

Sustainability is Survivability.



Construction and Sustainability Consultants

AHSPO Conference

Green Approach –Stepping into action

**Primum Non Nocere—
Above All, Do No Harm!**

'Sustainable Hospitals'

Presented 21st October; 2010

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Principal, VIM Sustainability P/L



Vim Sustainability-who are we?

- Est 2003
- ❑ We are specialist sustainability consultants and engineers
- ❑ ESD Consultants on the World's first Zero Emissions Development (ZED) Standard Healthcare precincts
- ❑ We specialise in the following for the built environment:-
- ❑ Sustainable design science
- ❑ Passive and low tech solutions as the first option
- ❑ Educational workshops and presentations
- ❑ Sustainable business operations analysis, diagnostics and policy
- ❑ Energy audits to AS level 3, NABERS and beyond
- ❑ Detailed CFD, energy, daylighting, thermal, LCA software modelling engineers
- ❑ New or refurbished buildings
- ❑ Innovative yet cost effective
- ❑ We work personally with our clients

What is sustainability?

❑ “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

❑ (World Commission on Environment and Development- Bruntland Commission, 1987; WBSCD)

❑ Doing more for less

❑ Achieve multi benefit from one item

❑ My definition...

❑ ‘Profit + Environment = Sustainability’
OR.....another definition



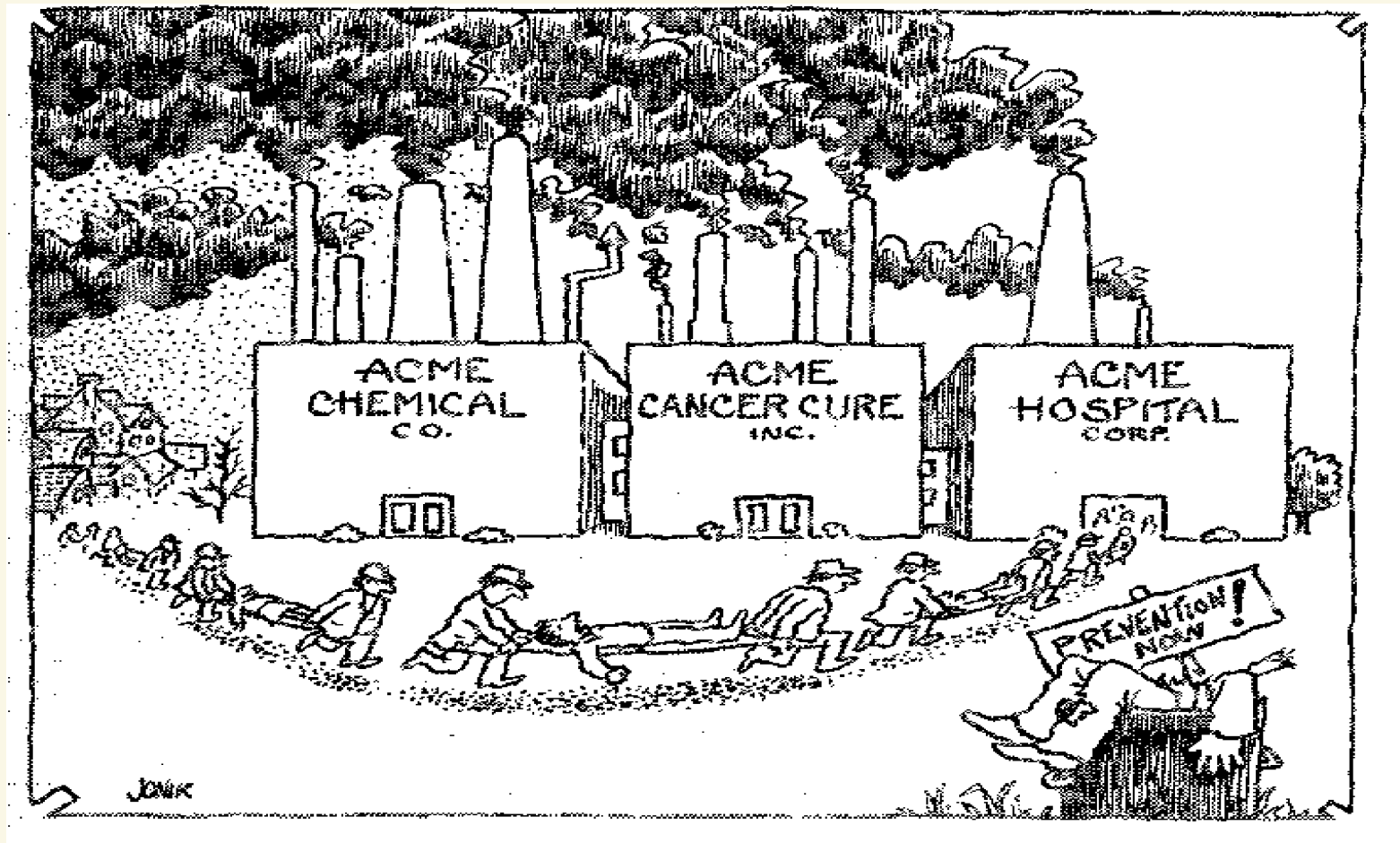
The cat amongst the pigeons

“[Hospitals have] nothing to do with health. There are no facilities in hospitals for health or for any of the things commonly recognized as contributing to health. The food is as bad as you’d find in the worst fast-food drive-in. There are no facilities for exercise. All the personal factors that can make you well or keep you healthy are removed—family, friends, and sense of *self*.”

— Mendelsohn, *Confessions of a Medical Heretic* (1979), p. 80

***"Green" hospitals are
resource efficient in
design, construction,
operation, maintenance
and demolition.***

ASK YOURSELF: What is the environmental footprint of an industry, combined?



What is a better design?



The Importance of Design

**Frank Lloyd Wright
once said "he could
DESIGN a house for a
newlywed couple
that could cause
them to divorce in a
few, short weeks."**



How we do it?

'Natural ventilation was an important design feature. In general hospitals verandahs were to be wide enough so that patients' beds could be wheeled out onto them, in mental hospitals they provided shelter for mobile patients and **the associated gardens and ferneries provided a restorative ambience.** It was through the correct use of space - classification and separation of patients - that moral well-being emerged and was maintained'... (Rosen in Jackson, Teece, Chesterman, Willis Consultants Pty. Ltd., Vol. 1, 1996, 4-5.).

` At Parramatta, Ward 12 and its companion Male Admission Block and Administration Block represent physically a new stage in the evolution of the Hospital. Their setting is typical of the concern **to place patients in a pastoral and tranquil environment, and the open orientation toward the river** is in variance with the totally enclosed courtyards that dominate other parts of the Institution occupied by the chronically ill.'

(Rosen in Jackson, Teece, Chesterman, Willis Consultants Pty. Ltd., Vol. 1, 1996, 4-5.).

Which do you prefer?



Healthy Hospitals –have we forgotten??

Ward 12, the former Female Admission Block, was the first building designed as part of an enlightened new mental hospital in the early twentieth century at Parramatta Psychiatric Hospital. *Its design, arrangement and orientation towards the river, as part of a group of similar 'pavilions', most of which still survive, demonstrates the concern to place patients in a pastoral and tranquil environment*. (Rosen in Jackson, Teece, Chesterman, Willis Consultants Pty. Ltd., Vol. 1, 1996, 1, 30.).



Do you prefer now?



OR.....the future..?



**Poor environmental quality harms
the quality of human health**

**Building designs, materials, and
construction practices are
responsible for a variety of
environmental issues that impact
human health**



**environmental health
overview**

Nature creates conditions conducive to life!

“A consistent ethic means that our healthcare organizations must change practices. At Catholic Healthcare West, we see a clear link between environmental responsibility and our basic mission, which is to provide quality healthcare services to all.”

“ There is a direct link between healing the individual and healing this planet. We will not have healthy individuals, healthy families, and healthy communities if we do not have clean air, clean water and healthy soil.”

Lloyd Dean, MA President & CEO, October, 2000



What is health?

- ❑ Paraphrasing WHO (from Halbert Dunn MD PhD, 1954):
- ❑ “The highest attainable mental, physical, and spiritual development for each individual”
- ❑ Russell Jaffe MD PhD: “Youthful longevity”
- ❑ Health is not the absence of disease; it is the presence of vitality and resilience
- ❑ Biological and integrative medicine recognize that perhaps 80% of what brings people to physicians is related to stress, diet, relationship, and environment—not disease, where they’re far more comfortable & focused

Health and Hospitals.. the dichotomy!!

❑ Hospitals could free bed-days cheaper than making more; in a sense, insurers regulate their prices; is there a worthwhile analogy here?

❑ “Research teams from Texas A&M University and Georgia Tech combed through several thousand scientific articles and identified more than 600 studies—most in top peer-reviewed journals—that establish how hospital design can impact clinical outcomes.” RMI 2007

David Lawrence, MD, Chairman & CEO Kaiser Permanente, 2000

“Just as we have responsibility for providing quality patient care, just as we have responsibility for keeping our facilities and technology up to date, we have a responsibility for providing leadership in the area of the environment.

The stakes are extraordinarily high.

86% of Directors of Nursing say that hospital design is ‘very important’ or ‘important’ in nurses’ performance, with the most crucial aspect being the design and organisation of the internal hospital environment – 93% say that this is either ‘very important’ or ‘important’.

CABE/PwC study 2004

The role of hospital design in the recruitment, retention and performance of NHS nurses in England

EXECUTIVE SUMMARY

cabe
HEALTHY HOSPITALS

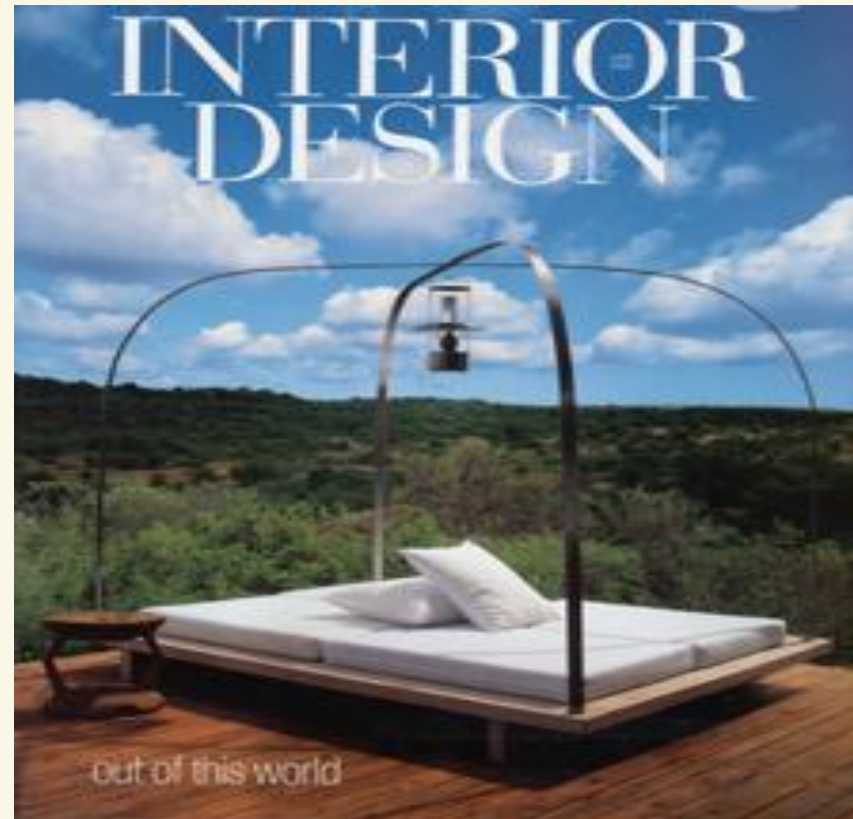
THE CABE STUDY

Linkages between hospital design and staff recruitment and retention are made in Healthy Hospitals

Internal Environment Quality-The facts

Resident and Worker Health

- ❑ US EPA (2005) ranks indoor air quality (IAQ) as one of top 5 environmental risks to public health.
- ❑ Indoor contamination levels can be 25 times as high as outdoors
- ❑ People spend 90% of time indoors (EPA,2004)
- ❑ Internal pollutants are 10-90 times worse than outside (EPA ,2004)
- ❑ More than 1000 studies and reports link green building attributes such as improved internal air quality and thermal comfort to health and productivity
- ❑ World Health Organization (2002) says Sick Building Syndrome (SBS) affects:
 - ❑ 20 million U.S. workers daily
 - ❑ Costs California about \$6 billion annually (Lawrence Berkeley National Laboratory, LBNL)



The 'cost' of a healthy building

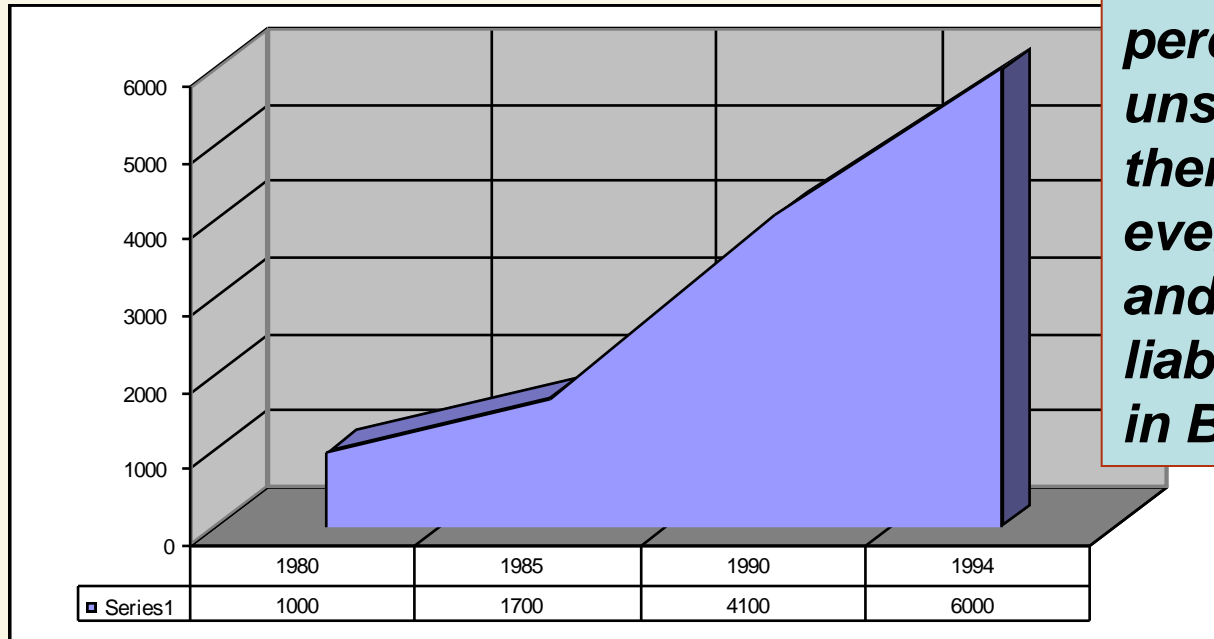
- Healthy buildings can ↓ illness and costs
- Estimated annual staff productivity ↑
\$30 - \$150 billion
- 10 - 30% ↓ respiratory diseases
- 20 - 50% ↓ SBS symptoms
- .5 - 5% ↑ office worker performance
- \$17 - \$43 billion annual health care savings
- \$12 - \$125 billion direct ↑ in worker productivity

EPA, USA, 2005



Mid Argyle Hospital Glasgow

Worker Respiratory Claims



Buildings that are perceived as weak, unsafe, or contaminating themselves will fall under eventual public scrutiny and future financial liabilities-See ABC Office in Brisbane

The number of worker respiratory claims in healthcare environments more than doubled in 5 years between 1985 and 1990, and has continued at the same rate since measurements were taken

Hospitals: an important opportunity for cleaner air

- ❑ U.S. spent >\$16b building hospitals in 2004, projects >\$20b/y by 2010, and they'll remain in service for decades
- ❑ The Institute of Medicine (2000, 2001) found that medical errors and nosocomial infections are among the leading causes of death in the United States, each killing more Americans than AIDS, breast cancer, or automobile accidents
- ❑ Three-fourths of Toronto SARS cases were hospital-acquired; as the SE Asian flu factory churns out more pathogens with prospects for pandemic (not to mention rising bioterrorism risk), it becomes ever more vital to design hospitals for enhanced containment, negative pressure options,...

Infection control by airflow design

- ❑ Hospital-acquired infections decrease with single rooms and very high air quality: design affects both airborne and contact transmission routes
- ❑ Immuno compromised patients have fewer infections when in HEPA-filtered isolation rooms (e.g., by 10× for *Aspergillus* in bone-marrow-transplant patients)
- ❑ Yet hospital air is often less clean than is normal in Industrial cleanrooms—insufficient tech transfer so far
- ❑ 100% outside air may (as in the new UC/Davis Medical Center hospital) *reduce* capital cost



The effect of sunlight on postoperative analgesic medication use: a prospective study of patients undergoing spinal surgery.

- ❑ Patients staying on the bright side of the hospital unit were exposed to 46% higher-intensity sunlight on average ($p = .005$).
- ❑ Patients exposed to an increased intensity of sunlight experienced less perceived stress ($p = .035$),
- ❑ marginally less pain ($p = .058$),
- ❑ took 22% less analgesic medication per hour ($p = .047$),
- ❑ and had 21% less pain medication costs ($p = .047$).
- ❑ Patients housed on the bright side of the hospital consistently used less analgesic medications in all age quartiles.
- ❑ **CONCLUSION:** The exposure postoperatively of patients who have undergone spinal surgery to increased amounts of natural sunlight during their hospital recovery period may result in decreased stress, pain, analgesic medication use, and pain medication costs.

Department of Pathology, University of Pittsburgh, Pittsburgh, Pennsylvania, USA. JM Walch et al (2005) walchjm@upmc.edu

Hospital daylighting

- ❑ Sunlight influences mood, sleep-wake patterns, and length of hospital stay. E.g., bipolar patients randomly assigned to morning-bright eastern rooms had a mean 3.67-d shorter stay than those in west-facing rooms
- ❑ Morning light is twice as effective as evening light in reducing Seasonal Affective Disorder (photobiologically linked winter depression) and can reduce agitation from senile dementia
- ❑ There's evidence that brighter light can reduce medication errors (**caution**—this may be artifactual: better lighting *quality* is often more important, while more light delivered with poor quality can *reduce* visibility)

Effective electric lighting .

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Non daylighted rooms,
directional lighting, no
controls are not healthy.

Introduction of daylight, effective electric
lighting that is dimmable is healthy



Balance daylight with electric lighting consider the colour of the light

Reduce contrast with lighter surfaces



Traditional overhead lighting approach





Vegetated “green” roof technologies
Combined Heat & Power with waste heat recovery
Bio-Remediation Waste Treatment system on site
Daylight/ occupant controls
Low emitting materials/ PVC reduction

METROPOLITAN HOSPITAL

Wyoming, Michigan Owner: Metropolitan Healthcare Village

Boston Hospital

- ❑ Artwork enlivens and “humanizes” nursing station
- ❑ Productivity gains: nursing turnover now below 12%
- ❑ Patient Recovery and Satisfaction:
- ❑ Nosocomial infection rates down 10–11%;
- ❑ Overall patient satisfaction rose to 95.4%
- ❑ Operations: 6% market share increase,
- ❑ Occupancy rate has been 80–85% since opening



Boston Hospital

Sources: Center for Health Design, “Design Matters in Health-care Facilities”

Rikshospitalet University Hospital Oslo, Norway

- ❑ Ranked 3rd in world for kidney transplants
- ❑ Fountains, sculptures, and textile hangings aid wayfinding
- ❑ Piano on main street for patients' and visitors' use
- ❑ Staff members travel long distances on electric scooters
- ❑ Windows—even in operating rooms—allow patients views of gardens and staff and family
- ❑ Views of fjords
- ❑ Has nearly doubled its number of patients (250,000 a year), reduced turnover & absenteeism, and reinvigorated recruitment



University of Texas Houston **School of Nursing and Student Community Center**

Blend of passive and mechanical strategies:-

- ❑ long elevations face east and west, but
- ❑ high-performance glazing keeps them cool
- ❑ dramatic downsizing of chiller
- ❑ underfloor air distribution
- ❑ desiccant system removes humidity
- ❑ solar cells and fuel cells
- ❑ considers health and environmental effects of material choices



Patient recovery and nature images

At Uppsala University Hospital in Sweden, of 166 patients who had undergone openheart surgery, those exposed to a picture of an open view of water experienced much less postoperative anxiety than those exposed to no picture or to other types of pictures (rectilinear abstract art *increased* anxiety levels)
—Ulrich & Lundén



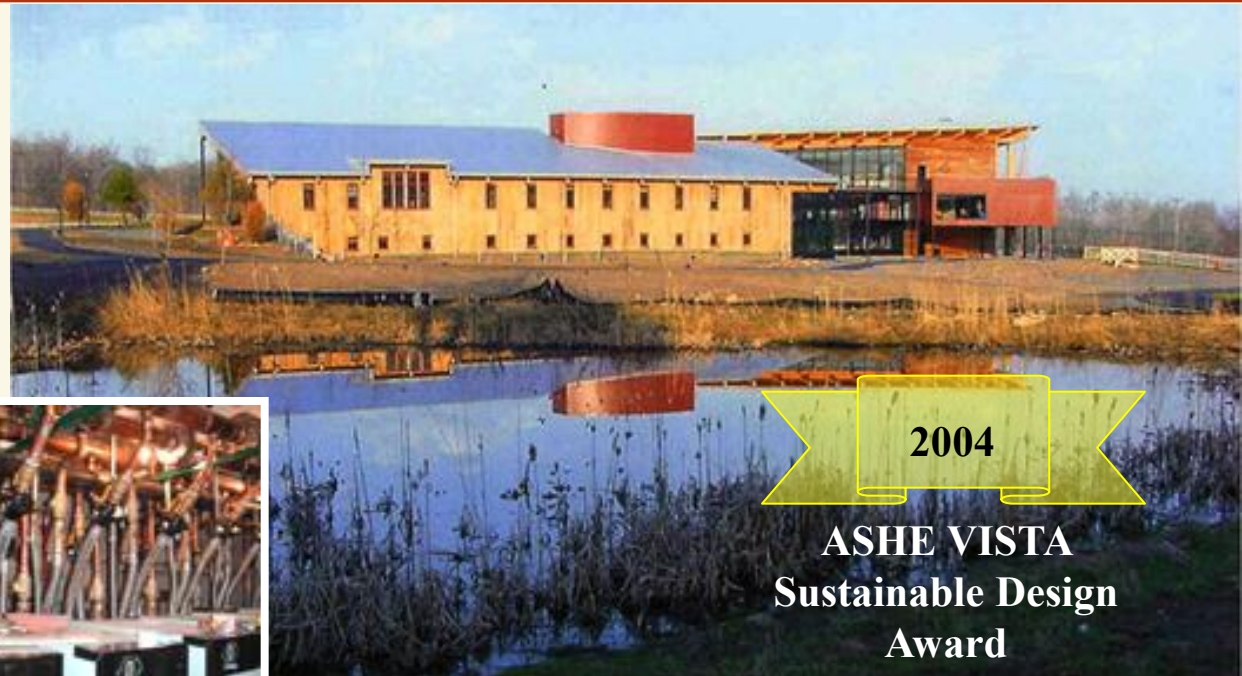
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42% Energy Demand Reduction - Ground Source Heat Pumps
Rainwater Harvesting for Fire Reserve
High Reflectance Roofing
Local & Regional/ Recycled Content/ Low Emitting Materials
PVC elimination in finish materials and Plumbing



Patrick H Dollard Discovery Health Center

Owner: The Center for Discovery



2004

ASHE VISTA
Sustainable Design
Award

Sunday, November 14, 2010

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PIONEERS

HEALING OUTCOMES

There are tremendously powerful healing potentials within each human being. When we are talking about designing and organizing healing environments, what we are really trying to do is find effective ways to engage those inner-healing potentials within each human being.

Ulrich (1991) and Malkin (2001) identify five areas of research in health facility design that fall within the domain of stress relief:

- ☐ connection to nature,
- ☐ options and choices,
- ☐ social support,
- ☐ pleasant diversions,
- ☐ and the elimination of environmental stressors.

'..any architect worth his salt must resort to animal cunning... ' James Stirling

- ❑ Oversized single rooms
- ❑ Acuity adaptable rooms
- ❑ Double-door bathroom access
- ❑ Decentralized barrier free nursing stations in close proximity to rooms
- ❑ Alcohol rub hand hygiene dispensers at the patient bedside
- ❑ HEPA filter filtration systems
- ❑ Larger, more flexible and adaptable spaces in surgical/procedural areas
- ❑ Peaceful settings (artwork, music, gardens, etc.)
- ❑ Noise reduction elements such as sound absorbing floors /ceilings, wireless communication systems (no overhead paging) etc.
- ❑ Patient education centers on each floor
- ❑ Staff focus supportive elements (access to daylight in break areas, exercise facilities, etc.)

American Institute of Architects



Evidence based design.

The role of the Environment in improving patient health

Major Design Conclusions (Ulrich 2004):

- ☐ Provide single-bed rooms
- ☐ Provide quieter environments
- ☐ Provide stress reducing views of nature and other positive
- ☐ Distractions
- ☐ Develop efficient, simple way finding systems
- ☐ Improve ventilation through the use of improved filters, appropriate pressurization, and vigilance during construction / renovations
- ☐ Improve lighting – especially the access to natural lighting
- ☐ Design layouts to reduce staff walking and fatigues, increase patient care time, and support staff activities.

WHAT DO YOU THINK?.....

Shouldn't our buildings...

- ❑ Make people healthier, happier, and higher performing?
- ❑ Create delight when entered, well-being when occupied, regret when departed?
- ❑ Take nothing, waste nothing, and do no harm?
- ❑ Be net producers of energy, clean water, beauty, perhaps food, and right pedagogy?
- ❑ Cost less to build and operate?
- ❑ Be more flexible for unknowable future needs?

**'Views of nature reduce
ICU nurses' stress' CABE 2004**



Nurses who took their noon break in a lounge with windows overlooking mature trees had significantly reduced stress levels and made 40% fewer errors on a task than nurses who took their break in a windowless lounge
—Ovitt 1996

Lyall McEwen Hospital, South Australia; Stage A Redevelopment;

**2006 National Rider Hunt Property
Council Award**

Energy Benchmark :

1312 MJ/m²

Target : < 918 MJ/m² –

30% reduction

Outcome : (06-07) =

1023 MJ/m² – 23% reduction

Water Benchmark :

1.9KI/M²

Target : 1.34 KI/M²

(30% reduction)

Outcome (06-07) =

1.23KL/M² 35% reduction



Conclusion

SUSTAINABLE HOSPITALS

- ☐ Improve healing outcomes
- ☐ Increase staff productivity
- ☐ Reduce absenteeism
- ☐ Reduce risk of cross infection
- ☐ Reduce running costs
- ☐ Improve opportunity
- ☐ Reduce risk
- ☐ Improve the environment
- ☐ Improve our world
- ☐ Are the way of the future



This is your big chance!

'Sustainability is the single biggest business opportunity of the 21st century, and will be the next source of competitive advantage.'

H. Lee Scott, President and CEO of Wal-Mart

Message for today

Efficiency is free
...Ask for more!

Who is 'Vim Sustainability'?

- ❑ **Appointed ESD Consultants on Australia's First ZED community healthcare projects!**
- ❑ We understand sustainable design science
- ❑ We are strategists, engineers and consultants
- ❑ We make proposed, new or old buildings/developments more sustainable
- ❑ We do energy/water/eco audits of designs or new and existing buildings
- ❑ We provide sustainable solutions for your home or business .
- ❑ **Contact us:-**
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 Boston Hopsital

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Vim Sustainability Consulting... Remember...
“We **save** you
*a **lot** more*
than we cost you!”

Sustainability..... money does
grow on trees!

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