known toxic human carcinogens, as outlined in the earlier sections of this report.

With the Australian Government making a number of positive changes to support the natural environment, it should also be making a number of positive changes to enhance the current standards of workplace design. Educated decisions should be made on the materials, products and systems we use in our workplace.

The Australian Government needs to be at the forefront of sustainable design. With its volume of work and buying power the government needs to influence the way forward and eliminate materials, products and systems that are known to be detrimental to our health and wellbeing.

Industry

Individually, it is hard to influence change in the design and construction industry. Collectively, we can be more influential in effecting change. For example, five years ago, E0 MDF was only manufactured by one company in Australia and not readily used in the industry. E0 MDF is now regarded as a standard material and manufactured by multiple companies throughout Australia. The industry influenced this change by collectively specifying E0 MDF for furniture and joinery substrates.

A number of companies within the industry have influenced positive change, such as LIFE textiles, a commercial textile manufacturing company that contributed to developing national and international sustainable textile guidelines. RMIT, the Green Building Council of Australia, Ecospecifier, and Good Environmental Choice Label have all been part of the grass roots of sustainable design. They continue to influence positive change and ignite the ongoing debate of sustainable commercial design in Australia.

As outlined in this report, a number of our building projects contain toxic chemicals that need to be eliminated to improve the IEQ and our health. For example, vinyl, known to be harmful, is still being used in a number of applications in workplace environments.

As an industry, we need to make positive choices when specifying materials and products for our commercial built environment.

The design industry has demonstrated the positive changes it can influence, if the industry stands on a united front. With the current research and resources available there should be no reason for designers to be specifying materials, products and systems which are known to be detrimental to our health. The simple tool of communication and knowledge sharing is a method that can be so simple yet so bold in influencing change.

Education

Knowledge is the key to success. Ideally, it would be ensured that designers and the trades are abreast of current issues related to IEQ and are provided with a curriculum that is heavily weighted with all aspects of environmentally sustainable design.

A number of avenues are available for ongoing education in commercial sustainable design. The Australian Institute of Architects (www.architecture.com.au) and the DIA (www.dia.org.au) hold a number of seminars/workshops in sustainable design yearly, which are advertised on their websites. A range of courses and qualifications can also be sourced through the National Training Information Service, NTIS (www.ntis.gov.au) and the Australian Qualification Framework, AQF (www.aqf.edu.au) websites.

In addition, the Green Building Council of Australia (www.gbca.org.au) holds a number of seminars/conferences and training courses nationally, including the Green Star Accredited Professional course.

Community

As the mother of a child under one year of age, the Fellow is aware and concerned about the toxic chemicals used in infants' equipment and toys. BPA- and Phthalates-free bottles, storage containers and pacifiers are available in the market, but are only sold at a limited number of shops. The community is becoming aware of and demanding this change to environmentally safe products for infants. The same pressure can be brought to bear regarding building safety and environmental concerns.

We spend approximately 90% of our lives indoors, 5% in our cars and only 5% in the great outdoors[17]. Reducing materials with known human carcinogens is essential for our workplace as well as our homes. The principles in this report can also be used and adapted for improving the indoor health of our homes.

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Attachments

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