



II. Test Facilities

Test Facility

Since 1975 MCC has been involved in the testing and validation of HVAC products and systems for transit, off-road, utility, military, and specialty applications. With our sophisticated and flexible test chambers and analysis equipment, we are able to quantify performance, robustness, and reliability of all types of equipment, in all types of conditions.



Test Facility Capabilities

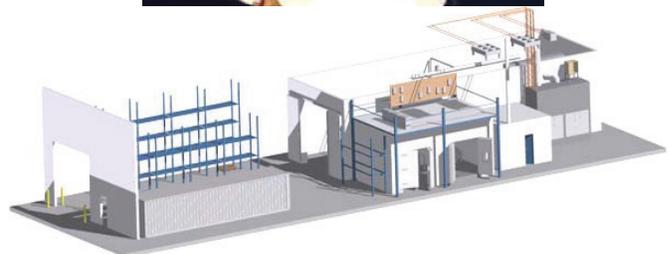
MCC's research & development testing facilities include extensive equipment for testing the performance of HVAC systems as well as components within the systems. Our custom-built climate chamber, the core of our test facility, enables MCC to provide a chamber with a large internal volume capable of accepting large articles. In our climate chamber, we are able to simulate the most severe environmental conditions and put our client vehicles or HVAC systems through the most demanding tests. MCC's Vaughan test facility meets the demanding expectations of being a sophisticated and flexible engineering tool. This, along with our experience, enables us to develop and tailor test processes and configurations for each client while providing fast and cost-efficient solutions.

Experience and Skills

MCC has expertise working in the global market within the mass-transit, off-road, construction/utility, and military industries. Our products have consistently met or exceeded our clients specifications and expectations. Our on-site engineering staff has extensive experience with a broad spectrum of test standards and procedures such as: SAE, ISO, MIL, and ASHRAE. With these in mind, we work to provide the best possible technical and economical solutions for testing to the required specification. Our test team has many years of experience providing summarized data, data analysis, images, thermal images, summary reports, and comprehensive reports. Having licensed refrigerant mechanics on staff allows us not only to provide thorough results but also to put our experience at your disposal for further guidance.

Real Time System Evaluation

Testing in the Large Environmental Drive-In Chamber and the Calorimeter are controlled from the Central Control Room. To improve personnel safety, cameras and hazardous gas detectors are installed in the chamber. 1000+ channels of I/O are available for measurement acquisition. In-house designed DAQ software and a wide range of instruments are used, providing highly accurate results throughout the various test conditions. Equipment includes, pressure transducers, thermocouples, humidity sensors, mass flowmeters, and tachometers. Every measurement is viewed in real-time in the Central Control Room using our customizable software. We can quickly provide custom software to meet your needs.



Qualified, certified, reliable. We are ready when you are!

In Vehicle Heating and AC Testing

In order to fully characterize and map the performance of a vehicle's HVAC system, tests can be conducted throughout the system operating range and design conditions. These include analyzing the performance of the system when faced with extreme conditions, analyzing the effects of cabin heating via solar load, mapping airflow, and optimizing the system refrigerant charge. The purpose is always to ensure maximum performance throughout the design conditions.

Tests may include but are not limited to:

- Vehicle A/C Pull-Down Testing
- Heating System Pull-Up Testing
- Vehicle Level Refrigerant Charge optimization
- Thermal Imaging
- Windscreen Airflow Velocity Profile for Defroster
- Solar Load Simulation for Cab A/C System Testing
- Vehicle Defrosting Performance Test
- Vehicle Defogging Performance Test

System Testing at Component Level

When designing or implementing new components, validation is needed to ensure the performance and durability requirements are met. These components can be cycle tested in one of our many Test Chambers, thereby assuring fast and cost-effective customized testing. Customized data acquisition and measurements, combined with one of our many Wind Tunnels provides for quick and precise airflow validation for blowers and fans.

Tests may include but are not limited to:

- Evaporator Heat Exchange Testing
- Condenser Heat Exchange Testing
- System Capacity Testing
- System Airflow Testing

Component Durability Testing

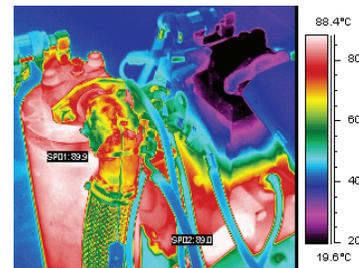
Our products are built for function, reliability and longevity and we are able to validate these components for the intended design condition.

Tests may include but are not limited to:

- Corrosion Salt Fog Chamber Testing as per B117
- Thermal & Pressure Cycle Testing
- Mechanical cycling



Windscreen Velocity Profile



Thermal Imaging



Defrosting Performance Test



In-house developed software



Airflow Test Cell