Easy Radiant Equator
Model HI-40N2
Patio Heater Performance Test

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Acknowledgments

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Specific appreciation is extended to Easy Radiant, for supplying the Food Service Technology Center with the HI-40N2 heater for controlled testing in the appliance laboratory.

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Easy Radiant Patio Heater Performance Testing

Background

Patio heaters are gaining popularity with food service operators as an effective method of extending the outdoor dining season. A deck or patio can be operational earlier in the spring and later into the autumn by providing additional heat to an area that would otherwise be unpleasantly cold. A patio heater can also take the edge off a cool summer night to help keep customers comfortable and relaxed.

Also known as radiant space heaters, their conceivable applications extend well beyond the realm of food service into nearly any situation requiring additional heat. There are countless outdoor, as well as many indoor, uses for patio heaters when people or objects require warmth that is otherwise not available.

While initial capital cost is a determining factor in the selection of a new patio heater, the appliance can also be evaluated with regards to long-term operational cost and performance, as characterized by preheat time, energy consumption, and effective heated area. The Food Service Technology Center (FSTC), operated by Fisher-Nickel, inc, developed a standard testing procedure to evaluate the performance of gas and electric patio heaters. This test procedure was designed to allow evaluation of patio heater performance and energy consumption in a structured laboratory setting.[1]

The primary objective of this procedure is to determine the area under or near the heater where a person could reasonably expect to be comfortable. Relating a person's thermal comfort at specific locations under the heater can be challenging, since the environment is not uniform. Some surfaces are hot, while others may be cold when compared to the surface temperature of a person's body or clothing. Mean radiant temperature is a measure of the combined affect of these non-uniform, hot and cold surfaces on a body (person) within the space.

The test procedure uses mean radiant temperature to characterize the useful output from a radiant patio heater. The useful output is specified as the area under and around the heater having a mean radiant temperature rise of at least 3°F in a design environment of 60°F. While a 3°F temperature rise does not sound significant, it is referring to a rise in radiant temperature, which is more noticeable than a 3°F rise in ambient temperature. Stated another way, a heater producing a 3°F rise in mean radiant temperature in a 60°F environment would feel warmer than an environment with an ambient temperature of 63°F.

Using the 63°F boundary not only determines the area where the heater is delivering the most useful heat, but also sets standard criteria for comparing different heaters.[2-5]

The glossary in Appendix A is provided so that the reader has a quick reference to the terms used in this report.

Objective

The objective of this report is to examine the operation and performance of the Easy Radiant natural gas-powered patio heater, model HI-40N2, under the controlled conditions of the FSTC Test Method. The scope of this testing is as follows:

1. Energy input rate is determined to confirm that the heater is operating within 5% of the nameplate energy input rate.
2. Preheat time and energy consumption is determined.
3. The temperature distribution and effective heated area is determined with the heater operating at high input while mounted at heights of 8-feet and 9-feet and at angles of horizontal, 30-degrees and 45 degrees.
4. The temperature distribution and effective heated area is determined with the heater operating at low input while mounted at a height of 8-feet and at angles of horizontal, 30-degrees and 45 degrees.
5. The heater's heating index is determined to relate the input rate to the effective heated area.

Easy Radiant Patio Heater

Appliance Description

The Easy Radiant heater, model HI-40N2, is a hanging-style, natural-gas powered patio heater using a 2-stage infrared burner. The heater is toggled between the low (30,000 Btu/h) and high (40,000 Btu/h) stages using a manual switch on the side of the enclosure. The heater can be pole or wall mounted, in addition to being suspended from overhead. The HI-40N2 heater (Figure 1) also has the ability to be mounted at an angle of up to 45 degrees from horizontal. Appliance specifications are listed in Table 1, and the manufacturer's literature is included in Appendix B.

Figure 1.
Easy Radiant Equator Heater, Model HI-40N2.

Table 1. Appliance Specifications.

Manufacturer	Easy Radiant
Model	Equator HI-40N2
Generic Appliance Type	Patio Heater
Rated Energy Input Rate	40,000 Btu/h (High) / 30,000 Btu/h (Low)
Technology	Infrared Burner
Construction	Aluminized Steel Enclosure Aluminum Reflector
Ignition	Direct Spark
Controls	Hi/Low Input Switch Optional Remote Control
Overall Dimensions	44" Wide × 9.5" Wide × 11" High

Setup and Instrumentation

The HI-40NS heater was tested in three positions at two mounting heights. At a height of 8 feet, as measured from the floor to the bottom of the enclosure, the heater was tested in the horizontal, 30° and 45° positions at both low and high input. At a height of 9 feet, the heater was tested in the horizontal, 30° and 45° positions using the high input setting.

Gas consumption was monitored using a positive displacement meter, which generated a pulse for every 0.1 ft^3 of gas used. Power and energy were measured with a watt/watt-hour transducer that generated a pulse for every

0.00001 Wh used. Heater temperature was monitored with a 24 gauge, type K, fiberglass insulated thermocouple wire.

The mean radiant temperature can be determined at a specific point under the heater with a globe thermometer. A globe thermometer, shown in Figure 2, consists of a thermocouple junction located in the geometric center of a sphere. The thermocouple measures the average surface temperature of the sphere, and, when combined with the ambient air temperature and the convection heat transfer for the sphere, can be used to calculate the mean radiant temperature for that location. By using an array of globe thermometers, the entire area under the heater can be covered.

After calculating the mean radiant temperature of the space both with and without the heater operating, the effect of the heater can be determined. Once the effect of the heater at a specific ambient temperature is known, its effect on a design environment having a different ambient temperature can be calculated. With a minimum temperature rise specified, a boundary is drawn and the heated area calculated.

A grid of 60 globe thermometers with a spacing of 2 feet was used to measure the radiant heat from the heater, and four 24 gauge, type K, teflon insulated, aspirated thermocouples monitored the ambient temperature. The globe thermometers were positioned 36 inches off the floor, to approximate the position of the center of a sitting person’s chest. Figure 3 shows the globe thermometer grid. The gas meter and all thermocouples were connected to a computerized data acquisition unit that recorded data every 10 seconds.

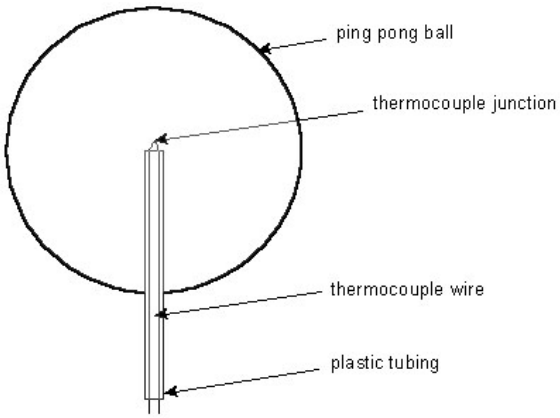

Figure 2.
Globe thermometer design.

Figure 3.
Globe thermometer grid.

Test Procedure and Results

Energy Input Rate

The energy input rate was determined by turning the heater on and measuring the energy consumed for a period of 15 minutes. The energy used and the time elapsed were used to calculate the maximum energy input rate. The energy input rate on the high setting was calculated at 38,400 Btu/h, within 4.0% of the nameplate rate of 40,000 Btu/h. This ensured the heater was operating as per the manufacturer's specification, and testing could continue

without adjustment. On the low setting, the energy rate was calculated at 32,480 Btu/h. The HI-40N2 heater also consumed a small amount of electrical energy for the controls— 8 Watts.

Preheat Test

The preheat test recorded the time and energy required for the heater to increase the reflector temperature from 75 ± 5°F to a temperature that equals 95% of the heater's maximum stabilized temperature (as measured by the thermocouple attached to the reflector). The test continued until the reflector temperature had stabilized to within ±3°F over a period of 5 minutes. The point when the reflector temperature had reached 95% of its maximum temperature was then determined. The elapsed time and the energy consumed by the heater up until this point was reported as preheat time and energy. The preheat test indicated a maximum reflector temperature of 495.8°F, which meant the heater was considered preheated when the reflector reached 471.0°F (95% of maximum). The heater reached this temperature in 10.4 minutes, while consuming 6,585 Btu of energy. The preheat chart for the Equator HI-40N2 heater is shown in Figure 4.

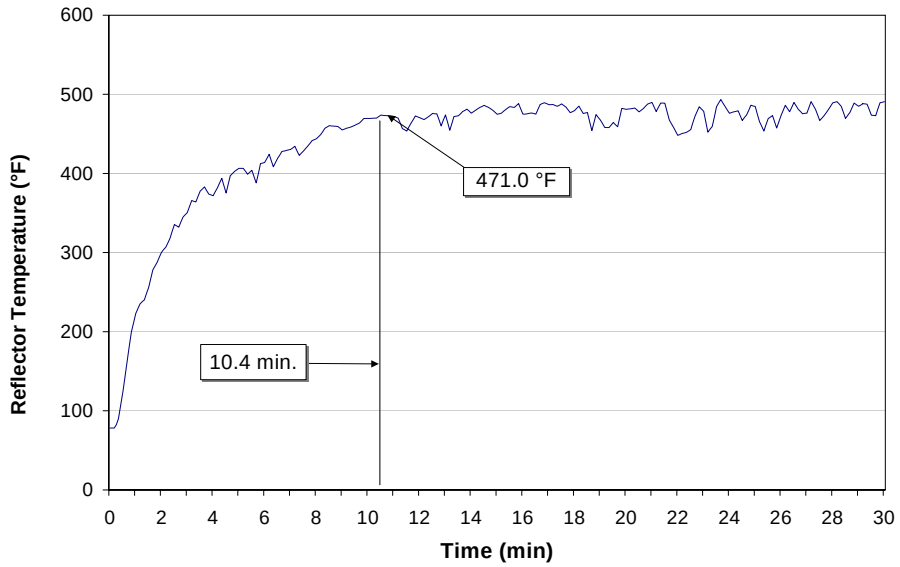

Figure 4.
Preheat characteristics.

Table 2 summarizes the results of the input and preheat tests for the Easy Radiant heater.

Table 2. Input and Preheat Test Results.

Rated Energy Input Rate, High Setting (Btu/h)	40,000
Measured Energy Input Rate, High Setting (Btu/h)	38,400
Percentage Difference From Rated (%)	2.3
Measured Energy Input Rate, Low Setting (Btu/h)	32,480
Electrical Energy Input Rate (W)	8
Preheat	
Time (min)	10.4
Energy (Btu)	6,585

Temperature Distribution and Effective Heated Area

Temperature distribution and effective heated area tests are used to determine the specific boundary where the heater has raised the mean radiant temperature of the globe thermometers to 3°F above the design temperature of 60°F. With this information, the size and shape of the heat pattern can be determined and the heater's heating index can be calculated.

To confirm that all test apparatus was in a stable condition, the temperatures of the globe thermometers and the heater reflector were monitored for a period of 5 minutes before the heater was turned on. Each temperature was verified to be stable to within ± 0.5° F during this period, indicating the test cell was not in a transitional state of heating up or cooling down. The heater was then turned on and allowed to run for 15 minutes, after which time the globe thermometer temperatures were recorded for 5 minutes. This test was performed in triplicate to ensure the accuracy of the results.

In order to generate the plots, each average globe thermometer temperature from the 5-minute test was first normalized to the design mean radiant tem-

perature. To determine the exact location of the distribution plot boundary, the linear interpolation procedure described in the FSTC Test Method is applied to the areas where one globe is above the threshold temperature and an adjacent globe is below it. The HI-40N2 heater was first tested in a horizontal position at a height of 8-feet while operating at high input. The distribution plot for the test is shown in Figure 5, which includes the 63°F temperature boundary specified by the test method, as well as additional boundaries indicating further temperature increments of 1°F.

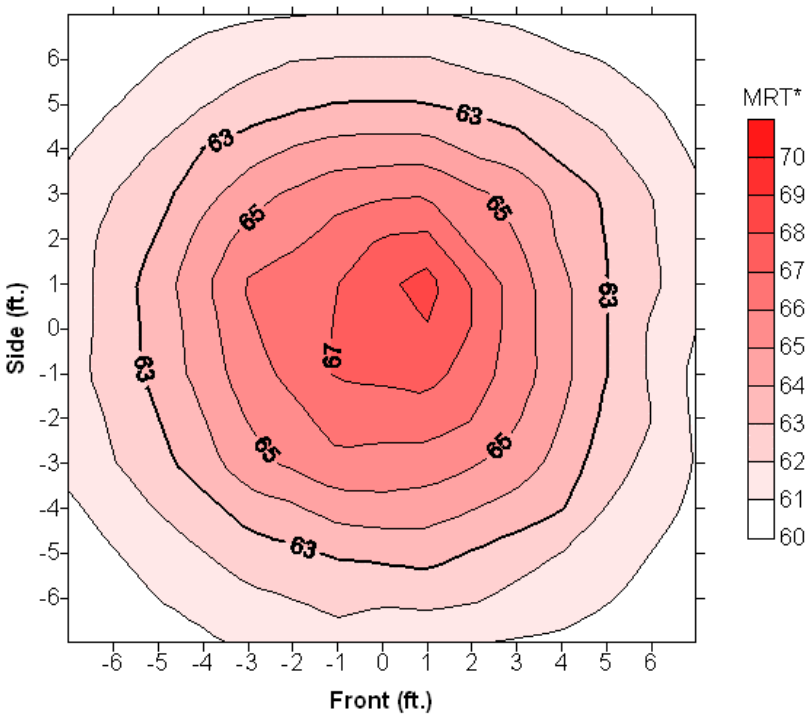

Figure 5. Temperature distribution plot in the 8-foot, horizontal, high-input configuration.

The effective heated area is the area contained within the boundary of the 63°F contour line shown in the temperature distribution plot. The heated area for the HI-40N2 heater in this configuration was 89.6 ± 5.1ft^2.

Figure 6 characterizes the radiant heat distribution of the HI-40N2 heater in the 8-foot height, horizontal, high-input configuration by showing the average front to back and left to right temperatures across the test grid.

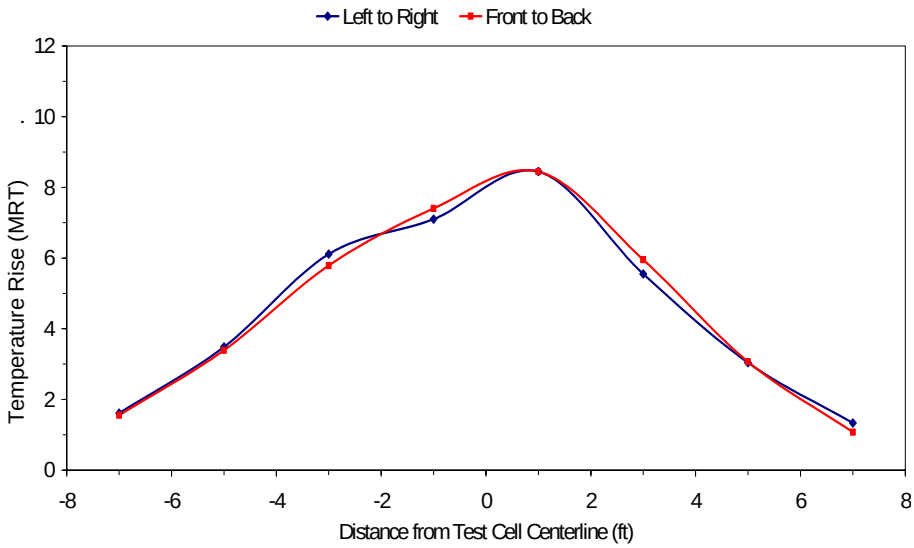

Figure 6.
Radiant heat distribution in the 8-foot, horizontal, high-input configuration.

The heater was next tested at the same 8-foot height and horizontal angle, but with the heater operating at the low-input setting. The temperature distribution plot is show in Figure 7.

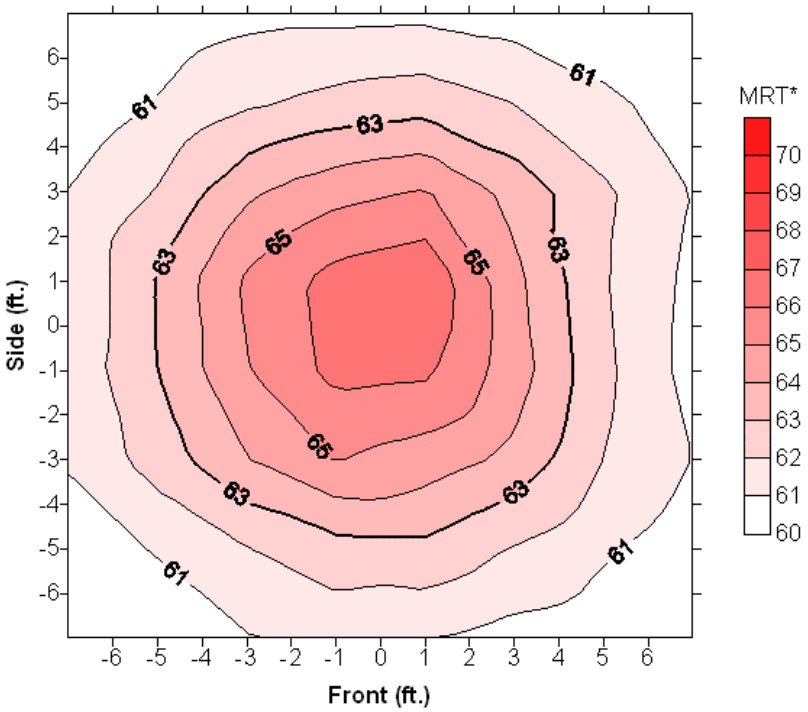

Figure 7. Temperature distribution plot in the 8-foot, horizontal, low-input configuration.

The heated area for this test was 71.6 ± 2.2 ft^2. Figure 8 characterizes the radiant heat distribution of the HI-40N2 heater at the 8-foot, horizontal, low-input configuration.

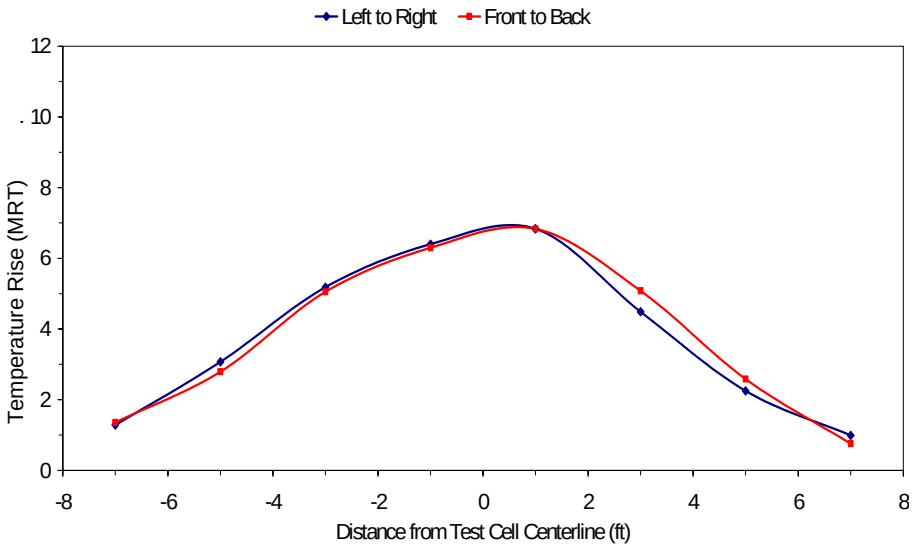

Figure 8. Radiant heat distribution with heater in the 8-foot, horizontal, low-input configuration.

The next tests were performed with the heater at a height of 8-feet, but with the face of the heater angled 30° from horizontal. To ensure the entire heat signature of the heater was captured, the heater was positioned so its center was 2 ½ feet from the left edge of the globe thermometer array, facing the right edge. Figure 9 shows the temperature distribution plot for the HI-40N2 heater in the 8-foot, 30-degree, high-input configuration.

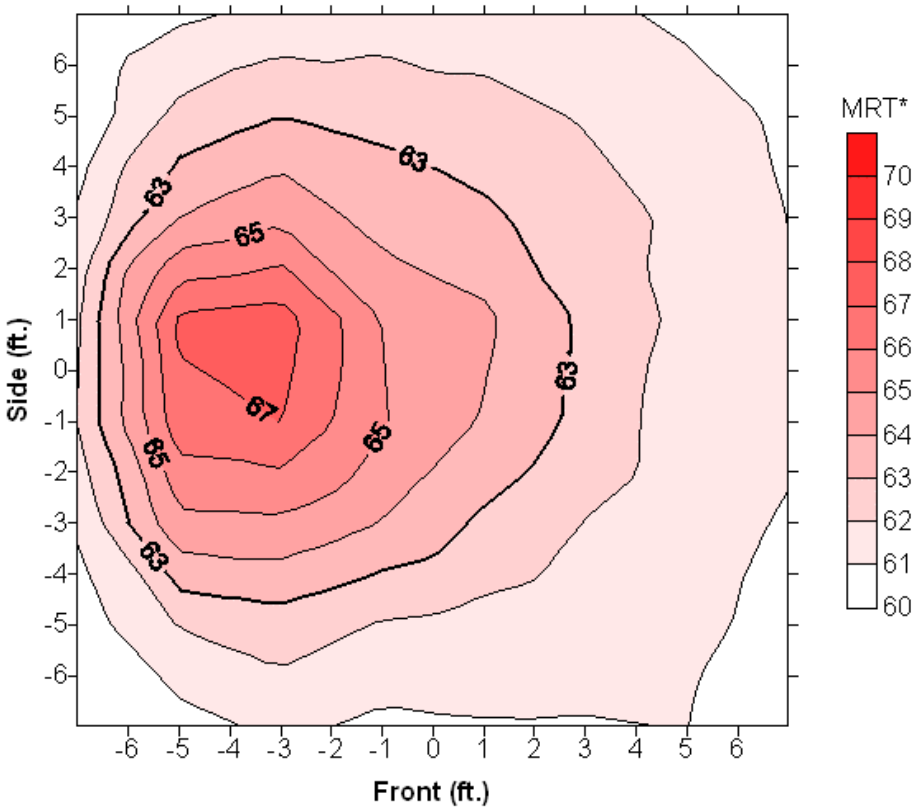

Figure 9. Temperature distribution plot in the 8-foot, 30-degree, high-input configuration.

The heated area for this test was 67.7 ± 2.4 ft^2. Figure 10 characterizes the radiant heat distribution of the HI-40N2 heater at the 8-foot, 30-degree, high-input configuration.

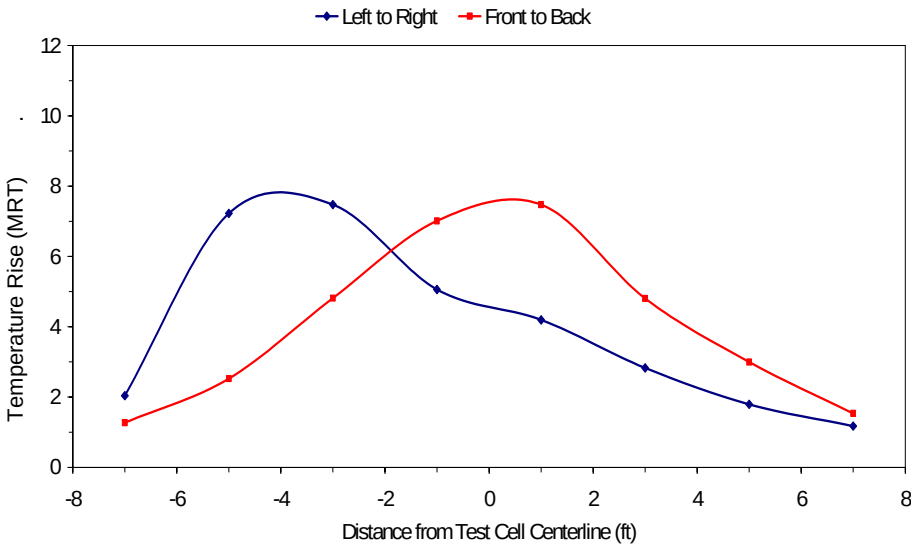

Figure 10. Radiant heat distribution with heater in the 8-foot, 30-degree, high-input configuration.

The next test was at the low-input setting, with the same height of 8-feet and angle of 30°. The temperature distribution plot is show in Figure 11.

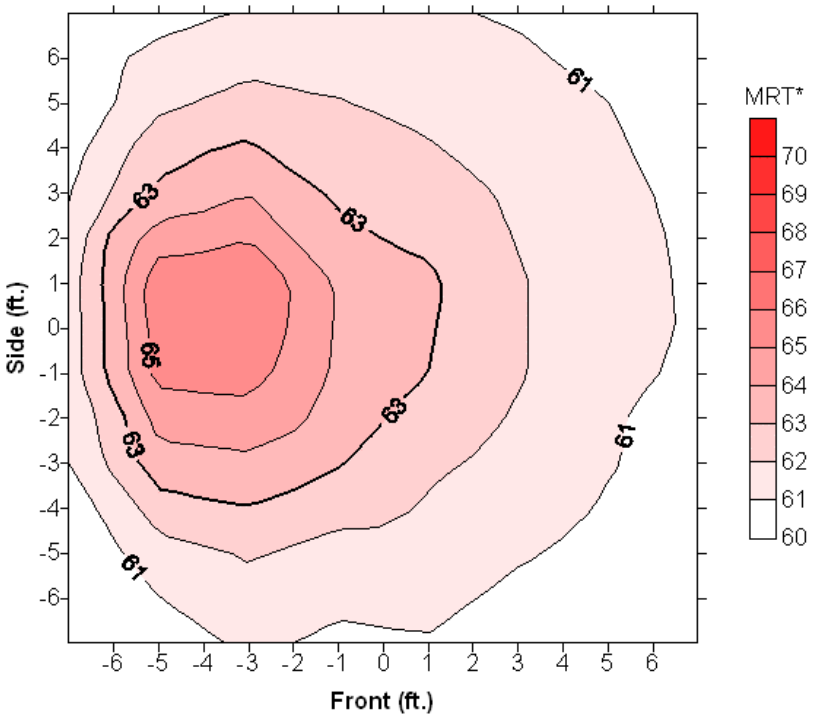

Figure 11. Temperature distribution plot in the 8-foot, 30-degree, low-input configuration.

The test showed a heated area of 44.1 ± 4.5 ft^2. The radiant heat distribution at the 8-foot, 30-degree, low-input configuration is characterized in Figure 12.

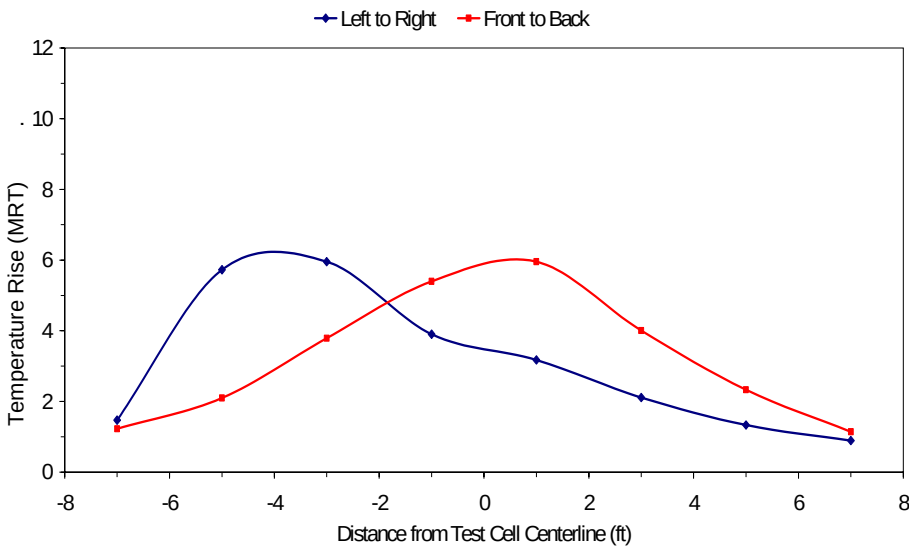

Figure 12. Radiant heat distribution with heater in the 8-foot, 30-degree, low-input configuration.

The heater was now increased to an angle of 45° from horizontal, the maximum at which it can operate. The heater remained at the 8-foot height, and Figure 13 shows the temperature distribution plot at the high-input setting.

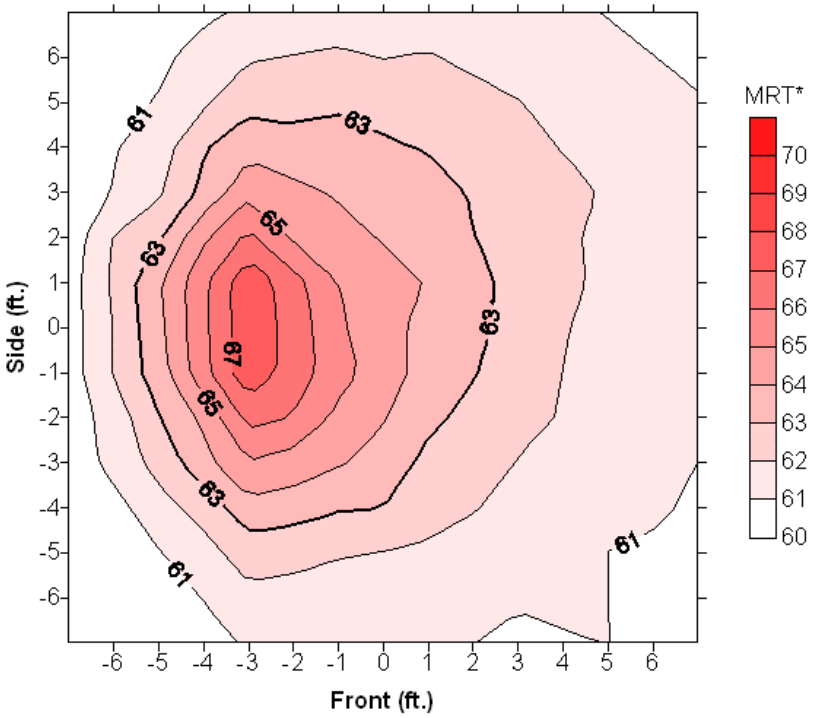

Figure 13. Temperature distribution plot in the 8-foot, 45-degree, high-input configuration.

The heated area for this test was 55.2 ± 9.6 ft^2. Figure 14 characterizes the radiant heat distribution of the HI-40N2 heater at the 8-foot, 45-degree, high-input configuration.

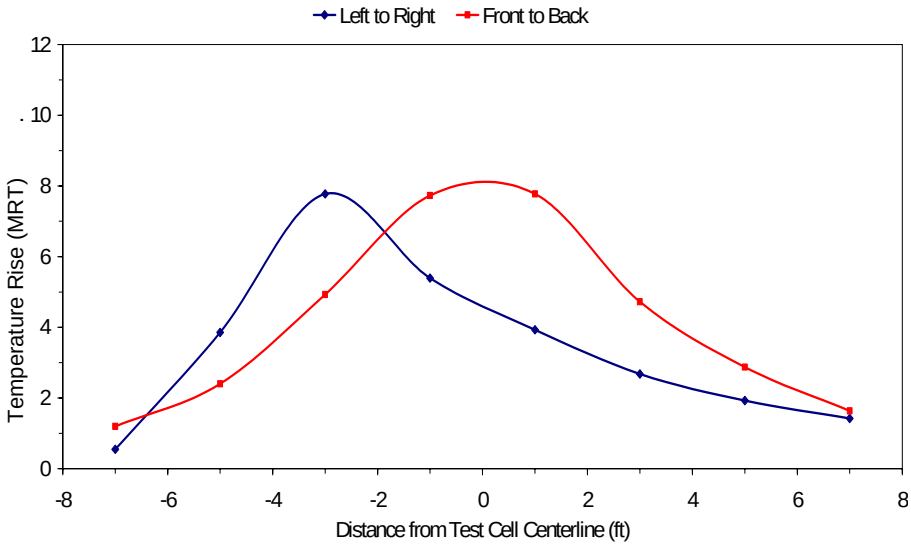

Figure 14. Radiant heat distribution with heater in the 8-foot, 45-degree, high-input configuration.

The heater was also tested at the 8-foot height and 45° angle, but with the heater operating at the low-input setting. The temperature distribution plot is show in Figure 15.

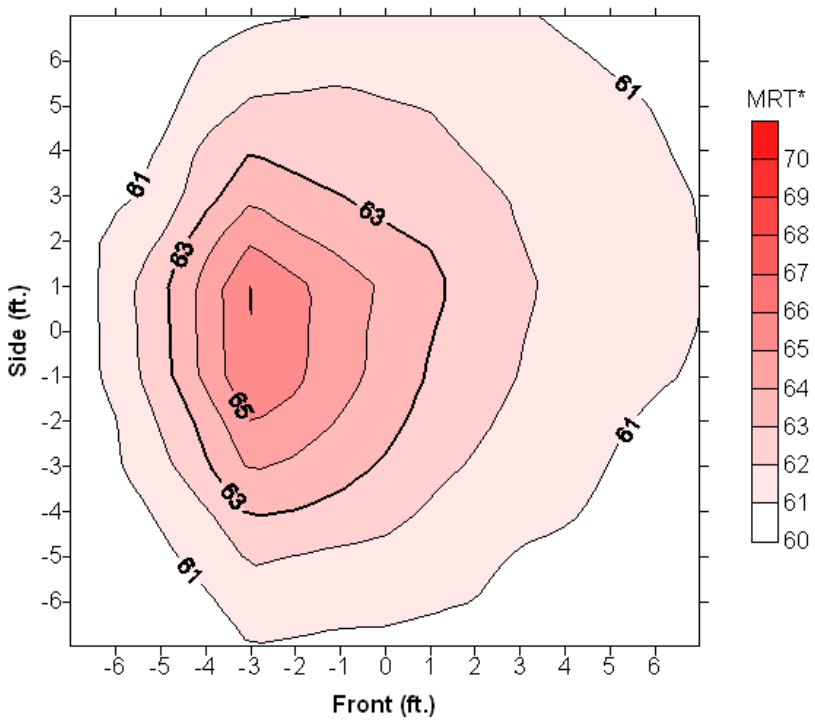

Figure 15. Temperature distribution plot in the 8-foot, 45-degree, low-input configuration.

The test showed a heated area of 35.0 ± 1.1 ft^2. The radiant heat distribution at the 8-foot, 45-degree, low-input configuration is characterized in Figure 16.

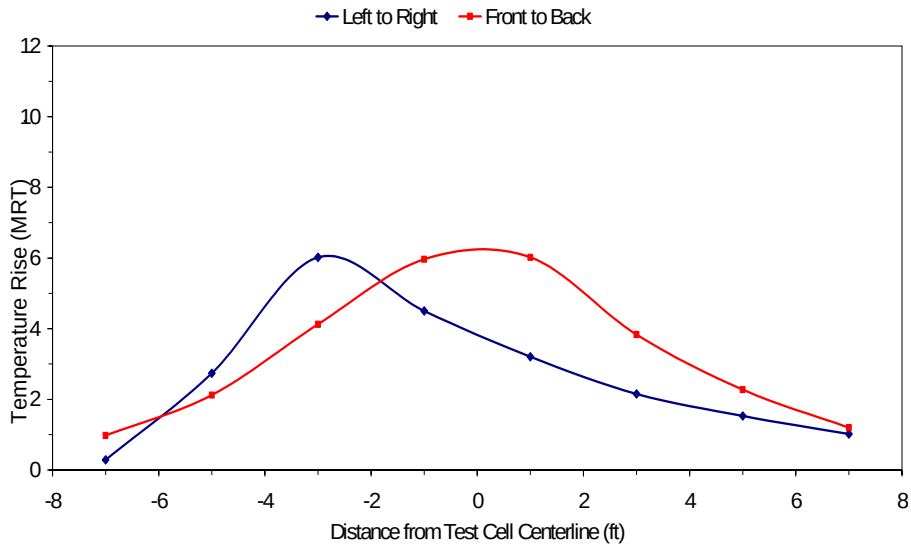

Figure 16. Radiant heat distribution with heater in the 8-foot, 45-degree, low-input configuration.

The heater was now moved to a height of 9-feet from the floor, with the heater above the center of the test cell. Figure 17 shows the results of the tests conducted at the high-input setting with the heater in the horizontal position.

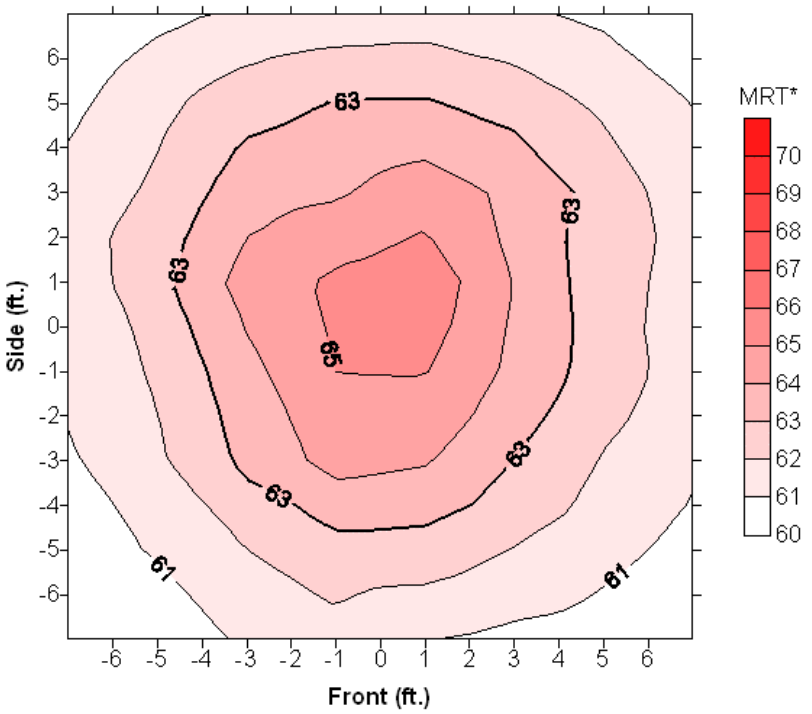

Figure 17. Temperature distribution plot in the 9-foot, horizontal, high-input configuration.

The heated area for this test was 68.1 ± 7.1 ft^2. Figure 18 characterizes the radiant heat distribution of the HI-40N2 heater at the 9-foot, horizontal, high-input configuration.

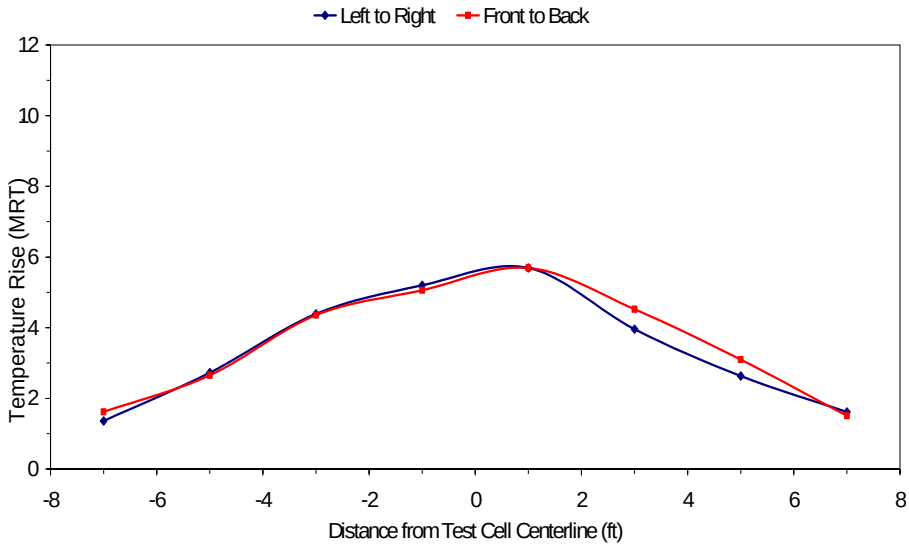

Figure 18. Radiant heat distribution with heater in the 9-foot, horizontal, high-input configuration.

For the angled tests at 9-feet, the heater was again positioned so its center was 2 ½ feet from the left edge of the globe thermometer array, facing the right edge. Figure 19 shows the temperature distribution plot for the HI-40N2 heater in the 9-foot, 30-degree, high-input configuration.

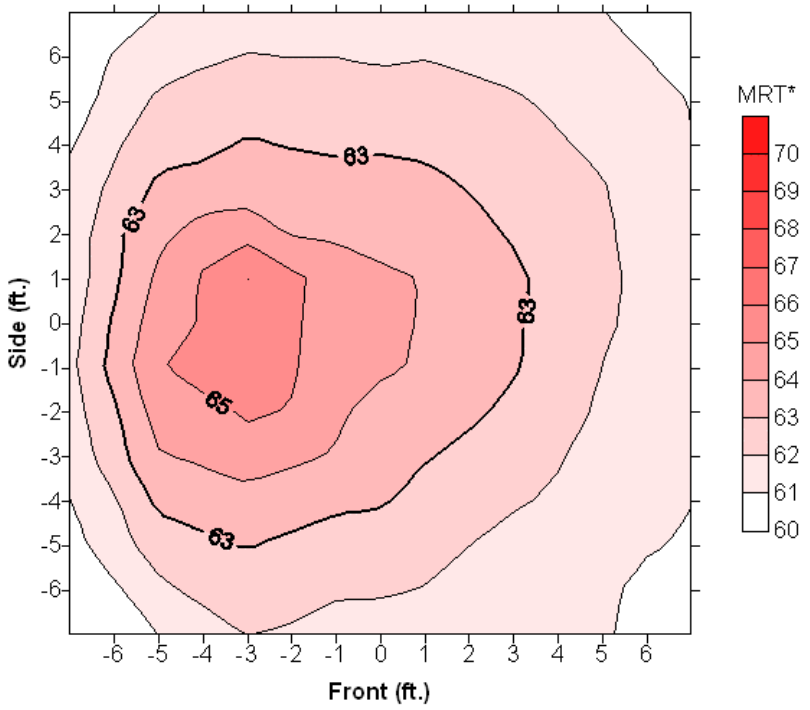

Figure 19. Temperature distribution plot in the 9-foot, 30-degree, high-input configuration.

The test showed a heated area of 66.3 ± 7.51 ft^2. The radiant heat distribution at the 9-foot, 30-degree, high-input configuration is characterized in Figure 20.

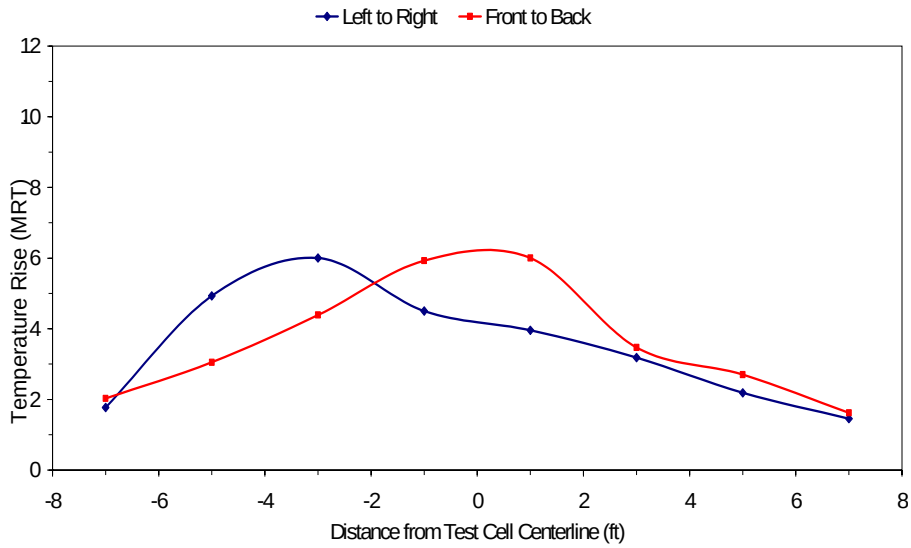

Figure 20. Radiant heat distribution with heater in the 9-foot, 30-degree, high-input configuration.

For the final test, the heater angle was increased to 45° from horizontal. The heater remained at the 9-foot height, and Figure 21 shows the temperature distribution plot at the high-input setting.

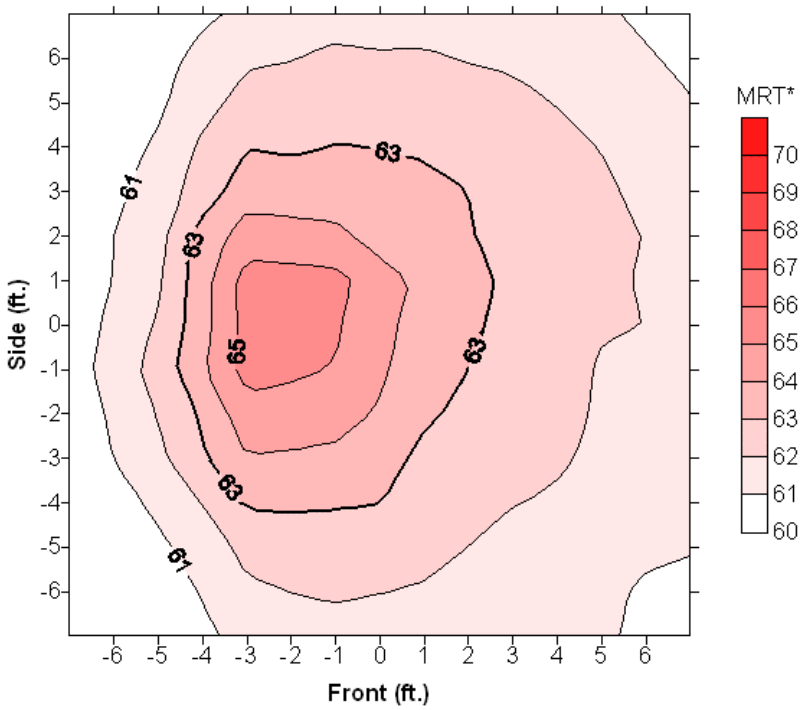

Figure 21. Temperature distribution plot in the 9-foot, 45-degree, high-input configuration.

The heated area for this test was 45.9 ± 4.1 ft^2. Figure 22 characterizes the radiant heat distribution of the HI-40N2 heater at the 9-foot, 45-degree, high-input configuration.

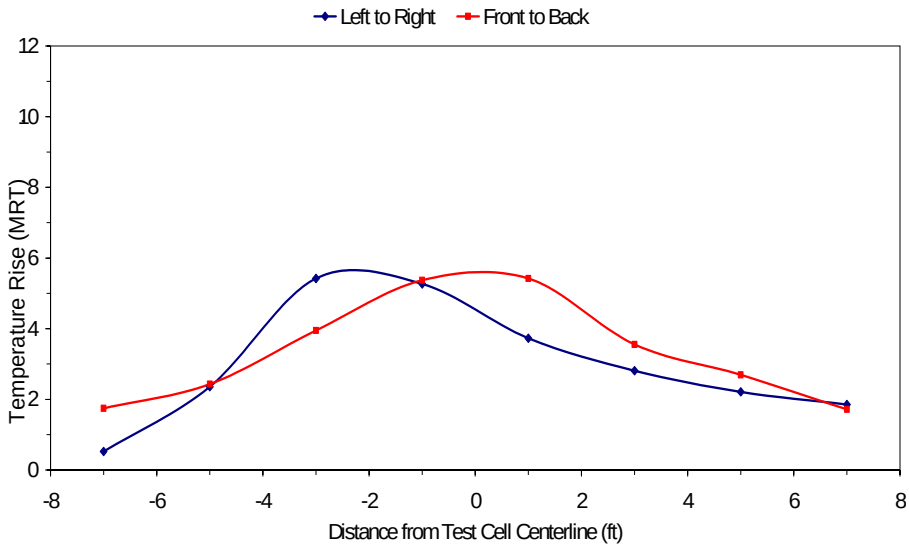

Figure 22. Radiant heat distribution with heater in the 9-foot, 30-degree, high-input configuration.

Heating Index

The heating index relates the effective heated area to how much energy is consumed by the patio heater in one hour. It is calculated by dividing the effective heated area by the patio heater input rate. Table 3 lists the heating indices for the HI-40N2 heater in each of the positions tested.

Table 3. Heating Indices.

Heater Configuration			Heated Area (ft^2)	Heater Input (Kbtu/hr)	Heating Index (ft^2/Kbtu/hr)
8 Foot Height	Horizontal	High Input	89.6	38.4	2.33
		Low Input	71.6	32.48	2.20
	30 Degrees	High Input	67.7	38.4	1.76
		Low Input	44.1	32.48	1.36
	45 Degrees	High Input	55.2	38.4	1.44
		Low Input	35.0	32.48	1.08
9 Foot Height	Horizontal	High Input	68.1	38.4	1.77
	30 Degrees	High Input	66.3	38.4	1.73
	45 Degrees	High Input	45.9	38.4	1.20

Conclusions

The largest heated area of 89.6ft^2 was obtained at the height of 8 feet with the heater mounted horizontally. When the heater was angled at 30 degrees, the heated area was 67.7 ft^2, a difference of 24%. Increasing the angle to 45° produced a heated area of 55.2 ft^2, 19% smaller than the 30° result. While the useable output at the 45° angle is still significant, the results indicate that for greatest coverage, the heater should be mounted as close to horizontal as the installation permits.

The low-input test results at 8-feet showed a similar trend as the high-input tests. In the horizontal position, the low-input setting produced a heated area of 71.6 ft^2. At the 30° angle, the difference was 38%, with a heated area of 55.2 ft^2. The maximum 45° mounting angle produced a heated area of 35.0 ft^2, 21% smaller than the 30° position.

At the 9-foot height, the difference in heated area between the horizontal and 30° angle tests was not as substantial as during the 8-foot tests. In the horizontal position at the high-input setting, the heated area was 68.1ft^2. When angled at 30°, the heated area of 66.3 ft^2 was a difference of less than 3%. However, at an angle of 45°, the heated area was 31% smaller than at the 30° angle. This suggests that at the 9-foot height, the heater should be mounted at no more than a 30° angle for maximum coverage.

With two-stage input and the ability to be mounted at an angle of up to 45°, the Easy Radiant Equator heater demonstrated great operational flexibility. Mounting options are pole or wall mount, in addition to overhead suspension, allowing the HI-40N2 heater to be mounted in a variety of positions as well.

References

1. Food Service Technology Center. 2002. *FSTC Test Method for the Performance of Patio Heaters.* #025-02, Version 6.2.

2. Sorensen, G. 2003. *Infratech Model W-3024 Patio Heater Performance Test.* Food Service Technology Center Report 5011.03.11, August.

3. Sorensen, G., Zabrowski, D., 2004. *Roberts-Gordon Model HE-40 Patio Heater Performance Test.* Food Service Technology Center Report 5011.04.11, December.

4. Sorensen, G., Zabrowski, D., 2005. *Schwank, Model 2315 Patio Heater Performance Test.* Food Service Technology Center Report 5011.05.05, March.

5. Sorensen, G., Zabrowski, D., 2005. *Schwank, Model 2313 Patio Heater Performance Test.* Food Service Technology Center Report 5011.05.06, March.

6. Sorensen, G. 2005. *Easy Radiant Model PH-50-H-R-N Patio Heater Performance Test.* Food Service Technology Center Report 5011.05.04, December.

7. Sorensen, G., Zabrowski, D., 2006. *Sunpak® Heater Model S34 Patio Heater Performance Test*. Food Service Technology Center Report 5011.06.11, August.

8. Sorensen, G., Zabrowski, D., 2006. *Sunglo™ Heater Model A242 Patio Heater Performance Test*. Food Service Technology Center Report 5011.06.16, November.

A Glossary

Design Environment

Unheated environment for which test unit's performance is to be evaluated. Design environment is specified as having a mean radiant temperature of 60°F.

Effective Heated Area (ft^2)

The amount of square footage under a patio heater that can be warmed to a specified mean radiant temperature (3°F above the design environment).

Efficiency Index (Btu/ft^2)

The quotient of the effective heated area and the measured energy input rate.

Energy Input Rate (kW or kBtu/h)
Energy Consumption Rate
Energy Rate

The peak rate at which an appliance will consume energy, typically reflected during preheat.

Heating Index (ft^2/kBtu/h)

The quotient of the measured energy input rate and the effective heated area.

Heating Value (Btu/ft^3)
Heating Content

The quantity of heat (energy) generated by the combustion of fuel. For natural gas, this quantity varies depending on the constituents of the gas.

Measured Input Rate (kW or Btu/h)
Measured Energy Input Rate
Measured Peak Energy Input Rate

The maximum or peak rate at which an appliance consumes energy, typically reflected during preheat.

Mean Radiant Temperature (°F)

The uniform surface temperature of an imaginary black enclosure in which an occupant would exchange the same amount of radiant heat as in the actual non-uniform space.

Rated Energy Input Rate
(kW, W or Btu/h, Btu/h)
Input Rating (ANSI definition)
Nameplate Energy Input Rate
Rated Input

The maximum or peak rate at which an appliance consumes energy as rated by the manufacturer and specified on the nameplate.

Pilot Energy Rate (kBtu/h)
Pilot Energy Consumption Rate

The rate of energy consumption by the standing or constant pilot while the appliance is not being operated (i.e., when the thermostat(s) or control knob(s) have been turned off by the operator).

Preheat Energy (kWh or Btu)
Preheat Energy Consumption

The total amount of energy consumed by an appliance during the preheat time.

Preheat Time (min)
Preheat Period

The time required for an appliance to "preheat" from the ambient room temperature (75 ± 5°F) to a specified (and calibrated) operating temperature or thermostat set point.

Test Method

A definitive procedure for the identification, measurement, and evaluation of one or more qualities, characteristics, or properties of a material, product, system, or service that produces a test result.

B Manufacturer's Specifications

"The Equator" by Easy Radiant

Features

- 30,000/40,000 BTUs/hour, single or two-stage input
- Direct spark ignition, no standing pilot
- Natural or propane gas
- 24 volt control
- 120/24 volt transformer included
- Weatherproof aluminized, baked on, high temperature, black powder or stainless steel enclosure
- Decorative safety grill
- Windproof up to 15 mph
- 100% safety shut off
- Slim profile

Accessories

- Wall and ceiling mounting brackets
- Mounting brackets for 4 x 4 wooden posts
- Mounting brackets for 3" round steel post
- Hand-held remote control available

C Results Reporting Sheets

Manufacturer	Easy Radiant
Model	HI-40N2
Date:	November, 2006

Test Patio Heater:

Description of operational characteristics: The HI-40N2 is a high-intensity, dual stage heater with a rated input of 40,000/30,000 Btu/h. The infrared burner is mounted in a steel enclosure and is lit by an electronic ignition.

Apparatus:

The heater was installed in a 20 by 20-foot space at heights of 6-feet and 8-feet, as measured from the floor to the bottom of the hanging bracket.

An array of 60 globe thermometers was arranged beneath the heater at a height of 36-inches above the floor to monitor mean radiant temperature. The globes in the array were spaced 24-inches apart, making a 14 by 14-foot test grid. Each of the four quadrants contained an aspirated thermocouple at a height of 36-inches above the floor for measuring ambient air temperature.

Energy was monitored using a positive displacement meter that generated a pulse for every 0.1ft^3 of gas used. The gas meter and thermocouples were connected to an automated data acquisition unit that recorded data every 5 seconds.

Energy Input Rate:

Measured (High Setting)	38,400 Btu/h
Rated	40,000 Btu/h
Percent Difference between Measured and Rated	2.3 %
Electrical Energy Input Rate	8 W
Measured (Low Setting)	32,480 Btu/h

Preheat:

Preheat Time	10.4 min.
Preheat Energy	6,585 Btu

Effective Heated Area and Heating Index:

The effective heated area is defined as the area under the heater with a normalized mean radiant temperature of 63°F and higher. The heating index is the number of square feet of patio effectively heated for each unit of energy (kBtu) consumed by the heater. The effective heated area and heating indices for the Equator heater in each tested configuration are shown in Table C-1.

Table 3. Heating Indices.

Heater Configuration			Heated Area (ft^2)	Heating Index (ft^2/Kbtu/hr)	Efficiency Index (Btu/ft^2)
8 Foot Height	Horizontal	High Input	89.6	2.33	429
		Low Input	71.6	2.20	454
	30 Degrees	High Input	67.7	1.76	567
		Low Input	44.1	1.36	737
	45 Degrees	High Input	55.2	1.44	696
		Low Input	35.0	1.08	928
9 Foot Height	Horizontal	High Input	68.1	1.77	564
	30 Degrees	High Input	66.3	1.73	579
	45 Degrees	High Input	45.9	1.20	837

D Test Cell Data

Mean Radiant Temperature Distribution:

Tables D-1 through D-9 show the average normalized mean radiant temperatures from the three test replicates performed in each configuration.

Table D-1. Normalized Mean Radiant Temperatures for 8-foot, horizontal, high-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	61.0	61.0	60.4	1	-3	64.0	63.9	63.5
3	7	61.8	61.9	61.1	-1	-3	64.2	63.9	63.8
1	7	61.4	61.7	61.1	-3	-3	63.6	63.4	63.6
-1	7	61.5	61.7	61.1	-5	-3	62.5	62.6	62.6
-3	7	61.9	61.8	61.0	5	-5	61.9	61.7	61.4
-5	7	60.9	61.7	60.8	3	-5	62.0	61.9	61.8
5	5	61.6	62.0	61.9	1	-5	62.2	62.0	62.2
3	5	62.3	62.2	62.7	-1	-5	62.1	62.0	61.8
1	5	62.0	62.2	62.1	-3	-5	62.3	62.4	62.2
-1	5	62.3	62.0	62.2	-5	-5	61.6	61.7	61.7
-3	5	62.5	62.8	62.3	5	-7	61.2	60.9	61.2
-5	5	61.7	62.2	61.7	3	-7	61.2	61.0	61.1
5	3	63.1	62.9	62.8	1	-7	61.2	61.1	60.9
3	3	63.9	63.6	63.8	-1	-7	61.4	61.5	61.3
1	3	63.3	63.5	63.4	-3	-7	61.8	61.5	61.4
-1	3	63.5	63.9	63.9	-5	-7	61.0	61.0	60.8
-3	3	63.4	63.8	63.4	-7	5	61.2	61.7	61.2
-5	3	62.6	62.9	62.5	-7	3	61.6	61.8	61.7
5	1	63.4	63.5	63.4	-7	1	61.9	62.0	62.2
3	1	65.3	64.7	64.6	-7	-1	61.8	62.2	62.1
1	1	66.3	66.1	65.9	-7	-3	61.4	61.8	61.6
-1	1	65.3	64.6	64.9	-7	-5	61.1	61.4	61.3
-3	1	65.5	65.4	65.8	7	5	61.0	61.3	61.1
-5	1	63.6	63.7	64.0	7	3	61.6	61.2	61.3
5	-1	64.0	63.5	63.7	7	1	62.0	61.5	62.1
3	-1	65.1	64.4	64.8	7	-1	62.4	61.9	62.0
1	-1	65.0	64.9	64.9	7	-3	61.9	61.6	61.5
-1	-1	65.2	64.9	64.9	7	-5	61.3	60.9	60.8
-3	-1	65.3	65.2	65.2	-7	-7	60.0	60.0	60.0
-5	-1	63.3	63.5	63.6	-7	7	60.0	60.0	60.0
5	-3	62.8	62.6	62.4	7	7	60.0	60.0	60.0
3	-3	63.5	63.1	63.0	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-2. Normalized Mean Radiant Temperatures for 8-foot, horizontal, low-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	60.1	60.4	60.4	1	-3	64.6	64.5	64.4
3	7	60.5	60.7	60.5	-1	-3	65.2	64.9	65.1
1	7	60.7	60.9	60.7	-3	-3	64.0	63.7	64.2
-1	7	60.7	60.8	60.7	-5	-3	62.6	62.1	62.8
-3	7	60.6	60.6	61.0	5	-5	61.1	61.2	61.1
-5	7	60.2	60.3	60.7	3	-5	61.9	61.9	61.9
5	5	61.2	61.3	61.1	1	-5	62.8	62.8	62.8
3	5	62.1	62.0	61.9	-1	-5	62.6	62.7	62.5
1	5	62.5	62.6	62.6	-3	-5	61.9	62.2	61.7
-1	5	62.2	62.5	62.2	-5	-5	61.0	61.3	60.9
-3	5	61.8	62.0	61.8	5	-7	60.5	60.4	60.4
-5	5	61.0	61.2	61.0	3	-7	60.6	60.6	60.7
5	3	62.2	62.0	62.2	1	-7	61.1	61.0	61.1
3	3	63.5	63.8	63.6	-1	-7	61.4	61.4	61.3
1	3	64.8	65.2	65.3	-3	-7	60.9	61.1	60.8
-1	3	64.6	64.7	64.7	-5	-7	60.2	60.5	60.2
-3	3	64.0	64.1	63.4	-7	5	60.3	60.4	60.1
-5	3	62.1	62.2	61.9	-7	3	61.1	61.0	61.0
5	1	61.9	62.2	62.2	-7	1	61.2	61.0	61.0
3	1	64.2	64.4	64.3	-7	-1	61.2	61.2	61.5
1	1	66.8	67.0	66.7	-7	-3	61.0	61.0	61.4
-1	1	66.4	66.8	66.0	-7	-5	60.4	60.4	60.5
-3	1	65.2	65.2	65.2	7	5	60.5	60.5	60.7
-5	1	62.9	62.8	63.4	7	3	60.9	60.9	61.1
5	-1	62.2	62.4	62.1	7	1	61.0	60.5	60.7
3	-1	64.3	64.6	64.5	7	-1	60.7	60.7	60.6
1	-1	66.2	66.1	66.4	7	-3	60.9	60.9	61.2
-1	-1	66.2	66.5	66.2	7	-5	60.4	60.5	60.5
-3	-1	65.0	64.7	65.1	-7	-7	60.0	60.0	60.0
-5	-1	63.1	62.5	63.5	-7	7	60.0	60.0	60.0
5	-3	61.9	62.2	61.8	7	7	60.0	60.0	60.0
3	-3	63.7	64.0	63.6	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-3. Normalized Mean Radiant Temperatures for 8-foot, 30-degree, high-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	60.8	61.0	60.6	1	-3	62.7	62.7	63.0
3	7	61.4	61.2	61.2	-1	-3	63.9	63.8	64.2
1	7	61.7	61.5	61.4	-3	-3	64.8	64.7	64.9
-1	7	61.6	61.7	61.3	-5	-3	64.9	65.0	64.4
-3	7	61.3	61.4	61.2	5	-5	61.2	61.3	61.2
-5	7	61.1	60.8	60.6	3	-5	61.3	61.3	61.3
5	5	61.5	61.5	61.3	1	-5	61.6	61.8	61.6
3	5	62.0	61.9	61.9	-1	-5	61.9	61.9	61.9
1	5	62.4	62.4	62.1	-3	-5	62.7	62.3	62.5
-1	5	62.9	63.0	62.5	-5	-5	62.4	62.1	61.7
-3	5	63.0	63.2	62.8	5	-7	60.9	61.2	60.9
-5	5	62.4	62.4	62.1	3	-7	61.0	60.9	61.0
5	3	61.8	61.7	61.8	1	-7	60.8	61.0	60.9
3	3	62.5	62.4	62.4	-1	-7	60.7	60.8	60.8
1	3	63.3	63.2	63.2	-3	-7	61.3	61.2	61.3
-1	3	63.5	63.7	63.5	-5	-7	60.7	60.4	60.6
-3	3	64.7	64.6	65.1	-7	5	60.4	60.4	60.1
-5	3	64.1	64.0	63.9	-7	3	61.2	61.3	60.9
5	1	61.8	61.6	61.7	-7	1	62.0	62.1	61.5
3	1	62.9	62.8	62.9	-7	-1	61.9	62.3	61.9
1	1	64.1	64.0	64.5	-7	-3	61.0	61.3	61.1
-1	1	65.0	65.0	65.0	-7	-5	60.4	60.7	60.4
-3	1	67.1	67.4	67.9	7	5	60.9	60.9	60.7
-5	1	67.1	67.3	67.2	7	3	61.1	61.0	61.0
5	-1	61.5	61.4	61.3	7	1	61.1	61.1	61.2
3	-1	62.6	62.6	62.8	7	-1	61.2	61.2	61.2
1	-1	63.8	63.7	64.3	7	-3	60.9	61.0	60.9
-1	-1	64.9	64.9	65.4	7	-5	60.7	60.8	60.6
-3	-1	66.9	66.9	67.3	-7	-7	60.0	60.0	60.0
-5	-1	66.4	66.8	66.6	-7	7	60.0	60.0	60.0
5	-3	61.4	61.3	61.3	7	7	60.0	60.0	60.0
3	-3	61.9	61.9	62.1	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-4. Normalized Mean Radiant Temperatures for 8-foot, 30-degree, low-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	60.6	60.3	60.6	1	-3	62.4	62.2	62.1
3	7	61.0	60.8	60.9	-1	-3	63.2	63.2	62.9
1	7	61.2	60.9	61.2	-3	-3	63.9	64.0	63.5
-1	7	61.2	60.9	61.3	-5	-3	63.8	63.4	63.4
-3	7	61.1	60.9	61.2	5	-5	60.7	60.7	60.8
-5	7	60.6	60.5	60.9	3	-5	61.0	61.1	61.2
5	5	61.0	60.9	61.1	1	-5	61.3	61.5	61.7
3	5	61.4	61.3	61.4	-1	-5	61.6	61.8	61.6
1	5	61.8	61.5	61.8	-3	-5	62.1	62.2	62.0
-1	5	62.2	61.8	62.2	-5	-5	61.8	61.6	61.3
-3	5	62.4	62.1	62.5	5	-7	60.7	60.3	60.8
-5	5	61.7	61.7	62.0	3	-7	60.7	60.4	60.5
5	3	61.3	61.3	61.3	1	-7	60.8	60.7	61.3
3	3	61.7	61.8	61.9	-1	-7	61.0	60.7	60.7
1	3	62.4	62.5	62.5	-3	-7	61.3	61.2	61.1
-1	3	62.7	62.9	62.9	-5	-7	60.5	60.5	60.2
-3	3	63.8	64.3	64.0	-7	5	60.2	60.0	60.3
-5	3	63.1	63.1	63.5	-7	3	61.0	60.7	61.1
5	1	61.3	61.3	61.3	-7	1	61.5	61.1	61.8
3	1	62.1	62.2	62.0	-7	-1	61.7	61.0	61.8
1	1	63.3	63.2	63.1	-7	-3	61.0	60.8	61.2
-1	1	64.5	64.5	64.5	-7	-5	60.2	60.1	60.3
-3	1	65.7	66.2	66.0	7	5	60.5	60.5	60.7
-5	1	65.6	65.7	65.9	7	3	60.6	60.7	60.7
5	-1	61.1	61.1	61.2	7	1	60.9	60.8	60.9
3	-1	62.3	62.0	62.0	7	-1	60.9	60.9	61.0
1	-1	63.3	62.9	62.8	7	-3	60.5	60.6	60.6
-1	-1	64.2	63.7	63.6	7	-5	60.3	60.3	60.6
-3	-1	65.6	65.3	65.3	-7	-7	60.0	60.0	60.0
-5	-1	65.3	65.0	65.5	-7	7	60.0	60.0	60.0
5	-3	61.0	61.1	61.1	7	7	60.0	60.0	60.0
3	-3	61.6	61.6	61.7	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-5. Normalized Mean Radiant Temperatures for 8-foot, 45-degree, high-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	60.9	61.1	60.8	1	-3	62.8	62.8	62.8
3	7	61.6	61.4	61.4	-1	-3	64.2	64.0	64.2
1	7	61.8	61.6	61.5	-3	-3	65.0	64.8	65.0
-1	7	61.5	61.5	61.4	-5	-3	62.5	62.4	62.1
-3	7	61.2	61.2	61.1	5	-5	61.1	61.0	60.9
-5	7	60.4	60.4	60.2	3	-5	61.5	61.3	61.2
5	5	61.8	61.7	61.5	1	-5	61.9	61.8	62.0
3	5	62.2	61.9	62.0	-1	-5	62.1	62.1	62.1
1	5	62.7	62.4	62.3	-3	-5	62.3	62.3	62.6
-1	5	63.0	62.8	62.8	-5	-5	60.9	60.9	61.1
-3	5	62.7	62.7	62.6	5	-7	61.0	61.1	60.9
-5	5	61.1	61.2	61.0	3	-7	60.9	60.9	60.7
5	3	62.1	62.0	61.8	1	-7	61.2	61.2	61.2
3	3	62.7	62.4	62.3	-1	-7	61.0	60.9	61.2
1	3	63.6	63.4	63.1	-3	-7	61.2	61.0	61.1
-1	3	64.2	63.9	63.5	-5	-7	60.1	60.0	60.2
-3	3	65.0	64.7	64.5	-7	5	60.0	60.0	59.9
-5	3	61.9	61.9	61.8	-7	3	60.3	60.3	60.2
5	1	61.9	61.8	61.7	-7	1	60.5	60.6	60.5
3	1	62.7	62.7	62.6	-7	-1	60.6	60.7	60.4
1	1	64.0	63.8	63.9	-7	-3	60.5	60.4	60.1
-1	1	65.0	65.0	65.0	-7	-5	60.0	59.9	59.7
-3	1	68.1	67.9	67.4	7	5	61.1	61.3	61.0
-5	1	64.1	63.8	63.6	7	3	61.3	61.3	61.3
5	-1	61.6	61.4	61.4	7	1	61.4	61.4	61.5
3	-1	62.6	62.5	62.5	7	-1	61.5	61.2	61.6
1	-1	63.7	63.5	63.5	7	-3	61.1	60.8	61.1
-1	-1	65.5	65.3	65.4	7	-5	60.8	60.8	60.9
-3	-1	68.0	67.7	67.5	-7	-7	60.0	60.0	60.0
-5	-1	63.9	63.5	63.3	-7	7	60.0	60.0	60.0
5	-3	61.4	61.2	61.4	7	7	60.0	60.0	60.0
3	-3	62.0	61.9	62.0	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-6. Normalized Mean Radiant Temperatures for 8-foot, 45-degree, low-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	60.8	60.6	60.6	1	-3	62.2	62.2	62.5
3	7	61.1	61.0	61.1	-1	-3	63.4	63.3	63.6
1	7	61.3	61.0	61.2	-3	-3	63.9	64.1	64.4
-1	7	61.2	60.9	61.1	-5	-3	61.9	61.5	61.6
-3	7	60.9	60.7	60.9	5	-5	60.7	60.6	60.8
-5	7	60.2	60.0	60.1	3	-5	61.0	60.9	61.0
5	5	61.2	61.1	61.3	1	-5	61.5	61.3	61.4
3	5	61.6	61.5	61.7	-1	-5	61.8	61.6	62.0
1	5	61.9	61.9	62.0	-3	-5	61.9	62.1	62.3
-1	5	62.4	62.3	62.2	-5	-5	60.8	60.6	60.8
-3	5	62.3	62.1	62.1	5	-7	60.7	60.5	60.7
-5	5	60.9	60.7	60.7	3	-7	60.7	60.4	60.6
5	3	61.5	61.5	61.6	1	-7	60.9	60.7	60.7
3	3	61.9	62.0	61.8	-1	-7	60.8	60.7	60.9
1	3	62.7	62.7	62.7	-3	-7	60.9	60.9	61.1
-1	3	63.0	63.1	62.9	-5	-7	60.1	60.1	60.0
-3	3	64.0	63.9	63.6	-7	5	59.7	59.5	59.9
-5	3	61.5	61.4	61.3	-7	3	60.1	60.0	60.1
5	1	61.4	61.3	61.5	-7	1	60.3	60.2	60.3
3	1	62.2	62.1	62.1	-7	-1	60.2	60.2	60.3
1	1	63.3	63.2	63.1	-7	-3	60.2	60.1	60.1
-1	1	64.5	64.5	64.5	-7	-5	59.9	59.7	59.8
-3	1	66.0	66.1	65.9	7	5	60.7	60.7	60.9
-5	1	62.9	62.6	62.8	7	3	60.9	60.9	61.1
5	-1	61.2	61.1	61.1	7	1	61.0	61.0	61.0
3	-1	62.0	61.9	61.9	7	-1	60.9	61.0	61.0
1	-1	62.9	62.8	63.0	7	-3	60.7	60.6	60.8
-1	-1	64.3	64.4	64.5	7	-5	60.6	60.4	60.6
-3	-1	66.0	65.9	66.0	-7	-7	60.0	60.0	60.0
-5	-1	62.7	62.4	62.6	-7	7	60.0	60.0	60.0
5	-3	61.0	61.0	61.0	7	7	60.0	60.0	60.0
3	-3	61.5	61.5	61.5	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-7. Normalized Mean Radiant Temperatures for 9-foot, horizontal, high-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	60.8	60.4	61.2	1	-3	64.1	64.3	63.9
3	7	61.0	61.1	61.4	-1	-3	64.3	64.5	64.3
1	7	61.4	61.4	61.7	-3	-3	63.1	63.4	63.2
-1	7	61.5	61.4	61.3	-5	-3	61.7	61.8	62.1
-3	7	61.3	61.3	61.0	5	-5	61.3	61.2	61.4
-5	7	60.7	60.9	60.6	3	-5	62.1	62.0	61.8
5	5	61.7	61.5	62.2	1	-5	62.6	62.6	62.6
3	5	62.6	62.4	62.9	-1	-5	62.7	62.6	62.7
1	5	63.3	62.8	63.1	-3	-5	62.1	61.9	62.0
-1	5	63.1	62.9	63.1	-5	-5	61.2	61.1	61.1
-3	5	62.8	62.5	62.6	5	-7	60.4	60.6	60.6
-5	5	61.9	61.7	61.7	3	-7	60.6	60.7	60.9
5	3	62.6	62.4	62.9	1	-7	61.1	61.0	61.1
3	3	63.7	63.6	64.0	-1	-7	61.5	61.6	61.8
1	3	64.5	64.2	64.8	-3	-7	61.2	61.0	61.3
-1	3	64.1	63.6	63.9	-5	-7	60.3	60.1	60.3
-3	3	63.7	63.5	63.6	-7	5	60.8	60.7	60.7
-5	3	62.3	62.1	62.2	-7	3	61.3	61.3	61.4
5	1	62.4	62.3	62.5	-7	1	61.5	61.4	61.0
3	1	64.0	64.1	63.8	-7	-1	61.3	61.4	61.1
1	1	65.8	65.8	65.5	-7	-3	60.6	60.8	61.1
-1	1	65.5	64.8	65.3	-7	-5	60.4	60.3	60.6
-3	1	64.5	64.3	64.4	7	5	60.8	61.0	61.1
-5	1	62.9	62.7	62.5	7	3	61.2	61.1	61.7
5	-1	62.6	62.2	62.9	7	1	61.6	61.3	61.9
3	-1	63.7	63.9	63.8	7	-1	61.5	61.3	61.7
1	-1	65.2	65.0	65.0	7	-3	61.0	61.1	61.4
-1	-1	65.0	64.9	65.1	7	-5	60.6	60.6	60.9
-3	-1	63.7	63.5	63.9	-7	-7	60.0	60.0	60.0
-5	-1	61.9	62.2	62.3	-7	7	60.0	60.0	60.0
5	-3	62.1	61.7	62.0	7	7	60.0	60.0	60.0
3	-3	62.9	63.2	62.9	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-8. Normalized Mean Radiant Temperatures for 9-foot, 30-degree, high-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	61.0	60.9	61.2	1	-3	63.4	63.2	62.6
3	7	61.0	61.2	61.5	-1	-3	64.1	64.3	63.4
1	7	61.5	61.5	61.8	-3	-3	64.6	64.7	63.9
-1	7	61.2	61.5	61.5	-5	-3	64.1	64.0	63.7
-3	7	61.4	61.5	61.4	5	-5	61.2	61.4	61.4
-5	7	61.0	61.0	61.1	3	-5	61.8	61.7	61.6
5	5	61.4	61.5	61.9	1	-5	62.5	62.3	62.0
3	5	62.0	61.9	62.5	-1	-5	62.8	62.5	62.2
1	5	62.1	62.3	62.6	-3	-5	63.5	63.0	62.7
-1	5	62.5	62.5	62.7	-5	-5	62.4	62.7	62.4
-3	5	62.6	62.7	62.9	5	-7	61.0	61.3	61.2
-5	5	62.1	62.2	62.3	3	-7	61.2	61.5	61.3
5	3	61.9	62.0	62.3	1	-7	61.6	61.7	61.7
3	3	62.5	62.6	62.9	-1	-7	61.7	61.8	61.5
1	3	63.2	63.3	63.4	-3	-7	62.1	62.3	61.8
-1	3	63.2	63.1	63.4	-5	-7	60.9	61.2	60.9
-3	3	62.9	63.7	63.8	-7	5	60.3	60.5	60.8
-5	3	63.0	63.2	63.5	-7	3	61.0	61.4	61.6
5	1	62.1	62.3	62.1	-7	1	61.0	61.1	62.1
3	1	63.2	63.4	63.0	-7	-1	61.7	61.8	61.8
1	1	64.0	64.0	63.8	-7	-3	61.1	61.4	61.4
-1	1	64.5	64.5	64.5	-7	-5	60.6	60.6	60.7
-3	1	66.2	65.8	66.0	7	5	60.8	60.9	61.2
-5	1	64.5	64.0	64.2	7	3	61.1	60.7	61.4
5	-1	62.2	62.1	61.7	7	1	61.2	61.3	61.6
3	-1	63.4	63.2	62.7	7	-1	61.2	61.6	61.6
1	-1	64.4	64.1	63.3	7	-3	61.0	61.3	61.3
-1	-1	64.3	64.5	64.1	7	-5	60.7	60.9	60.9
-3	-1	66.2	66.0	65.6	-7	-7	60.0	60.0	60.0
-5	-1	64.9	65.1	64.7	-7	7	60.0	60.0	60.0
5	-3	61.8	61.7	61.5	7	7	60.0	60.0	60.0
3	-3	62.6	62.5	62.2	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet

Table D-9. Normalized Mean Radiant Temperatures for 9-foot, 45-degree, high-input configuration.

Globe Position†		Test Replicate			Globe Position†		Test Replicate		
X	Y	Test 1	Test 2	Test 3	X	Y	Test 1	Test 2	Test 3
5	7	61.0	61.5	61.4	1	-3	62.7	62.9	62.9
3	7	61.5	61.7	61.4	-1	-3	63.7	63.9	63.8
1	7	61.7	61.7	61.7	-3	-3	64.3	63.9	63.6
-1	7	61.7	61.6	61.7	-5	-3	61.9	61.8	61.7
-3	7	61.3	61.2	61.2	5	-5	61.7	61.3	61.5
-5	7	60.3	60.4	60.2	3	-5	61.7	61.8	61.6
5	5	61.7	61.9	61.6	1	-5	62.0	62.5	62.3
3	5	62.1	62.3	62.1	-1	-5	62.3	62.4	62.5
1	5	62.4	62.6	62.4	-3	-5	62.6	61.9	62.2
-1	5	62.8	62.6	62.7	-5	-5	61.1	60.5	60.7
-3	5	62.5	62.4	62.3	5	-7	61.7	61.1	61.0
-5	5	60.9	61.0	60.7	3	-7	61.4	61.1	61.1
5	3	62.2	62.3	62.1	1	-7	61.5	61.6	61.7
3	3	62.6	62.8	62.7	-1	-7	61.8	61.7	61.7
1	3	63.2	63.2	63.5	-3	-7	61.4	61.4	61.3
-1	3	63.4	63.3	63.4	-5	-7	60.4	60.1	60.1
-3	3	63.5	63.6	63.5	-7	5	60.0	59.9	59.8
-5	3	61.4	61.7	61.2	-7	3	60.1	60.1	60.1
5	1	62.3	62.0	62.1	-7	1	60.2	60.4	60.0
3	1	62.8	62.7	62.9	-7	-1	60.5	60.7	60.4
1	1	63.8	63.7	63.8	-7	-3	60.4	60.4	60.1
-1	1	65.0	65.4	65.4	-7	-5	60.0	59.8	59.7
-3	1	65.4	65.5	65.3	7	5	61.2	61.2	60.9
-5	1	61.9	61.9	61.9	7	3	61.3	61.2	61.1
5	-1	62.1	61.6	62.2	7	1	61.8	61.6	61.7
3	-1	62.6	62.3	62.9	7	-1	62.0	61.7	61.9
1	-1	63.3	63.3	63.6	7	-3	61.6	61.2	61.5
-1	-1	65.1	65.0	64.8	7	-5	61.3	60.9	61.2
-3	-1	65.6	65.6	64.9	-7	-7	60.0	60.0	60.0
-5	-1	62.2	62.3	62.6	-7	7	60.0	60.0	60.0
5	-3	62.1	61.6	61.9	7	7	60.0	60.0	60.0
3	-3	62.3	62.3	62.4	7	-7	60.0	60.0	60.0

† Distance from test cell centerline, in feet