The wing HOUSE

#### Targeting:















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③ 5 minutes to read

đ

#### Raw sewage leaks from underwater pipe onto popular Auckland swimming spot

TORIKA TOKALAU • 21:11, Feb 08 2019

#### f 💟 😏 🖾 😰



Raw sewage has been leaking onto the Kaipara River from a large underwater wastewater pipe in Parakai.

NEW ZEALAND

#### Are sewage spills hurting Auckland's marine life?

14 Feb, 2018 6:04pm



Sewage overflows that have hit city beaches this summer has left an environment group worried about ongoing impacts on Auckland's marine life. Photo / File



By: Jamle Morton Science Reporter, NZ Herald jamie.morton@nzherald.co.nz @Jamienzherald





A growing Auckland is producing 700,000 tonnes of waste a year from construction and demolition creating a big challenge for Auckland Council





According to Auckland Council around 700,000 tonnes of construction and demolition waste is generated each year in the City of Sails.



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\*)





# **BIG ISSUES**



# WHAT CAN YOU DO?



# WHAT CAN YOU DO?

Stop being a part of the problem



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New Tab

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#### LIVING BUILDING CHALLENGE

To curb sprawl, restore natural ecosystems and protect productive agricultural lands and ecologically sensitive areas from the negative impacts of development.

#### REQUIREMENTS

Projects may only be built on greyfields or brownfields: previously developed sites that are not classified as on or adjacent to any of the following sensitive ecological habitats:

- Wetlands: maintain at least 15 meters, and up to 70 meters of separation
- Primary dunes: maintain at least 40 meters of separation
- Old-growth forest: maintain at least 60 meters of separation
- Virgin prairie: maintain at least 30 meters of separation
- Prime farmland
- Within the 100-year flood plain





Subdivision











GROUND FLOOR

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MAY 15, 2017

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FROM THE PLATINUM HOMES 'VENICE' COLLECTION - TYPICAL OF NEW SUBDIVISIONS IN NZ

## Why does New Zealand keep building such massive houses?



New Zealand has some of the largest and most overpriced houses anywhere in the world. Motu Research affiliate Andrew Coleman looks at little-discussed tax change in 1989 which sowed the seeds for the current crisis.

## Are our house sizes getting too big?

9 Apr, 2016 3:50pm

③ 13 minutes to read



The small 50 sq home that Andrew Simpson and Krysty Peebles live in.

By: Paul Little



What's better when it comes to living well, a huge house or a tiny one? Paul Little talks to exponents on both ends of the housing spectrum.







https://www.qv.co.nz/property-insights-blog/average-house-size-by-age/62



## GUILTY

Gross floor area: 320sqm Conditioned area: 218sqm





## GUILTY

FIRST FLOOR Gross floor area: 320sqm Conditioned area: 218sqm All flooring on all levels to have a slip resistance of 0.4 in accordance with NZBC D1 Table 2. Concrete Earth floor W04 2.4 x 1.2 Statutate Vinyl (non slip) W04 2.4 x 1.2 W04 2.4 x 1.2 Carpet Bed 2 10 the homestar<sup>™</sup> Design Dwelling Resource Adjustment Factor (DRAF) 1.126 Density Factor (DF) 1.000 W03 0.9x 1.3 1.126 Resource Adjustment Factor (RAF)  $1.2 \times 2$ A REAL PROPERTY AND W03 0.9x1.2 241012

W02 2.4x 1.5

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12

Pop Top

Bed 4 (Master)

> W03 0.9 x 1.2

> > GROUND FLOOR

Pop Top

W02 2.4 x 1.5

X//N/

W01 24x21

W02 2.4 x 1.5

Bed 3

۲

Dres

(B)-Study

Nook

W03 2.09 0.4 coemcian Carpet

Timber

E F



# **Construction waste**



## LIVING BUILDING CHALLENGE

What if every single act of design and construction made the world a better place?

The Living Building Challenge is the world's most rigorous proven performance standard for buildings. People from around the world use our regenerative design framework to create spaces that, like a flower, give more than they take.

#### **14. NET POSITIVE WASTE**



This project must reduce environmental burdens from the extraction, processing, and disposal of materials and turn waste into a valuable resource through beneficial reuse.

The project team must strive to reduce or eliminate the production of waste during design, construction, operation, and end of life in order to conserve natural resources and to and ways to integrate waste back into either an industrial loop or a natural nutrient loop.

All projects must feature at least one salvaged material per 500 square meters of gross building area. Projects that are an adaptive reuse of an existing structure are exempt from this requirement.

The project team must create a Materials Conservation Management Plan that explains how the project optimizes materials in each of the following phases:

- Design Phase, including the consideration of appropriate durability in product specification
- · Construction Phase, including product optimization and collection of wasted materials
- · Operation Phase, including a collection plan for consumables and durables
- End of Life Phase, including a plan for adaptable reuse and deconstruction

materials Diversion Requirements	
Material	Minimum Diverted/ Weight
Metals	99%
Paper and cardboard	99%
Soil and biomass	100%
Rigid foam, carpet, and insulation	95%
All others - combined weighted average	90%

#### Materials Diversion Requirements



## **PROCESSING FACILITY**

#### 79.8% OF CONSTRUCTION & DEMOLITION WASTE IS DIVERTED FROM LANDFILL

Our 2.7 ha Waste Processing Facility in Onehunga allows us to maximise recycling and reprocessing of waste and divert waste from landfill. The processing systems include a large scale mechanical and manual sort line to recover timber, metals, card, plasterboard and other valuable commodities.









### Timber

### Concrete

Steel

## Plasterboard



Like Page

Why is the earth in trouble?.....because this type of thing is situation normal and totally acceptable.

Brand new plastic plumbing fittings heading to landfill.

Think of all the effort that has gone into the manufacture of these fittings from extraction to manufacture to shipping......just to be sent to landfill!

And none batts an eye about it. Totally accepted and acceptable!



## As a society we have a problem!





## **Timber Weatherboards**

- Wash each year
- Repaint every 10

**50 year life** 50 washes 5 repaints

### **Timber weatherboards waste streams**





## What about brick?

## Enjoy your weekends. Zero maintenance required.



### **Timber weatherboards**





1) Weatherboard 2) Nails (to fix weatherboard) *3)* Undercoat and top coat (to protect weatherboard) 4) Cavity batten *4a) More nails (to fix cavity batten)* 5) Building wrap (or rigid air barrier) 6) Staples (to fix building wrap) 7) Timber Framing 8) Insulation 9) Plasterboard 10) Screws to fix plasterboard 11) Plasterboard adhesive 12) Plaster 13) Undercoat *14) Paint topcoat* 

### **Timber weatherboards waste streams**













### **Timber weatherboards waste streams**











#### If soiled (ie put in a skip)









SOUND SOLUTIN Premium Acoustic Insulc O High Performance O Eco Friendly O So Vear Durability Non-Irritant & Non-Allergenic

n

GreenStu

OUND COLUTIO





#### **On-Site Waste Sorting**

An additional point is available where on-site waste sorting is included in the (1)Site Waste Minimisation plan, with a minimum of 3 sorting stations.

1 point





A High Performance

Year Durability








n-	Site Waste Sorting	
.)	An additional point is available where on-site waste sorting is included in the Site Waste Minimisation plan, with a minimum of 3 sorting stations.	1 point

#### **Built Rating**

#### All Projects

Monthly waste and RRR reports for the entire duration of construction works are to be signed and witnessed at each stage of reporting by senior company representatives of the waste and RRR contractor.

These reports will clearly state the reported level of RRR that has actually taken place.

#### Reduced Construction Waste

Photo or copy of the completed waste records based on monthly reports for the whole of site which display the weight of waste sent to landfill/cleanfill measured in units of kg/m<sup>2</sup>.

#### Increased Waste Diversion

Photo or copy of the completed waste records and RRR records for the whole of the site which display the percentage of total waste reused, recycled or recovered measured in units or kg.

If the waste has been sorted off site (i.e. mixed waste has been collected from site) then proof of RRR performance must be provided. Receipts/dockets from the recycling providers are acceptable.

#### Not Applicable

Signed Confirmation of Existing Dwelling from the owner to confirm that the dwelling has not been built within the last three years and has not undergone a major refurbishment.

## **Timber weatherboards waste streams**



















## Timber weatherboards waste streams













## So what did we do?

## **Rammed Earth**





## What is the Living House doing.....











# Materials

#### × +

New Tab



#### INTENT

To eliminate the use of worst-in-class materials/chemicals with the greatest impact to human and ecosystem health.

#### REQUIREMENT

The project cannot contain any of the following Red List materials or chemicals:

- Alkylphenols
- Asbestos
- Bisphenol A (BPA)
- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated
  Polyethlene
- Chlorobenzenes
- Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs)
- Chloroprene (Neoprene)
- Chromium VI
- Chlorinated Polyvinyl Chloride (CPVC)
- Formaldehyde (added)

- Halogenated Flame Retardants (HFRs)
- Lead (added)
- Mercury
- Perfluorinated Compounds (PFCs)
- Polychlorinated Biphenyls (PCBs)
- Phthalates
- Polyvinyl Chloride (PVC)
- Polyvinylidene Chloride (PVDC)
- Short Chain Chlorinated Paraffins
- Wood treatments containing Creosote, Arsenic
  or Pentachlorophenol
- Volatile Organic Compounds (VOCs) in wetapplied products



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The wing HOUSE

Where are we at.....







Where are we at.....





The wing HOUSE

Fun times.....





The ling HOUSE

Fun times.....







# **Climate Change**



## Life cycle analysis

void and lap allows some air circulation between back of board and wall underla minima contact

#### Traditional Construction

1) Weatherboard

2) Nails (to fix weatherboard)3) Undercoat and top coat (to protect weatherboard)

4) Cavity batten

*4a) More nails (to fix cavity batten)* 

5) Building wrap (or rigid air barrier)

6) Staples (to fix building wrap)

7) Timber Framing

8) Insulation

*9) Plasterboard* 

- 10) Screws to fix plasterboard
- 11) Plasterboard adhesive
- 12) Plaster
- 13) Undercoat
- 14) Paint topcoat



#### **Rammed Earth**

1) Earth (aggregate / cement

- / oxides / sand
- 2) Rebar (steel)
- 3) XPS insulation
- + formwork (reusable)

- For passive house we also have: 4) Hebel
- 5) Hebel adhesive
- 6) Proclima tapes

## **Durability:** Jiayuguan Fort and the great wall of China



## But there is a problem.....





# Climate change: The massive CO2 emitter you may not know about

By Lucy Rodgers BBC News

O 17 December 2018

🛉 🔗 😏 🗹 < Share

Climate change



# Concrete is the most widely used man-made material in existence. It is second only to water as the most-consumed resource on the planet.

But, while cement - the key ingredient in concrete - has shaped much of our built environment, it also has a massive carbon footprint.

Cement is the source of **about 8% of the world's carbon dioxide (CO2) emissions**, according to think tank Chatham House.

If the cement industry were a country, it would be the third largest emitter in the world behind China and the US. It contributes more CO2 than aviation fuel (2.5%) and is not far behind the global agriculture business (12%).





Energy and Buildings Volume 42, Issue 3, March 2010, Pages 380-385

Embodied energy in cement stabilised rammed earth walls

B.V. Venkatarama Reddy A B, P. Prasanna Kumar B

Show more

https://doi.org/10.1016/j.enbuild.2009.10.005



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Contents lists available at ScienceDirect

#### **Construction and Building Materials**

journal homepage: www.elsevier.com/locate/conbuildmat

Life cycle analysis of environmental impact vs. durability of stabilised rammed earth



Construction and Building

Alessandro Arrigoni<sup>a,\*</sup>, Christopher Beckett<sup>b</sup>, Daniela Ciancio<sup>b</sup>, Giovanni Dotelli<sup>a</sup>

<sup>a</sup> Dipartimento di Chimica, Materiali e Ingegneria Chimica "G. Natta", Politecnico di Milano, Piazza Leonardo da Vinci 32, Milano 20133, Italy <sup>b</sup> School of Civil & Resource Engineering, The University of Western Australia, 35 Stirling Highway, Perth, WA 6009, Australia

#### HIGHLIGHTS

- Reducing cement content in SRE results in considerable emissions and energy savings.
- The use of waste materials is recommended to reduce the environmental impact of SRE.
- Consequential LCA results depend on the marketability of the by-product used.
- It is possible to have durable, strong and environmentally sustainable SRE mixes.
- Unconfined compressive strength should not be used as an indicator of durability.

#### GRAPHICAL ABSTRACT





Procedia Engineering

www.elsevier.com/locate/procedia

9th International Symposium on Heating, Ventilation and Air Conditioning (ISHVAC) and the 3rd International Conference on Building Energy and Environment (COBEE)

Life Cycle Energy Analysis of Eight Residential Houses in Brisbane, Australia

Lisa Guan<sup>a,\*</sup>, Madeleine Walmsely<sup>a</sup> and Guangnan Chen<sup>b</sup>

<sup>e</sup>Queensland University of Technology (QUT), GPO Box 2434, Brisbane, QLD 4001, Australia <sup>b</sup>Faculty of Health, Engineering and Sciences, University of Southern Queensland, Toowoomba, QLD 4350, Australia

Assembly	Embodied energy MJ/m <sup>2</sup>
110mm concrete slab-on-ground	645
200mm precast concrete, T beam/infill	644
Timber frame, concrete tile, plasterboard ceiling	251
Timber frame, terracotta tile, plasterboard ceiling	271
Timber frame, steel sheet, plasterboard ceiling	330
Single skin autoclaved aerated concrete (AAC) block wall	440
Single skin AAC block wall gyprock lining	448
Single skin stabilised (rammed) earth wall (5% cement)	405
Steel frame, compressed fibre cement clad wall	385
Timber frame, reconstituted timber weatherboard wall	377
Timber frame, fibre cement weatherboard wall	169
Cavity clay brick wall	860
Cavity clay brick wall with plasterboard internal lining and acrylic paint finish	906
Cavity concrete block wall	465

#### Table 4. Embodied energy for assembled floors, roofs and walls [3].





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# Double skinned rammed earth 4.8 times worse

#### Table 4. Embodied energy for assembled floors, roofs and walls [3].

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Timber frame, steel sheet, plasterboard ceiling	330
Single skin autoclaved aerated concrete (AAC) block wall	440
Single skin AAC block wall gyprock lining	44.8
Single skin stabilised (rammed) earth wall (5% cement)	405
Steel frame, compressed fibre cement clad wall	385
Timber frame, reconstituted timber weatherboard wall	377
Timber frame, fibre cement weatherboard wall	169
Cavity clay brick wall	860
Cavity clay brick wall with plasterboard internal lining and acrylic paint finish	906
Cavity concrete block wall	465





#### Environmental Product Declaration

EverSure<sup>™</sup> GP cement EverFast<sup>™</sup> HE cement

In accordance with ISO 14025 and EN 15804



Version 1.0 of 12 May 2019 Valid until 12 May 2024 No. S-P-01170



## **Results of assessment**

Table 2: Life Cycle Impact Assessment (LCIA) indicators

Indicator	Unit	GP, EverSure	HE, EverFast
Global warming potential (GWP)	[kg CO2-Equiv.]	732	734
Ozone Layer Depletion Potential (ODP)	[kg R11-Equiv.]	5.29E-12	5.57E-12
Acidification Potential (AP)	[kg SO2-Equiv.]	0.823	0.838
Eutrophication Potential (EP)	[kg Phosphate-Equiv.]	0.207	0.208
Photochemical Ozone Creation Potential (POCP)	[kg Ethene-Equiv.]	0.0683	0.0691
Abiotic Depletion Potential (ADP elements)*	[kg Sb-Equiv.]	9.99E-06	1.30E-05
Abiotic Depletion Potential (ADP fossil)	[MJ]	2860	2870



## Space heating.....



## Space heating.....

#### Home heating running costs



https://www.energywise.govt.nz/at-home/heatingand-cooling/types-of-heater/

## Space heating.....

#### Home heating running costs



cents per unit (kWh) of heat released

https://www.energywise.govt.nz/at-home/heatingand-cooling/types-of-heater/

# **homestar**<sup>®</sup> Better homes, proven. | *Kāinga pai ke atu, tūturu.*

#### **6 Homestar Checklist for Standalone Homes**

I construction of the second se		
SELECT MINIMUM OF 10 POINTS FROM THE FOLLOWING LIST:		
Density and Resource Efficiency = up to 8 points using Resource Efficiency and Density table. See tables below for values.	Floor plans	DRE
Fixed space heating source is a Heat pump (air/ground to air/water) = 1 point	Site check	EHC-2



Heat pumps use refrigerants



Heat pumps use refrigerants Refrigerants leak



Heat pumps use refrigerants Refrigerants leak

Heat pumps in NZ used to use R22, then R410 and now R32



The living

Heat pumps use refrigerants Refrigerants leak

Global warming potential (GWP) of  $CO_2 = 1$ 

Heat pumps in NZ used to use R22, then R410 and now R32

## Heat pumps use refrigerants Refrigerants leak

Heatpumps in NZ used to use R22, then R410 and now R32

The ling HOUSE

Global warming potential (GWP) of  $CO_2 = 1$ 

Refrigerant	Туре	ODP	GWP
R-32	HFC	zero	675
R-134a	HFC	zero	1,430
R-404A	HFC	zero	3,922
R-410A	HFC	zero	2,088
R-290	HC	zero	3
R-600a	HC	zero	3
R-1234yf	HFO	zero	4
R-1234ze	HFO	zero	6

GWP values are from the IPCC  $4^{\text{th}}$  Assessment Report, 2007, (100 year), carbon dioxide = 1.
## Unintended consequences.....

## Heat pumps use refrigerants Refrigerants leak

# Heat pumps in NZ used to use R22, then R410 and now R32

	Energy Policy 39 (2011) 1369-1381	
	Contents lists available at ScienceDirect	ENERGY POLICY
	Energy Policy	
ELSEVIER	journal homepage: www.elsevier.com/locate/enpol	

Air-source heat pump carbon footprints: HFC impacts and comparison to other heat sources

Eric P. Johnson\*





### Global warming potential (GWP) of $CO_2 = 1$

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R-600a	HC	zero	3
R-1234yf	HFO	zero	4
R-1234ze	HFO	zero	6

GWP values are from the IPCC  $4^{\text{th}}$  Assessment Report, 2007, (100 year), carbon dioxide = 1.

Fig. 1. Refrigerant's contribution to the heat-pump footprint is significant.



# What did we choose for space heating?



## Passive House Institute New Zealand

Advocating for healthy, highly energy efficient homes and public buildings in New Zealand.



# And if you aren't doing the same then you are the problem!

New Zealand Architects Declare Climate & Biodiversity Emergency

### Founding signatories:

Andrew Patterson, Architype, Assembly Architects, Ben Hudson Architects, Black Pine Architects, Context Architects, Drawing Room, Gordon Moller, Graeme North EcoDesign, Herbst Architects, Jack Manning, Jasmax, Jeremy Salmond, Jessop Architects, Judi Keith-Brown Architects, Marshall Cook, Pacific Environments, Patrick Clifford, Pete Bossley, Pip Cheshire, Rafe Maclean Architects, Roger Walker, RTA Studio, Stuart Gardyne, Team Green Architects, Tennent Brown Architects, VIA Architecture



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#### 26 Aroha Apartments Auckland



26 Aroha Avenue in Auckland is a Build to Rent project with sustainability and community at its heart. The apartments are planned to replace a single 1920s dwelling in Sandringham with 12 quality rental apartments with high sustainability aspirations.

#### The Foundries Auckland



The Foundries at 61 Wellington Street are Freemans Bay's newest residential offering. The boutique development of 19 two-storey townhouses provides an alternative to the increasing number of high-rise apartments around the CBD.

#### Launch Bay <sup>Auckland</sup>



Launch Bay is a watershed new development in Hobsonville Point set to transform a historic military base into a new residential precinct only 20 minutes from downtown Auckland.

#### Arvida Living Well Park Lane Christchurch



Arvida Park Lane is a new approach to retirement living that promotes empowering and enriching retirees lives. It is community-focused, with facilities such as a wellness centre, community creche and cafe.

## context Architects Portfolio Individual ×





Clearwater house No.2, Christchurch Confident architecture, elegant spaces





High-performance homes Leaky 80s leftovers to high-scoring beauties



Modern-day bach, Raglan Elegantly reticent, with homely ambitions





Hunua residence Rural vernacular, great for parties and pets



MENU



# What firm has stood up and said we won't design/build BAU anymore?





Designing Eco-Friendly Green Homes ... pinterest.com



Green Building - RNL Homes mlhomes.com



GREEN MAGIC HOMES - YouTube youtube.com



Free eBook - Green Homes New ... greenhomesnz.co.nz





Eco-homes: the future of house-building ... homesandproperty.co.uk



18 INEXPENSIVE SUSTAINABLE HOMES ALMO... medium.com



Sustainable Homes - Ranger Roofing of ... rangerroofingok.com



Trends for Sustainable Homes elemental.green



- architectural homes for sale in New Zeal... homestolove.co.nz
- Modern New Zealand House by Creative ... pinterest.com
- Modern Home Plans Natural ... naturalconstruction.co.nz

House Plans - Bella Homes bellahomes.co.nz



New Homes Gallery - Modern House ... designbuilders.co.nz



Modern Home Plans - Natural ... naturalconstruction.co.nz



Black Box Modern - HOUSE PLANS NEW ... houseplans.co.nz



Modern House Plans | Signature Homes signature.co.nz





Homestar Practitioner and Assessor ... mackit.co.nz



Homestar rated house firth.co.nz

trendsideas.com

New Zealand Green Building Council

nzgbc.org.nz



homes streets ahead of building code ... oneroof.co.nz

## **Green building rating tools**











# BREEAM®

## Green building rating tools





You can't just specify 6-Homestar, 5 **Green Star**, **LEED Gold and** expect to get a 'sustainable' outcome







## You know what you are getting. If you are designing to this standard you are a part of the problem!

## Green building rating tools





## The Living Building Challenge IS a challenge.....but it's worth remembering that LBC is first and foremost a **philosophy** and advocacy tool

Tricia Love

"You cannot get through a single day without having an impact on the world around you. What you do makes a difference, and you have to decide what kind of difference you want to make." -- Jane Goodall