

Users' Perceptions of Commercial and Institutional Buildings – Key findings and issues for NZ

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Issues & Aims

- ◉ **Emphasis on technical aspects of sustainable design, not user's perceptions**
- ◉ **Current – identify good buildings and their common features**
- ◉ **Future – develop user performance benchmarks**
- ◉ **Incorporate them into BSRTs**

Key Findings - Five aspects

- ◉ Key Elements of the buildings
- ◉ Refurbished vs New Buildings
- ◉ Sustainable vs Conventional Buildings
- ◉ Users' Comments of their Scores
- ◉ User Perceptions Benchmarks?

Methods

31 buildings worldwide

- Award Winners – Sustainable/Low Energy
- Highly rated on BSRTs: BREEAM, LEED, CASBEE, Green Globes, Green Stars
- Range of climates: 6 Cold-Temperate; 11 Moderate; 9 Warm-Temperate; 5 Hot-Humid
- Range of activities : 15 offices, 10 tertiary education, 4 laboratories, 2 light industrial
- Willing (31 buildings; 2035 respondents)

What did we ask the users?

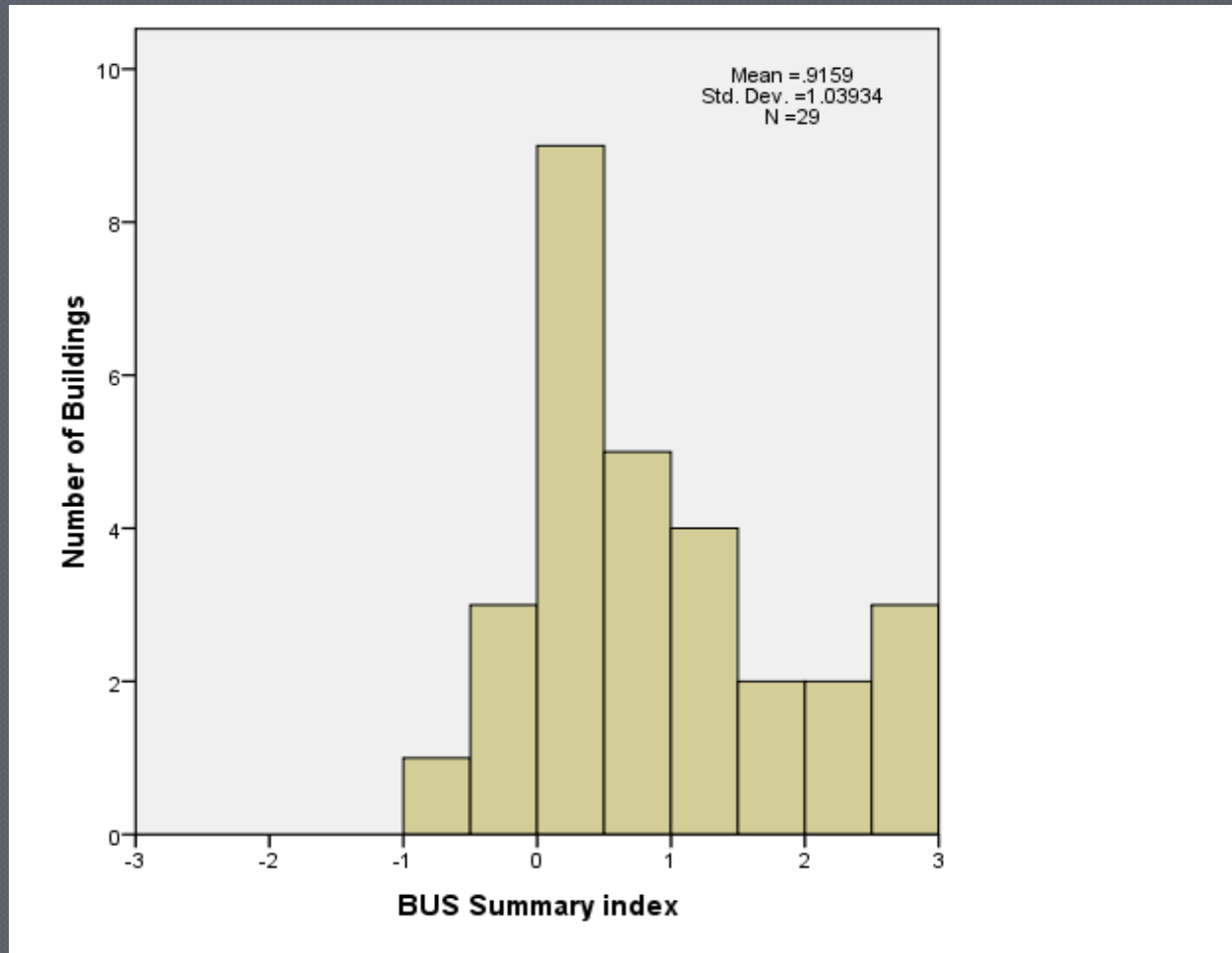
- ◉ **Demographics** – age, sex, time in building and at desk/computer
- ◉ **Operational** - space needs, furniture, cleaning, meeting room availability, storage arrangements, facilities, and image;
- ◉ **Environmental** - temperature and air quality in different climatic seasons, lighting, noise, and comfort overall;
- ◉ **Personal Control** - of heating, cooling, ventilation, lighting, and noise; and
- ◉ **Satisfaction** - design, needs, productivity, and health.

Summary Index '-3' to '+3' scale

where '+3' is 'best' and mid-point is zero

- Summary Index - an 'amalgam' of :
- Comfort overall, lighting, noise, temperature and air overall in both summer and winter
- Design, needs, health & productivity

Summary Index - Frequency Distribution



‘Best’ Performers

Summary Indices >2 (+3 to -3 scale)

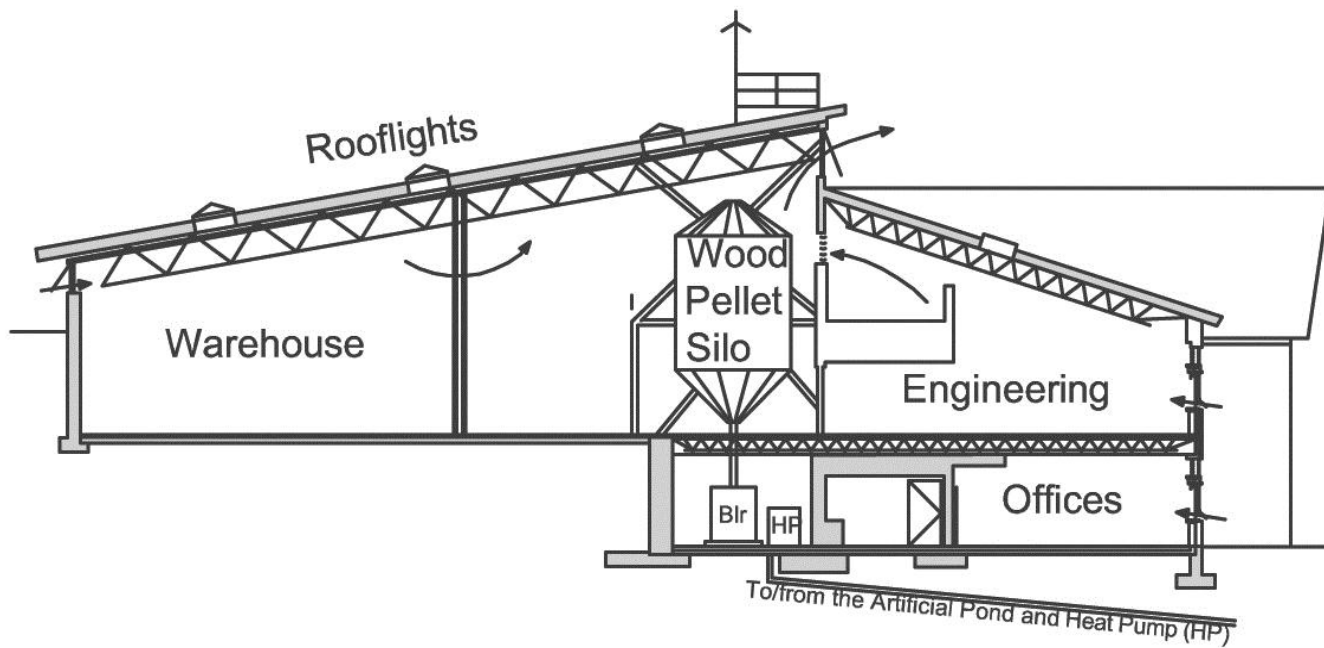
BUILDING	LAT	CLIMATE	VENT’N	INDEX
NRG	44.5°N	Cold- Temp	Mixed-mode	2.93
TRC-AC	23.0°N	Hot-Humid	Full AC	2.83
NRDC	34.0°N	Warm-Temp	Mixed-mode	2.82
MFRC	44.0°N	Cold-Temp	Mixed-mode	2.45
Erskine	44.0°S	Medium-Temp	Adv’d NV	2.39
TRC-PDEC	23.0°N	Hot-Humid	PDEC	1.95

Key Elements



NRG Systems Facility, Hinesburg, Vermont, USA

Summary Index +2.93





NRG Systems Hinesburg Vermont, USA

Summary Index +2.93

Comfort 6.56

Health 5.47

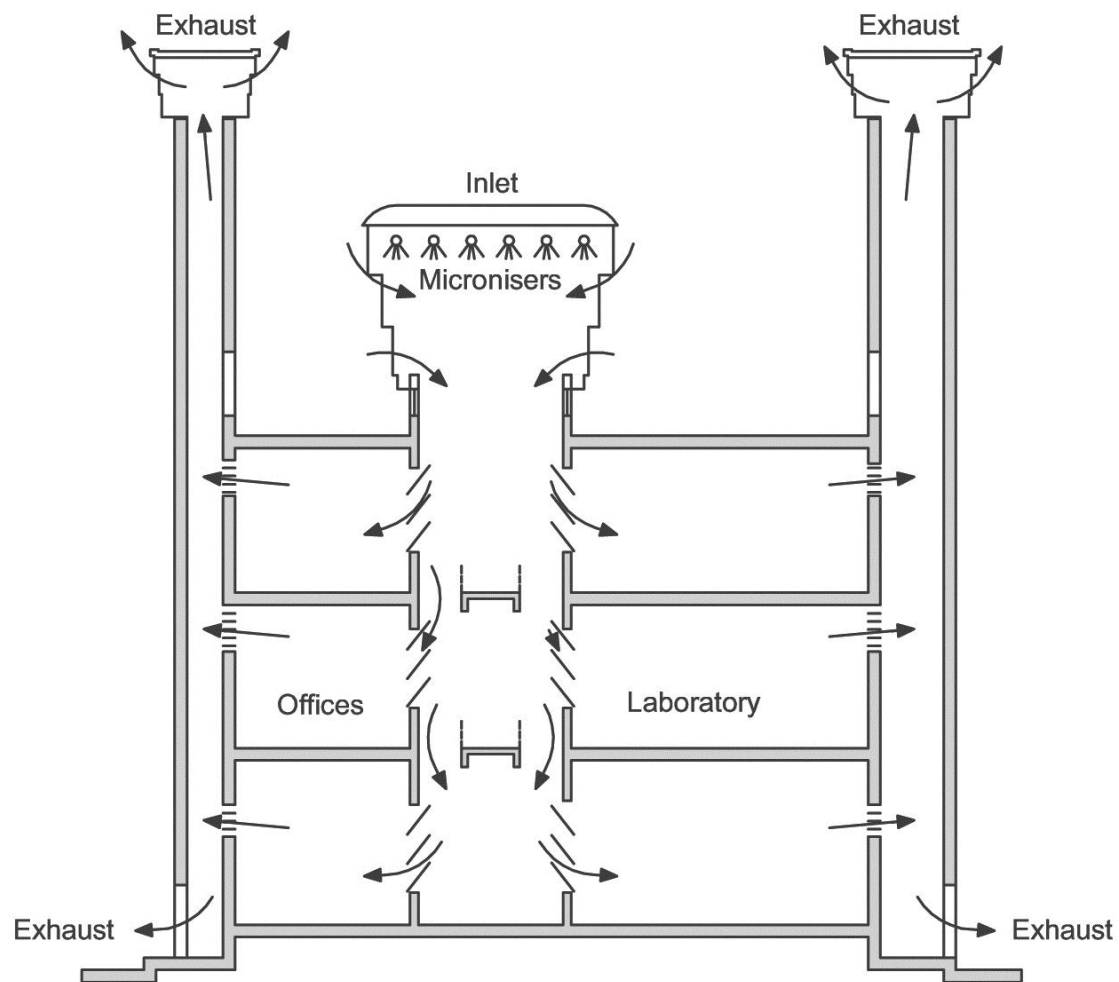
Productivity +20%



Torrent Research Centre, Ahmedabad

Summary Indices - AC Buildings +2.83

PDEC Buildings +1.95



0 5

Torrent Research Centre



Summary Index	+2.83
Comfort	5.72
Health	5.53
Productivity	+21%

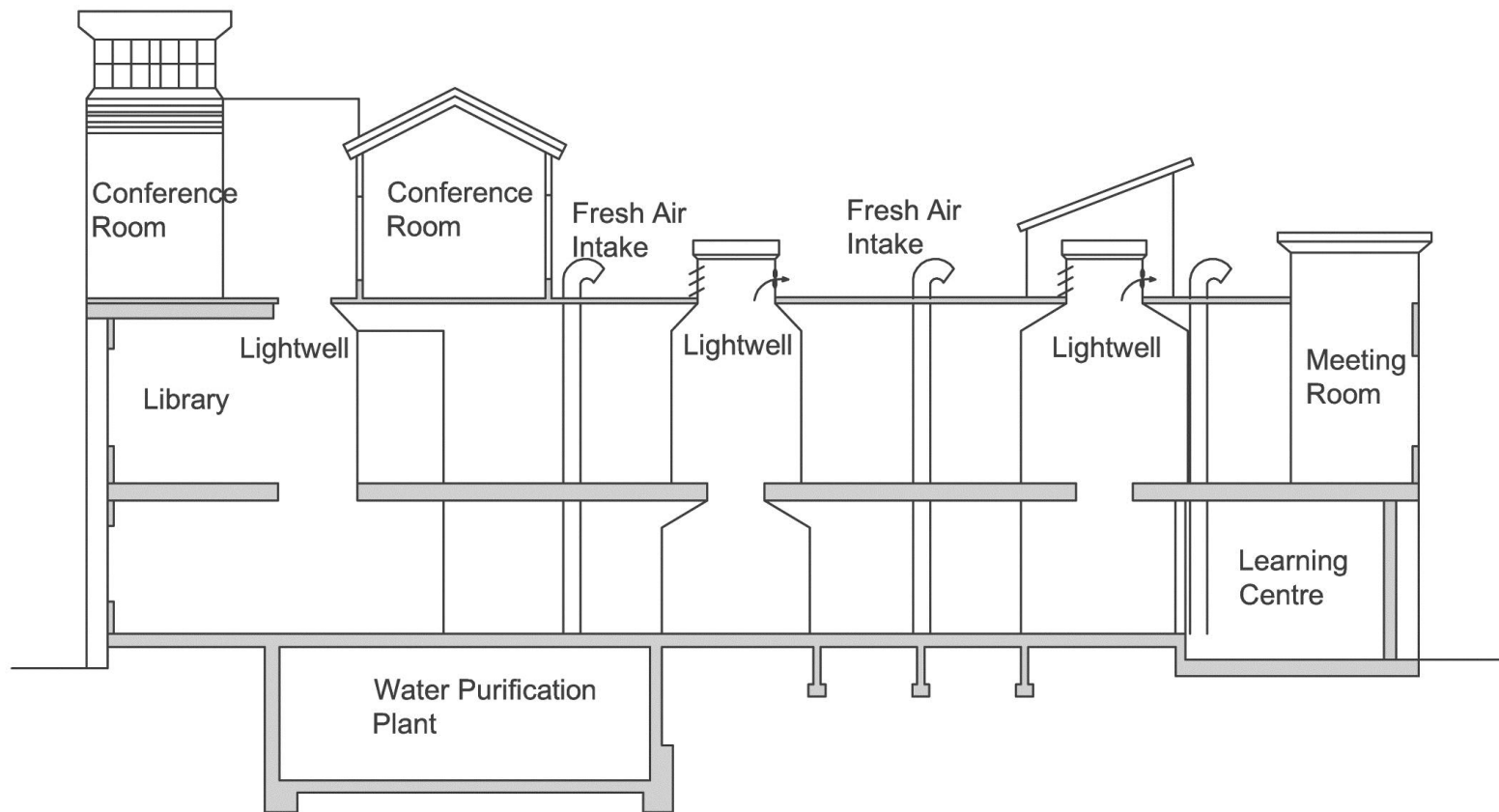
AIRCONDITIONED PDEC

Summary Index	+1.95
Comfort	5.16
Health	4.74
Productivity	+14%



Natural Resources Defence Council, Santa Monica, California, USA

Summary Index +2.82





Natural Resources Defence Council, Santa Monica, California, USA

Summary Index +2.82

Comfort 6.50

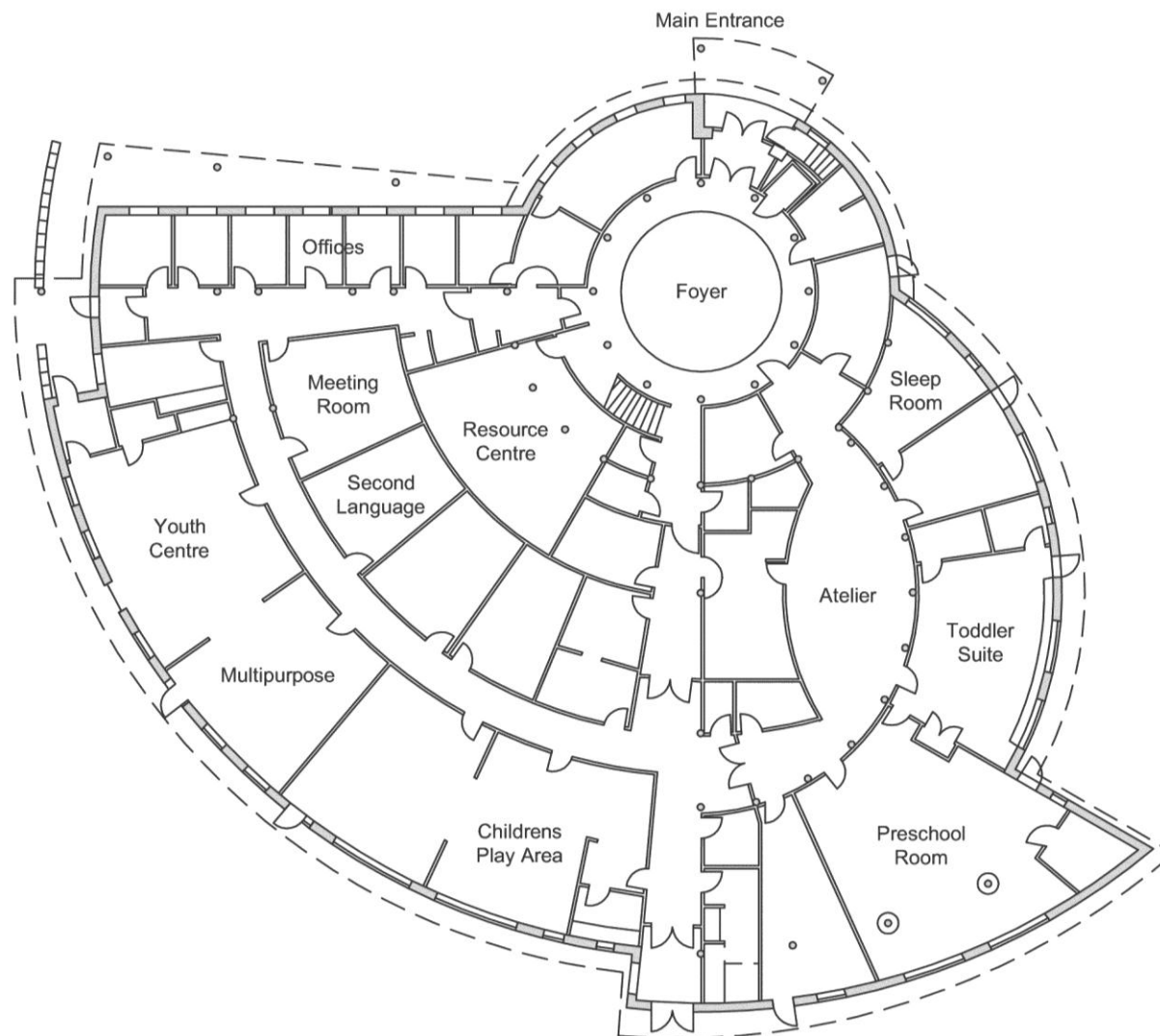
Health 5.85

Productivity +23%



Toronto Military Families Resource Centre, Ontario, Canada

Summary Index +2.45





Toronto Military Families Resource Centre, Ontario, Canada

Summary Index +2.45

Comfort 5.92

Health 5.17

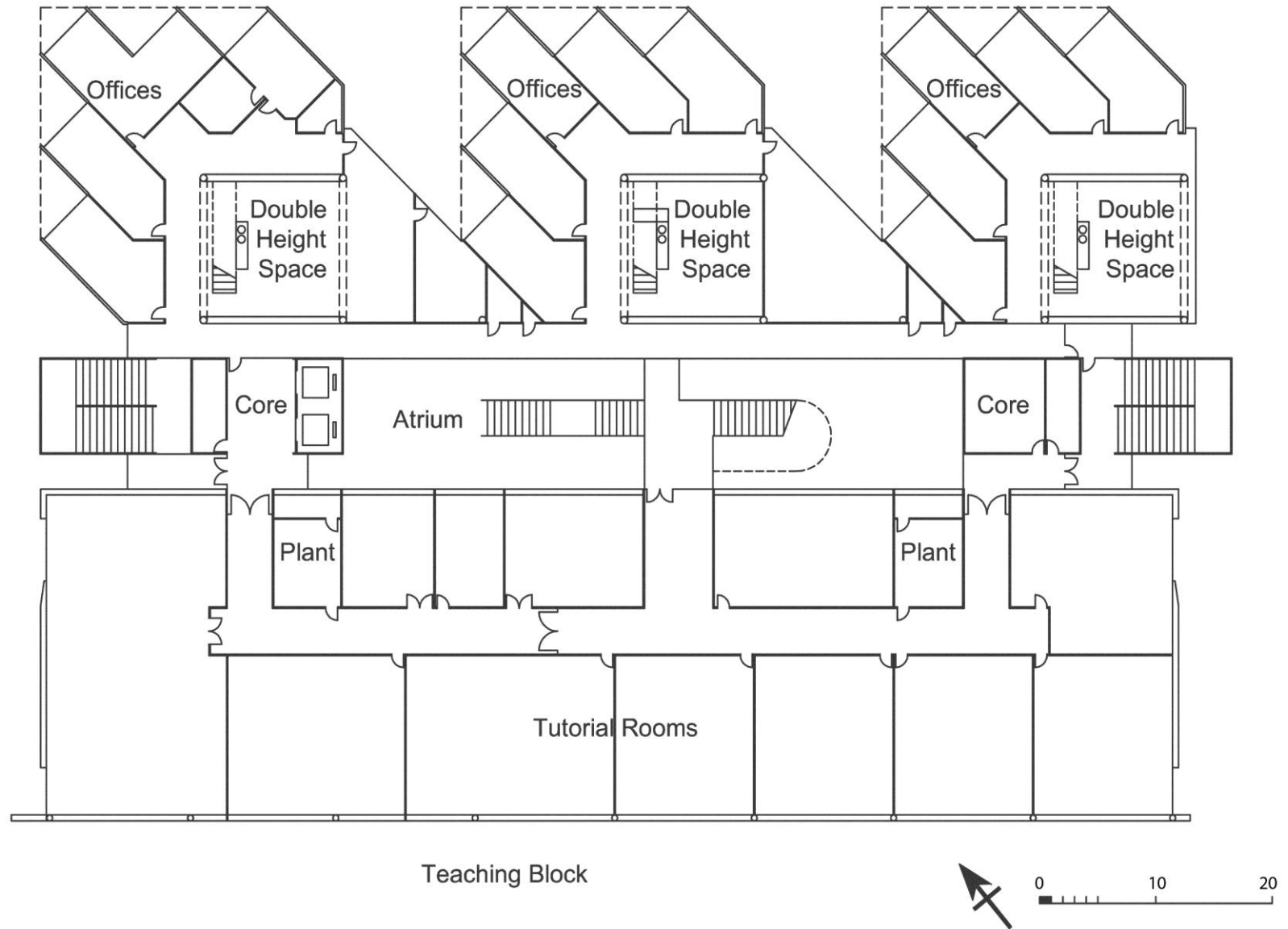
Productivity +20%



Erskine Building, Canterbury University

Summary Index +2.39

Academic Towers





Erskine Building, Canterbury University

Summary Index +2.39

Comfort 5.86

Health 4.52

Productivity +10%

Common Elements - 'Best' Buildings

- Clients committed to sustainability and energy efficiency
- Design teams similarly committed – local with track record
- Integrated design processes and adequate time for them
- Insulation and double glazing +; air tight envelope; appropriate solar orientation and shading; judicious use of thermal mass
- Mixed-mode HVAC systems with automated natural ventilation openings, plus thoughtful daylighting arrangements
- Atriums or similar to promote natural ventilation and daylighting
- Committed to commissioning and continued building management

GEORGE BAIRD

SUSTAINABLE
BUILDINGS
IN PRACTICE
WHAT THE USERS THINK



**Want to know
more?**

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Published by Routledge, UK, 2010

Refurbished vs New Buildings



Natural Resources Defence Council, Santa Monica, California, USA

Summary Index +2.82

Comfort 6.50

Health 5.85

Productivity +23%



Aorangi House, Wellington

Summary Index +1.74

Comfort 5.75

Health 4.65

Productivity +8.16%



Conservation House Wellington

Summary Index +1.59

Comfort 5.43

Health 4.54

Productivity +4.44%



40 Albert Road, South Melbourne, Australia

Summary Index +1.42

Comfort 5.65

Health 4.73

Productivity +10.0%



60 Leicester Street, Melbourne, Australia

Summary Index +1.23

Comfort 5.62

Health 5.25

Productivity +11.39%

Ranking by Summary Index (for > +1.00)

Building	Summary Index (-3 to +3 scale)	Comfort (1 to 7 scale)	Health (1 to 7 scale)	Productivity (percentage scale)
NRG	2.93 ¹	6.56 ¹	5.47 ³	19.51 ⁴
TRC-AC	2.83 ²	5.72 ⁵	5.53 ²	20.88 ²
NRDC	2.82 ³	6.50 ²	5.85 ¹	23.00 ¹
MFRC	2.45 ⁴	5.92 ³	5.17 ⁵	20.00 ³
MSCS	2.39 ⁵	5.86 ⁴	4.52 ¹¹	9.80 ¹⁰
TRC-PDEC	1.95 ⁶	5.16 ¹²	4.74 ⁷	13.66 ⁶
Aorangi	1.74	5.75	4.65	8.16
St Mary's	1.73 ⁷	5.67 ⁶	4.67 ¹⁰	10.83 ⁸
DoC	1.59	5.46	4.53	4.44
40Alb	1.42 ⁸	5.65 ⁷	4.73 ⁸	10.00 ⁹
MEWC	1.33 ⁹	5.20 ¹⁰⁼	4.77 ⁶	16.00 ⁵
Para Lib	1.31	5.40	4.11	5.56
60L	1.23 ¹⁰	5.62 ⁸	5.24 ⁴	11.39 ⁷
AUT	1.18 ¹¹	5.20 ¹⁰⁼	4.18 ¹³	3.64 ¹⁵

Sustainable

vs

Conventional

Buildings

The Sample

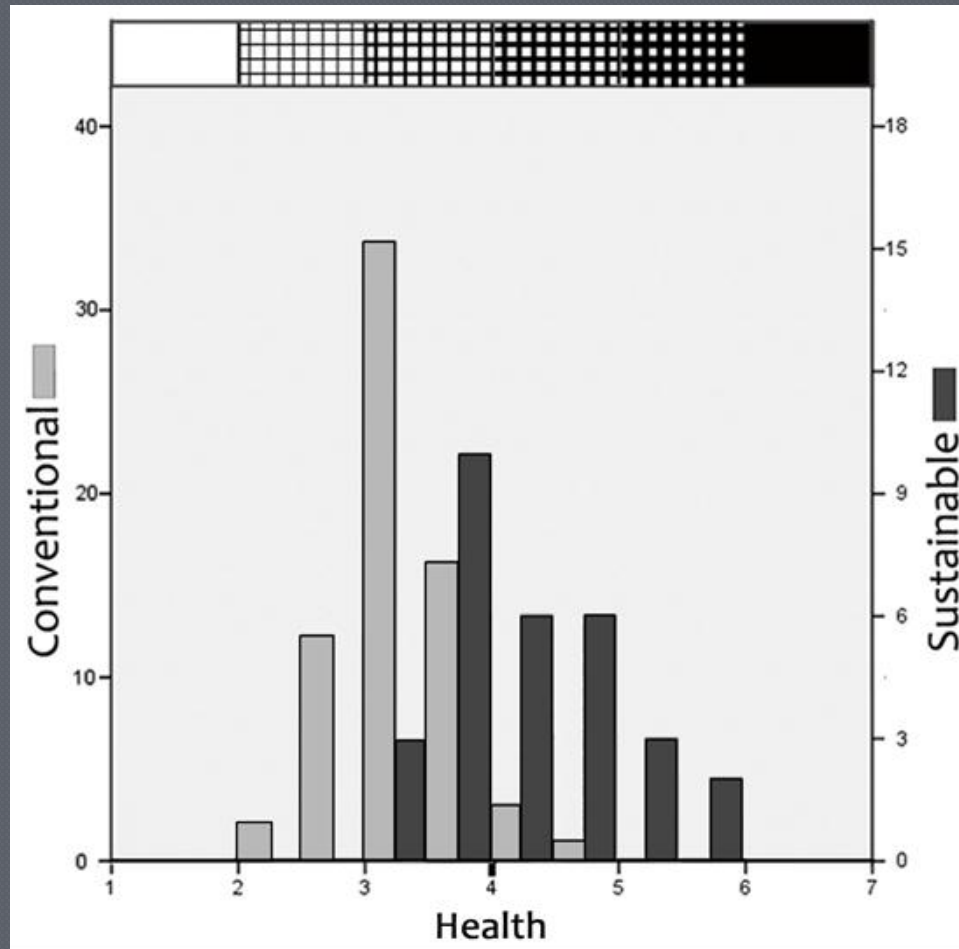
- Sustainable Buildings ~ 30 cases, worldwide
- Conventional Buildings ~ 100 cases, UK mainly
- All surveyed using Building Use Studies two-page office questionnaire

Mean Perception Scores compared

Factor	Conventional	Sustainable
Temp Overall (winter)	4.07	4.42
Temp Overall (summer)	3.72	4.32
Air Overall (winter)	3.90	4.44
Air Overall (summer)	3.72	4.33
Lighting Overall	4.32	5.15
Noise Overall	4.16	4.42
Design	4.39	4.99
Needs	4.42	5.16
Comfort Overall	4.14	4.91
Health	3.29	4.25
Productivity (%)	-3.70	+4.25

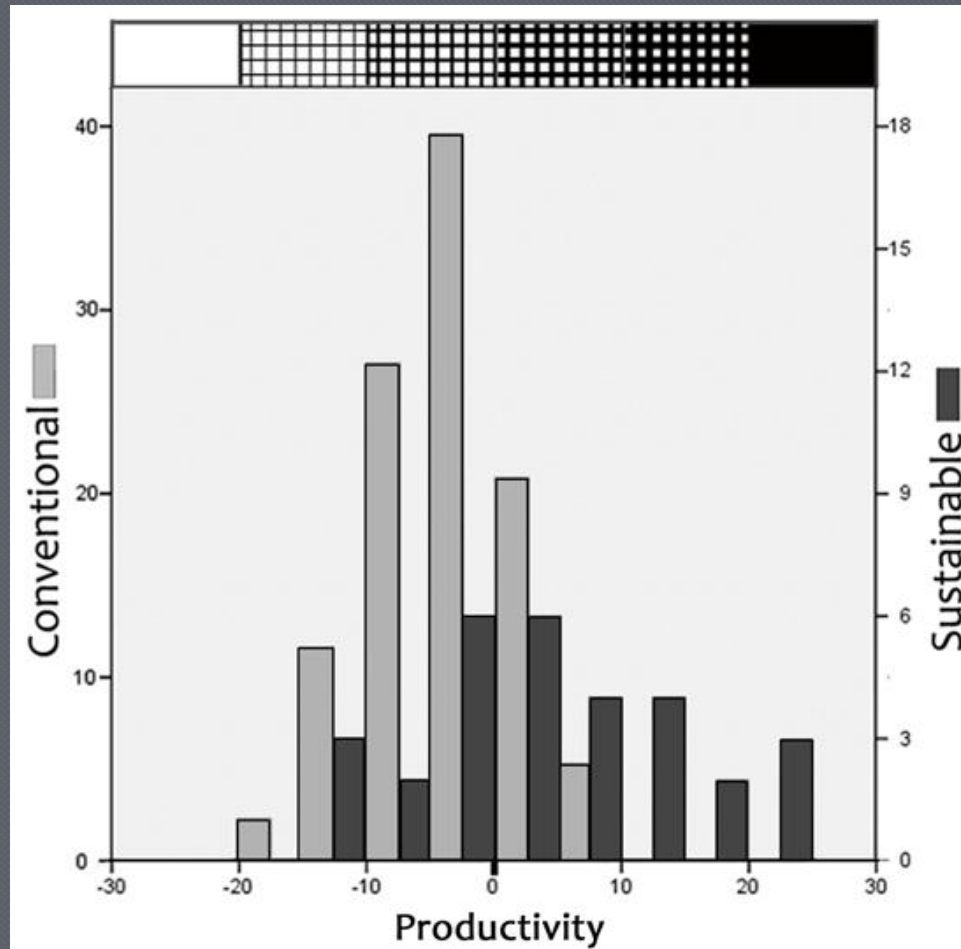
Perceptions of Health

“Do you feel more or less healthy in the building?”



Perceptions of Productivity

“Estimate how you think your productivity at work is decreased or increased”



Gary Raw – SBS Researcher

- “in buildings, people are the best measuring instruments: they are just harder to calibrate”

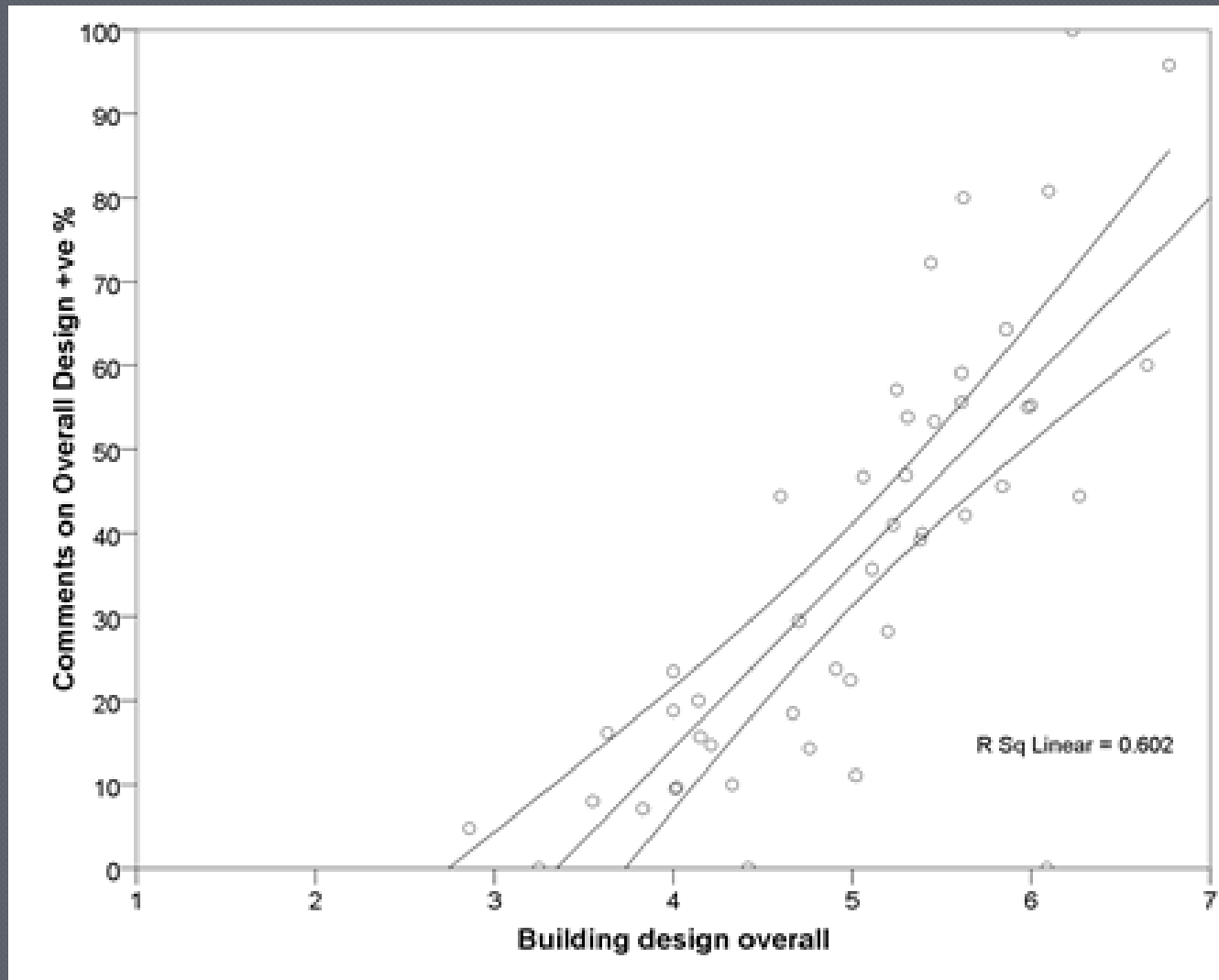
Users'
Comments
c.f.
Scores

Number and Nature of Comments

ASPECT	NUMBER OF RESPONDENTS				
	Positive	Balanced	Negative	Total	Ratio -ve/+ve
Overall Design	633	335	826	1794	1.30
Needs Overall	223	194	906	1323	4.06
Meeting Rooms	191	190	826	1207	4.32
Storage	85	177	915	1177	10.76
Comfort Overall	269	144	436	849	1.62
Noise Overall	100	214	1001	1315	10.01
Lighting Overall	300	213	592	1105	1.97
Productivity	205	343	536	1084	2.61
Health	223	253	568	1044	2.55
Work Well	1714	-	-	1714	1.27
Hinder	-	-	2183	2183	
Totals	3943	2063	8789	14795	2.23
Per cent	26.7%	13.9%	59.4%	100.0%	

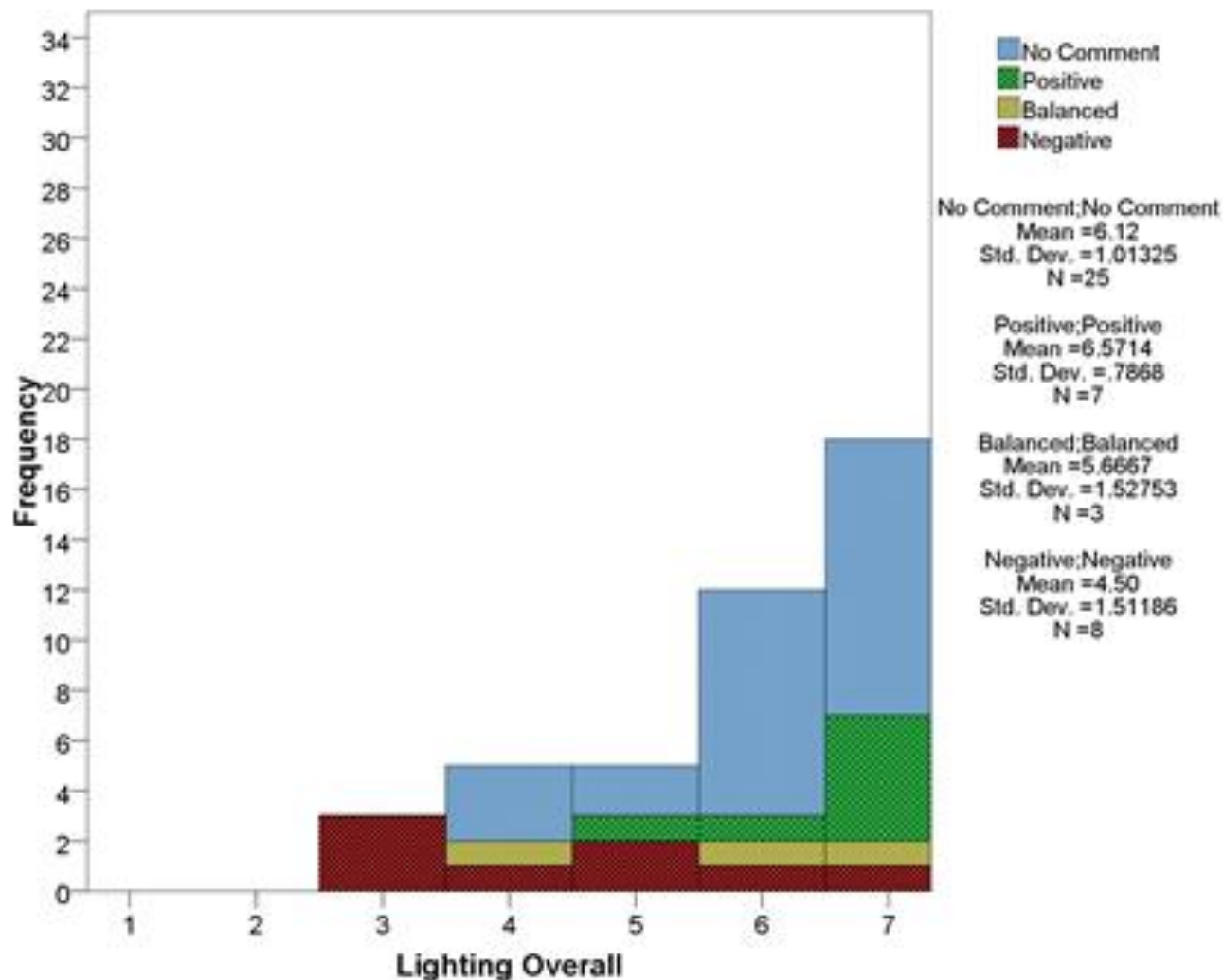
Overall Design

– positive comments vs scores



Lighting Overall: mean score 5.86

- scores c.f. nature of comments



Users' Comments c.f. Scores Summary

- Negative comments outweigh positive approx 2:1. >5:1 alert!; >10 urgent!!
- Approx 20% positive comments indicate an 'acceptable' building performance.
- Approx 65% negative comments indicate an 'acceptable' building performance.
- Building occupants are quite capable of assessing them to a fine degree.

Users' Perceptions Benchmarks?

- **Current Benchmarking Approaches**

- **Building Use Studies:**

 - UK, Australia, New Zealand

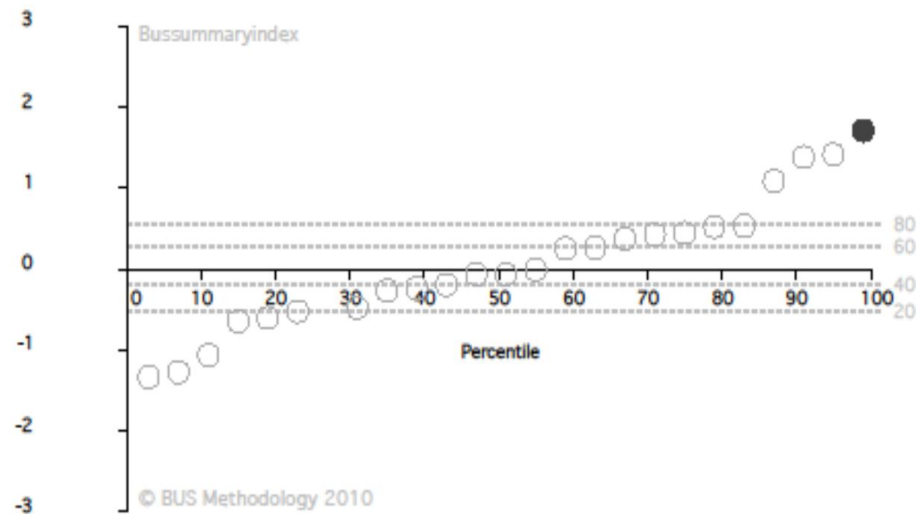
- **Center for the Built Environment:**

 - USA mainly

- **Incorporate into BSRTs?**

 - Already in Aussie NABERS IEQ

BUS Summary Indices for NZ buildings



Towards Valid and Realistic Benchmarks

- ◉ Require random sampling.
- ◉ Selection of relevant indicators.
- ◉ Incorporate into BSRTs?
Already in Aussie NABERS IEQ
- ◉ A challenge for Green Building Councils – worldwide.

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