# Airbox Testing

The airbox, designed and assembled by the Cyclone Testing Station at James Cook University, is basically an open topped pressure chamber.

## What is an Airbox?

The airbox is basically an open topped pressure chamber. It is 11 m long, 2 m wide and 0.5 m high. It is used to simulate wind pressure on structural elements such as roof sheeting, wall cladding, structural panels, roof vents, skylights, windows, doors and other building elements. For testing cladding, a specimen consisting of a section of roof or wall is fabricated in the normal manner and installed to become the top surface of the chamber. The cladding can be extended over a number of spans to form the test specimen.

## What is its main function?

The airbox is available as a tool for industry to predict the likely response of products when subject to high wind pressures. In addition, it is used for research into the performance of cladding and other structural elements.

The facility is used by manufacturers to verify the performance of their material in a particular situation, or to develop sets of pressure/span tables showing the recommended use of their product. It is the only such facility in Australia that has been built and is operated by an establishment independent of the roofing and cladding industry. As such it can provide a completely independent and confidential service for all manufacturers and is available for cyclic loading commercial testing.

## How does it work?

The air for the chamber is supplied under pressure by large twin fans, powered by 45 kW motors. They can generate air pressure far in excess of what the strongest tropical cyclone would inflict on a house. This pressure can be made to simulate the positive pressure on the windward side, or the negative pressure (suction) on the lee side of a roof or building. Computer controlled valves in the system apply cyclic pressures to simulate the gustiness within a tropical cyclone or steady state pressure to simulate gale winds. The box can be divided into compartments so that strategic opening or closing of the inlet ducts can produce different pressures on adjacent spans of the test specimen.

### What are its advantages?

To fully appreciate the advantages of the airbox facility, one must understand the previously used alternatives. The old fashioned method of using dead weights has many problems including uneven distribution of load because of the size and shape of the individual weights, the inability to uniformly load a profiled shape, instability caused by deflection of the test specimen and uneven loading due to arching between the stacked elements. Of course load cycling cannot be done this way.

The more modern technique of using flexible plastic air bags which are inflated between the test specimen and a strong reaction frame overcomes most of the problems associated dead weights. However, there is a potential shortcoming in immediate vicinity of sharp re-entrants in the profile of the test panel. While the airbag system may apply the correct total load to a surface, the airbag can arch across sudden profile changes and therefore may produce a different localised pressure distribution in the micro scale. In many circumstances this redistribution of local forces is minor and does not matter, but there may be cases where it could become critical.

The airbox overcomes all of these constraints, as the free air in the pressure chamber acts equally on all surfaces. It pressurises sharp re-entrants in the same way as it pressurises flat surfaces.

## Further Information

For further information about airbox testing and technical details, see our Technical Note 2(https://www.jcu.edu.au/__data/assets/pdf_file/0020/310934/Technical-note-2.pdf) - Airbox Testing.

For detailed information about testing metal roof cladding to the Low-High-Low cyclic test regime, see our Draft Guide to LHL Cyclic Testing(https://www.jcu.edu.au/__data/assets/pdf_file/0003/310935/Draft_Guide_LHL_Cyclic_Testing.pdf).

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*The CTS has NATA (http://www.nata.com.au/nata/accreditation-info/what-is-accreditation)accreditation(http://www.nata.com.au/nata/accreditation-info/what-is-accreditation) for testing services. Please contact us for further details.*

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