Certification Document CD0156
Statement of Compliance to NFPA 1901-2016
Vehicle Stability

Pierce fire apparatus comply with NFPA 1901 Section 4.13 Vehicle Stability using the tilt table method. As prescribed by the standard, each apparatus is compared to a substantially similar apparatus that has been loaded as required and tested on a tilt table per the SAE J2180 test procedure. If the apparatus configuration was not expected to meet the minimum tilt table criteria, then it will be equipped with the Electronic Stability Control option. A listing of all tested apparatus is maintained by the Research and Development lab and is available for inspection at the Appleton factory.





4.13 Vehicle Stability.

4.13.1* Rollover Stability. The apparatus shall meet the criteria defined in 4.13.1.1, or it shall be equipped with a stability control system in accordance with 4.13.1.2.

4.13.1.1 The apparatus shall meet the criteria defined in either of the following:

(1)*The apparatus shall remain stable to 26.5 degrees in both directions when tested on a tilt table in accordance with SAE J2180, *A Tilt Table Procedure for Measuring the Static Rollover Threshold for Heavy Trucks.*

(2) The calculated or measured center of gravity (CG) shall be no higher than 80 percent of the rear axle track width.

4.13.1.1.1 Compliance shall be certified by testing, calculating, or measuring the apparatus or by comparing the apparatus to a compliant, substantially similar example apparatus, and the certification shall be delivered with the fire apparatus.

4.13.1.1.2 The example apparatus shall be considered substantially similar if it includes a chassis with the same or higher CG height, the same or narrower rear axle track width, the same or greater water tank size and CG height, the same type of front and rear suspension, and the same type and size of aerial device.

4.13.1.1.3 For purposes of 4.13.1.1, the apparatus shall be loaded with fuel, fire-fighting agents, hose, ladders, a weight of 250 lb in each seating position, and weight equivalent to the miscellaneous equipment allowance as defined in Table 12.1.2.

4.13.1.1.3.1 If the apparatus is designed to meet a specified higher equipment loading or larger hose bed capacity or to carry additional ground ladders, these greater loads shall be included in the testing, calculating, or measuring.

4.13.1.1.3.2 The weight added to the fire apparatus for the purpose of test, calculation, or measurement shall be distributed to approximate typical in-service use of the fire apparatus while not exceeding the manufacturer's published individual compartment weight ratings.

4.13.1.2 If the apparatus is equipped with a stability control system, the system shall have, at a minimum, a steering wheel position sensor, a vehicle yaw sensor, a lateral accelerometer, and individual wheel brake controls.

VALIDATION TEST: Multiple Tests

Pierce Manufacturing, Inc.

David W. Archer
Vice President of Engineering
June 1, 2017

Certification Document CD0155
Engine Installation – Enforcer GHG17 Cummins L9 Engine

Pierce Manufacturing, Inc. certifies that the GHG17 Cummins L9 Engine as installed in an Enforcer chassis meets the engine installation requirements of the engine manufacturer, the NFPA 1901 and NFPA 1906 guidelines as applicable, and Pierce engine design standards.

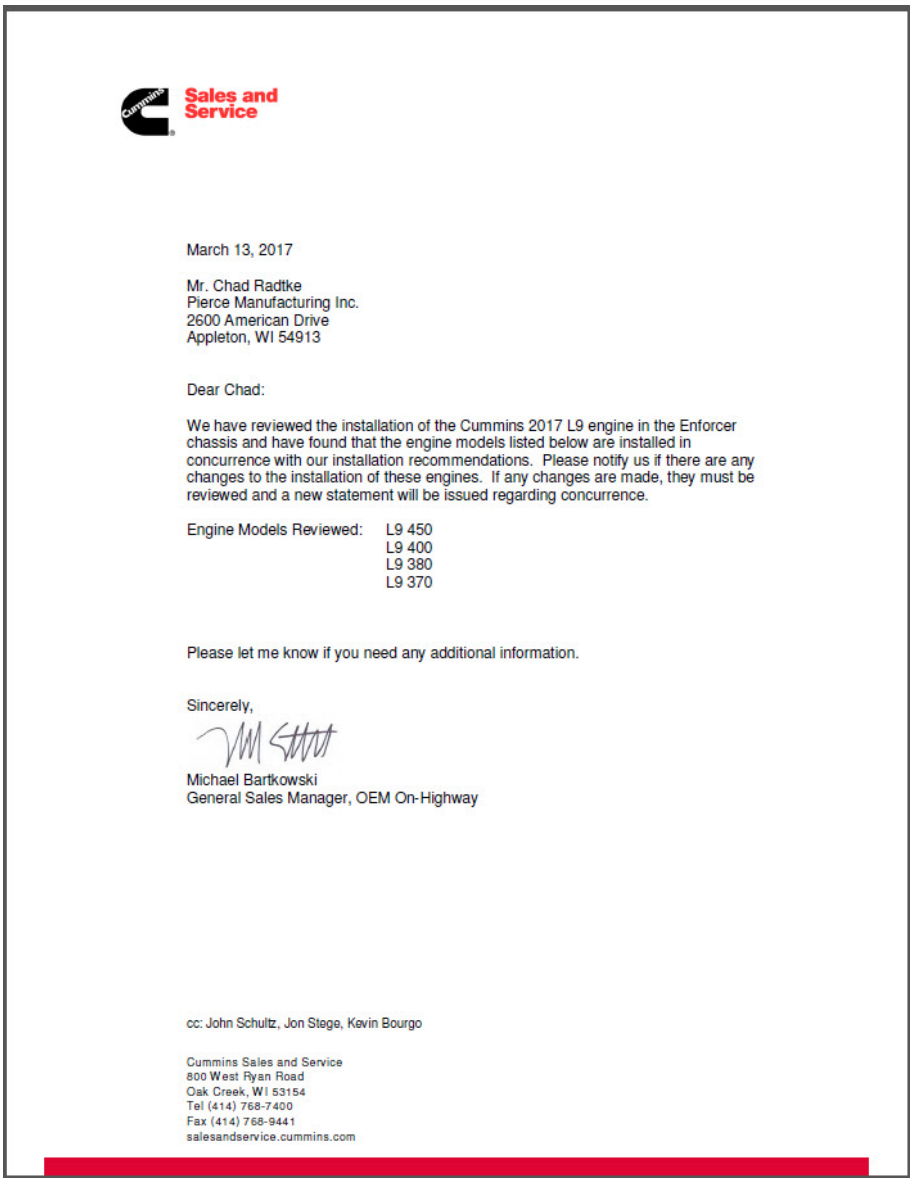
Validation testing was conducted in the Pierce wind tunnel chassis dynamometer and cooling test laboratory. Test results have been reviewed and accepted by representatives of the engine supplier.





Pierce Manufacturing, Inc.

David W. Archer
Vice President of Engineering
June 5, 2017



Sales and Service

March 13, 2017

Mr. Chad Radtke
Pierce Manufacturing Inc.
2600 American Drive
Appleton, WI 54913

Dear Chad:

We have reviewed the installation of the Cummins 2017 L9 engine in the Enforcer chassis and have found that the engine models listed below are installed in concurrence with our installation recommendations. Please notify us if there are any changes to the installation of these engines. If any changes are made, they must be reviewed and a new statement will be issued regarding concurrence.

Engine Models Reviewed: L9 450
L9 400
L9 380
L9 370

Please let me know if you need any additional information.

Sincerely,

Michael Bartkowski
General Sales Manager, OEM On-Highway

cc: John Schultz, Jon Stege, Kevin Bourgo

Cummins Sales and Service
800 West Ryan Road
Oak Creek, WI 53154
Tel (414) 768-7400
Fax (414) 768-9441
salesandservice.cummins.com

Certification Document CD0158
Engine Installation – Saber FR GHG17 Cummins L9 Engine

Pierce Manufacturing, Inc. certifies that the GHG17 Cummins L9 Engine as installed in a Saber FR chassis meets the engine installation requirements of the engine manufacturer, the NFPA 1901 and NFPA 1906 guidelines as applicable, and Pierce engine design standards.

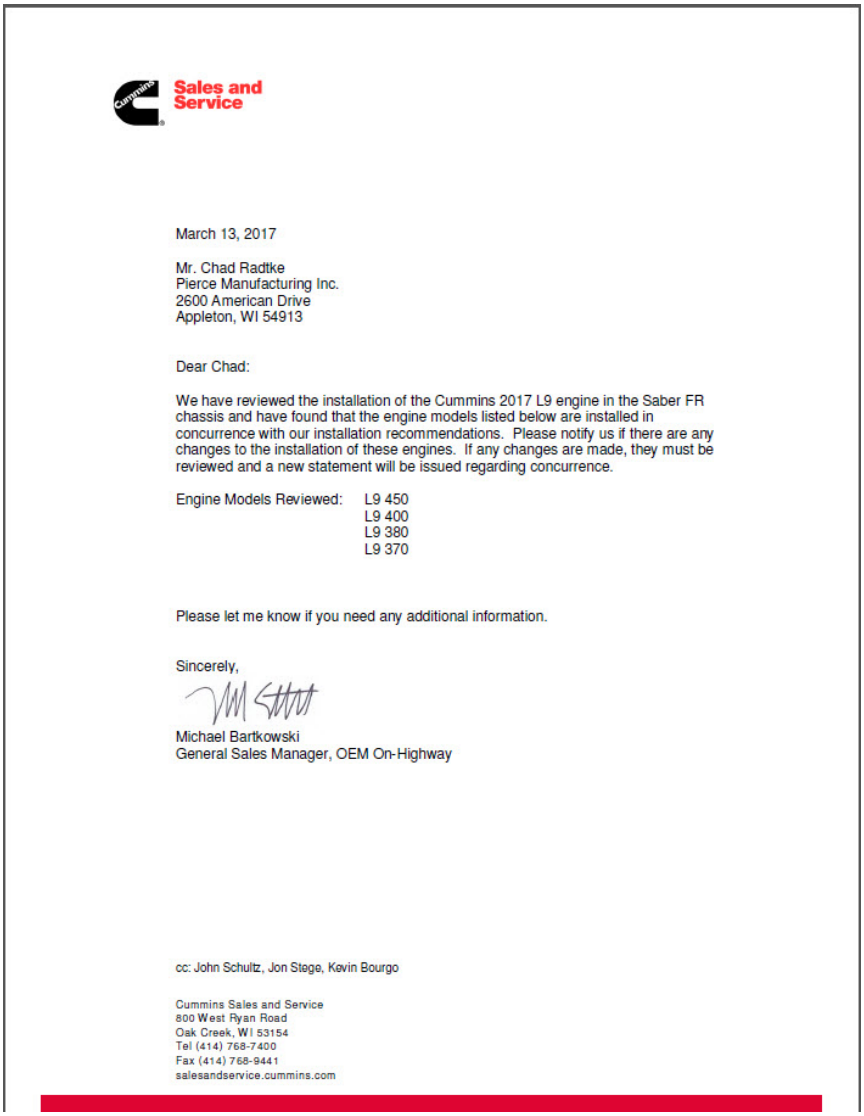
Validation testing was conducted in the Pierce wind tunnel chassis dynamometer and cooling test laboratory. Test results have been reviewed and accepted by representatives of the engine supplier.





Pierce Manufacturing, Inc.

David W. Archer
Vice President of Engineering
June 5, 2017



Sales and Service

March 13, 2017

Mr. Chad Radtke
Pierce Manufacturing Inc.
2600 American Drive
Appleton, WI 54913

Dear Chad:

We have reviewed the installation of the Cummins 2017 L9 engine in the Saber FR chassis and have found that the engine models listed below are installed in concurrence with our installation recommendations. Please notify us if there are any changes to the installation of these engines. If any changes are made, they must be reviewed and a new statement will be issued regarding concurrence.

Engine Models Reviewed: L9 450
L9 400
L9 380
L9 370

Please let me know if you need any additional information.

Sincerely,

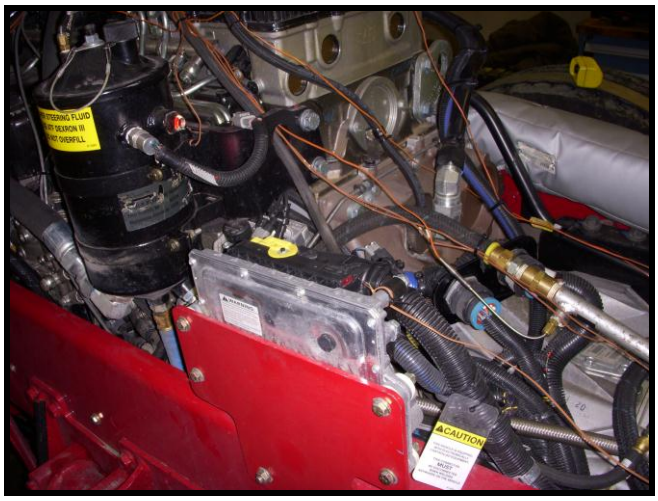
Michael Bartkowski
General Sales Manager, OEM On-Highway

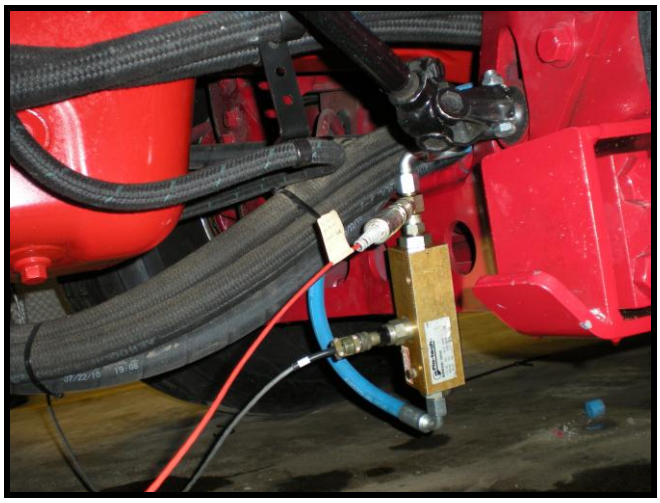
cc: John Schultz, Jon Stege, Kevin Bourgo

Cummins Sales and Service
800 West Ryan Road
Oak Creek, WI 53154
Tel (414) 768-7400
Fax (414) 768-9441
salesandservice.cummins.com

Certification Document CD0098
Power Steering System

Pierce Manufacturing, Inc. certifies that the power steering system as installed in our custom chassis meets the requirements of the component supplier, the NFPA 1901 and NFPA 1906 guidelines as applicable, and Pierce internal design standards.





VALIDATION TEST: RD1987, RD2055
RD2056, RD2057, RD2058, RD2059

Pierce Manufacturing, Inc.

David W. Archer
Director of Engineering
June 03, 2011

PIERCE MANUFACTURING INC.®

AN OSHKOSH TRUCK CORPORATION® COMPANY

Certification Document CD0130
Saber® FR - Enforcer™
Cab Integrity Certification

Pierce Manufacturing certifies the integrity of the Saber® FR – Enforcer™ cab relative to occupant protection.

A specimen representing the substantial structural configuration of the Saber® FR – Enforcer™ cab models has been successfully tested in accordance with the following standards.

- SAE J2422 Cab Roof Strength Evaluation – Quasi-Static Loading Heavy Trucks.
- European Occupant Protection Standard ECE Regulation No. 29.
- SAE J2420 COE Frontal Strength Evaluation – Dynamic Loading Heavy Trucks.

Side Impact: The test cab was subjected to dynamic preload where a 14,253 lb moving barrier was slammed into the side of the cab at 5.25 mph, striking with an impact of 13,000 ft-lbs of energy. This test is not required to meet the ECE 29 standard, but is part of the SAE J2422 test procedure and more closely represents the forces a cab will see in a roll-over incident.



Frontal Impact: The test cab was struck by the 14,253 lb moving barrier at a speed sufficient to impart the required 32,549 ft-lbs of energy.



Roof Crush: This same test cab was then subjected to a roof crush force of 24,453 lbs. This value meets the ECE 29 criteria, which must be equivalent to the front axle rating up to a maximum of 10 metric tons.



Pass-Fail criteria of the SAE tests and the ECE 29 test is a measure of whether the “survival space” inside the cab is compromised, all doors remain shut, and the cab remained attached to the chassis frame in at least one location. The Pierce cab met all of the Performance Criteria requirements on all 3 integrity tests.

Witnessed and Certified by:

Pierce Manufacturing, Inc.

David Archer
Vice President of Engineering

PIERCE MANUFACTURING INC.®

AN OSHKOSH CORPORATION® COMPANY

Certification Document CD0137
Saber®FR – Enforcer™
Cab Doors

Pierce Manufacturing certifies the integrity of the Saber®FR – Enforcer™ cab doors.

Specimens representing the substantial structural configuration of the Saber®FR – Enforcer™ cab front and crew doors have been successfully tested to meet the following objectives:

OBJECTIVES:

- Survive a 200,000-cycle door slam test with a slam acceleration up to 20 g's on one representative
- Validate the assembly concept of the main structure of the door by evaluating the durability of the bonding technique.
- Evaluate components, structure, and mounting of the door during and the end of the test for fatigue and failure to ensure durability.
- Verify that the door seals function properly at the end of the test.
- Evaluate the new extrusions and castings of the cab doorframe during and at the end of the test for fatigue, failure, and deformation of seal flanges.
- Evaluate various mounting options for the electronic control module for durability during portions of the slam test.

CONCLUSIONS:

- The door structure and doorframe successfully completed a 200,000-cycle door slam test with a door slam acceleration of 20 g's.

VALIDATION TEST: RD2425

Pierce Manufacturing, Inc.



David Archer
November 18, 2014

Certification Document CD0132
Saber®FR – Enforcer™
Windshield Wiper System

Pierce Manufacturing certifies the integrity of the Saber® FR –Enforcer™ Windshield Wiper System.

Specimens representing the configuration of the Saber® FR –Enforcer™ windshield wipers have been successfully tested to meet the following objectives:

OBJECTIVES:

- Complete 3,000,000 cycles of windshield wiper operation per SAE J198 § 6.2
- Inspect wiper motor, pivots, linkages, and mounts frequently to validate cumulative wiper system integrity.

CONCLUSIONS:

- The wiper linkage, pivots, and mounts successfully completed the 3,000,000 cycles.

VALIDATION TEST: RD2462



Pierce Manufacturing, Inc.

David Archer
Vice President of Engineering

Certification Document CD0133
Saber® FR – Enforcer™
Window Regulators

Pierce Manufacturing certifies the integrity of the Saber ®FR – Enforcer™ window regulators.

Specimens representing the substantial structural configuration of the Saber®FR – Enforcer™ window regulators have been successfully tested to meet the following objectives:

OBJECTIVES:

- Electric window regulators withstand 30,000 up-down cycles.

CONCLUSIONS:

- The electric window regulators withstood 30,000 cycles without failure.

VALIDATION TEST: RD2425



Pierce Manufacturing, Inc.

David Archer
Vice President of Engineering

Certification Document CD0134
Saber® FR – Enforcer™
Seats and Seat Belts

Pierce Manufacturing certifies the conformance of the Saber® FR – Enforcer™ cab seats and seat belts to Federal Motor Vehicle Safety Standards. Representative Saber® FR – Enforcer™ Seat and Seat Belt designs have been tested successfully in accordance with FMVSS 207.

Physical testing was performed to qualify passenger seats to meet Federal Motor Vehicle Safety Standards (FMVSS) 207 and 210. This requires that a minimum of 3,000 lbf be applied to both the lap and shoulder belts via appropriate body blocks. A third force of twenty times the mass of the seat must be applied at the center-of-gravity (CG) of the seat. All three forces are applied at the same time, reached within thirty seconds of the start of the test, and be held for a minimum of ten seconds.

A force equal to twenty times the mass of the seat was applied to each seat in the direction opposite to the combination pull. A moment of 275 lb-ft was applied to the seat with reference to the H-point.

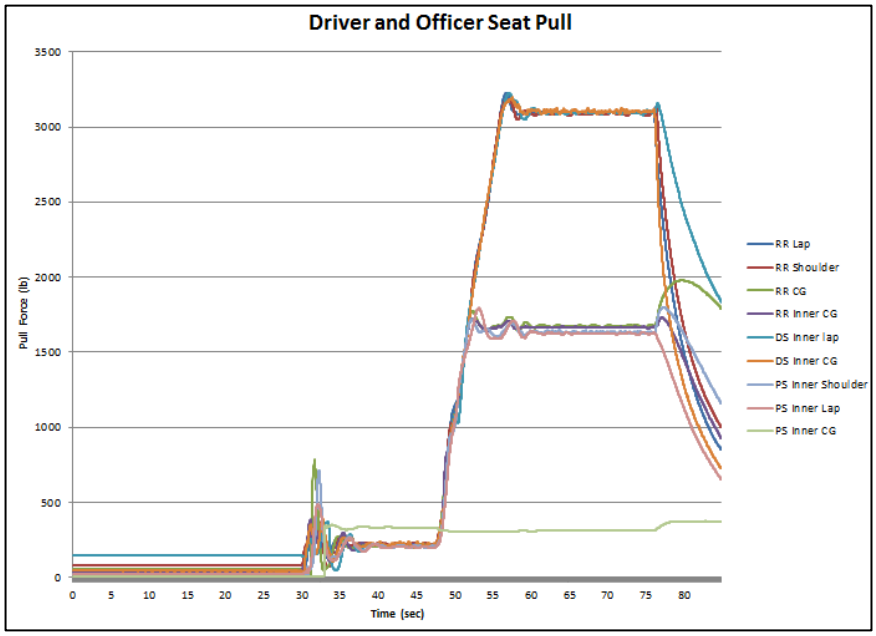
This testing ensures that the seat mounting and seat belt anchors are adequate to retain the seats and occupants in a crash. The Federal requirements are based on the high deceleration rates of passenger vehicles, so the design requirements are significantly more conservative considering the slower crash speeds of heavy trucks.

VALIDATION TESTS: RD2397

Pierce Manufacturing, Inc.



David Archer
Vice President of Engineering



PIERCE MANUFACTURING INC.®

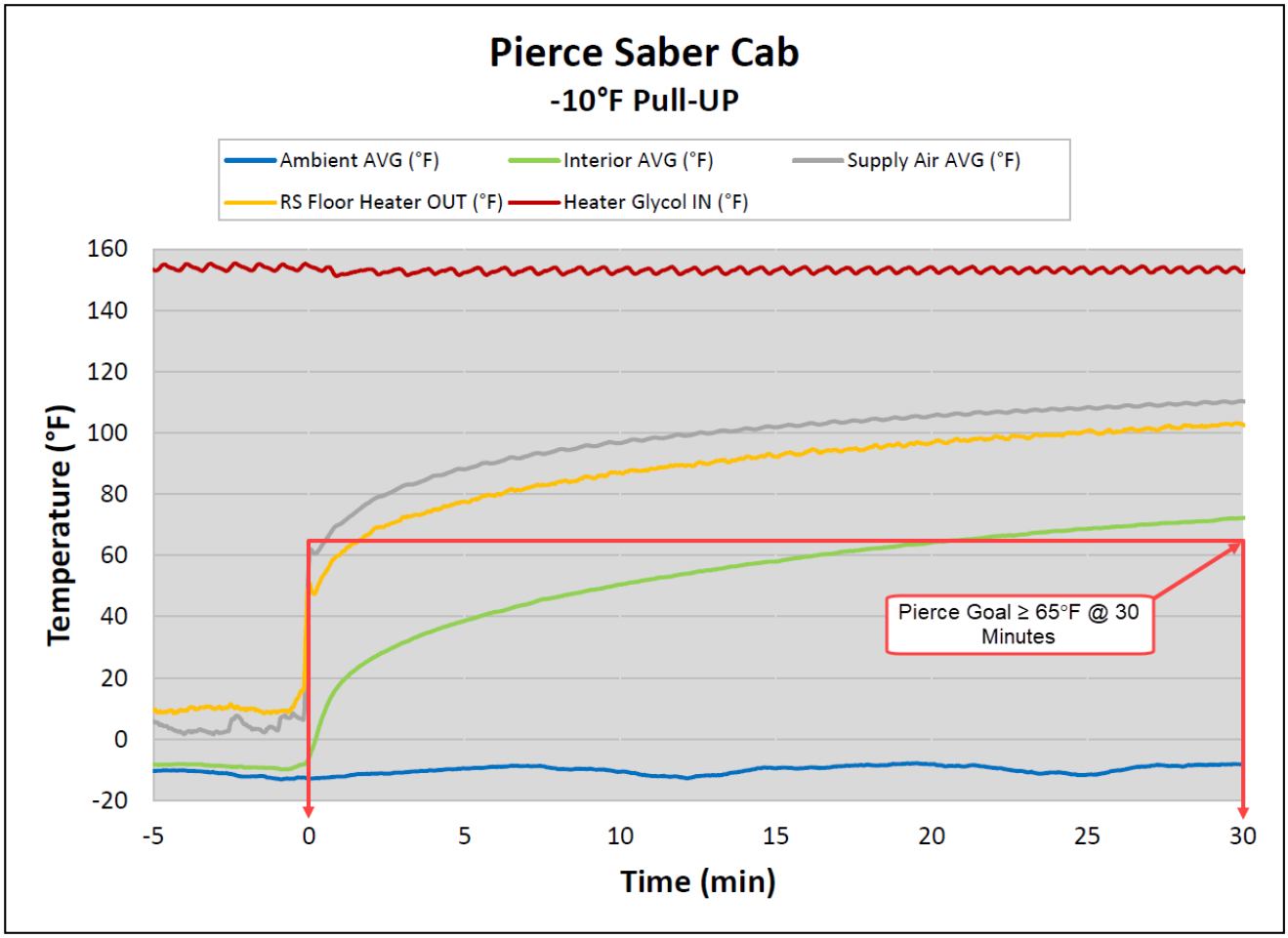
AN OSHKOSH CORPORATION® COMPANY

Certification Document CD0165
Saber® FR – Enforcer™
Cab Heater

Pierce Manufacturing certifies the performance of the Saber® FR – Enforcer™ cab heat systems.

The Saber®FR - Enforcer™ Heater System was tested successfully in an environmental chamber.

Heater testing was performed using the coolant supply procedures from SAE J381. The average cab temperature increased 82.3º F from -10º F to 72.3º F within the prescribed 30 minutes utilizing the right side under seat auxiliary heater. The cab was contained in a cold chamber at -10º F during the duration of the test.



VALIDATION TEST: TR#19-0047 R00

Pierce Manufacturing, Inc.



David Archer
Vice President of Engineering

PIERCE MANUFACTURING INC.®

AN OSHKOSH CORPORATION® COMPANY

Certification Document CD0167
Saber® FR - Enforcer™
Air Conditioning & Defrost

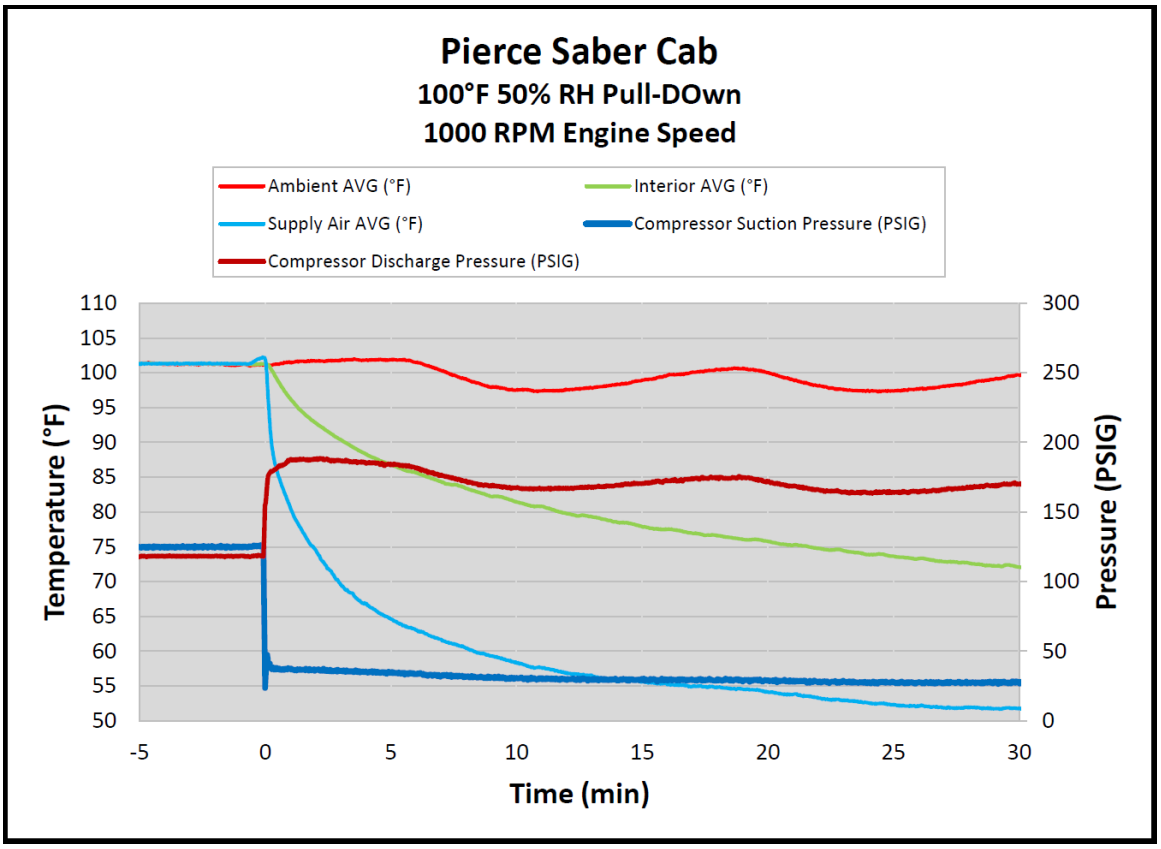
Pierce Manufacturing certifies the performance of the Saber®FR - Enforcer™ cab air conditioning and defrost system.

The air conditioning and defrost system was tested successfully in an environmental chamber.

Air Conditioning:
Air conditioning performance testing was conducted at an ambient of 100°F and 50 percent relative humidity. The engine speed was maintained at 1000 RPM with the QP21 compressor

The vehicle was heat soaked in the environmental chamber. All temperature probes were monitored to confirm temperature stabilization. The transient test began when all the vehicle doors were closed, and the air conditioning turned on.

The average cab temperature dropped to a maximum of 72.1°F within 30 minutes.



Defrosting

Defroster testing was performed in accordance with *SAE J381 Windshield Defrosting Systems Test Procedure and Performance Requirements-Trucks, Buses, and Multipurpose Vehicles.*

This SAE Recommended Practice establishes uniform test procedures and performance requirements for the defrosting system of enclosed cab trucks, buses, and multipurpose vehicles. Current engineering practice prescribes that for laboratory evaluation of defroster systems, an ice coating of known thickness be applied to the windshield and left- and right-hand side windows to provide more uniform and repeatable test results, even though under actual conditions such a coating would necessarily be scraped off before driving. The test condition, therefore, represents a more severe condition than the actual condition, where the defroster system must merely be capable of maintaining a cleared viewing area.

During the test, the vehicle is cold soaked to 0º F in a cold chamber. A prescribed layer of ice is applied to the windshield. The defroster is then run, and the advancing melt boundary marked as the test proceeds.

The SAE prescribed area of the windshield was 100% cleared and the side windows were 75% cleared within the specified 30-minute period.

Defrost Results



Start of Test



15 Minutes



30 Minutes



Right Viewed From Outside Left

VALIDATION TEST: MCC Test Report TR#19-0047 R00

Pierce Manufacturing, Inc.



David W. Archer
Vice President of Engineering

PIERCE MANUFACTURING INC.®

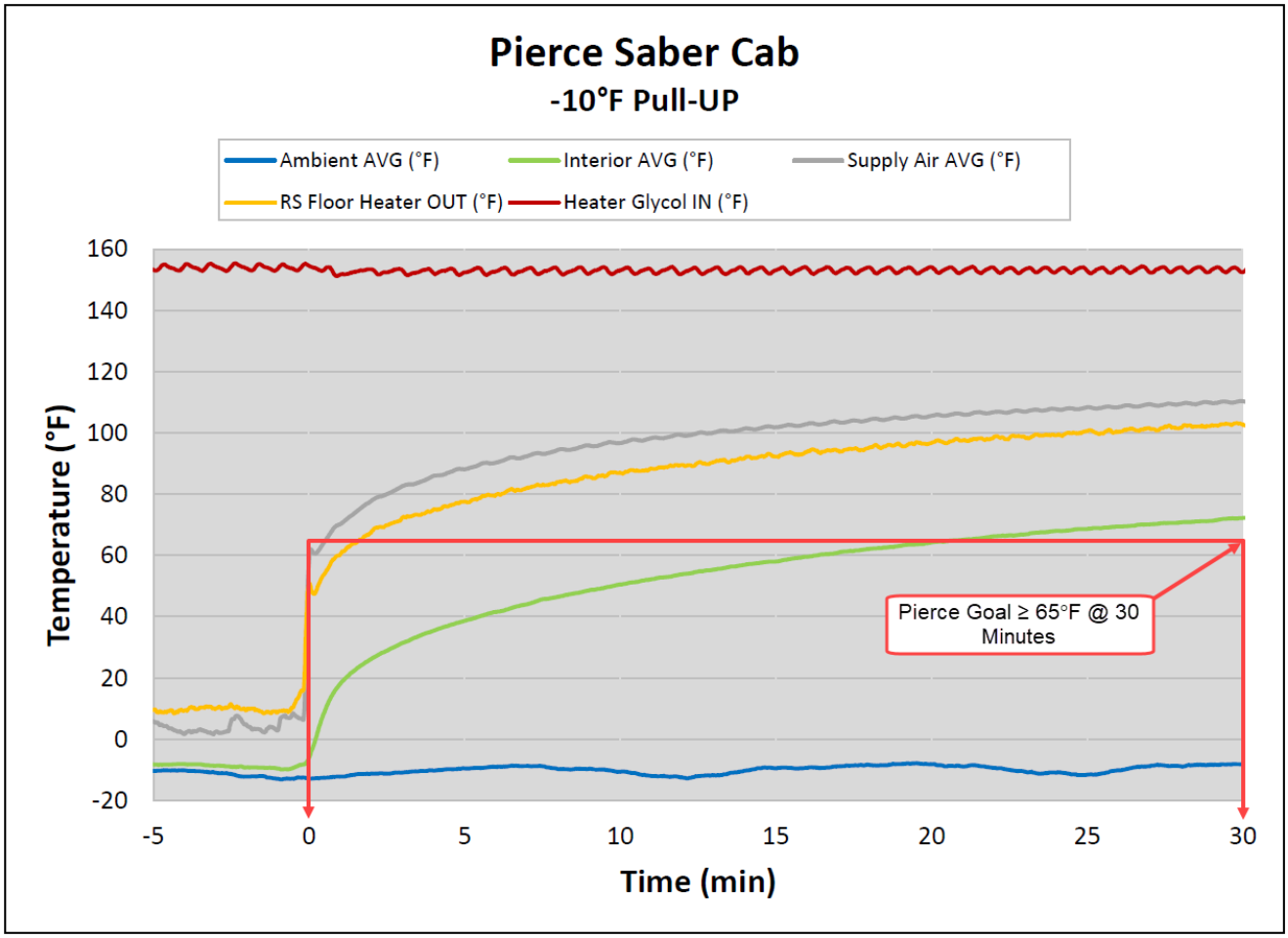
AN OSHKOSH CORPORATION® COMPANY

Certification Document CD0174
Saber® FR – Enforcer™
Cab Heater

Pierce Manufacturing, in conjunction with Mobile Climate Control, Inc., certifies the performance of the Saber® FR – Enforcer™ cab heat systems.

The Saber®FR - Enforcer™ Heater System was tested successfully in an environmental chamber.

Heater testing was performed using the coolant supply procedures from SAE J381. The average cab temperature increased 82.3º F from -10º F to 72.3º F within the prescribed 30 minutes utilizing the right side under seat auxiliary heater. The cab was contained in a cold chamber at -10º F during the duration of the test.



VALIDATION TEST: TR#19-0047 R00

Pierce Manufacturing, Inc.



David Archer
Vice President of Engineering

Mobile Climate Control, Inc.



Brent Griffith
Lead Test Engineer & Large Application Specialist

PIERCE MANUFACTURING INC.®

AN OSHKOSH CORPORATION® COMPANY

Certification Document CD0175
Saber® FR - Enforcer™
Air Conditioning & Defrost

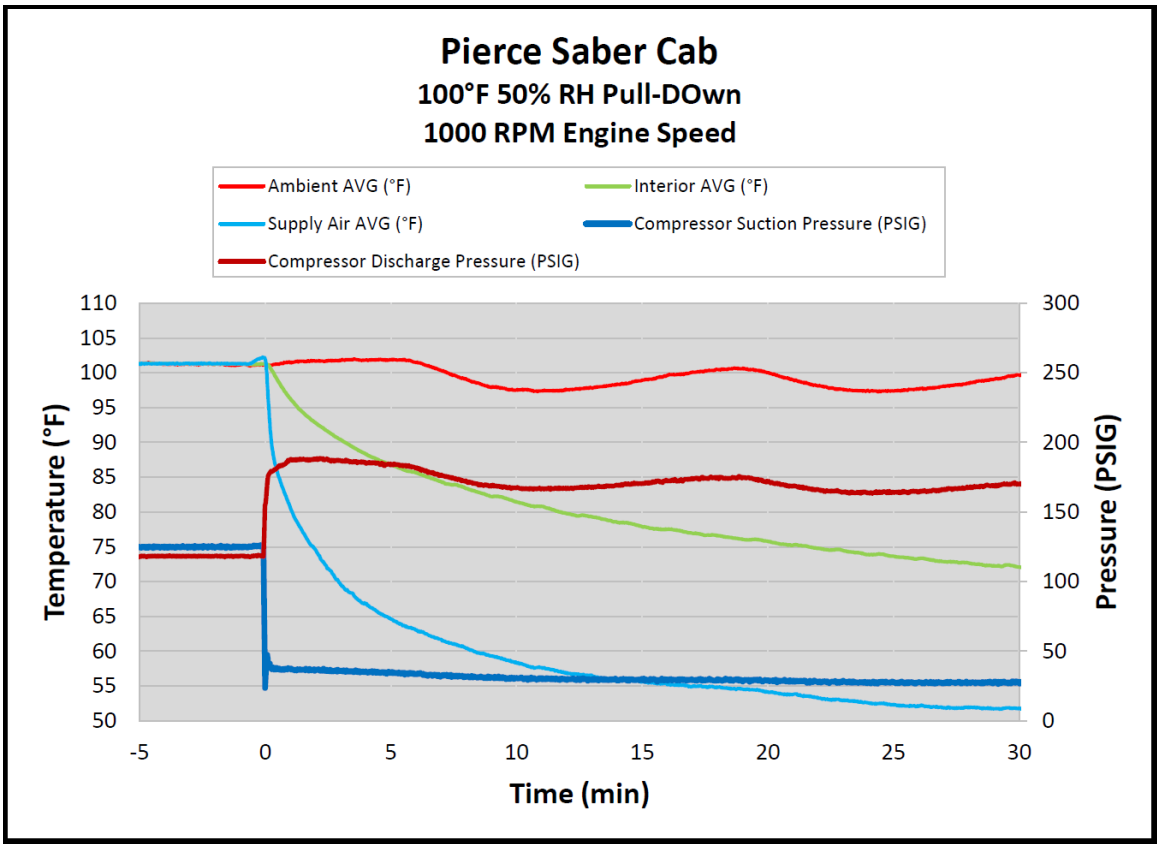
Pierce Manufacturing, in conjunction with Mobile Climate Control, Inc., certifies the performance of the Saber®FR - Enforcer™ cab air conditioning and defrost system.

The air conditioning and defrost system was tested successfully in an environmental chamber.

Air Conditioning:
Air conditioning performance testing was conducted at an ambient of 100°F and 50 percent relative humidity. The engine speed was maintained at 1000 RPM with the QP21 compressor

The vehicle was heat soaked in the environmental chamber. All temperature probes were monitored to confirm temperature stabilization. The transient test began when all the vehicle doors were closed, and the air conditioning turned on.

The average cab temperature dropped to a maximum of 72.1°F within 30 minutes.



Defrosting

Defroster testing was performed in accordance with *SAE J381 Windshield Defrosting Systems Test Procedure and Performance Requirements-Trucks, Buses, and Multipurpose Vehicles.*

This SAE Recommended Practice establishes uniform test procedures and performance requirements for the defrosting system of enclosed cab trucks, buses, and multipurpose vehicles. Current engineering practice prescribes that for laboratory evaluation of defroster systems, an ice coating of known thickness be applied to the windshield and left- and right-hand side windows to provide more uniform and repeatable test results, even though under actual conditions such a coating would necessarily be scraped off before driving. The test condition, therefore, represents a more severe condition than the actual condition, where the defroster system must merely be capable of maintaining a cleared viewing area.

During the test, the vehicle is cold soaked to 0º F in a cold chamber. A prescribed layer of ice is applied to the windshield. The defroster is then run, and the advancing melt boundary marked as the test proceeds.

The SAE prescribed area of the windshield was 100% cleared and the side windows were 75% cleared within the specified 30-minute period.

Defrost Results



Start of Test



15 Minutes



30 Minutes



Right Viewed From Outside Left

VALIDATION TEST: MCC Test Report TR#19-0047 R00

Pierce Manufacturing, Inc.



David W. Archer
Vice President of Engineering

Mobile Climate Control, Inc.



Brent Griffith
Lead Test Engineer & Large Application Specialist