

The Development of a Building Performance Laboratory for South Africa

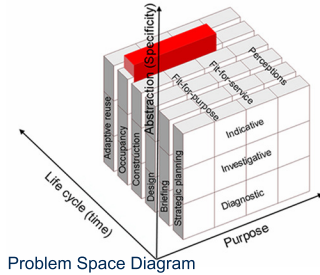
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Purpose

The CSIR Building Science and Technology Competence Area is currently in the process of establishing a Building Performance Laboratory (BPL). The BPL is aimed at becoming a centre at which the following knowledge generation and technology development activities in respect of South African building infrastructure can be developed and undertaken.

Predictive Simulation & Analysis



- Through case-study application and critical analysis, consolidate, adapt, integrate, extend and strengthening of the various building performance measurement instruments.
- Conduct research, demonstrations and capacity development in relation to the 'a priori' and 'a posteriori' performance of building systems and technologies
- Identify local and international developments in infrastructure design, organisational approaches, and developments in integrated components and systems.
- Generate concepts, prototypes and test new products and new integrated assemblies to support long-term performance of buildings;

- The CSIR is actively seeking opportunities for research collaboration, knowledge dissemination and product (or process) development, and forging appropriate links. For example, the development of air change modelling in architectural spaces for airborne infection control for use in health-care settings is being undertaken in a joint project with National Health.

Scope

Building performance analysis, assessment, benchmarking, modelling and rating systems, are used to determine:

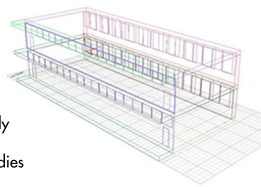
- whether a building (actual or proposed) has been (or would be) successful in meeting an expected level of performance through various declared indicative or predictive criteria.
- which performance levels are acceptable, desirable or required.
- links between cause and effect to support evidence-based design or diagnostics.
- the impact of various interventions or modifications.

Attributes & Potential

- provide building investment decision support.
- significantly shift public awareness and perceptions about building quality.
- stimulate stakeholder demands for higher environmental performance levels.
- improve the process for delivery of high performance building infrastructure by building performance and quality-assurance processes.

Current Focus

To quantify and analyse airflow in buildings to inform design for passively ventilated (naturally ventilated) building design for infection control, human comfort and efficient energy use.



Processes/space simulation techniques:

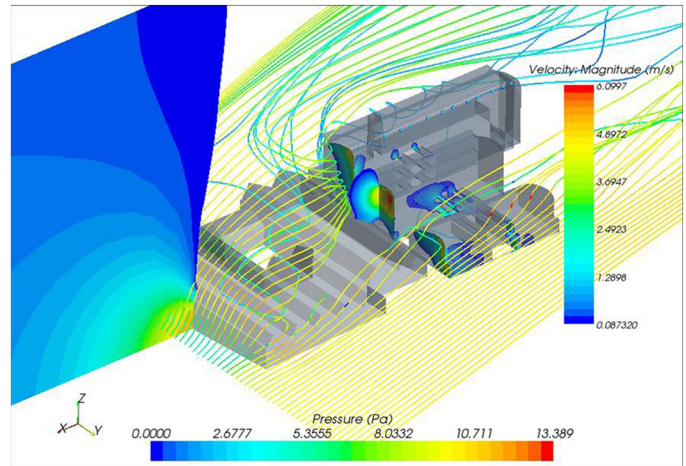
- Computational Fluid Dynamics (CFD)
 - For advanced investigative and quantitative study
- Wind Tunnel
 - For verification & validation of CFD external studies
- Ecotect
 - Providing various performance assessments such as solar projections, shadows, reflections and shading, space planning, lighting and thermal analyses.

In Development

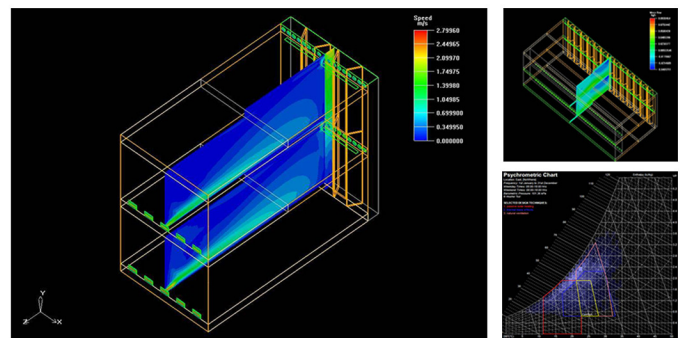
- Determine links between performance and outcome to support evidence-based design.
- Quantify and measure building performance over time.
- Provide validation for modelling and simulation software.
- Investigate and develop methods of data collection (update paper-based systems).
- Investigate, test and implement new methods of output (such as stereo lithography).
- Lighting analysis.
- Thermal environmental performance analysis.
- Spatial comfort.

Case Study 1

Buffalo City - East London
University of Fort Hare, Lecture Building



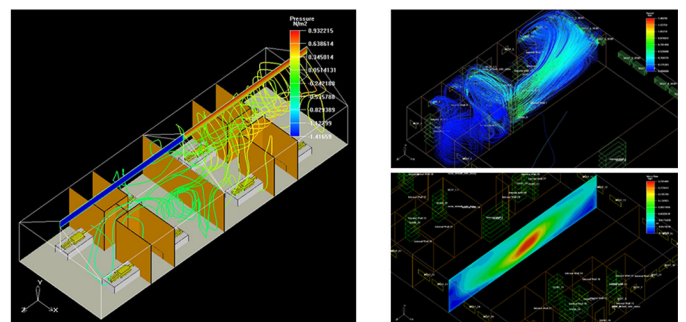
External wind study of an urban context indicating pressure and velocity on and around the building to determine simulated boundary conditions.



Internal air flow study based on simulated boundary conditions acquired from external wind study (See above).

Case Study 2

Generic M(X) DR TB wards



Exploratory studies for natural ventilation

CSIR - Built Environment

Knowledge generation and technology development for an efficient and globally competitive built environment.