

**MARQUETTE MI**

Latitude = 46.53 N

Longitude = 87.55 W

Period of Record = 1973 to 1996

WMO No. 727430

Elevation = 1424 feet

Average Pressure = 28.46 inches Hg

**Design Criteria Data**

|                                                  | <b>Design Value</b> | Mean Coincident (Average) Values |                         |                        |                             |
|--------------------------------------------------|---------------------|----------------------------------|-------------------------|------------------------|-----------------------------|
|                                                  |                     | Wet Bulb Temperature (°F)        | Humidity Ratio (gr/lb)  | Wind Speed (mph)       | Prevailing Direction (NSEW) |
| <b>Dry Bulb Temperature (T)</b>                  | <b>(°F)</b>         |                                  |                         |                        |                             |
| Median of Extreme Highs                          | 90                  | 72                               | 94                      | 12.5                   | SW                          |
| 0.4% Occurrence                                  | 86                  | 70                               | 88                      | 11.1                   | SW                          |
| 1.0% Occurrence                                  | 82                  | 67                               | 83                      | 11.1                   | SW                          |
| 2.0% Occurrence                                  | 79                  | 66                               | 79                      | 10.9                   | SW                          |
| Mean Daily Range                                 | 15                  | -                                | -                       | -                      | -                           |
| 97.5% Occurrence                                 | -2                  | -2                               | 4                       | 8.6                    | W                           |
| 99.0% Occurrence                                 | -9                  | -9                               | 3                       | 8.6                    | W                           |
| 99.6% Occurrence                                 | -15                 | -15                              | 2                       | 7.6                    | W                           |
| Median of Extreme Lows                           | -21                 | -21                              | 1                       | 7.7                    | W                           |
|                                                  | <b>Design Value</b> | Mean Coincident (Average) Values |                         |                        |                             |
|                                                  |                     | Dry Bulb Temperature (°F)        | Humidity Ratio (gr/lb)  | Wind Speed (mph)       | Prevailing Direction (NSEW) |
| <b>Wet Bulb Temperature (T<sub>wb</sub>)</b>     | <b>(°F)</b>         |                                  |                         |                        |                             |
| Median of Extreme Highs                          | 76                  | 87                               | 122                     | 11.2                   | SW                          |
| 0.4% Occurrence                                  | 72                  | 82                               | 107                     | 10.5                   | SW                          |
| 1.0% Occurrence                                  | 70                  | 78                               | 101                     | 9.6                    | SW                          |
| 2.0% Occurrence                                  | 68                  | 75                               | 95                      | 9.2                    | S                           |
|                                                  | <b>Design Value</b> | Mean Coincident (Average) Values |                         |                        |                             |
|                                                  |                     | Dry Bulb Temperature (°F)        | Vapor Pressure (in. Hg) | Wind Speed (mph)       | Prevailing Direction (NSEW) |
| <b>Humidity Ratio (HR)</b>                       | <b>(gr/lb)</b>      |                                  |                         |                        |                             |
| Median of Extreme Highs                          | 128                 | 87                               | 0.82                    | 9.4                    | S                           |
| 0.4% Occurrence                                  | 113                 | 78                               | 0.72                    | 9.6                    | SW                          |
| 1.0% Occurrence                                  | 104                 | 75                               | 0.67                    | 9.0                    | SW                          |
| 2.0% Occurrence                                  | 98                  | 73                               | 0.62                    | 8.6                    | SW                          |
| <b>Air Conditioning/<br/>Humid Area Criteria</b> | <b># of Hours</b>   | T ≥ 93°F                         | T ≥ 80°F                | T <sub>wb</sub> ≥ 73°F | T <sub>wb</sub> ≥ 67°F      |
|                                                  |                     | 4                                | 147                     | 29                     | 263                         |

**Other Site Data**

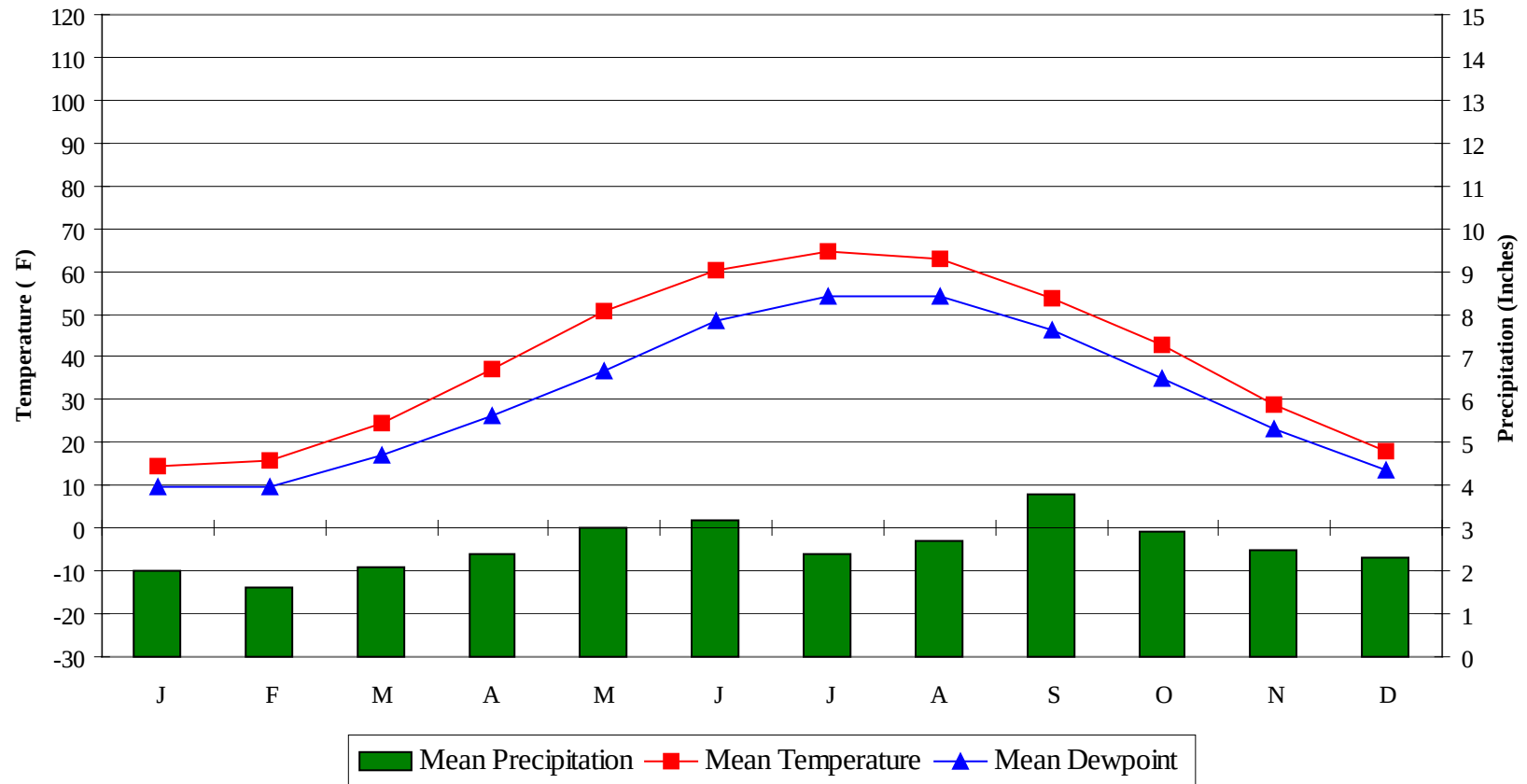
| Weather Region                                   | Rain Rate<br>100 Year Recurrence<br>(in./hr) | Basic Wind Speed<br>3 sec gust @ 33 ft<br>50 Year Recurrence (mph) | Ventilation Cooling Load Index<br>(Ton-hr/cfm/yr) Base 75°F-RH 60%<br>Latent + Sensible |
|--------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 4                                                | 2.5                                          | 90                                                                 | 0.2 + 0.1                                                                               |
| Ground Water Temperature (°F)<br>50 Foot Depth * | Frost Depth<br>50 Year Recurrence<br>(in.)   | Ground Snow Load<br>50 Year Recurrence<br>(lb/ft <sup>2</sup> )    | Average Annual<br>Freeze-Thaw Cycles<br>(#)                                             |
| 42.2                                             | 102                                          | 53                                                                 | 58                                                                                      |

\*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.

MARQUETTE MI

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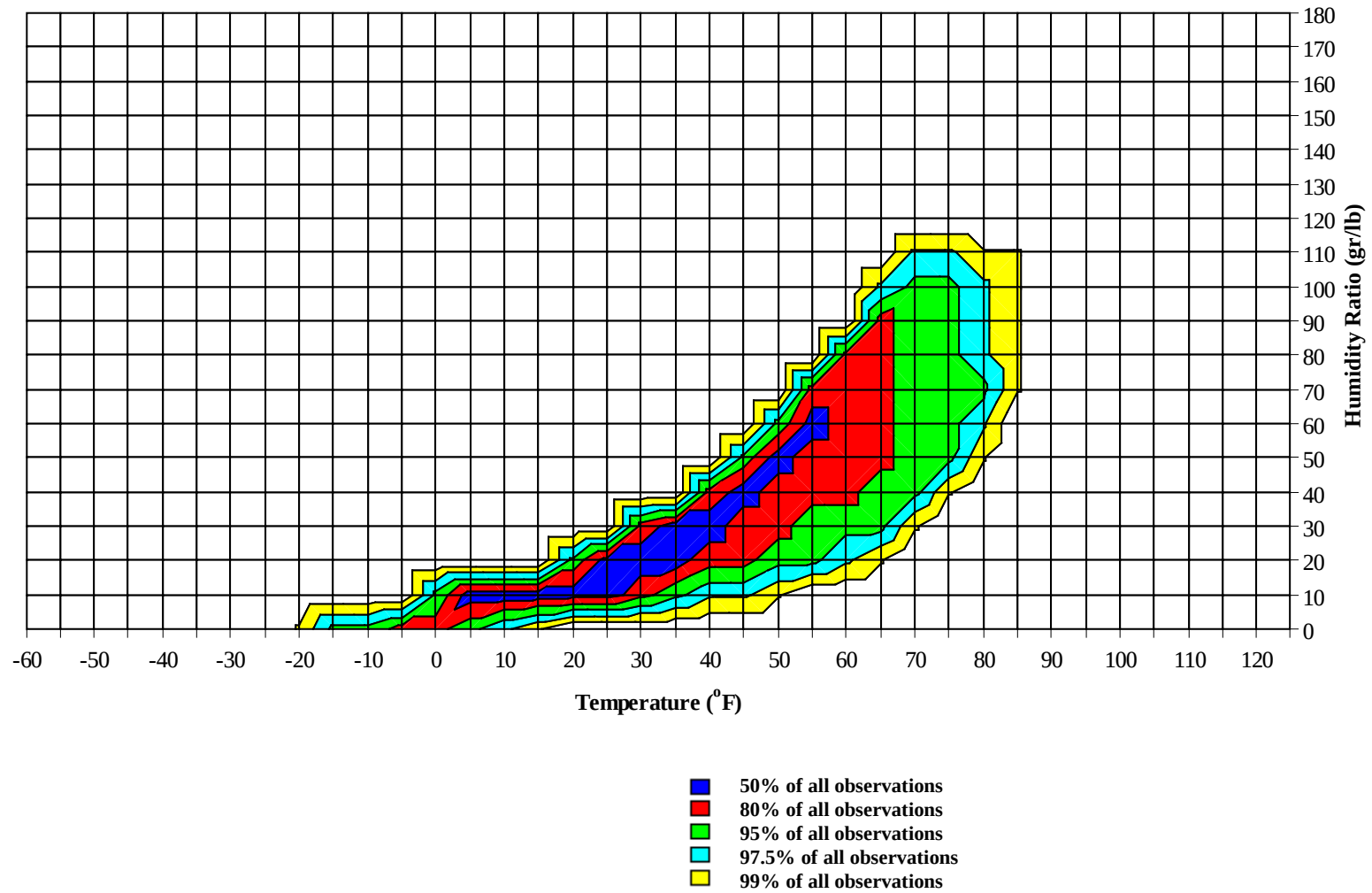
### Average Annual Climate



MARQUETTE MI

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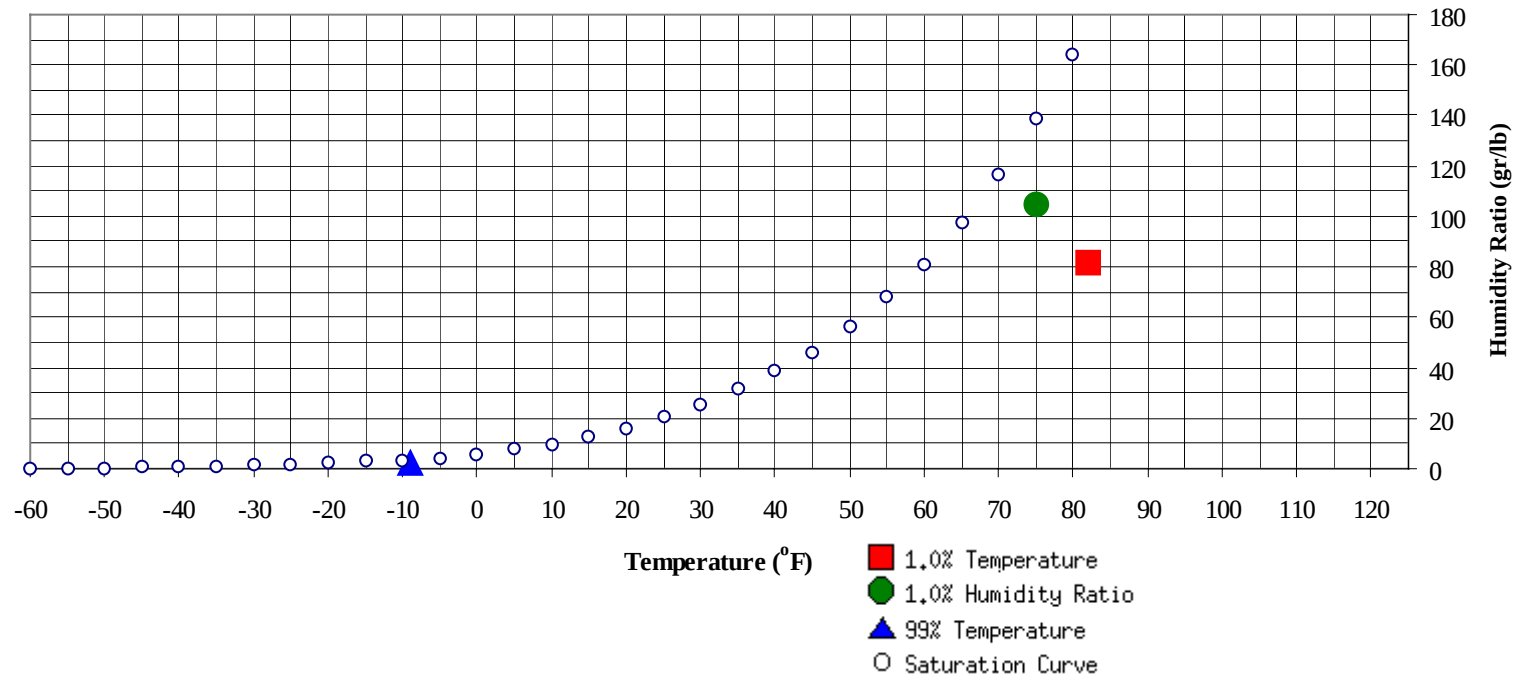
### Long Term Psychrometric Summary



MARQUETTE MI

WMO No. 727430

## Psychrometric Summary of Peak Design Values



| 99% Dry Bulb | (°F) | MCHR<br>(gr/lb) | Enthalpy<br>(btu/lb) | 1.0% Humidity<br>Ratio | (gr/lb) | MCDB<br>(°F) | MCWB<br>(°F) | MC Dewpt<br>(°F) | Enthalpy<br>(btu/lb) |
|--------------|------|-----------------|----------------------|------------------------|---------|--------------|--------------|------------------|----------------------|
|              | -9   | 2.7             | -1.8                 |                        | 104.3   | 75.1         | 69.5         | 66.9             | 34.3                 |

| 1.0% Dry Bulb | (°F) | MCHR<br>(gr/lb) | MCWB<br>(°F) | Enthalpy<br>(btu/lb) |
|---------------|------|-----------------|--------------|----------------------|
|               | 82   | 81.4            | 67.1         | 32.4                 |

MARQUETTE MI

WMO No. 727430

**Dry-Bulb Temperature Hours For An Average Year (Sheet 1 of 5)**

Period of Record = 1973 to 1996

| Temperature<br>Range<br>(°F) | January             |                |                |              |                          | February            |                |                |              |                          | March               |                |                |              |                          |
|------------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|
|                              | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) |
|                              | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          |
| 95 / 99                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 90 / 94                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 85 / 89                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 80 / 84                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 75 / 79                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 70 / 74                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 65 / 69                      |                     |                |                |              |                          |                     |                |                |              |                          |                     | 0              | 0              | 0            | 51.0                     |
| 60 / 64                      |                     |                |                |              |                          |                     |                |                |              |                          |                     | 2              | 1              | 3            | 49.9                     |
| 55 / 59                      |                     |                |                |              |                          |                     | 0              |                | 0            | 43.0                     | 0                   | 3              | 2              | 5            | 47.2                     |
| 50 / 54                      |                     |                |                |              |                          |                     | 1              | 0              | 1            | 40.6                     | 0                   | 5              | 3              | 8            | 43.3                     |
| 45 / 49                      | 0                   |                | 0              | 0            | 42.0                     |                     | 1              | 1              | 2            | 38.0                     | 2                   | 11             | 8              | 21           | 40.2                     |
| 40 / 44                      | 0                   | 2              | 0              | 2            | 35.8                     | 2                   | 6              | 5              | 13           | 36.2                     | 7                   | 19             | 13             | 39           | 36.8                     |
| 35 / 39                      | 2                   | 6              | 5              | 13           | 33.4                     | 5                   | 14             | 10             | 29           | 32.8                     | 15                  | 30             | 24             | 69           | 33.0                     |
| 30 / 34                      | 14                  | 20             | 20             | 54           | 29.8                     | 19                  | 20             | 23             | 61           | 29.5                     | 38                  | 47             | 45             | 130          | 29.4                     |
| 25 / 29                      | 28                  | 34             | 33             | 95           | 25.6                     | 23                  | 30             | 28             | 81           | 25.0                     | 47                  | 44             | 47             | 138          | 25.1                     |
| 20 / 24                      | 38                  | 44             | 40             | 122          | 20.9                     | 24                  | 30             | 31             | 85           | 20.4                     | 33                  | 28             | 35             | 97           | 20.4                     |
| 15 / 19                      | 38                  | 41             | 37             | 116          | 15.9                     | 34                  | 34             | 33             | 101          | 15.6                     | 30                  | 23             | 26             | 80           | 15.7                     |
| 10 / 14                      | 35                  | 39             | 34             | 108          | 11.0                     | 28                  | 30             | 29             | 87           | 10.7                     | 24                  | 18             | 18             | 61           | 10.9                     |
| 5 / 9                        | 26                  | 29             | 30             | 86           | 6.3                      | 26                  | 27             | 27             | 80           | 6.3                      | 18                  | 9              | 12             | 39           | 6.4                      |
| 0 / 4                        | 27                  | 15             | 20             | 63           | 1.3                      | 19                  | 16             | 18             | 54           | 1.3                      | 15                  | 5              | 6              | 26           | 1.4                      |
| -5 / -1                      | 12                  | 8              | 11             | 31           | -2.9                     | 13                  | 5              | 9              | 27           | -2.9                     | 8                   | 1              | 3              | 12           | -2.8                     |
| -10 / -6                     | 13                  | 5              | 8              | 26           | -7.4                     | 12                  | 4              | 6              | 22           | -7.4                     | 5                   | 1              | 2              | 8            | -7.0                     |
| -15 / -11                    | 8                   | 3              | 6              | 17           | -12.1                    | 9                   | 3              | 2              | 14           | -12.1                    | 4                   | 0              | 2              | 6            | -12.0                    |
| -20 / -16                    | 4                   | 1              | 3              | 8            | -17.0                    | 5                   | 1              | 1              | 7            | -17.0                    | 2                   |                | 0              | 2            | -17.0                    |
| -25 / -21                    | 2                   | 0              | 1              | 3            | -21.9                    | 3                   | 1              | 1              | 5            | -21.6                    | 1                   |                |                | 1            | -21.3                    |
| -30 / -26                    | 1                   | 0              | 0              | 1            | -26.0                    | 1                   | 0              | 0              | 1            | -26.5                    | 0                   |                |                | 0            | -25.5                    |
| -35 / -31                    | 0                   | 0              |                | 0            |                          | 1                   | 0              |                | 1            | -31.0                    |                     |                |                |              |                          |
| -40 / -36                    | 0                   | 0              |                | 0            |                          | 0                   | 0              |                | 0            |                          |                     |                |                |              |                          |

**Caution:** This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary and the ventilation and infiltration load pages in this manual.

MARQUETTE MI

WMO No. 727430

**Dry-Bulb Temperature Hours For An Average Year (Sheet 2 of 5)****Period of Record = 1973 to 1996**

| Temperature<br>Range<br>(°F) | April               |                |                |              |                          | May                 |                |                |              |                          | June                |                |                |              |                          |
|------------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|
|                              | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) |
|                              | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          |
| 95 / 99                      |                     |                |                |              |                          |                     |                |                |              |                          |                     | 0              |                | 0            | 67.0                     |
| 90 / 94                      |                     |                |                |              |                          |                     | 0              |                | 0            | 65.0                     |                     | 2              | 1              | 3            | 72.3                     |
| 85 / 89                      |                     | 0              | 0              | 0            | 65.6                     |                     | 2              | 1              | 3            | 65.1                     | 0                   | 6              | 2              | 8            | 69.9                     |
| 80 / 84                      |                     | 1              | 0              | 1            | 64.0                     |                     | 7              | 4              | 11           | 62.9                     | 0                   | 13             | 7              | 20           | 66.7                     |
| 75 / 79                      |                     | 3              | 1              | 4            | 60.8                     |                     | 13             | 6              | 19           | 60.4                     | 2                   | 32             | 15             | 50           | 63.5                     |
| 70 / 74                      | 0                   | 5              | 2              | 7            | 57.3                     | 0                   | 21             | 10             | 31           | 57.6                     | 9                   | 44             | 27             | 80           | 61.2                     |
| 65 / 69                      | 0                   | 5              | 4              | 9            | 54.3                     | 6                   | 25             | 16             | 47           | 55.6                     | 19                  | 41             | 38             | 97           | 58.7                     |
| 60 / 64                      | 3                   | 8              | 5              | 16           | 51.6                     | 15                  | 31             | 26             | 71           | 52.4                     | 38                  | 34             | 41             | 113          | 55.9                     |
| 55 / 59                      | 5                   | 14             | 11             | 30           | 48.1                     | 27                  | 33             | 29             | 89           | 49.3                     | 51                  | 34             | 37             | 122          | 52.0                     |
| 50 / 54                      | 9                   | 18             | 14             | 42           | 44.0                     | 29                  | 39             | 39             | 107          | 44.9                     | 45                  | 18             | 36             | 99           | 48.1                     |
| 45 / 49                      | 13                  | 28             | 21             | 62           | 39.7                     | 40                  | 30             | 39             | 109          | 41.9                     | 36                  | 10             | 19             | 65           | 44.3                     |
| 40 / 44                      | 21                  | 37             | 32             | 90           | 36.5                     | 44                  | 23             | 35             | 102          | 38.3                     | 20                  | 3              | 11             | 34           | 40.0                     |
| 35 / 39                      | 43                  | 47             | 47             | 136          | 33.0                     | 41                  | 16             | 24             | 81           | 34.1                     | 14                  | 2              | 5              | 22           | 35.5                     |
| 30 / 34                      | 54                  | 39             | 52             | 145          | 29.4                     | 26                  | 4              | 12             | 43           | 29.8                     | 5                   |                | 1              | 6            | 31.0                     |
| 25 / 29                      | 42                  | 20             | 31             | 93           | 25.2                     | 18                  | 2              | 6              | 26           | 26.1                     | 1                   |                |                | 1            | 28.1                     |
| 20 / 24                      | 28                  | 11             | 13             | 53           | 20.6                     | 3                   |                | 1              | 4            | 21.9                     |                     |                |                |              |                          |
| 15 / 19                      | 13                  | 2              | 4              | 19           | 16.2                     | 0                   |                | 0              | 0            | 16.9                     |                     |                |                |              |                          |
| 10 / 14                      | 5                   | 0              | 1              | 6            | 11.2                     |                     |                |                |              |                          |                     |                |                |              |                          |
| 5 / 9                        | 3                   | 0              | 1              | 4            | 6.3                      |                     |                |                |              |                          |                     |                |                |              |                          |
| 0 / 4                        | 2                   | 0              | 0              | 2            | 1.6                      |                     |                |                |              |                          |                     |                |                |              |                          |
| -5 / -1                      | 0                   |                |                | 0            | -1.3                     |                     |                |                |              |                          |                     |                |                |              |                          |
| -10 / -6                     |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -15 / -11                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -20 / -16                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -25 / -21                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -30 / -26                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -35 / -31                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -40 / -36                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |

**Caution:** This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary and the ventilation and infiltration load pages in this manual.

MARQUETTE MI

WMO No. 727430

**Dry-Bulb Temperature Hours For An Average Year (Sheet 3 of 5)****Period of Record = 1973 to 1996**

| Temperature<br>Range<br>(°F) | July                |                |                |              |                          | August              |                |                |              |                          | September           |                |                |              |                          |
|------------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|
|                              | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) |
|                              | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          |
| 95 / 99                      |                     | 1              | 0              | 1            | 70.7                     |                     |                |                |              |                          |                     |                |                |              |                          |
| 90 / 94                      |                     | 4              | 2              | 6            | 71.7                     |                     | 2              | 0              | 2            | 72.4                     |                     | 0              |                | 0            | 70.3                     |
| 85 / 89                      |                     | 9              | 4              | 13           | 71.1                     |                     | 5              | 2              | 7            | 70.4                     |                     | 1              | 0              | 1            | 70.1                     |
| 80 / 84                      | 1                   | 24             | 12             | 37           | 68.1                     | 0                   | 19             | 8              | 28           | 68.5                     |                     | 4              | 1              | 5            | 67.9                     |
| 75 / 79                      | 4                   | 40             | 21             | 66           | 65.5                     | 2                   | 38             | 19             | 59           | 65.7                     | 0                   | 10             | 4              | 14           | 65.2                     |
| 70 / 74                      | 13                  | 55             | 40             | 108          | 63.0                     | 13                  | 56             | 36             | 104          | 63.8                     | 2                   | 22             | 11             | 35           | 62.9                     |
| 65 / 69                      | 35                  | 51             | 48             | 134          | 60.6                     | 33                  | 49             | 47             | 129          | 61.5                     | 8                   | 30             | 21             | 59           | 60.1                     |
| 60 / 64                      | 57                  | 36             | 49             | 142          | 57.5                     | 56                  | 43             | 51             | 150          | 57.9                     | 26                  | 42             | 37             | 105          | 57.2                     |
| 55 / 59                      | 57                  | 19             | 39             | 115          | 53.9                     | 57                  | 25             | 41             | 123          | 53.9                     | 35                  | 45             | 37             | 117          | 52.7                     |
| 50 / 54                      | 44                  | 5              | 22             | 71           | 49.9                     | 42                  | 10             | 25             | 77           | 50.0                     | 45                  | 39             | 46             | 131          | 48.9                     |
| 45 / 49                      | 24                  | 2              | 9              | 35           | 45.3                     | 25                  | 1              | 12             | 38           | 45.6                     | 49                  | 27             | 39             | 115          | 44.4                     |
| 40 / 44                      | 10                  |                | 2              | 12           | 41.3                     | 14                  | 0              | 5              | 19           | 41.1                     | 34                  | 13             | 22             | 69           | 40.2                     |
| 35 / 39                      | 3                   |                | 0              | 3            | 36.7                     | 6                   | 0              | 1              | 7            | 36.6                     | 24                  | 5              | 15             | 45           | 35.5                     |
| 30 / 34                      | 0                   |                |                | 0            | 32.0                     | 1                   |                |                | 1            | 31.4                     | 13                  | 1              | 4              | 18           | 31.3                     |
| 25 / 29                      |                     |                |                |              |                          |                     |                |                |              |                          | 4                   |                | 2              | 6            | 26.7                     |
| 20 / 24                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 15 / 19                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 10 / 14                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 5 / 9                        |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 0 / 4                        |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -5 / -1                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -10 / -6                     |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -15 / -11                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -20 / -16                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -25 / -21                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -30 / -26                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -35 / -31                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -40 / -36                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |

**Caution:** This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary and the ventilation and infiltration load pages in this manual.

MARQUETTE MI

WMO No. 727430

**Dry-Bulb Temperature Hours For An Average Year (Sheet 4 of 5)****Period of Record = 1973 to 1996**

| Temperature<br>Range<br>(°F) | October             |                |                |              |                          | November            |                |                |              |                          | December            |                |                |              |                          |
|------------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|---------------------|----------------|----------------|--------------|--------------------------|
|                              | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) |
|                              | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          |
| 95 / 99                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 90 / 94                      |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| 85 / 89                      |                     | 0              |                | 0            | 58.7                     |                     |                |                |              |                          |                     |                |                |              |                          |
| 80 / 84                      |                     | 0              | 0              | 0            | 62.0                     |                     |                |                |              |                          |                     |                |                |              |                          |
| 75 / 79                      |                     | 1              | 0              | 1            | 60.3                     |                     |                |                |              |                          |                     |                |                |              |                          |
| 70 / 74                      |                     | 3              | 1              | 4            | 58.6                     |                     |                |                |              |                          |                     |                |                |              |                          |
| 65 / 69                      | 0                   | 8              | 3              | 11           | 55.3                     |                     | 1              | 0              | 1            | 54.8                     |                     |                |                |              |                          |
| 60 / 64                      | 4                   | 17             | 11             | 32           | 54.0                     |                     | 1              | 0              | 1            | 54.6                     |                     |                |                |              |                          |
| 55 / 59                      | 11                  | 24             | 16             | 51           | 50.8                     | 1                   | 2              | 1              | 4            | 50.8                     |                     |                | 0              | 0            | 55.0                     |
| 50 / 54                      | 19                  | 35             | 27             | 81           | 46.8                     | 3                   | 5              | 3              | 11           | 47.7                     | 0                   | 0              | 0              | 0            | 42.9                     |
| 45 / 49                      | 35                  | 44             | 42             | 121          | 43.0                     | 6                   | 14             | 8              | 28           | 42.7                     | 0                   | 1              | 0              | 1            | 40.0                     |
| 40 / 44                      | 43                  | 49             | 47             | 139          | 39.2                     | 13                  | 20             | 15             | 49           | 38.6                     | 0                   | 4              | 2              | 6            | 36.2                     |
| 35 / 39                      | 52                  | 40             | 48             | 140          | 34.7                     | 27                  | 35             | 34             | 95           | 34.5                     | 7                   | 12             | 10             | 29           | 33.6                     |
| 30 / 34                      | 58                  | 22             | 37             | 116          | 30.3                     | 52                  | 55             | 53             | 160          | 30.0                     | 25                  | 30             | 30             | 85           | 30.1                     |
| 25 / 29                      | 21                  | 5              | 14             | 41           | 26.2                     | 55                  | 47             | 51             | 153          | 25.2                     | 46                  | 52             | 46             | 144          | 25.4                     |
| 20 / 24                      | 5                   | 0              | 2              | 7            | 21.7                     | 36                  | 35             | 38             | 108          | 20.6                     | 41                  | 38             | 38             | 116          | 20.9                     |
| 15 / 19                      | 1                   |                | 0              | 1            | 17.3                     | 23                  | 15             | 19             | 58           | 16.2                     | 33                  | 34             | 32             | 98           | 16.1                     |
| 10 / 14                      |                     |                |                |              |                          | 13                  | 7              | 11             | 32           | 11.3                     | 28                  | 28             | 31             | 86           | 11.2                     |
| 5 / 9                        |                     |                |                |              |                          | 6                   | 2              | 5              | 13           | 6.9                      | 25                  | 22             | 25             | 72           | 6.5                      |
| 0 / 4                        |                     |                |                |              |                          | 4                   | 0              | 1              | 5            | 1.8                      | 17                  | 16             | 17             | 51           | 1.4                      |
| -5 / -1                      |                     |                |                |              |                          | 1                   | 0              | 0              | 1            | -1.9                     | 9                   | 5              | 7              | 21           | -2.8                     |
| -10 / -6                     |                     |                |                |              |                          | 0                   |                |                | 0            | -6.0                     | 11                  | 4              | 6              | 21           | -7.1                     |
| -15 / -11                    |                     |                |                |              |                          |                     |                |                |              |                          | 5                   | 1              | 3              | 9            | -11.5                    |
| -20 / -16                    |                     |                |                |              |                          |                     |                |                |              |                          | 2                   | 1              | 1              | 4            | -16.5                    |
| -25 / -21                    |                     |                |                |              |                          |                     |                |                |              |                          | 0                   | 0              | 0              | 0            | -21.8                    |
| -30 / -26                    |                     |                |                |              |                          |                     |                |                |              |                          | 0                   | 0              |                | 0            | -26.5                    |
| -35 / -31                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |
| -40 / -36                    |                     |                |                |              |                          |                     |                |                |              |                          |                     |                |                |              |                          |

**Caution:** This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary and the ventilation and infiltration load pages in this manual.



**MARQUETTE MI**

WMO No. 727430

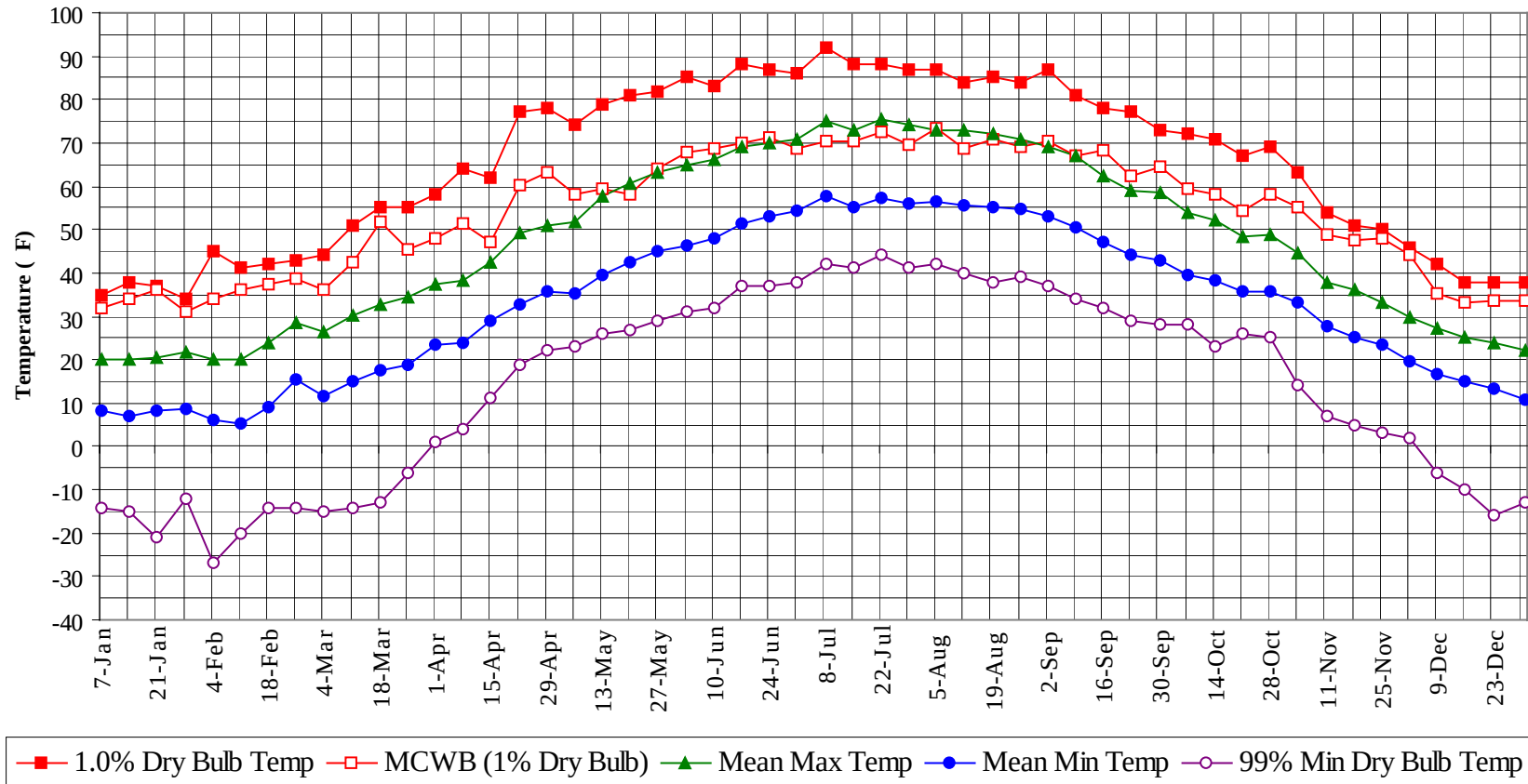
**Dry-Bulb Temperature Hours For An Average Year (Sheet 5 of 5)**

**Period of Record = 1973 to 1996**

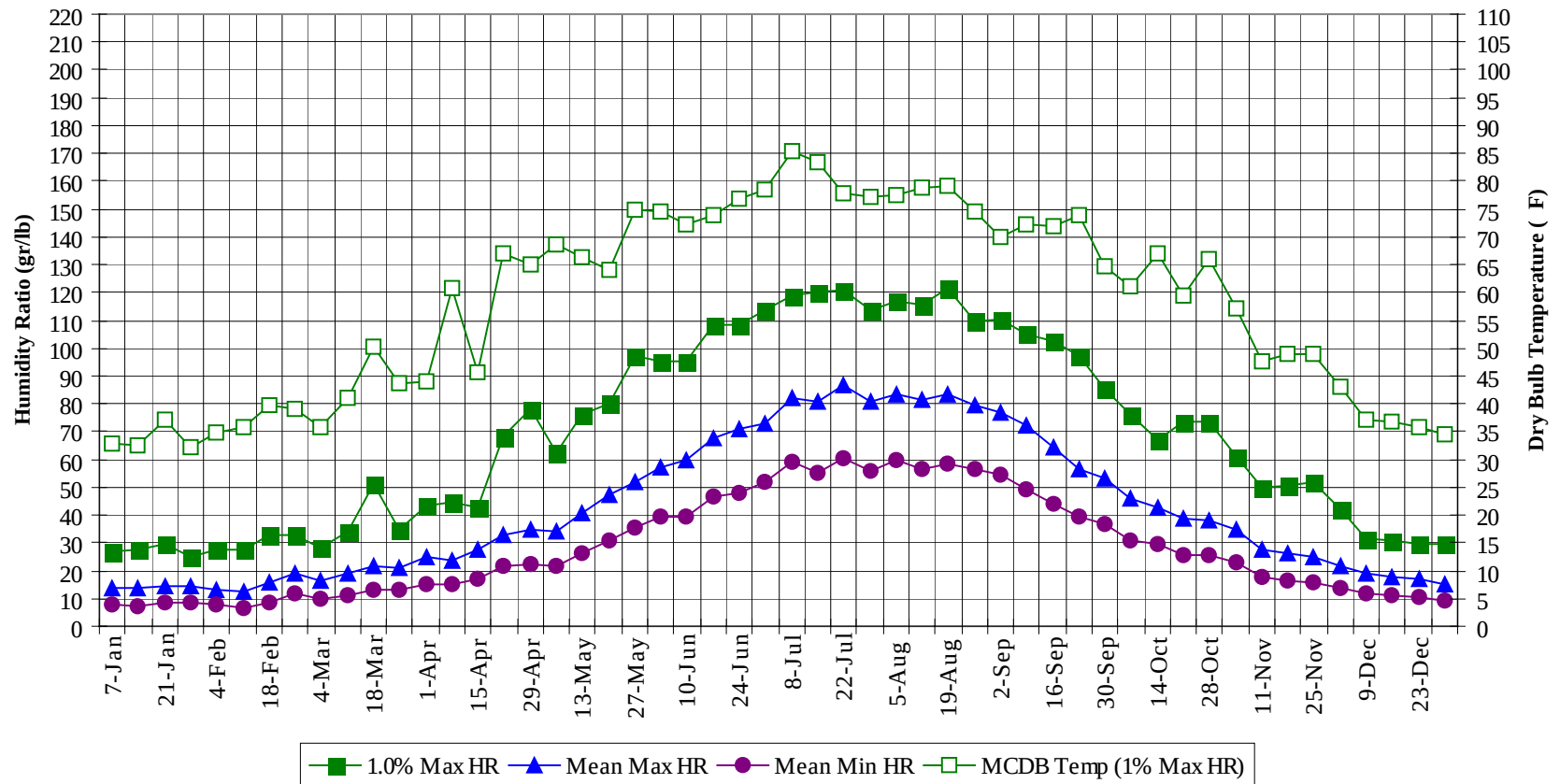
| Temperature<br>Range<br>(°F) | Annual Totals       |                |                |              |                          |
|------------------------------|---------------------|----------------|----------------|--------------|--------------------------|
|                              | Hour<br>Group (LST) |                |                | Total<br>Obs | M<br>C<br>W<br>B<br>(°F) |
|                              | 01<br>To<br>08      | 09<br>To<br>16 | 17<br>To<br>00 |              |                          |
| 95 / 99                      |                     | 1              | 0              | 1            | 70.4                     |
| 90 / 94                      |                     | 7              | 4              | 11           | 71.9                     |
| 85 / 89                      | 0                   | 24             | 10             | 35           | 69.9                     |
| 80 / 84                      | 1                   | 71             | 33             | 105          | 67.3                     |
| 75 / 79                      | 8                   | 140            | 69             | 217          | 64.5                     |
| 70 / 74                      | 37                  | 208            | 131            | 375          | 62.2                     |
| 65 / 69                      | 104                 | 214            | 181            | 498          | 59.7                     |
| 60 / 64                      | 200                 | 216            | 221            | 638          | 56.4                     |
| 55 / 59                      | 246                 | 200            | 214            | 660          | 52.2                     |
| 50 / 54                      | 237                 | 176            | 212            | 626          | 47.7                     |
| 45 / 49                      | 229                 | 168            | 195            | 592          | 43.1                     |
| 40 / 44                      | 205                 | 174            | 186            | 565          | 38.6                     |
| 35 / 39                      | 235                 | 204            | 222            | 661          | 34.0                     |
| 30 / 34                      | 301                 | 236            | 273            | 810          | 29.8                     |
| 25 / 29                      | 283                 | 232            | 257            | 772          | 25.3                     |
| 20 / 24                      | 208                 | 185            | 198            | 592          | 20.7                     |
| 15 / 19                      | 173                 | 152            | 152            | 477          | 15.9                     |
| 10 / 14                      | 135                 | 123            | 125            | 382          | 11.0                     |
| 5 / 9                        | 105                 | 90             | 100            | 295          | 6.4                      |
| 0 / 4                        | 83                  | 53             | 63             | 199          | 1.4                      |
| -5 / -1                      | 43                  | 20             | 30             | 92           | -2.9                     |
| -10 / -6                     | 40                  | 14             | 23             | 77           | -7.3                     |
| -15 / -11                    | 25                  | 8              | 13             | 47           | -12.0                    |
| -20 / -16                    | 14                  | 3              | 5              | 22           | -16.9                    |
| -25 / -21                    | 6                   | 1              | 1              | 8            | -21.7                    |
| -30 / -26                    | 2                   | 1              | 1              | 4            | -26.2                    |
| -35 / -31                    | 1                   | 0              |                | 1            | -31.0                    |
| -40 / -36                    | 0                   | 0              |                | 0            |                          |

**Caution:** This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary and the ventilation and infiltration load pages in this manual.

## Annual Summary of Temperatures



## Long Term Humidity and Dry Bulb Temperature Summary



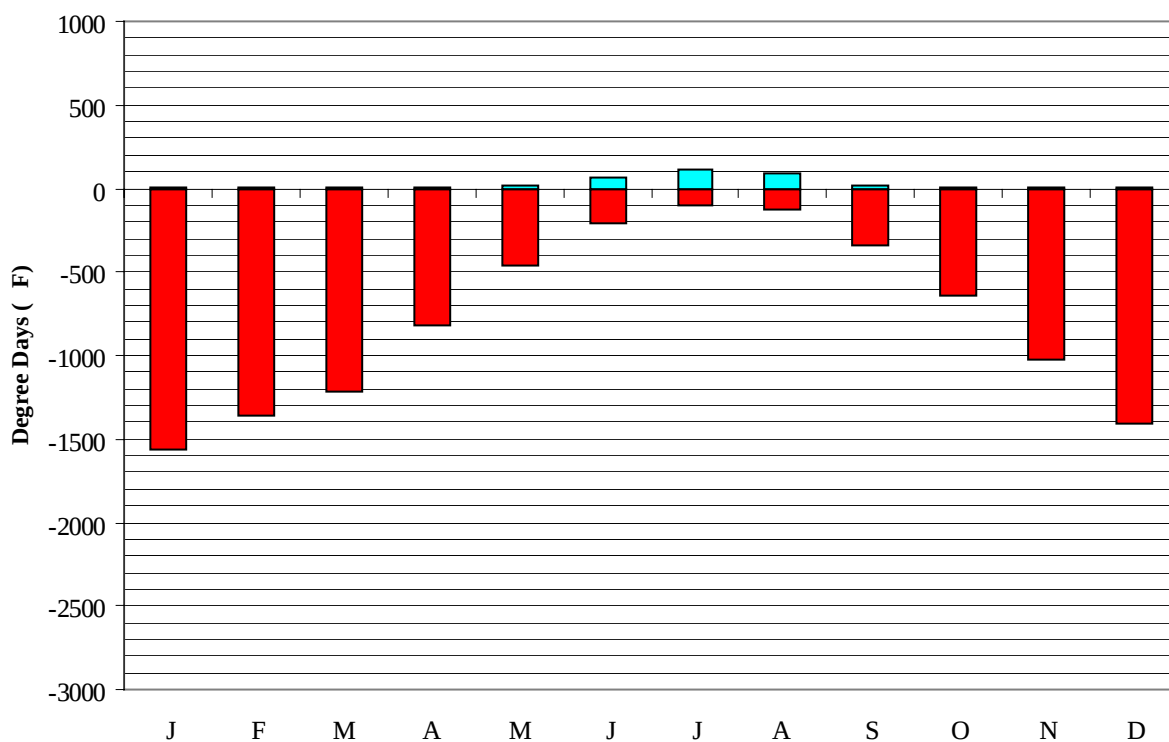
**MARQUETTE MI****WMO No. 727430****Long Term Dry Bulb Temperature and Humidity Summary**

| Week<br>Ending | 1.0%<br>Temp (°F) | MCWB @<br>1% Temp (°F) | Mean Max<br>Temp (°F) | Mean Min<br>Temp (°F) | 99%<br>Temp (°F) | 1.0%<br>HR (gr/lb) | MCDB @<br>1% HR (°F) | Mean Max<br>HR (gr/lb) | Mean Min<br>HR (gr/lb) |
|----------------|-------------------|------------------------|-----------------------|-----------------------|------------------|--------------------|----------------------|------------------------|------------------------|
| 7-Jan          | 35.0              | 32.0                   | 20.0                  | 8.1                   | -14.0            | 26.6               | 32.9                 | 13.7                   | 8.2                    |
| 14-Jan         | 38.0              | 33.8                   | 20.1                  | 6.9                   | -15.0            | 27.3               | 32.4                 | 13.7                   | 7.5                    |
| 21-Jan         | 37.0              | 36.1                   | 20.6                  | 8.1                   | -21.0            | 29.4               | 37.0                 | 14.6                   | 8.6                    |
| 28-Jan         | 34.0              | 30.9                   | 21.7                  | 8.8                   | -12.0            | 25.2               | 32.2                 | 14.7                   | 8.4                    |
| 4-Feb          | 45.0              | 34.2                   | 19.9                  | 6.1                   | -27.0            | 27.3               | 34.8                 | 13.3                   | 7.7                    |
| 11-Feb         | 41.0              | 36.2                   | 20.0                  | 5.3                   | -20.0            | 27.3               | 35.9                 | 12.6                   | 6.8                    |
| 18-Feb         | 42.0              | 37.4                   | 24.0                  | 9.1                   | -14.0            | 32.9               | 39.6                 | 15.5                   | 8.8                    |
| 25-Feb         | 43.0              | 38.7                   | 28.7                  | 15.6                  | -14.0            | 32.9               | 39.1                 | 19.3                   | 11.7                   |
| 4-Mar          | 44.0              | 36.0                   | 26.6                  | 11.8                  | -15.0            | 28.0               | 35.9                 | 16.6                   | 9.6                    |
| 11-Mar         | 51.0              | 42.7                   | 30.0                  | 15.0                  | -14.0            | 34.3               | 40.9                 | 19.4                   | 11.3                   |
| 18-Mar         | 55.0              | 51.8                   | 32.7                  | 17.7                  | -13.0            | 51.1               | 50.2                 | 21.6                   | 12.8                   |
| 25-Mar         | 55.0              | 45.4                   | 34.5                  | 19.0                  | -6.0             | 35.0               | 43.7                 | 21.3                   | 13.0                   |
| 1-Apr          | 58.0              | 48.0                   | 37.6                  | 23.6                  | 1.0              | 43.4               | 44.1                 | 25.1                   | 15.2                   |
| 8-Apr          | 64.0              | 51.5                   | 38.2                  | 23.7                  | 4.0              | 44.8               | 60.7                 | 23.9                   | 14.8                   |
| 15-Apr         | 62.0              | 47.0                   | 42.4                  | 28.8                  | 11.0             | 42.7               | 45.5                 | 27.3                   | 17.4                   |
| 22-Apr         | 77.0              | 60.4                   | 49.1                  | 32.7                  | 19.0             | 68.6               | 67.1                 | 33.0                   | 21.6                   |
| 29-Apr         | 78.0              | 63.0                   | 51.1                  | 35.6                  | 22.0             | 78.4               | 65.0                 | 35.0                   | 22.5                   |
| 6-May          | 74.0              | 58.0                   | 51.7                  | 35.3                  | 23.0             | 62.3               | 68.7                 | 33.9                   | 21.8                   |
| 13-May         | 79.0              | 59.5                   | 57.6                  | 39.6                  | 26.0             | 76.3               | 66.3                 | 40.6                   | 26.1                   |
| 20-May         | 81.0              | 58.3                   | 60.6                  | 42.5                  | 27.0             | 79.8               | 63.9                 | 47.4                   | 30.7                   |
| 27-May         | 82.0              | 63.9                   | 63.1                  | 45.2                  | 29.0             | 97.3               | 74.7                 | 51.6                   | 35.3                   |
| 3-Jun          | 85.0              | 67.7                   | 64.8                  | 46.4                  | 31.0             | 95.2               | 74.5                 | 56.8                   | 39.3                   |
| 10-Jun         | 83.0              | 68.5                   | 66.2                  | 47.8                  | 32.0             | 95.2               | 72.1                 | 59.8                   | 39.7                   |
| 17-Jun         | 88.0              | 70.0                   | 69.3                  | 51.3                  | 37.0             | 108.5              | 74.0                 | 67.7                   | 46.4                   |
| 24-Jun         | 87.0              | 71.3                   | 70.1                  | 53.0                  | 37.0             | 108.5              | 76.9                 | 70.7                   | 47.7                   |
| 1-Jul          | 86.0              | 68.7                   | 70.7                  | 54.3                  | 38.0             | 113.4              | 78.3                 | 73.2                   | 52.1                   |
| 8-Jul          | 92.0              | 70.5                   | 75.2                  | 57.7                  | 42.0             | 119.0              | 85.5                 | 82.2                   | 59.1                   |
| 15-Jul         | 88.0              | 70.4                   | 72.8                  | 55.2                  | 41.0             | 120.4              | 83.4                 | 80.6                   | 55.3                   |
| 22-Jul         | 88.0              | 72.7                   | 75.5                  | 57.2                  | 44.0             | 121.1              | 77.9                 | 86.8                   | 60.5                   |
| 29-Jul         | 87.0              | 69.5                   | 74.2                  | 55.9                  | 41.0             | 113.4              | 77.1                 | 80.6                   | 55.8                   |
| 5-Aug          | 87.0              | 73.3                   | 72.9                  | 56.6                  | 42.0             | 116.9              | 77.5                 | 83.5                   | 59.9                   |
| 12-Aug         | 84.0              | 68.6                   | 73.1                  | 55.7                  | 40.0             | 115.5              | 78.7                 | 81.3                   | 56.7                   |
| 19-Aug         | 85.0              | 70.7                   | 72.0                  | 55.4                  | 38.0             | 121.8              | 79.0                 | 83.3                   | 58.3                   |
| 26-Aug         | 84.0              | 69.1                   | 71.0                  | 54.6                  | 39.0             | 109.9              | 74.7                 | 79.3                   | 56.3                   |
| 2-Sep          | 87.0              | 70.3                   | 69.3                  | 53.0                  | 37.0             | 110.6              | 70.0                 | 76.6                   | 54.2                   |
| 9-Sep          | 81.0              | 66.9                   | 67.0                  | 50.4                  | 34.0             | 105.0              | 72.3                 | 72.0                   | 49.3                   |
| 16-Sep         | 78.0              | 68.1                   | 62.5                  | 47.2                  | 32.0             | 102.2              | 71.8                 | 64.1                   | 43.8                   |
| 23-Sep         | 77.0              | 62.4                   | 58.8                  | 44.2                  | 29.0             | 97.3               | 73.8                 | 56.3                   | 39.2                   |
| 30-Sep         | 73.0              | 64.5                   | 58.6                  | 42.7                  | 28.0             | 85.4               | 64.6                 | 52.9                   | 36.7                   |
| 7-Oct          | 72.0              | 59.2                   | 53.8                  | 39.4                  | 28.0             | 76.3               | 61.1                 | 45.8                   | 30.8                   |
| 14-Oct         | 71.0              | 58.0                   | 52.1                  | 38.2                  | 23.0             | 67.2               | 67.0                 | 42.8                   | 29.6                   |
| 21-Oct         | 67.0              | 54.2                   | 48.3                  | 35.6                  | 26.0             | 73.5               | 59.6                 | 38.6                   | 25.8                   |
| 28-Oct         | 69.0              | 58.3                   | 48.8                  | 35.6                  | 25.0             | 73.5               | 66.2                 | 38.2                   | 25.9                   |
| 4-Nov          | 63.0              | 55.2                   | 44.5                  | 33.1                  | 14.0             | 60.9               | 57.0                 | 34.5                   | 22.9                   |
| 11-Nov         | 54.0              | 48.7                   | 37.9                  | 27.5                  | 7.0              | 49.7               | 47.5                 | 27.7                   | 17.9                   |
| 18-Nov         | 51.0              | 47.4                   | 36.3                  | 24.9                  | 5.0              | 50.4               | 48.8                 | 26.2                   | 16.3                   |
| 25-Nov         | 50.0              | 48.2                   | 33.3                  | 23.4                  | 3.0              | 51.8               | 49.0                 | 24.7                   | 15.8                   |
| 2-Dec          | 46.0              | 44.2                   | 29.7                  | 19.6                  | 2.0              | 42.0               | 43.0                 | 21.7                   | 13.8                   |
| 9-Dec          | 42.0              | 35.4                   | 27.1                  | 16.7                  | -6.0             | 31.5               | 37.1                 | 18.8                   | 12.1                   |
| 16-Dec         | 38.0              | 33.0                   | 25.1                  | 14.8                  | -10.0            | 30.8               | 36.6                 | 17.7                   | 11.3                   |
| 23-Dec         | 38.0              | 33.5                   | 24.0                  | 13.1                  | -16.0            | 29.4               | 35.7                 | 16.8                   | 10.7                   |
| 31-Dec         | 38.0              | 33.8                   | 22.1                  | 10.7                  | -13.0            | 29.4               | 34.6                 | 15.3                   | 9.2                    |

MARQUETTE MI

WMO No. 727430

**Degree Days, Heating and Cooling**  
(Base 65°F)



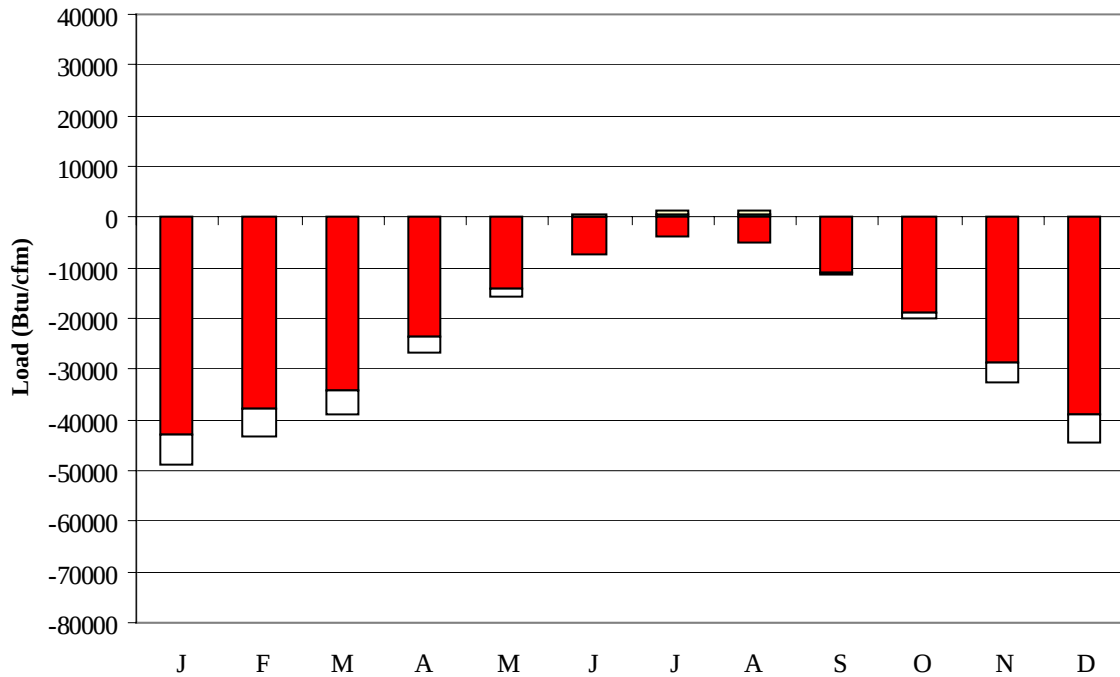
■ Mean Cooling Degree Days ■ Mean Heating Degree Days

|     | Mean Cooling<br>Degree Days (°F) | Mean Heating<br>Degree Days (°F) |
|-----|----------------------------------|----------------------------------|
| JAN | 0                                | 1559                             |
| FEB | 0                                | 1364                             |
| MAR | 0                                | 1218                             |
| APR | 4                                | 824                              |
| MAY | 23                               | 467                              |
| JUN | 63                               | 213                              |
| JUL | 119                              | 104                              |
| AUG | 89                               | 130                              |
| SEP | 21                               | 342                              |
| OCT | 2                                | 638                              |
| NOV | 0                                | 1024                             |
| DEC | 0                                | 1403                             |
| ANN | 323                              | 9286                             |

MARQUETTE MI

WMO No. 727430

**Average Ventilation and Infiltration Loads**  
**(Outside Air vs. 75°F, 60% RH summer; 68°F, 30% RH winter)**



|                                                                            |                                                                                |
|----------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <span style="color: red;">■</span> Average Sensible Cooling Load           | <span style="color: red;">■</span> Average Sensible Heating Load               |
| <span style="color: yellow;">■</span> Average Latent Cooling (Drying) Load | <span style="color: white;">■</span> Average Latent Heating (Humidifying) Load |

|     | Average Sensible Cooling Load (Btu/cfm) | Average Sensible Heating Load (Btu/cfm) | Average Latent Cooling Load (Btu/cfm) | Average Latent Heating Load (Btu/cfm) |
|-----|-----------------------------------------|-----------------------------------------|---------------------------------------|---------------------------------------|
| JAN | 0                                       | -42860                                  | 0                                     | -6092                                 |
| FEB | 0                                       | -37602                                  | 0                                     | -5580                                 |
| MAR | 0                                       | -34043                                  | 0                                     | -4800                                 |
| APR | 15                                      | -23682                                  | 0                                     | -3074                                 |
| MAY | 99                                      | -14269                                  | 49                                    | -1275                                 |
| JUN | 259                                     | -7189                                   | 335                                   | -138                                  |
| JUL | 574                                     | -4005                                   | 887                                   | -6                                    |
| AUG | 377                                     | -4898                                   | 963                                   | -5                                    |
| SEP | 48                                      | -10936                                  | 201                                   | -216                                  |
| OCT | 4                                       | -18815                                  | 1                                     | -1205                                 |
| NOV | 0                                       | -28877                                  | 0                                     | -3627                                 |
| DEC | 0                                       | -38778                                  | 0                                     | -5554                                 |
| ANN | 1376                                    | -265954                                 | 2436                                  | -31572                                |

## Average Annual Solar Radiation – Nearest Available Site

(Source: National Renewable Energy Laboratory, Golden CO, 1995)

City: HOUGHTON  
 State: MI  
 WBAN No: 94814  
 Lat(N): 47.17  
 Long(W): 88.5  
 Elev(ft): 1079

Stn Type: Secondary  
 SHADING GEOMETRY IN DIMENSIONLESS UNITS

Window: 1  
 Overhang: 0.741  
 Vert Gap: 0.327

| AVERAGE INCIDENT SOLAR RADIATION (Btu/sq.ft./day), Percentage Uncertainty = 9 |         | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Year |
|-------------------------------------------------------------------------------|---------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| HORIZ                                                                         | Global  | 420  | 700  | 1120 | 1460 | 1740 | 1910 | 1900 | 1590 | 1140 | 730  | 420  | 340  | 1130 |
|                                                                               | Std Dev | 53   | 81   | 106  | 104  | 153  | 144  | 91   | 115  | 98   | 51   | 40   | 46   | 42   |
|                                                                               | Minimum | 320  | 550  | 890  | 1250 | 1460 | 1640 | 1740 | 1380 | 930  | 640  | 340  | 230  | 1040 |
|                                                                               | Maximum | 490  | 820  | 1300 | 1670 | 2090 | 2220 | 2130 | 1800 | 1360 | 840  | 500  | 390  | 1190 |
|                                                                               | Diffuse | 300  | 430  | 630  | 710  | 730  | 770  | 740  | 650  | 530  | 390  | 290  | 260  | 540  |
| Clear Day                                                                     | Global  | 620  | 990  | 1540 | 2110 | 2490 | 2650 | 2550 | 2180 | 1650 | 1090 | 680  | 520  | 1590 |
| NORTH                                                                         | Global  | 160  | 240  | 350  | 440  | 540  | 620  | 580  | 460  | 330  | 230  | 160  | 140  | 360  |
|                                                                               | Diffuse | 160  | 240  | 350  | 430  | 480  | 520  | 500  | 430  | 330  | 230  | 160  | 140  | 330  |
| Clear Day                                                                     | Global  | 130  | 200  | 290  | 410  | 580  | 710  | 640  | 460  | 310  | 210  | 140  | 120  | 350  |
| EAST                                                                          | Global  | 290  | 470  | 720  | 920  | 1040 | 1120 | 1130 | 970  | 730  | 490  | 280  | 220  | 700  |
|                                                                               | Diffuse | 200  | 300  | 440  | 520  | 560  | 600  | 590  | 520  | 410  | 280  | 190  | 170  | 400  |
| Clear Day                                                                     | Global  | 550  | 800  | 1130 | 1410 | 1540 | 1600 | 1550 | 1410 | 1160 | 850  | 580  | 470  | 1090 |
| SOUTH                                                                         | Global  | 690  | 940  | 1120 | 1050 | 950  | 900  | 950  | 1030 | 1020 | 910  | 600  | 530  | 890  |
|                                                                               | Diffuse | 320  | 430  | 540  | 560  | 550  | 570  | 570  | 530  | 460  | 370  | 280  | 280  | 460  |
| Clear Day                                                                     | Global  | 1770 | 1990 | 2000 | 1660 | 1320 | 1170 | 1210 | 1470 | 1760 | 1890 | 1760 | 1640 | 1630 |
| WEST                                                                          | Global  | 300  | 470  | 730  | 900  | 1040 | 1130 | 1130 | 990  | 750  | 500  | 280  | 230  | 710  |
|                                                                               | Diffuse | 200  | 300  | 450  | 520  | 570  | 610  | 600  | 530  | 410  | 290  | 190  | 170  | 410  |
| Clear Day                                                                     | Global  | 550  | 800  | 1130 | 1410 | 1540 | 1600 | 1550 | 1410 | 1160 | 850  | 580  | 470  | 1090 |

## Average Annual Solar Heat and Illumination – Nearest Available Site

(Source: National Renewable Energy Laboratory, Golden CO, 1995)

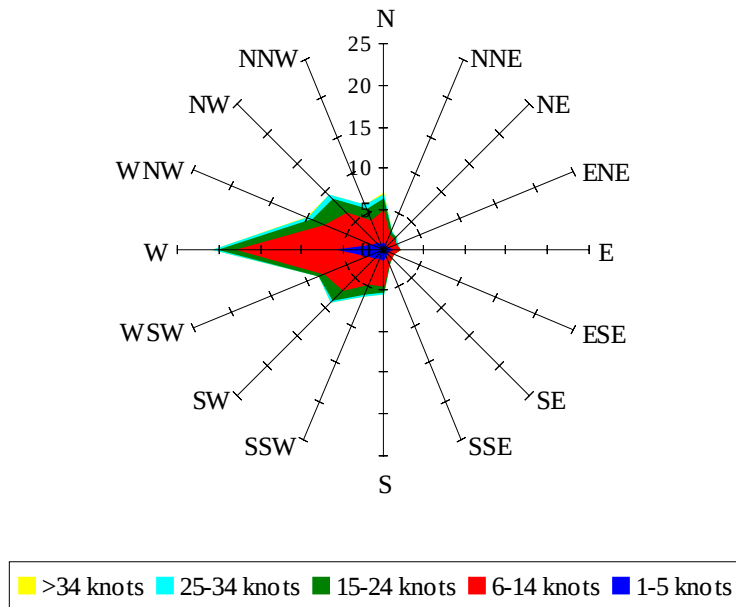
| AVERAGE TRANSMITTED SOLAR RADIATION (Btu/sq.ft./day) FOR DOUBLE GLAZING, Percentage Uncertainty = 9 |          | Jan | Feb | Mar | Apr  | May  | Jun  | Jul  | Aug  | Sep | Oct | Nov | Dec | Year |
|-----------------------------------------------------------------------------------------------------|----------|-----|-----|-----|------|------|------|------|------|-----|-----|-----|-----|------|
| HORIZ                                                                                               | Unshaded | 270 | 460 | 770 | 1040 | 1250 | 1380 | 1370 | 1140 | 800 | 490 | 270 | 220 | 790  |
| NORTH                                                                                               | Unshaded | 110 | 170 | 250 | 300  | 350  | 410  | 380  | 300  | 230 | 160 | 110 | 95  | 240  |
|                                                                                                     | Shaded   | 87  | 130 | 200 | 250  | 300  | 340  | 320  | 260  | 190 | 130 | 87  | 73  | 200  |
| EAST                                                                                                | Unshaded | 200 | 330 | 510 | 660  | 740  | 800  | 800  | 700  | 520 | 340 | 190 | 150 | 490  |
|                                                                                                     | Shaded   | 160 | 270 | 410 | 520  | 580  | 620  | 630  | 550  | 420 | 280 | 160 | 130 | 390  |
| SOUTH                                                                                               | Unshaded | 520 | 700 | 800 | 710  | 620  | 570  | 600  | 680  | 710 | 670 | 450 | 400 | 620  |
|                                                                                                     | Shaded   | 490 | 620 | 580 | 400  | 320  | 330  | 330  | 340  | 460 | 560 | 410 | 370 | 430  |
| WEST                                                                                                | Unshaded | 200 | 330 | 520 | 640  | 740  | 810  | 800  | 710  | 530 | 350 | 200 | 160 | 500  |
|                                                                                                     | Shaded   | 170 | 270 | 420 | 510  | 580  | 630  | 630  | 560  | 430 | 290 | 160 | 130 | 400  |

| AVERAGE INCIDENT ILLUMINANCE (klux-hr) FOR MOSTLY CLEAR AND MOSTLY CLOUDY CONDITIONS, Percentage Uncertainty = 9 |          | March |      |     |     |     | June |      |     |     |     |
|------------------------------------------------------------------------------------------------------------------|----------|-------|------|-----|-----|-----|------|------|-----|-----|-----|
|                                                                                                                  |          | 9am   | 11am | 1pm | 3pm | 5pm | 9am  | 11am | 1pm | 3pm | 5pm |
| HORIZ.                                                                                                           | M.Clear  | 19    | 53   | 71  | 66  | 39  | 33   | 69   | 90  | 94  | 79  |
|                                                                                                                  | M.Cloudy | 12    | 35   | 47  | 44  | 26  | 20   | 41   | 60  | 64  | 50  |
| NORTH                                                                                                            | M.Clear  | 6     | 12   | 14  | 13  | 10  | 20   | 14   | 16  | 16  | 15  |
|                                                                                                                  | M.Cloudy | 6     | 14   | 17  | 16  | 11  | 11   | 14   | 18  | 18  | 16  |
| EAST                                                                                                             | M.Clear  | 56    | 68   | 28  | 13  | 10  | 72   | 80   | 49  | 16  | 15  |
|                                                                                                                  | M.Cloudy | 17    | 31   | 22  | 16  | 11  | 26   | 38   | 34  | 18  | 16  |
| SOUTH                                                                                                            | M.Clear  | 22    | 66   | 89  | 83  | 48  | 9    | 28   | 52  | 57  | 40  |
|                                                                                                                  | M.Cloudy | 9     | 30   | 41  | 39  | 22  | 8    | 20   | 35  | 39  | 27  |
| WEST                                                                                                             | M.Clear  | 6     | 12   | 14  | 50  | 72  | 9    | 14   | 16  | 30  | 71  |
|                                                                                                                  | M.Cloudy | 6     | 14   | 17  | 28  | 29  | 8    | 14   | 18  | 26  | 40  |
| M.Clear                                                                                                          | (% hrs)  | 26    | 26   | 27  | 25  | 27  | 39   | 38   | 34  | 31  | 36  |
|                                                                                                                  |          | Sept  |      |     |     |     | Dec  |      |     |     |     |
|                                                                                                                  |          | 9am   | 11am | 1pm | 3pm | 5pm | 9am  | 11am | 1pm | 3pm | 5pm |
| HORIZ.                                                                                                           | M.Clear  | 11    | 46   | 69  | 73  | 55  | 0    | 19   | 32  | 25  | 4   |
|                                                                                                                  | M.Cloudy | 6     | 25   | 42  | 45  | 32  | 0    | 13   | 20  | 17  | 3   |
| NORTH                                                                                                            | M.Clear  | 4     | 11   | 14  | 14  | 12  | 0    | 7    | 9   | 8   | 2   |
|                                                                                                                  | M.Cloudy | 3     | 10   | 15  | 15  | 12  | 0    | 6    | 9   | 7   | 2   |
| EAST                                                                                                             | M.Clear  | 38    | 73   | 46  | 14  | 12  | 0    | 36   | 15  | 8   | 2   |
|                                                                                                                  | M.Cloudy | 9     | 26   | 26  | 15  | 12  | 0    | 11   | 10  | 7   | 2   |
| SOUTH                                                                                                            | M.Clear  | 7     | 46   | 75  | 79  | 57  | 0    | 53   | 77  | 63  | 15  |
|                                                                                                                  | M.Cloudy | 4     | 19   | 36  | 39  | 26  | 0    | 15   | 23  | 19  | 4   |
| WEST                                                                                                             | M.Clear  | 4     | 11   | 14  | 31  | 68  | 0    | 7    | 9   | 32  | 17  |
|                                                                                                                  | M.Cloudy | 3     | 10   | 15  | 22  | 29  | 0    | 6    | 9   | 13  | 4   |
| M.Clear                                                                                                          | (% hrs)  | 33    | 33   | 31  | 29  | 32  | 12   | 13   | 13  | 12  | 15  |



### Wind Summary - December, January, and February

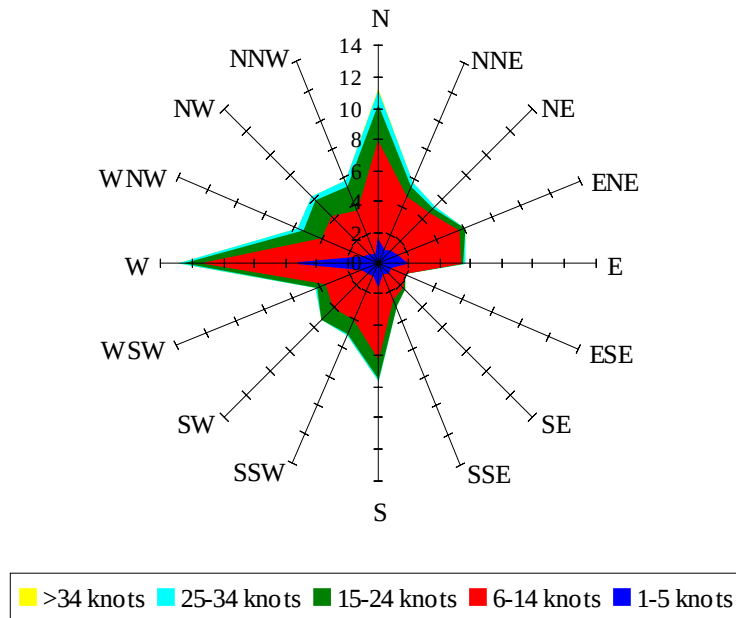
Labels of Percent Frequency on North Axis



Percent Calm = 6.27

### Wind Summary - March, April, and May

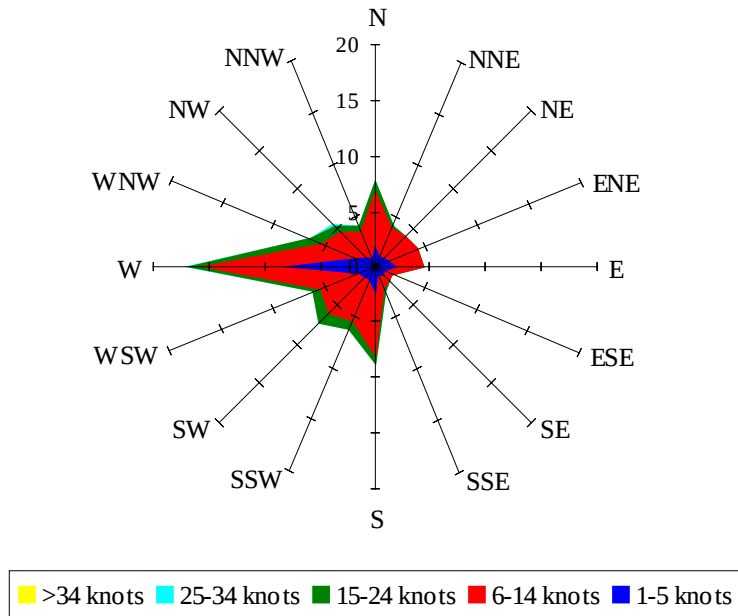
Labels of Percent Frequency on North Axis



Percent Calm = 8.26

### Wind Summary - June, July, and August

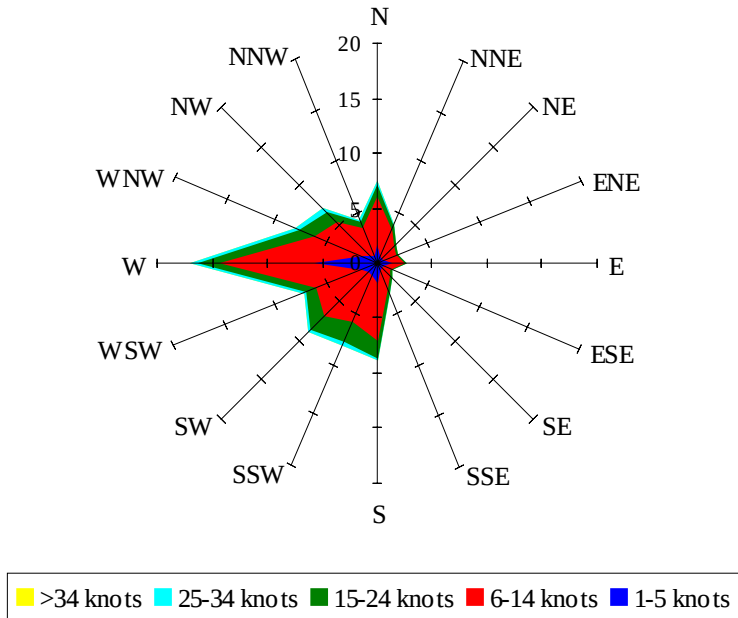
Labels of Percent Frequency on North Axis



Percent Calm = 9.84

### Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 7.40