



SURFACE VEHICLE RECOMMENDED PRACTICE

J1559™

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Superseded by J3078/6

Determination of Effect of Solar Heating

RATIONALE

SAE J1559 has been cancelled and superseded by SAE J3078/6.

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This Technical Report has been declared "CANCELLED" as of July 2020 and has been superseded by SAE J3078/6. By this action, this document will remain listed in the respective index, if applicable. Cancelled Technical Reports are available from SAE.

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1. SCOPE

This document specifies a test method for simulating solar heating in the laboratory and measuring the radiant heat energy from a natural or simulated source. This standard is applicable to all off-road, self-propelled work machines as listed in the scope of SAE J1116 (Rev Nov 2004) when equipped with an operator enclosure system.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1116 Categories of Off-Road Self-Propelled Work Machines

SAE J1503 Performance Test for Air-Conditioned, Heated, and Ventilated Off-Road Self-Propelled Work Machines

3. DEFINITIONS

3.1 SOLAR HEATING

Heating factor from the sun to be considered in determining air circulation and cooling requirements necessary to maintain comfortable temperature inside the operator enclosure

3.2 SOLAR RADIANT ENERGY

Process by which solar heating is generated.

3.3 MAJOR GLAZED SURFACE

Normally the largest glazed surface of the operator enclosure. However, there may be enclosure configurations where two or more adjacent glazed surfaces contribute the greatest solar load.

3.4 LIGHT SYSTEM

Groups of lamps in banks or other configurations relating to the major glazed surface.

3.5 FULL SPECTRUM SOLAR SIMULATION

Lamps designed to produce energy across the full visible spectrum as shown in Table 1.

TABLE 1 - SPECTRAL POWER DISTRIBUTION

Wavelength Range	Percent of Total Spectrum
< 320 nm	0%
320 - 400 nm	0% - 7%
400 - 780 nm	45% - 55%
>780 nm	35% - 53%

4. GENERAL

4.1 The intended result of this method is to record the radiant heat energy affecting an operator enclosure during tests of the air-conditioning system.

4.2 This method should be used in conjunction with the test given in SAE J1503.

5. MEASUREMENT OF SOLAR RADIANT ENERGY DURING FIELD TESTS

5.1 Place an appropriate measuring device such as a pyranometer, with an accuracy of $\pm 3\%$ of the observed values, in the same general area as the operator enclosure under test. Measure the radiance at 10 min intervals during the test period. These readings shall be averaged and recorded as part of the reported results.

5.2 A measured average solar radiant energy of $950 \text{ W/m}^2 \pm 95 \text{ W/m}^2$ is considered "normal" test conditions.

6. METHOD OF SIMULATING SOLAR RADIANT ENERGY DURING LABORATORY TESTS

6.1 Method One

6.1.1 Place lamps in banks above the operator enclosure being tested and in a horizontal plane.

6.1.2 The area within the perimeter of the light banks shall extend 25% beyond the projected area of the operator enclosure under test when measured in all four directions.

6.1.3 In order to simulate the effects of solar heating, the light source shall have 45% or more of its radiated energy above 700 nm. It is recommended that the method of controlling the intensity not change the spectral distribution of the lamps.

6.2 Method Two

6.2.1 Place the light system in front of the major glazed surface of the operator enclosure under test.

6.2.2 The area within the perimeter of the light system shall extend 25% beyond the projected area of the major glazed surface under test when measured in all four directions.

- 6.2.3 The light system shall be adjustable to allow the angle of the light projecting on the glazed surface to simulate solar lighting variations with time and season.

NOTE: Either the light system or individual lamps may be adjustable as shown in Figures 2 and 3.

- 6.2.4 In order to simulate the effects of solar heating, the light source shall provide full spectrum solar simulation. It is recommended that the method of controlling the intensity not change the spectral distribution of the lamps.

7. CALIBRATION OF SOLAR RADIANT ENERGY FROM A SIMULATED SOURCE

7.1 Method One

- 7.1.1 Mount a pyranometer on a tripod and maintain it on a horizontal plane.
- 7.1.2 The plane of measurement shall be $100\text{ mm} \pm 100\text{ mm}$ lower than the roof line of the operator enclosure under test.
- 7.1.3 Take readings at points on or within the perimeter of the area of uniform intensity as shown in Figure 1. Make sufficient measurements to ensure uniformity. The maximum distance between measuring points shall be 1200 mm.
- 7.1.4 The intensity level shall be adjusted to an average of $950\text{ W/m}^2 \pm 95\text{ W/m}^2$. No individual reading shall vary by more than 10% from the average.
- 7.1.5 The intensity level shall be recalibrated every six months or every time the elevation of the roof line of the operator enclosure being tested is changed.

7.2 Method Two

- 7.2.1 Mount a pyranometer at a point on a rack approximating the angle of the major glazed surface of the operator enclosure under test.
- 7.2.2 The plane of measurement shall be approximately the center of the major glazed surface of the operator enclosure under test.
- 7.2.3 Take readings at points on or within the perimeter of the area of uniform intensity as shown in Figure 1. Make sufficient measurements to ensure uniformity. The maximum distance between measuring points shall be 1200 mm.
- 7.2.4 The intensity level shall be adjusted as shown in Table 2. No individual reading shall vary by more than 10% from the average.
- 7.2.5 The intensity level shall be recalibrated every six months or every time the configuration of the glazed surface of the operator enclosure being tested is changed.

TABLE 2

Angle (Degrees)	Intensity (W/m ²)
30	400
45	700
60	900

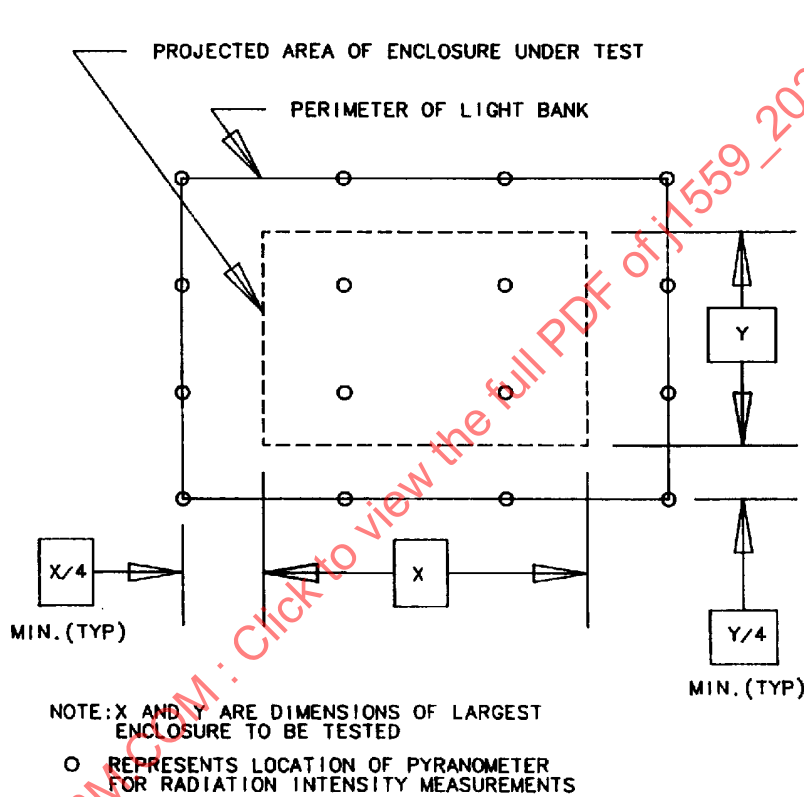


FIGURE 1 - PLANE OF MEASUREMENT