

Energy Reduction Analysis For Petro Oil Company

IntelliCon[®] ***-HW*** Performance Results

A Confidential Report

Prepared by

Intellidyne LLC

EXECUTIVE SUMMARY

The attached report summarizes the Energy Saving performance of an *IntelliCon*[®]-HW, installed on a Boiler located at 1074 Lynn Pl., Woodmere, NY. The pilot test demonstrates a 15.5% reduction of fuel consumption without any adverse effect on the temperatures within the home.

In addition to the 15.5% reduction of fuel usage, there was also more than an 8% reduction in burner cycling – considering the equipment that the *IntelliCon*[®]-HW was installed upon, this reduction in cycling is significant.

The report contains the documentation that supports the results and explains the methodology used to derive the data used in determining the results.

The charts display the results of the statistical-analysis performed on space temperatures, outdoor temperatures, and solar influences. From the analysis, it was determined that the solar influences upon the test results were negligible during the testing period, and that it was more than 5% colder on the days when the *IntelliCon*[®]-HW controller was being evaluated.

The IntelliCon controller can serve Petro in that it delivers a unique means by which Petro can reduce the defection of customers from oil to natural gas or from Petro to other oil companies. Petro would also be in the unique position to offer this technology to their customers a real value-add that no other large oil delivery company is currently offering as a service. The IntelliCon controllers should (due to reduced cycling) also reduce maintenance requirements, prolong equipment life expectancy, and reduce the environmental impact from sooting. They are priced so that they make economic sense as a sales and installation-labor item or as a “customer incentive” for long-term oil contracts.

Energy Savings Performance Report on the effect of an *IntelliCon*[®]-HW Installed on a Boiler located at 1074 Lynn Pl., Woodmere, NY

Methodology:

The test was conducted from 1/18/03 to 2/23/2003 (37 Days). Upon review of the first week's data, it was determined that random and wide-spread adjustments of the thermostats in all zones was taking place; making analysis of the data almost impossible. The home owner was requested to minimize these adjustments for the duration of the test. The first week's data was discarded and the test thus ran from 1/25/03 through 2/23/03 (30 Days). The test consisted of alternating the *IntelliCon*[®]-HW's operational state from "On" to "Off" on alternating days of the week. Thus it was operating Friday, Sunday, Tues, and Thurs the first and third weeks of the test, and not operating Friday, Sunday, Tues, and Thurs the second and fourth weeks of the test.

Burner run-time data was collected via a data logger that "time and date stamped" each transition of on-to-off and off-to-on of the burner. By analyzing these time/date stamps, the accumulated run-time of Burner operation was calculated for both the days when the IntelliCon unit was "On" and for the days when it was "Off".

To properly analyze the run-time data, and determine the savings, the effects of changing outdoor air temperatures and changing solar loads (on the building's heating demand) must be compensated for. During the test period, outdoor air temperature and solar data were gathered "on-site" using data loggers.

During this test it was found that the solar load had no statistical effect on the Heating demand and was not adjusted for in the calculations. The Solar Loading chart has been included as part of this report.

Using the logged data, the "Heating Degree Days" (HDD) were determined for the "On" days and for the "Off" days. It was found that the "On" days were on average colder than the "Off" days during the test period. To "normalize" the run-time data due to the effects of temperature changes we must either increase the "Off" data (since it was warmer on the "Off" days), or decrease the "On" data (since it was colder on the "On" days). For the purpose of this report the latter was chosen. In either case, the results are the same.

Following standard ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) methods, the run times accumulated for the "On" days were normalized by multiplying the "On" run-times by the ratio of the "Off" HDD to the "On" HDD. This computation estimates the actual run times that would have occurred during the "On" days if the average temperatures had been the same as on the "Off" days. The accumulated Heating Degree Days for both the "On" and "Off" days were found to be:

Heating Degree Days for "On" Days (HDD_{on}).....	711
Heating Degree Days for "Off" Days (HDD_{off}).....	673

As this data shows, **it was 5.27% colder when the *IntelliCon* unit was "On" compared to when it was "Off".**

The Correction Factor used to normalize the data is calculated using the "On" day and "Off" day Heating Degree Days. The Correction Factor formula is: $1 + ((HDD_{off} - HDD_{on}) / HDD_{off})$.

Once this correction factor is determined, the percentage of reduction in run-time for equivalent loads is then able to be calculated. The results are as follows:

Boiler:

Manufacturer: Valiant Oil Fired Hydronic Boiler with Riello 40-F5, type 262T Burner

Model: F70W-5PP

Max. Firing Rate: 1.00 GPH #2 Oil

Location: Basement, 1074 Lynn Place, Woodmere, NY.

Heating Zones: 5 Total: 4 Heating, 1 Domestic Hot Water

Runtime Data Analysis:

Total Run Time for "Off" Days	98:45:26 Hrs.
Total Run Time for "On" Days	90:35:14 Hrs.
Correction Factor: = $1 + ((673-711) / 673) =$	0.9435
HDD Corrected "On" Time: = $98:45:26 \times .9435 =$	85:28:48 Hrs.
HDD Corrected Savings: = $(98:45:26-85:28:48) / 98:45:26 =$	15.55%

Non HDD Corrected Savings: = $(90:35:14-90:35:14) / 90:35:14 =$ **9.02%**

Burner Cycling Reduction:

It was determined that during the test the Burner cycled 942 times during the "On" days, and 1020 times on the "Off" days. This is a **8.28% reduction in cycling** that will reduce pollution, sooting, and maintenance requirements.

Test Days:

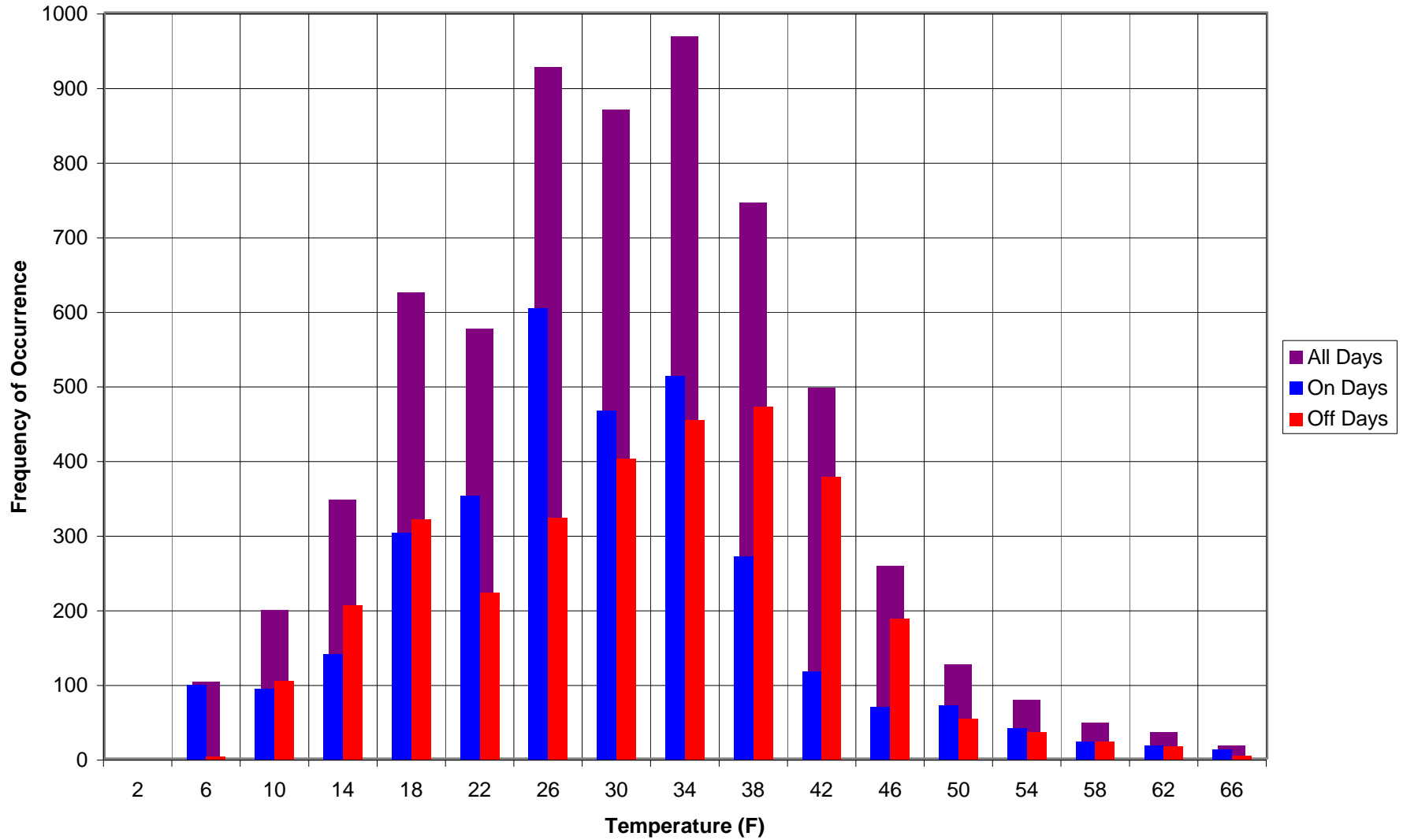
On days	DOW		Off days	DOW
01/24/03	Fri		01/25/03	Sat
01/26/03	Sun		01/27/03	Mon
01/28/03	Tue		01/29/03	Wed
01/30/03	Thu		01/31/03	Fri
02/01/03	Sat		02/02/03	Sun
02/03/03	Mon		02/04/03	Tue
02/05/03	Wed		02/06/03	Thu
02/07/03	Fri		02/08/03	Sat
02/09/03	Sun		02/10/03	Mon
02/11/03	Tue		02/12/03	Wed
02/13/03	Thu		02/14/03	Fri
02/15/03	Sat		02/16/03	Sun
02/17/03	Mon		02/18/03	Tue
02/19/03	Wed		02/20/03	Thu
02/21/03	Fri		02/22/03	Sat
02/23/03	Sun		02/24/03	Mon

Charts:

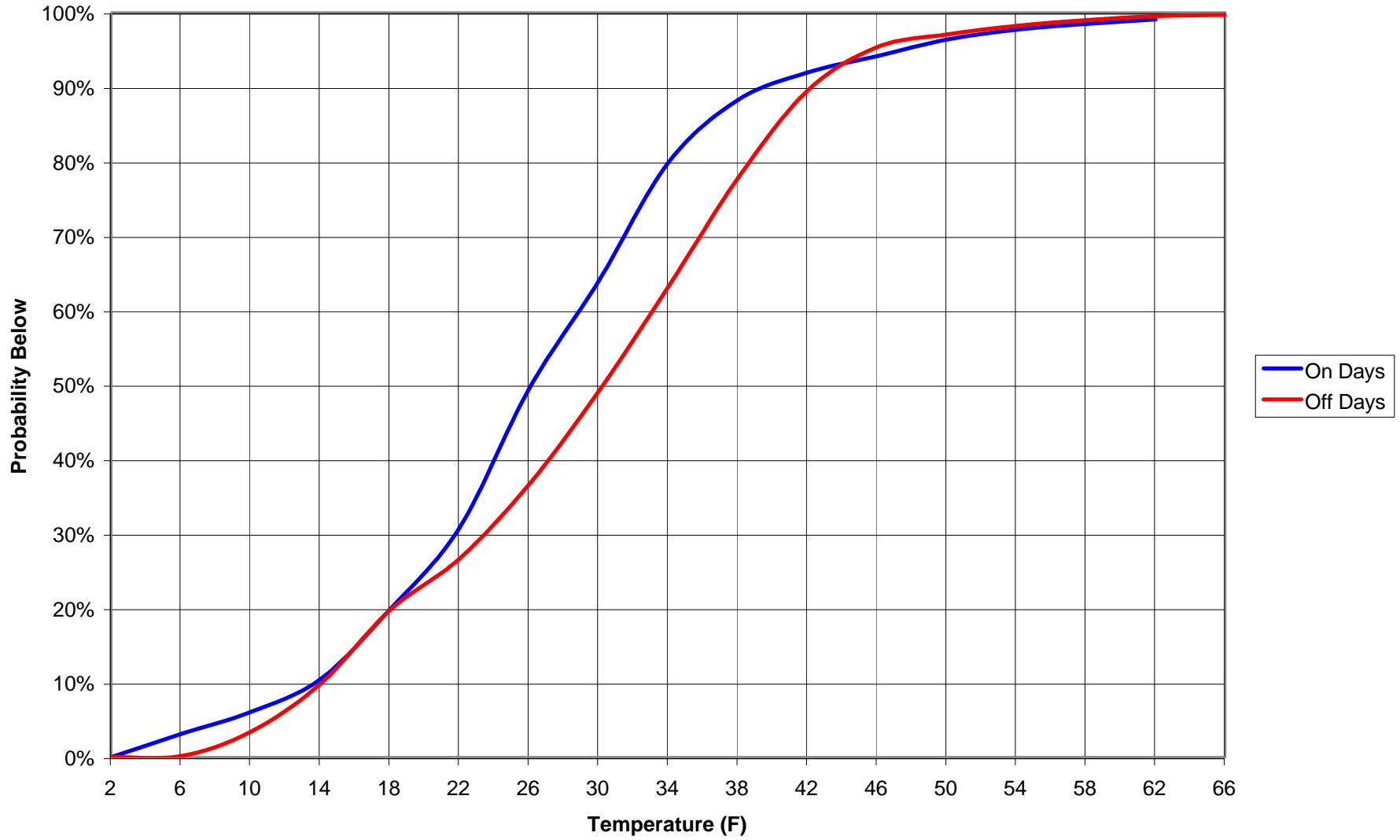
The following charts have been included for informational purposes and reflect no statistical differences between the days that the IntelliCon was “On” or “Off”.

- Space Temperature:
 - 2nd Floor
 - Main Floor
 - Den
 - Basement
- Solar Load
- Outdoor Air Temperature

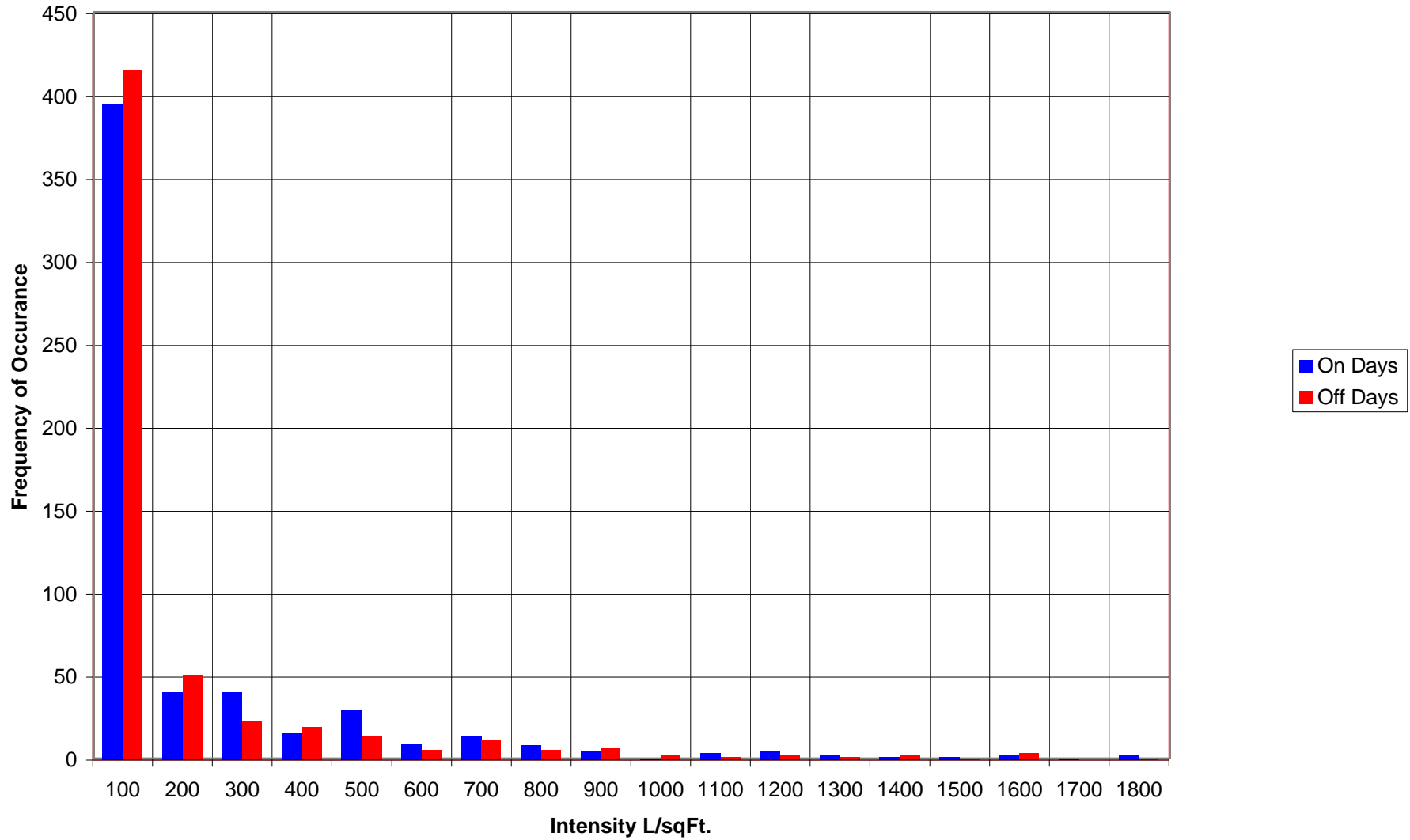
Outside Air Temp Histogram



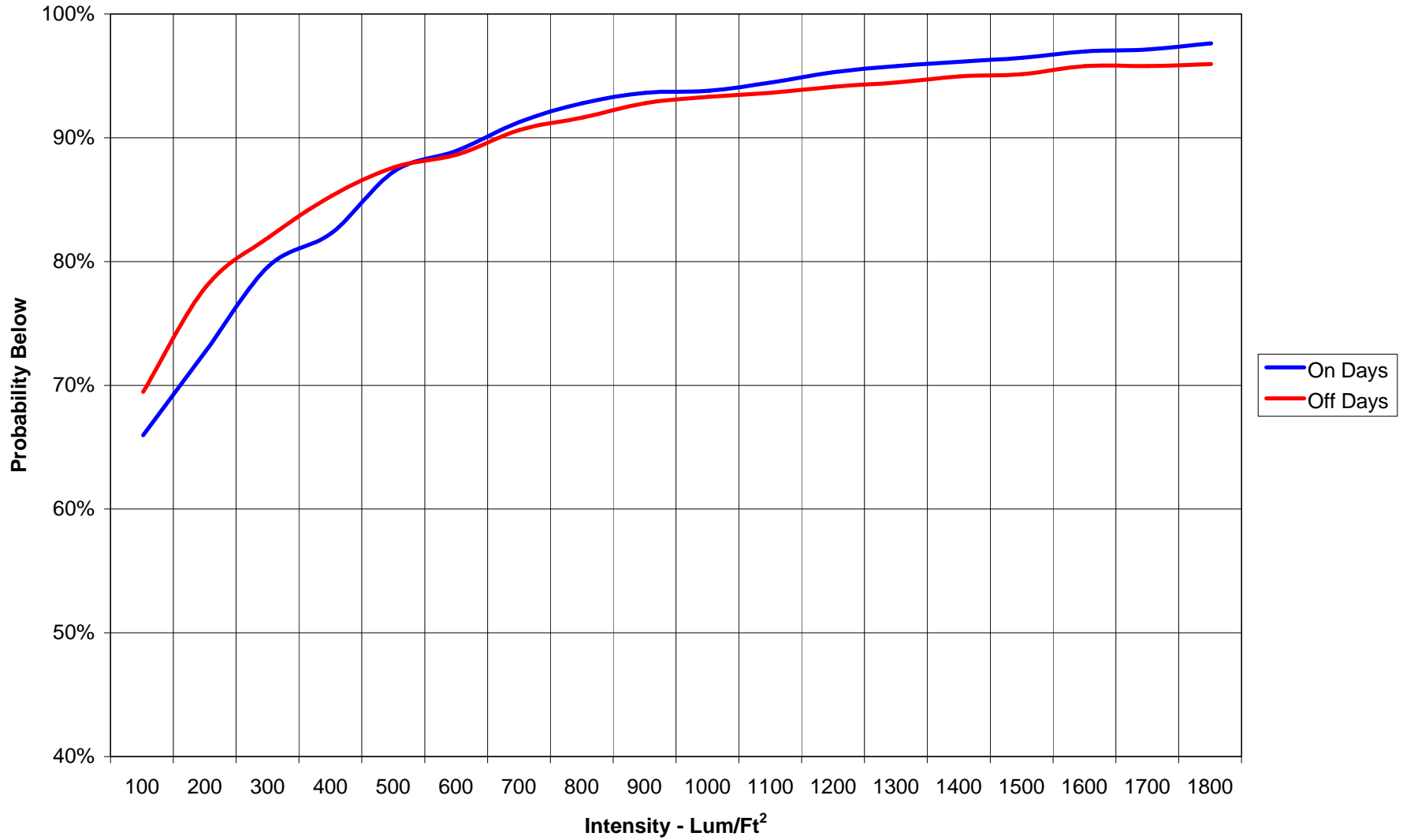
OAT Temperature Probabilities (1/18/03 --2/22/03)



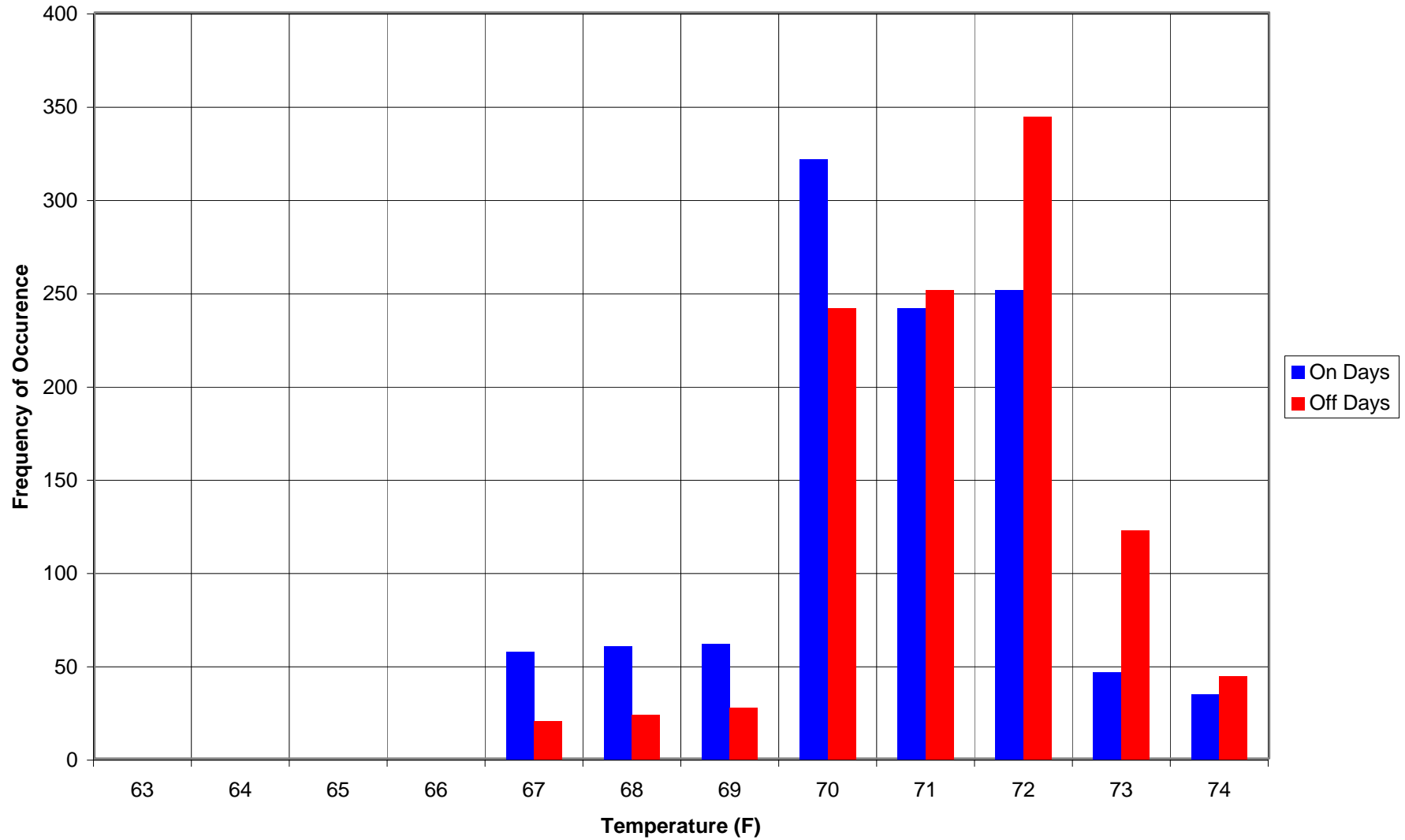
Solar Influence Histogram (1/25/03 - 2/23/03)



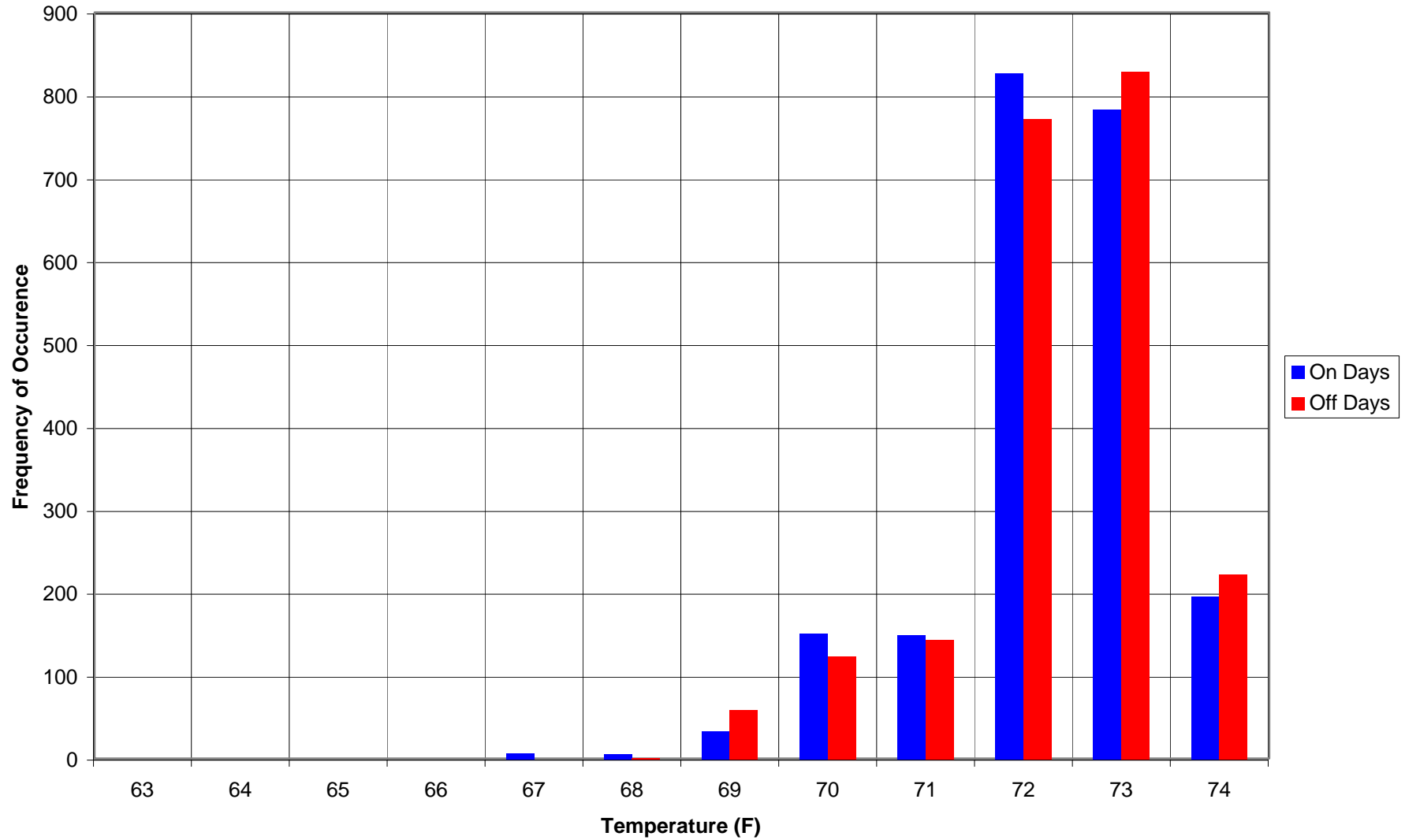
Solar Influence Probabilities



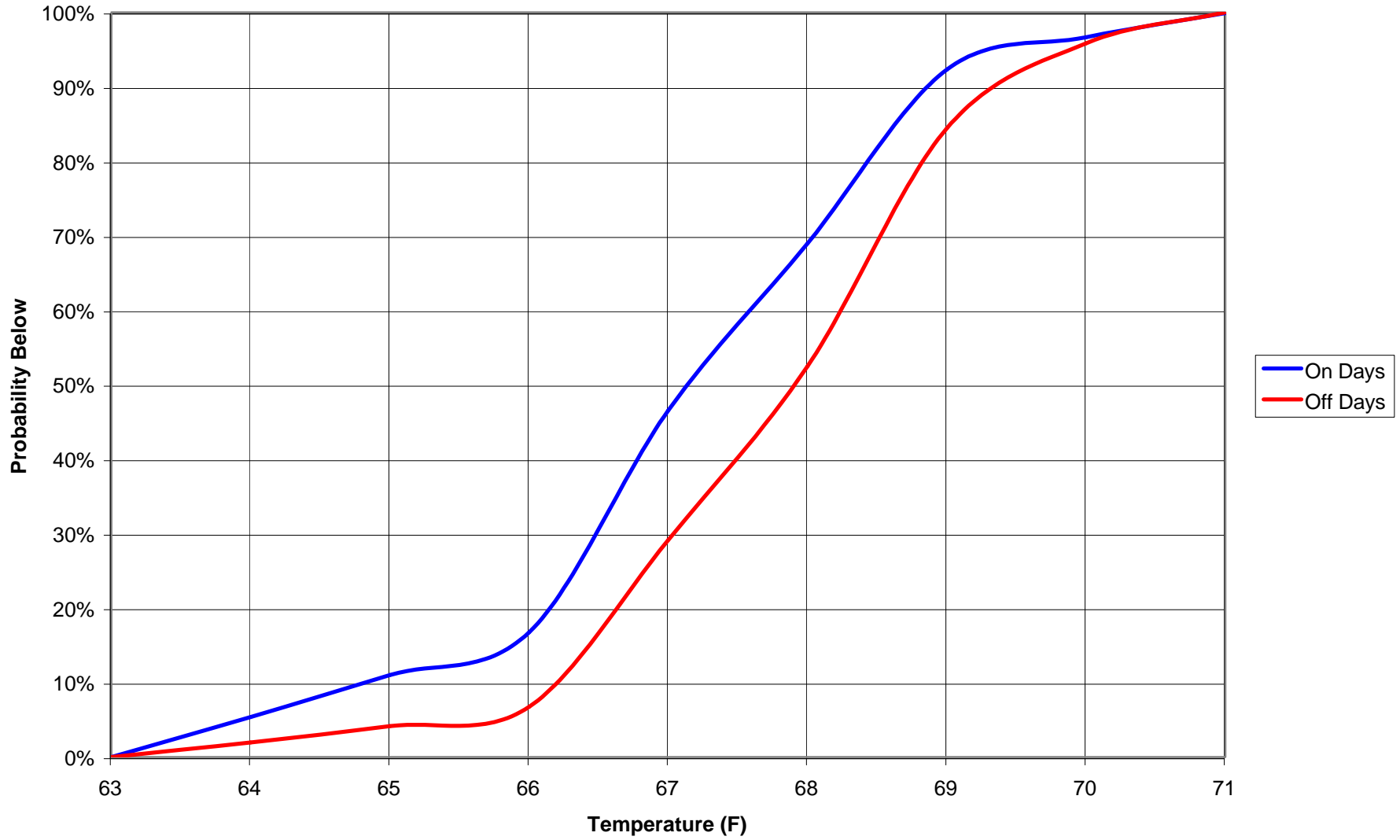
2nd Floor Temperature Histogram (1/18/03 -- 1/29/03)



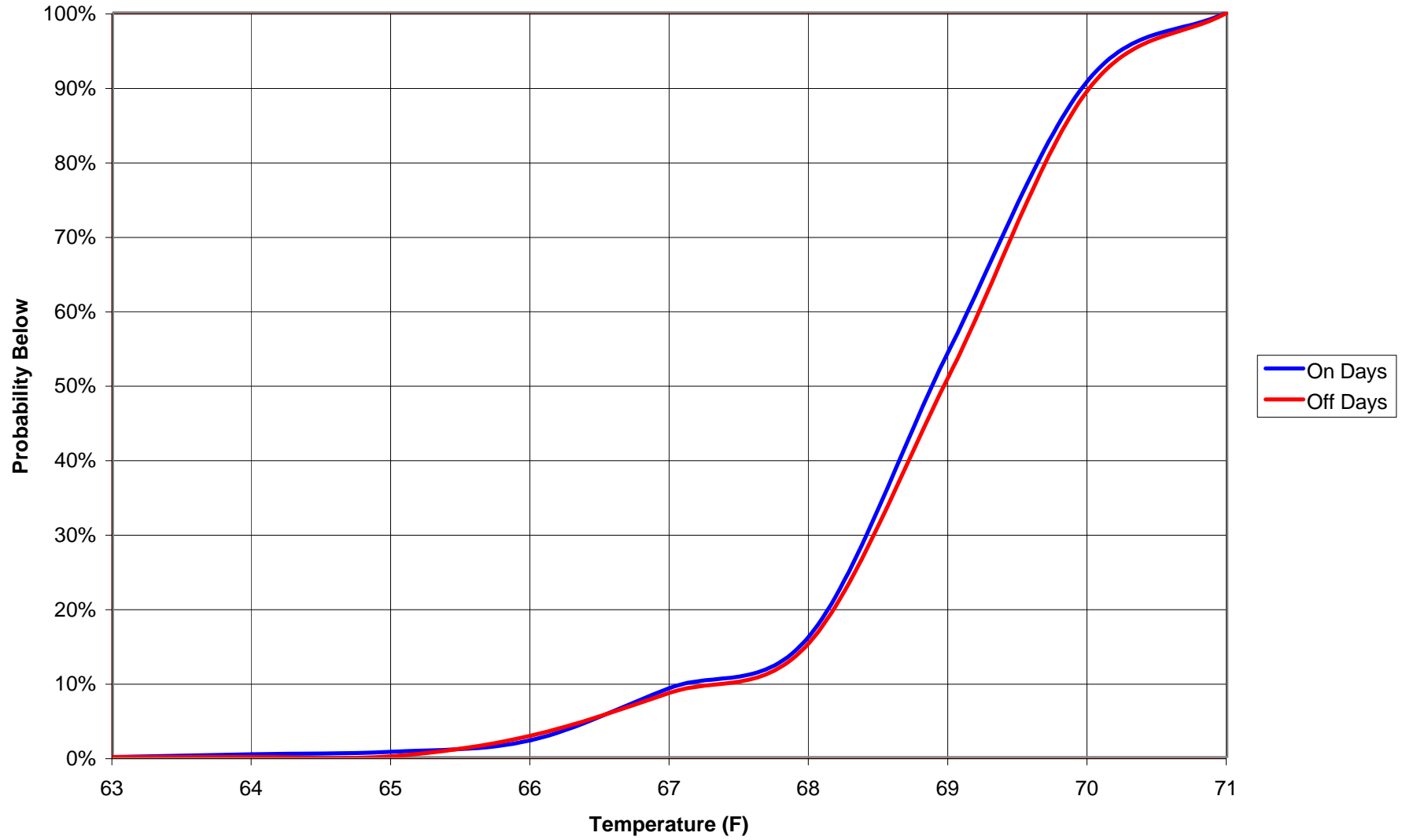
2nd Floor Temperature Histogram (1/30/03 -- 2/22/03)



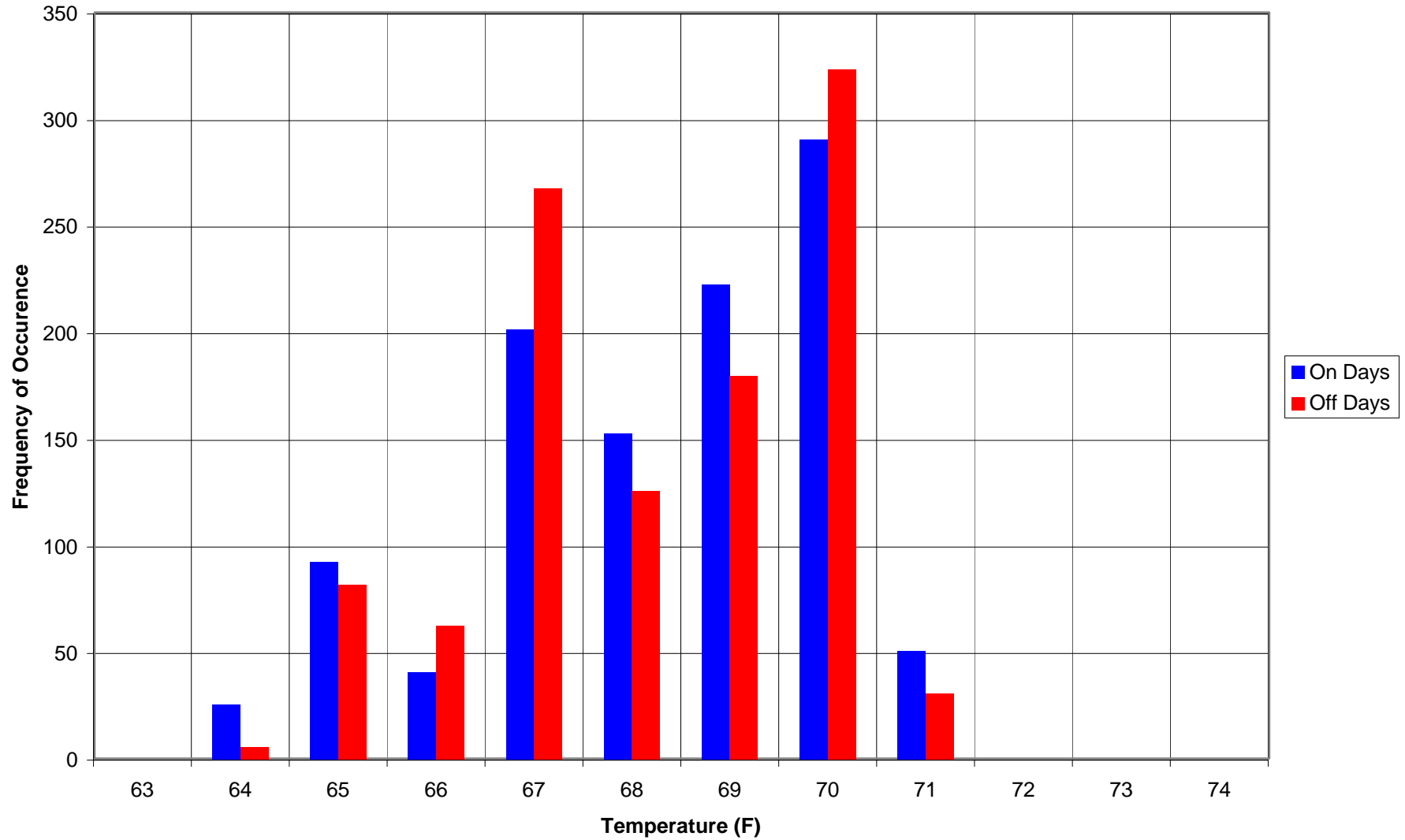
2nd Floor Temperature Probabilities (1/18/03 -- 1/29/03)



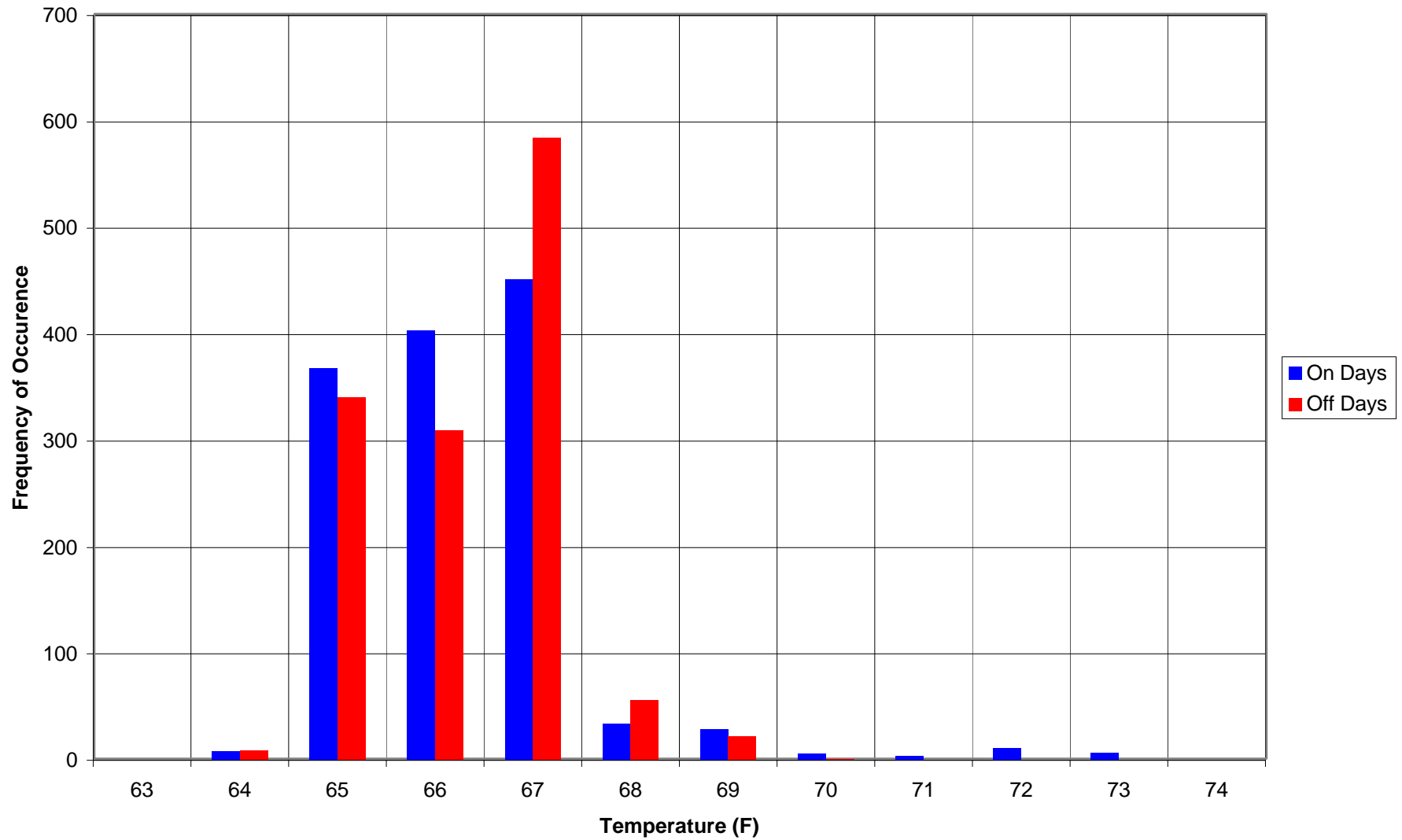
2nd Floor Temperature Probabilities (1/30/03 -- 2/22/03)



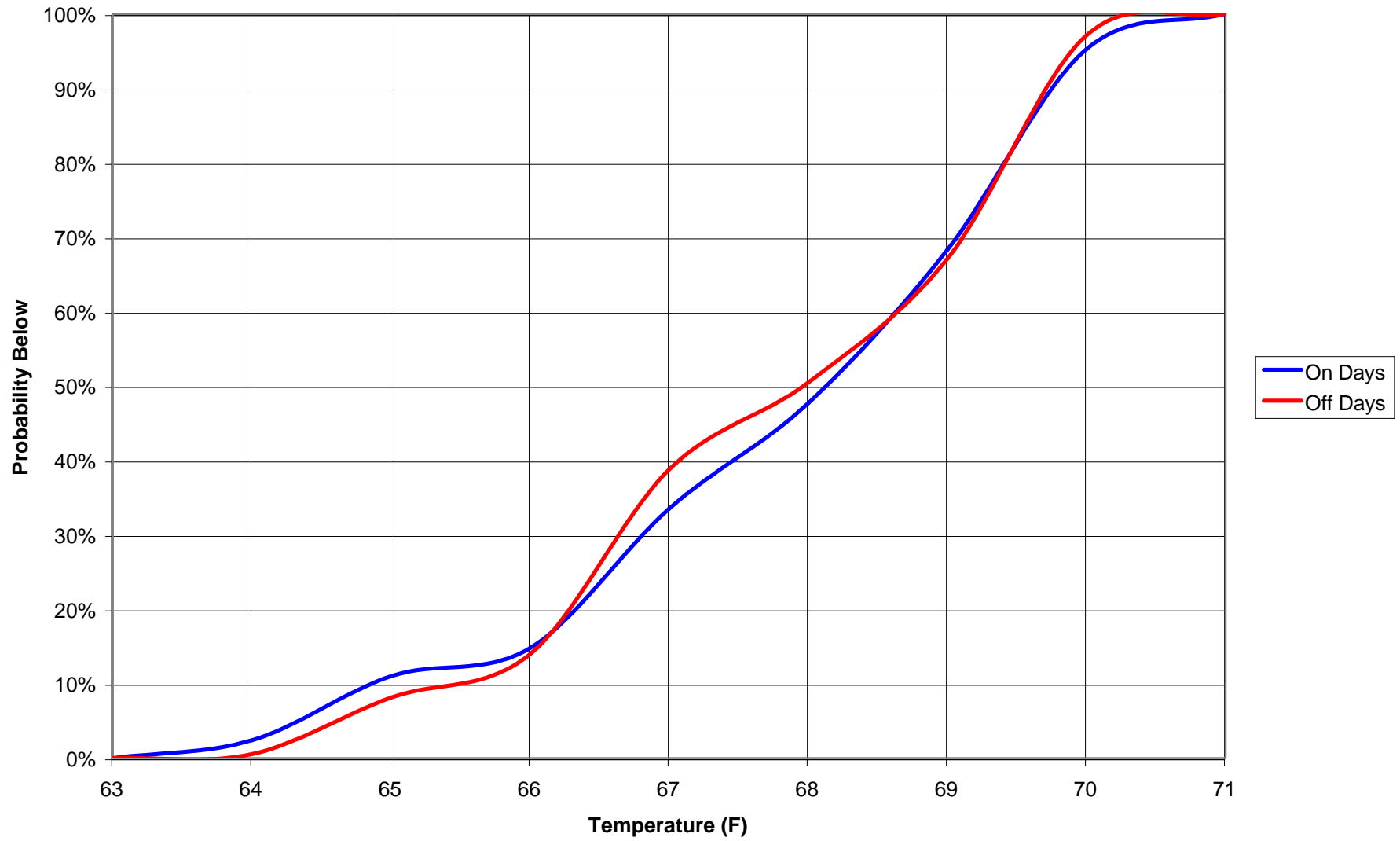
Basement Temperature Histogram (1/18/03 -- 1/29/03)



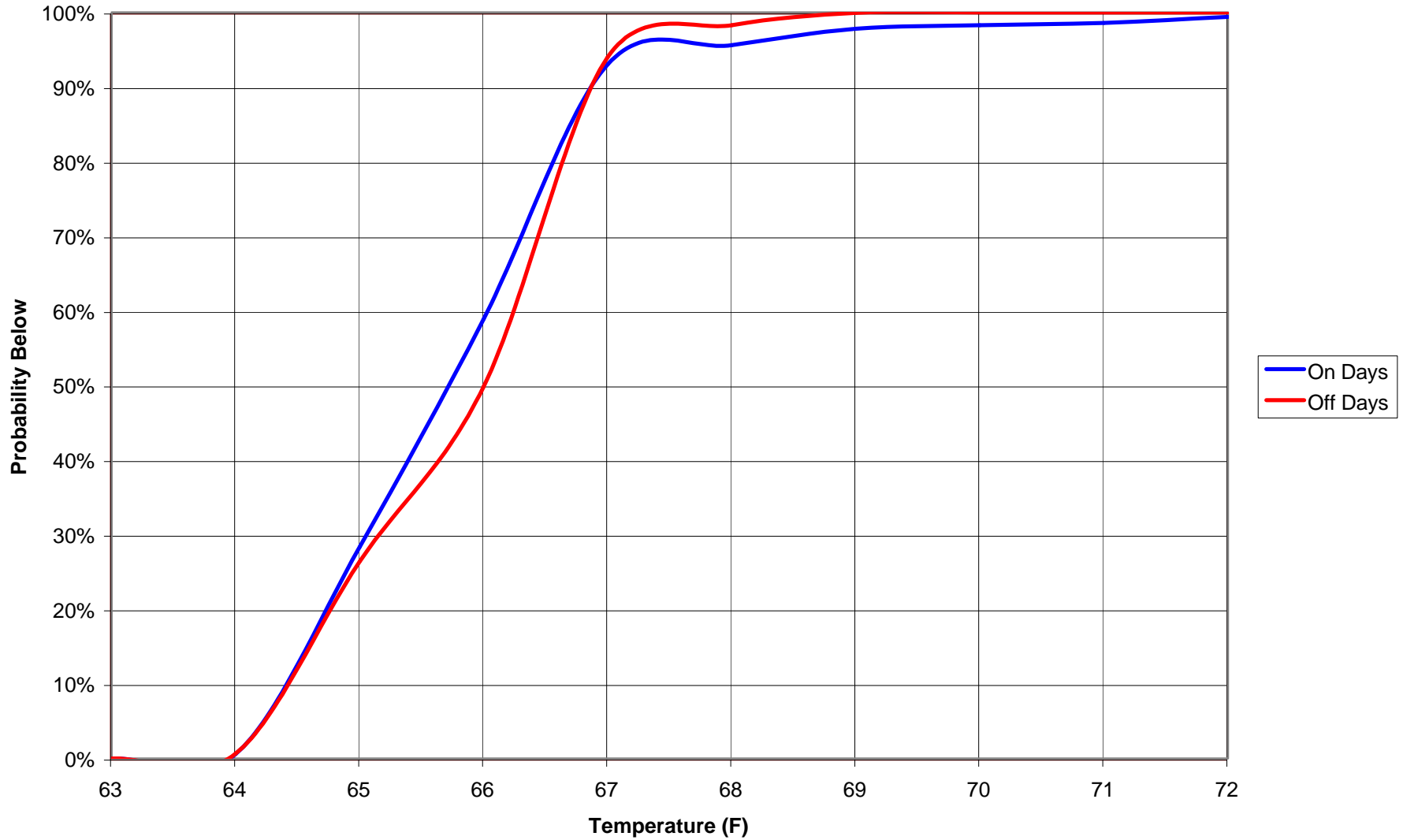
Basement Temperature Histogram (1/30/03 -- 2/14/03)



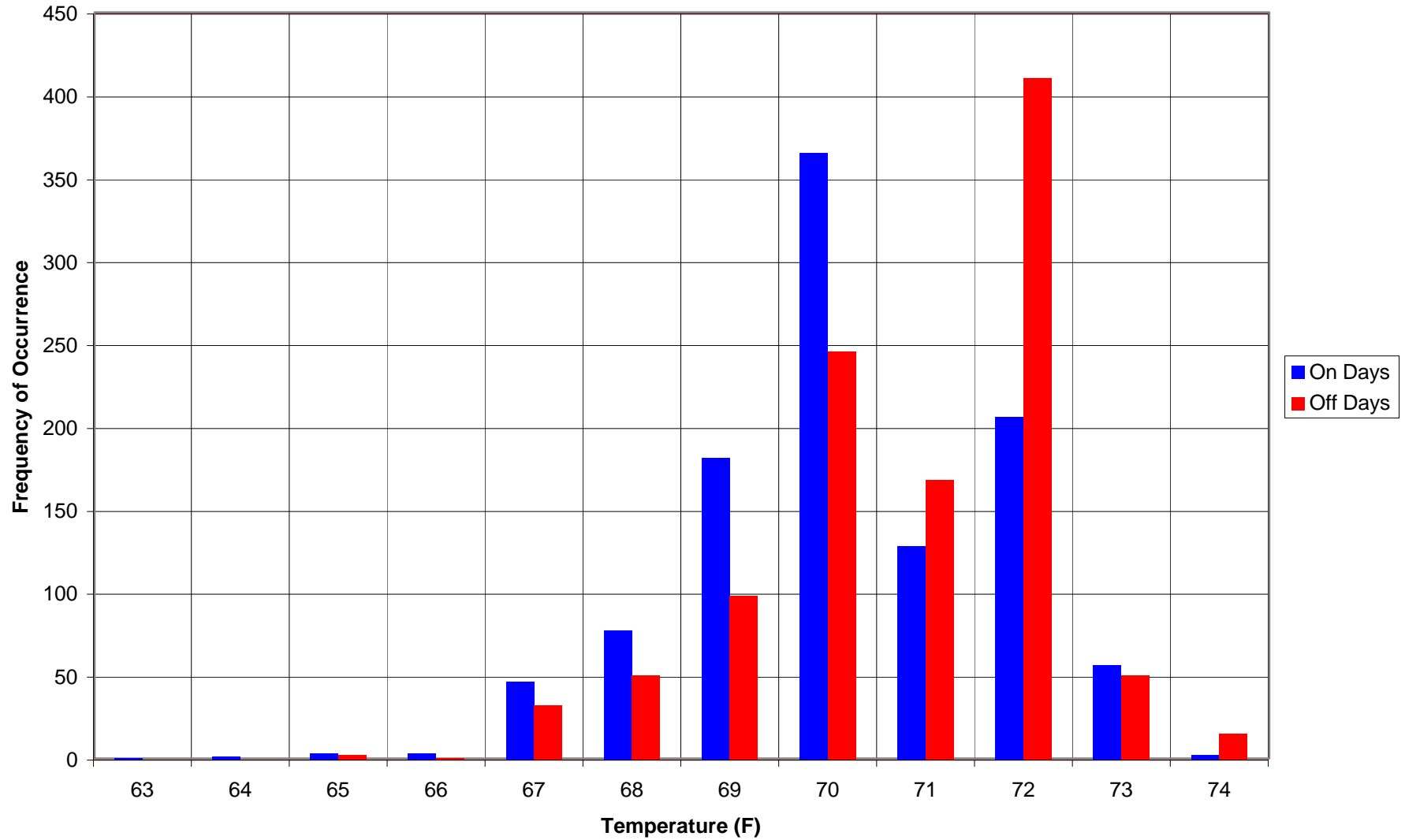
Basement Temperature Probabilities (1/18/03 -- 1/29/03)



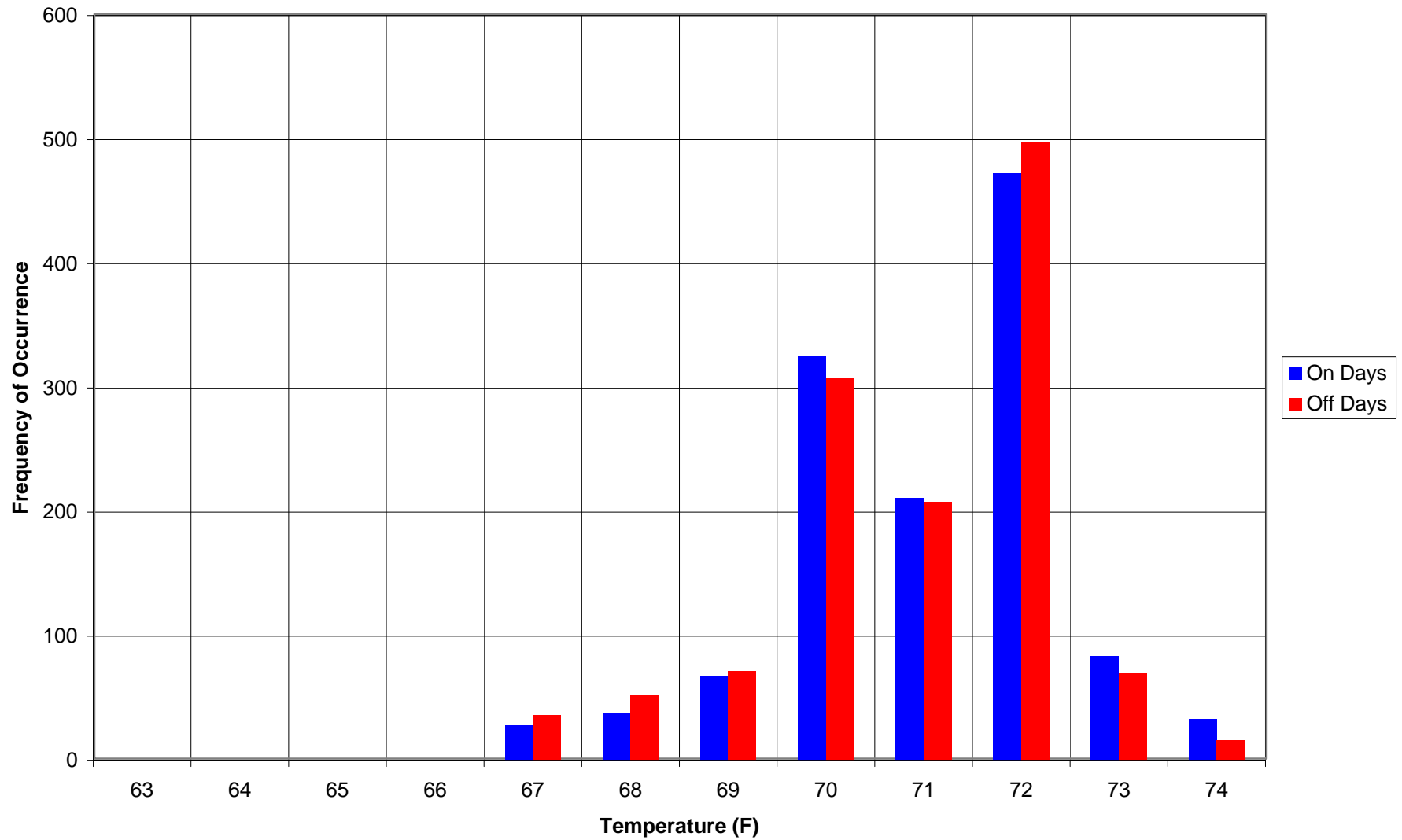
Basement Temperature Probabilities (1/30/03 -- 2/14/03)



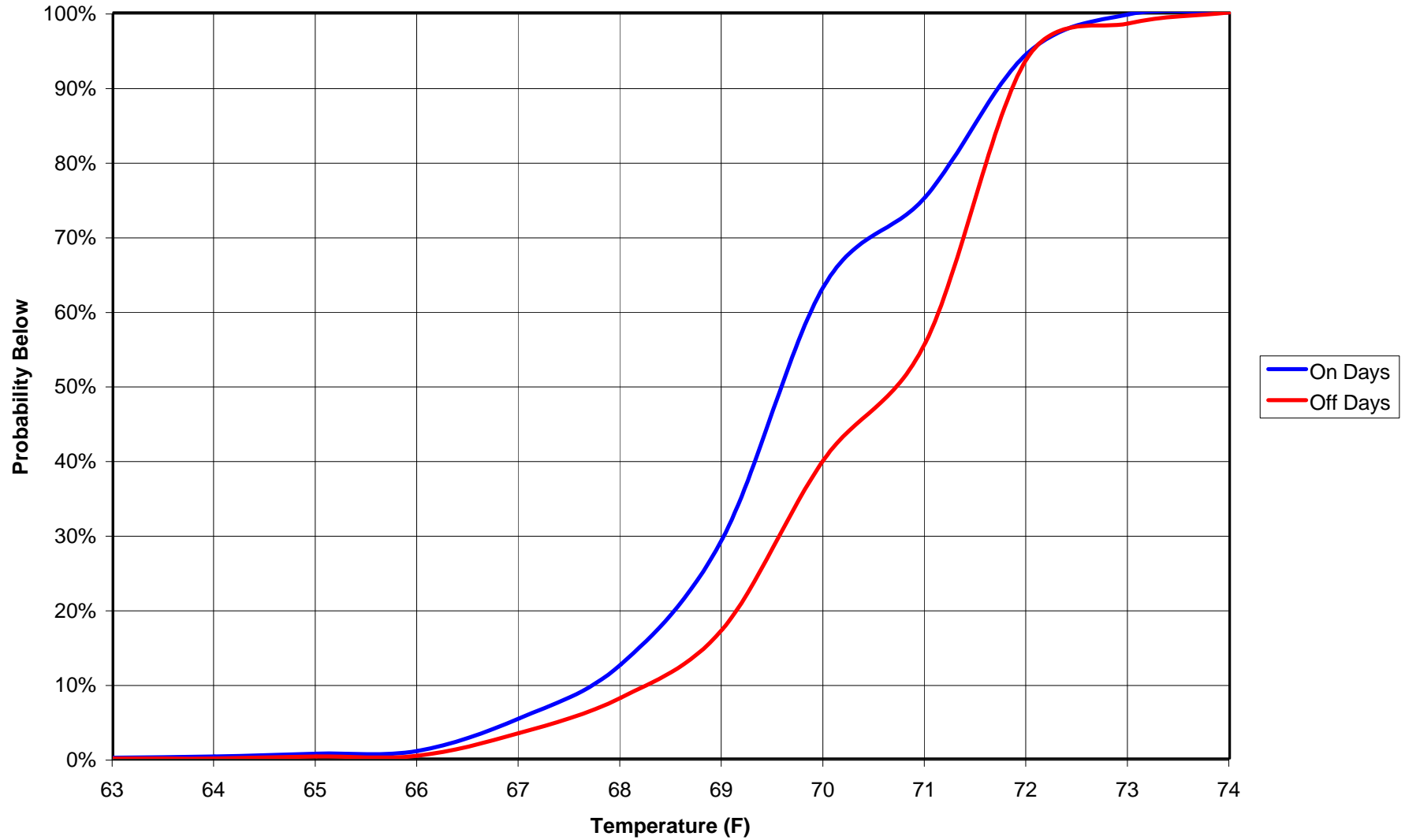
Den Temperature Histogram (1/18/03 -- 1/29/03)



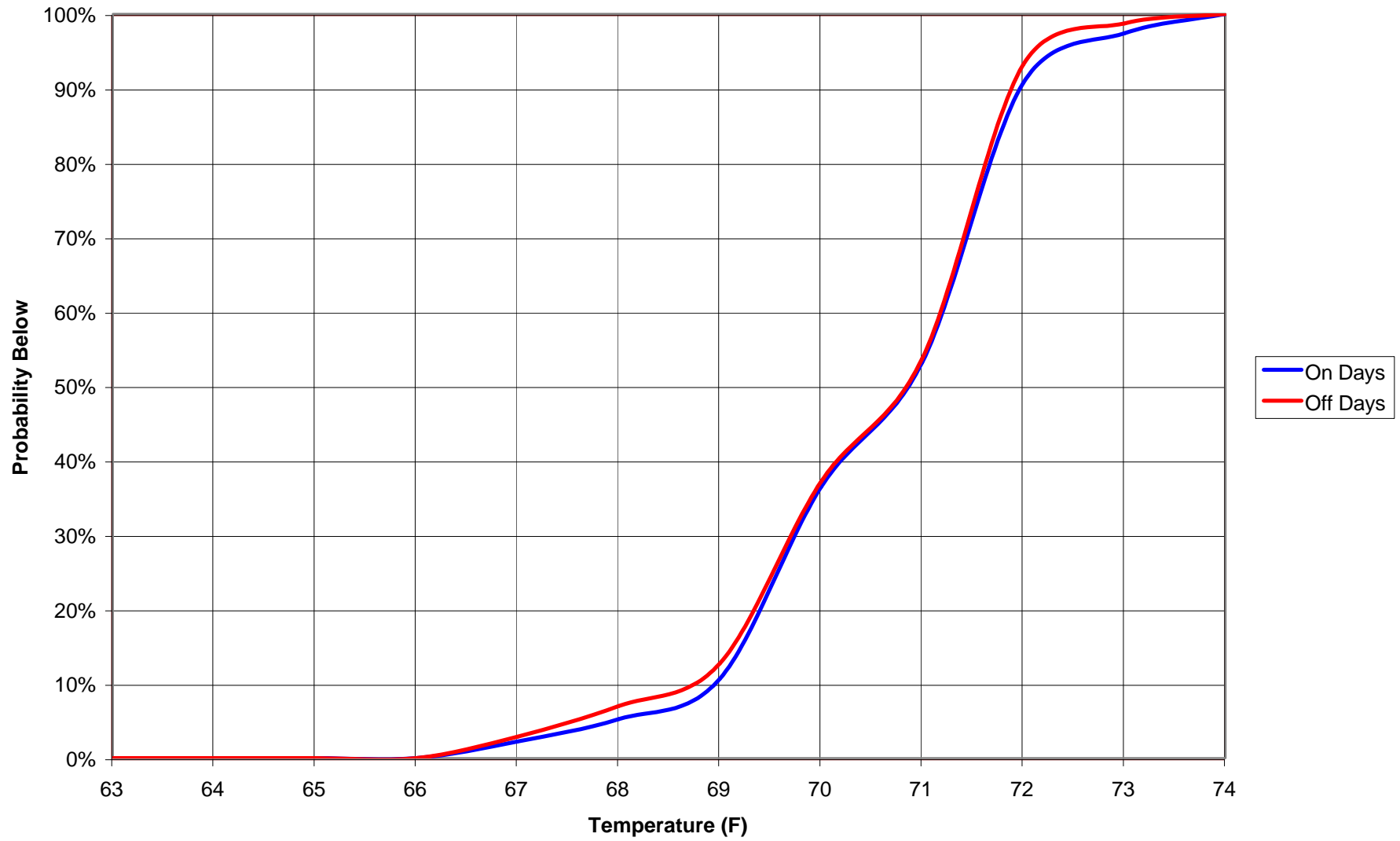
Den Temperature Histogram (1/30/03 -- 2/11/03)



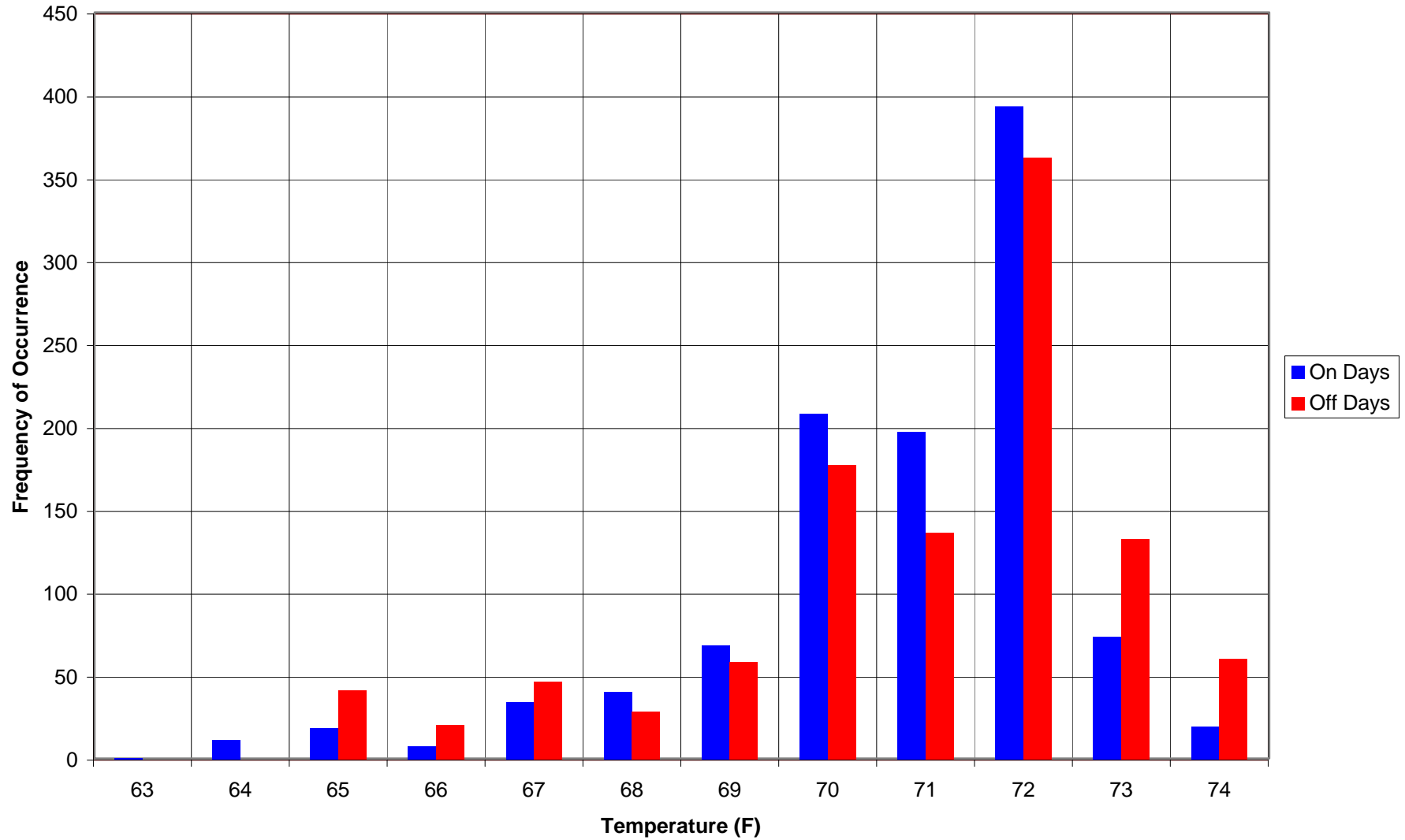
Den Temperature Probabilities (1/18/03 -- 1/29/03)



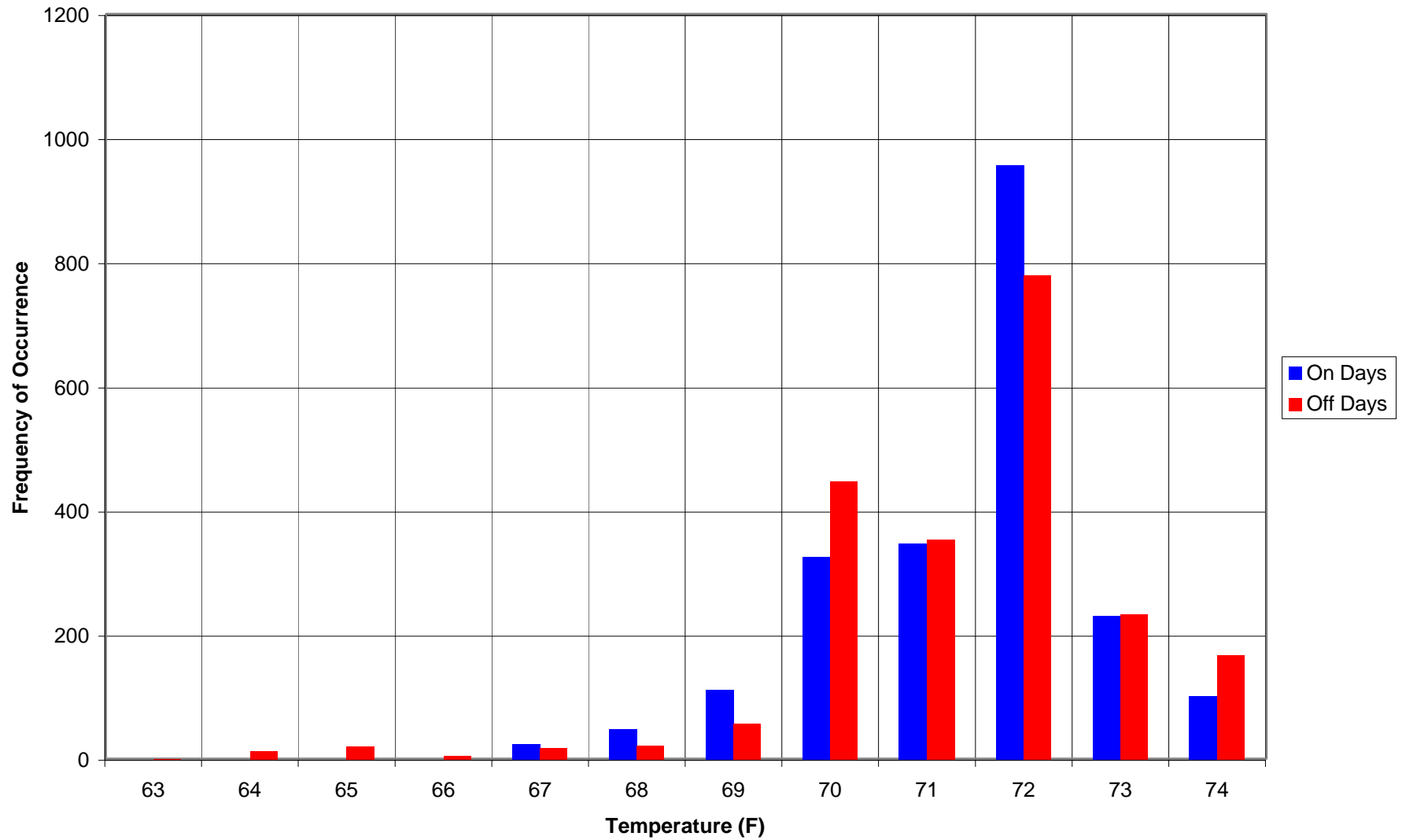
Den Temperature Probabilities (1/30/03 -- 2/11/03)



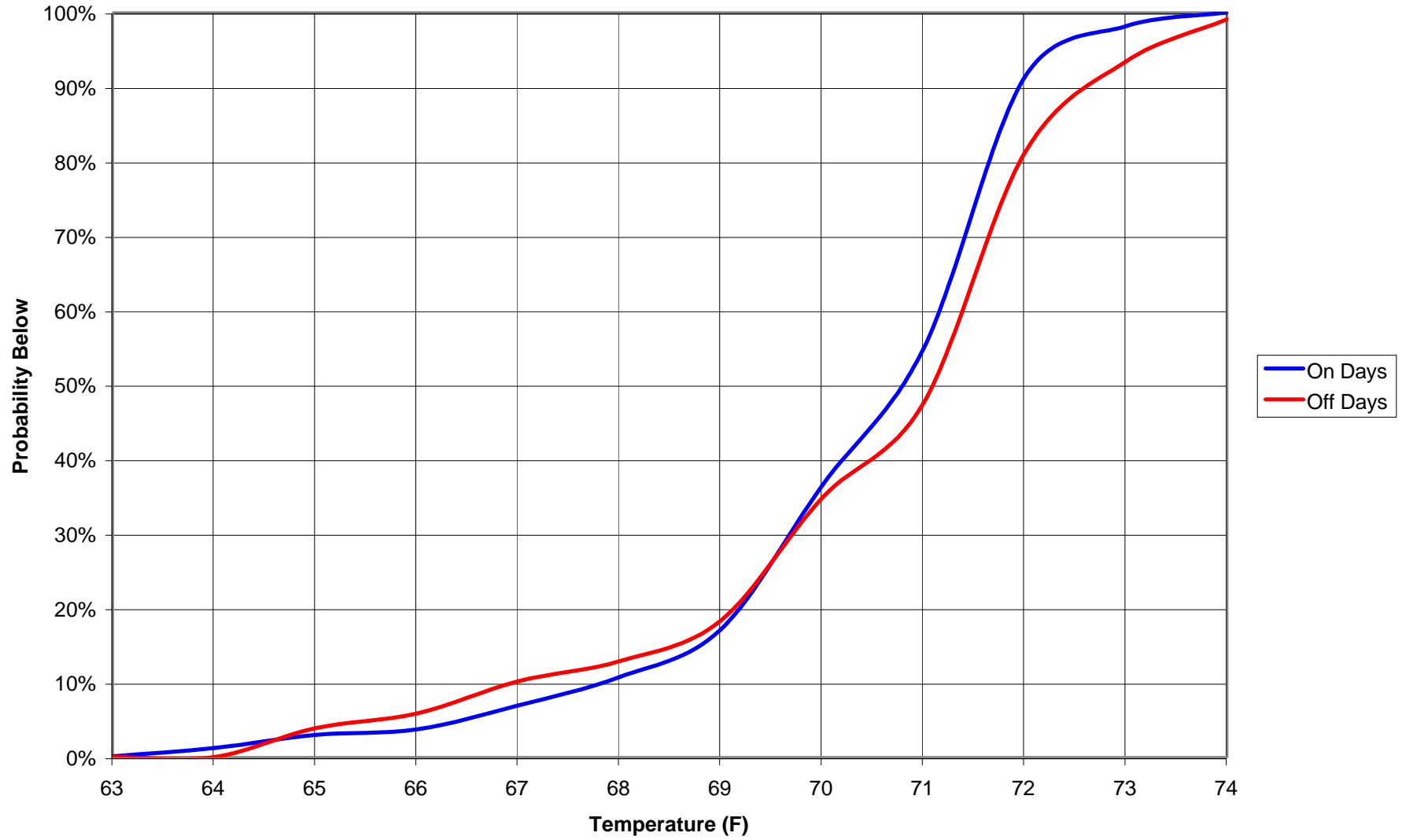
Main Floor Temperature Histogram (1/18/03 -- 1/29/03)



Main Floor Temperature Histogram (1/30/03 -- 2/22/03)



Main Floor Temperature Probabilities (1/18/03 -- 1/29/03)



Main Floor Temperature Probabilities (1/30/03 -- 2/22/03)

