Built Environment Research at Massey University - 2013
Randomised control trial in 30 Auckland homes with a ceiling cavity mechanical ventilation system installed

Monitored for two winters

Results; homes with ceiling ventilation system;
• Warmer during the day
• 1 hour offset in need to turn on heaters
• Colder overnight

Study completed, publications ongoing

Contact Robyn Phipps or Mikael Boulic
Ventilation

• MU contributor to WAVE; (Weathertightness, Air Quality and Ventilation Engineering Program)
• 6-year program, commenced in October 2009
• Airtightness in 60 homes and ventilation in 40 homes (Auckland, Palmerston North, Wellington and Dunedin).

• MU 10 new homes constructed since 1995 in Palmerston North
• Found new homes can have less 0.25 infiltration. Mechanical ventilation is becoming necessary
Housing, Heating and Health Study

- 409 children aged 6-12 years with asthma,
- MU and BRANZ: Intensive monitoring in subset of main sample living room and child’s bedroom.
- Results; UFGH produced insufficient heat, but exceeded WHO guidelines for NO2
- Replacement heater (heatpump, wood pellet burner or flued gas heater) increased warmth, improved asthma, decreased school absence and drug use,
- Contact Robyn Phipps, Mikael Boulic or Philippa Howden-Chapman
Schools

- Improving health in classrooms with a low cost solar ventilation system
- Classrooms can have bacteria levels similar to those found near a wastewater treatment plant and very high CO2 levels
- Need for increased ventilation and improved indoor air quality
- 12 junior classrooms to be monitored 2013 & 2014
- Measures include environmental, health and energy
- Contact Robyn Phipps or Mikael Boulic

Healthy Homes Design

- Development of a Healthy Housing Design and Remediation Decision Support System
- Modelling of tradeoffs between energy consumption, materials selection, heating ventilation, insulation, site factors, user requirements, existing structures, to achieve a healthy home

- Commenced late 2012
- Contact Aizat bin Basir, Robyn Phipps or Hans Guesgen

Phipps, R.A. (2012) Built environment research at Massey University
• **Smart homes for monitoring elderly living alone.**

• **Wireless sensors that can be retrofitted into peoples' houses, that provide sufficient information for machine learning algorithms to identify behaviours (and deviations from expected behaviours) without intruding upon the inhabitant's privacy (no cameras, microphones, etc.). We have developed algorithms that are capable of learning about behaviours based on sensor activations alone, and are now investigating how contextual information (such as time, temperature, previous behaviours) can help to detect normal and abnormal behaviours.**

• **Ongoing. Contact Stephen Marsland and Hans Guesgan**
Ongoing lighting research into three areas:

- LED technology, performance
- Energy efficient lighting systems, and the
- Photometry of lamps and luminaires.

The outcomes from the research are being incorporated into our laboratory practices and teaching programs.
LED’s

• **Investigation of MR16 Light Emitting Diode (LED) Lighting Technology.**
  • Low voltage MR16 LED lamps have been designed as direct one-for-one replacements for older halogen MR16 technology. The project considers whether these new lamps can live up to their marketing hype. Three areas are under investigation:
    – equivalency with halogen lamps
    – lighting quality over time
    – effect of heat build-up in downlights
  • Study began in 2011, experimentation ongoing
  • Contact Susan Mander, Robyn Phipps or Roy Speed
Development of a Road and Urban Lighting Holistic Assessment Model

The development of a computer based assessment model to calculate the economic and environmental performance of road and urban lighting systems to assess and compare holistic performance over whole-of-life.

The model is currently running and is being trialed in New Zealand and internationally.

Contact Roy Speed or Brian King
Stakeholder Perceived Barriers to the Use of Solar Energy in Thailand's Tourism Buildings

Design decisions based on past projects, solar technologies seen as risky and expensive by developers. Consultants don’t consider their fee structure allows them to incorporate new technologies.

Masters thesis completed 2012

Contact Manda Trevareth, Robyn Phipps or John Holland
Energy

- Development of a Benchmarking Tool for Assessing the Energy Performance of University Infrastructure
- Statistical analysis of energy use by factors including building use, student numbers, external contracts, weather, building’s resilience to weather, age of building
- Informs energy retrofit and investment decision making
- Masters thesis completed 2012, further research ongoing
- Contact Paul Compton or Robyn Phipps
Energy performance contracting is a new issue in NZ

The emergence of energy performance contracting in Australia will be reviewed and the lighting / potential energy savings in selected case study commercial buildings will be investigated.

Contact Tim Baty or Robyn Phipps
Thermal performance of wall insulation panels

- The thermal performance and air tightness of innovative wall insulation cladding panels is being monitored in two new Palmerton North houses and 4 retrofitted homes.

- Contact Robyn Phipps or Mikael Boulic.

• Reducing Construction Waste in Healthcare Sector

A Healthcare Construction Waste Minimisation Framework Self-Assessment Tool has been developed to address comprised six waste minimisation strategies namely project documents management, stakeholders' waste awareness, communication and coordination, buildability, materials selection and procurement, and change management.

• Contact Niluka Domingo
Energy

- Intelligent HVAC Control to Minimize Building Energy Use in a Lecture Theatre
- Assessment of HVAC system use, thermal comfort, energy balance and actual HVAC energy consumption
- Optimize the HVAC control using the Riccati equation in order to minimize energy use while maintaining thermal comfort in occupied rooms
- Contact Claire Flemmer or Rory Flemmer
Productivity

- Develop a model to measure and compare productivity for prefab and construct in situ construction systems.
  - 1) develop and test a model for measuring onsite productivity
  - 2) apply model to Auckland case studies
  - 3) establish the marginal productivity of prefab system and in situ to determine optimised applications for prefabrication

- Work-in-progress

- Contact Wajiha Shahzad, Jasper Mbachu or Niluka Domingo.
Productivity

• Pareto analysis of on-site productivity constraints and improvement techniques in New Zealand building industry
  – key constraints to on-site productivity in NZ construction industry
  – risk levels of constraints-impact and occurrence frequencies
  – innovative solutions for improving productivity in the industry

• Completed 2012
• Contact Serdar Durdyev or Jasper Mbachu
Knowledge and skills required for contractors’ high productivity and performance in construction project delivery: An exploratory study of the up-skilling needs of the New Zealand contractors.

Results: technical, managerial and generic knowledge and skills required to support high productivity and performance construction project delivery.

20 out of the 24 identified skills and knowledge were found to have moderate to high impact on contractors’ productivity and performance.

Completed in 2012.

Contact Jasper Mbachu
Productivity increase leverage points in the residential life cycle phases

Interviews with key players of 24 residential building projects.

Results:
- Architect & building owner most influential; need training in productivity issues
- Building Consent Authorities were rated low

Contact Jasper Mbachu

Productivity

- Holistic understanding of the concept and measurement of productivity in the construction industry
- Interview contractors and building owners of 16 recent medium to large industrial / retail projects in Auckland,
- Results; productivity resource efficiency (measured as the ratio of the value of the completed project to the total resource inputs), and goal effectiveness (measured as the extent to which the set project objectives were achieved, namely, budget, schedule and quality performance, as well as client satisfaction level).
- Contact Jasper Mbachu or Wajiha Shahzad
- Completed in 2012
• Diagnosing the strategic health of the Australasian quantity surveying organisations: a SWOT-based analytical model
• Develop Strategic Health Index (SHI) as a conceptual tool for diagnosing the strategic health of an organisation based on analysis of its strengths, weaknesses, opportunities and threats. The SHI is being applied to the Australasian quantity surveying profession to ascertain its strategic health and the key areas requiring corrective action.
• Contact Marcel Frei, Jasper Mbachu or Robyn Phipps Work-in-progress
Financial Risk

- Sources of contractor’s payment risks and cash flow problems in the New Zealand construction industry
- Investigate contractor's payment risks and cash flow problems and mitigation measures via interviews with contractors, subcontractors, project managers, designers and quantity surveyors
- Results; employers contributed 24% financial problems; contractors and subcontractors 19% and 17%,
- Valid payment and variation claims supported with well-documented evidence was a key mitigation measure

Contact Jasper Mbachu
Facilities management

- Challenges facing Australasian University Facilities managers
- Qualitative interviews, quantitative surveys and case studies (model-testing).
- Preliminary results; emergency management/business continuity planning, inadequate funding, statutory compliance, sustainability and environmental stewardship, technology changes. Poor funding root of all other issues.
- Contact Myzatul Kamarazaly, Jasper Mbachu or Robyn Phipps
- Work-in-progress
Disaster Management

• Systematic Information Flow: A Prerequisite for Managing Earthquake Risks and Disaster Mitigation Activities
  • Information flow within the earthquake risk management sector affects building owners’ risk mitigation decision.
  • Qualitative and quantitative approach.
  • Need to develop a unified earthquake safety assessment information system to provide information to all stakeholders involved in reducing the community’s vulnerability to earthquake risks.
• Contact Temitope Egbelakin or Suzanne Wilkinson
• Recently completed
Disaster Management

- Effect of Stakeholders’ Practices on Seismic Risk Mitigation Decisions
  - Investigation of property market practices affect on building owners’ decision to adopt mitigation measures.
  - Multiple case studies provided new insights on how practices such as non-assessment of seismic risks in property valuation, high earthquake insurance premiums and deductibles, and lack of trust in risk management professionals impeded building owners’ risk mitigation decisions.
- Contact Temitope Egbelakin or Suzanne Wilkinson
- Recently completed
Disaster Management

- Rebuilding Christchurch: Framework for Enhancing Property Owner’s Motivational Potential for Earthquake Disaster Preparedness

- A framework developed in the study shows that the process of motivating property owner’s motivational potential is made up of three sequential phases: intention formation, decision formation and adoption and implementation of seismic mitigation measures, where the first and second phases are influenced by a specific set of motivational interventions.

- Contact Temitope Egbelakin

- Recently completed
Modernising Construction Contracts Drafting – A Plea for Good Sense

Critical examination of drafting styles of construction contracts from several commonwealth jurisdictions and compared them against plain language drafting styles. Also some ‘before and after’ examples were compared to establish the potential benefits of plain legal drafting.

Recommendation for a model set of plain language drafting guidelines for developing and adopting construction contracts.

Contact Naseem Ameer Ali

Recently completed
Adjudication

• Statutory Adjudication – The Need for a Pre-legislation Model Framework

• A pre-legislation model framework was developed for determining industry needs and the concepts required in statutory adjudication processes. Adopting the model framework will help jurisdictions develop the most appropriate response model including a consideration of adjudication beyond the construction industry and one that avoids anomalies in legislation.

• Contact Naseem Ameer Ali

• Recently completed
Dispute Resolution

• The Ideal Construction Dispute Resolver – Professional Viewpoint On Users’ Expectations
  • Examination of qualifications, skills, and characteristics expected of a dispute resolver, (mediators, arbitrators, and adjudicators)
  • Results more comprehensive training required in adjudicator and other dispute resolver training courses, and (ii) the appointment of a dispute resolver should match the skills of the dispute resolver with the type of dispute.
• Contact Naseem Ameer Ali
• Recently completed

Phipps, R.A. (2012) Built environment research at Massey University