

7.0 SITE ATMOSPHERIC DIFFUSION CHARACTERISTICS

7.1 Data Collection

On-site meteorological data have been taken at the Dresden site since 1958. Data collected consist of wind speed and direction, recorded on a Bendix Friez aerovane with a continuous strip-chart recorder. The instrument and recorder are the standard type as used at many Weather Bureau stations, and until December 22, 1964, were located at an elevation of 15 feet about 1500 feet northwest of the Dresden I containment building.*

7.2 Data Summary

For purposes of this report, data taken during the period March 15, 1963, to March 14, 1964, were selected for summary and analysis.** Every other day has been examined on an hourly basis. Information extracted from the strip charts are:

- a. Minimum hourly wind speed (nearest 1 mph),
- b. Maximum hourly wind speed (nearest 1 mph),
- c. Average hourly wind speed (nearest 1 mph),
- d. Average hourly wind direction (nearest 10 degrees), and
- e. Range of wind direction (nearest 10 degrees).

From these data annual average hourly wind rose frequency distributions have been tabulated for wind speed increments of 0-3 mph, 4-7 mph, 8-12 mph, 13-25 mph and cumulatively for all wind speeds (see Exhibits III-7-1 to III-7-5). In addition, hourly wind direction variability (direction range in degrees) was tabulated for each of the above wind speed increments and cumulatively for all wind speeds.

7.3 Diffusive Characteristics

Wind direction distribution as averaged over a 1-year period is fairly uniform. Considering a 16-point direction increment, wind direction frequencies range from a minimum of about 3.04% of the year for the north-northwest direction to a maximum of 13.3% and 13.4% for the west and south directions respectively. Thus, the skewing of the wind direction pattern is a factor of 13.4/3.04 or approximately a factor of 4.4. Compared to a uniformly distributed wind rose (6.25% frequency for each direction) the skewing is 13.4/6.25 or approximately a factor of about 2.1.

Slow wind speeds, 0-3 mph, account for only about 12.9% of all wind velocities. The predominant direction during such slow speed conditions is from the sector west through south, with approximately 60% of this wind speed group included. The most frequent single direction is from the west-southwest with a frequency of 16.1%. About 75% of all wind speeds fall in the category of 4-12 mph. The average wind speed is about 8 mph.

*Supervised
by Amend. #1
7-9-65*

*The instrument was moved on December 22 and 23, 1964, to Environs Monitoring Station No. 3 at the south entrance of the site. Instrument elevation is now 30 feet.

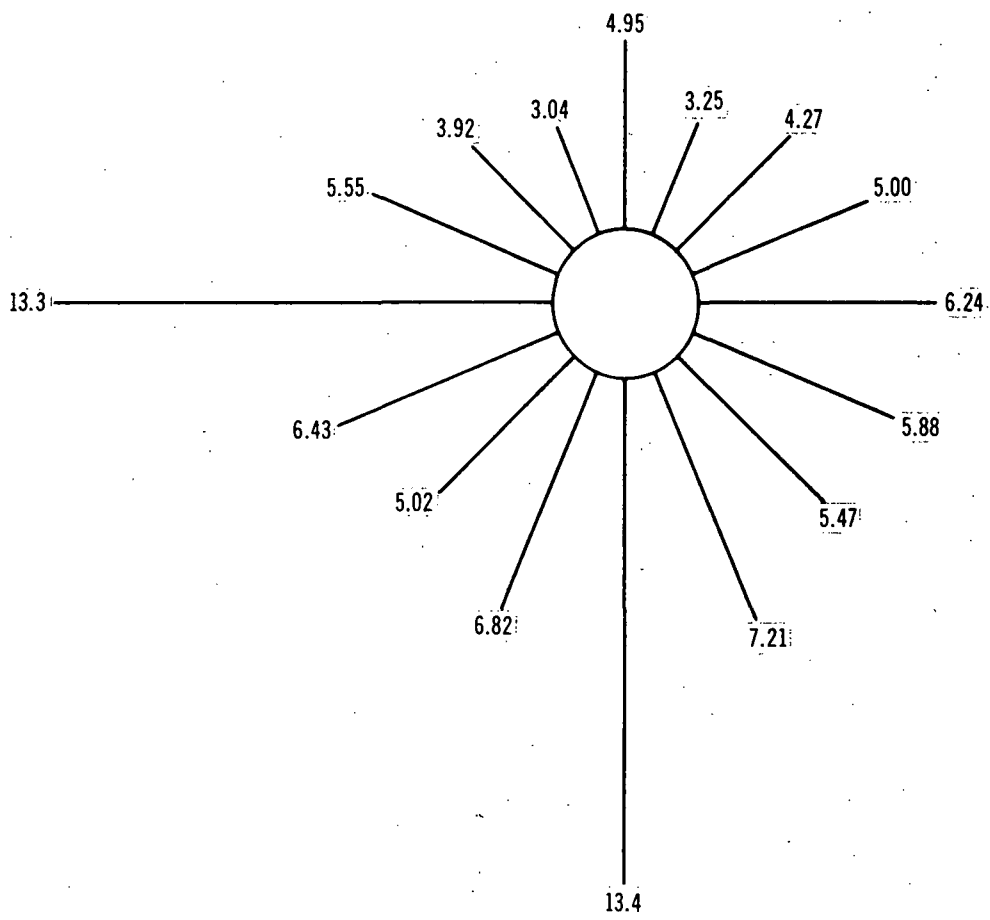
**See Section III-7.4 respecting summaries and analyses in progress for this and other periods.

Hourly wind direction variability summaries show that a significant angular spread in direction occurs during a large fraction of the time (see Exhibits III-7-6 to III-7-10). On the average, wind direction varies over an angle of 120 degrees in the course of a 1-hour period of time. Considering that this angular variation (or range) represents ± 3 standard deviations (σ), then the average standard deviation of wind direction (σ_θ) of a 1-hour period is 20 degrees or 0.35 radians. Combining this with the average wind speed (\bar{u}) of 8 mph gives an average value of the diffusion parameter $\sigma_\theta \bar{u}$ of 160 degrees-mph (or 1.18 radian-meter/second).

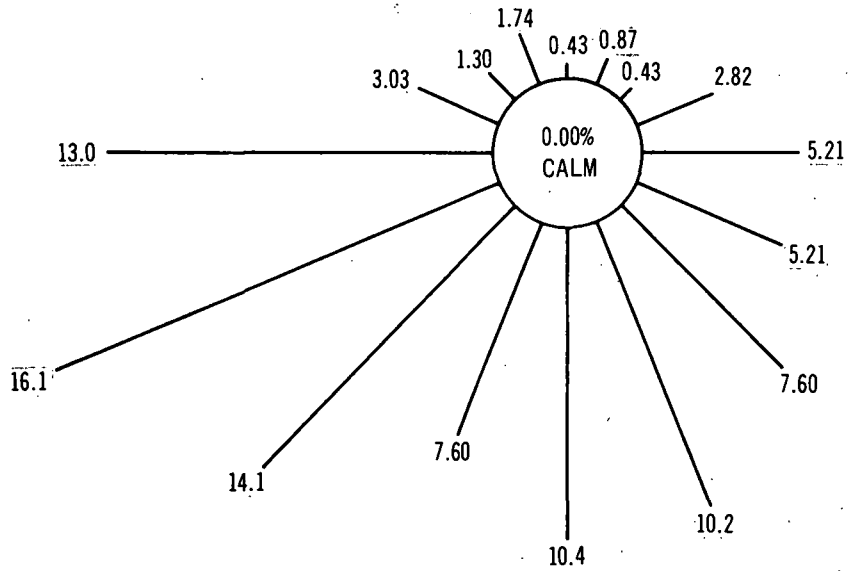
Considering the slow wind speed category of 0-3 mph (no 0 mph observed) the average hourly wind direction range is about 100 degrees. This corresponds to a standard deviation of 16.7 degrees (or 0.29 radians) and a value of $\sigma_\theta \bar{u} = 33.4$ degree-mph (or 0.26 radian-meter/second). About 87% of the time when the wind speed was in the 0-3 mph speed category, the hourly wind direction range was 60 degrees or more, which is a $\sigma_\theta \bar{u}$ value of 20 degree-mph (or 0.16 radian-meters/second). In terms of the total hours examined, such a low value of $\sigma_\theta \bar{u}$ is exceeded 98.3% of the time for a period as short as one hour.

7.4 Additional Data Analysis

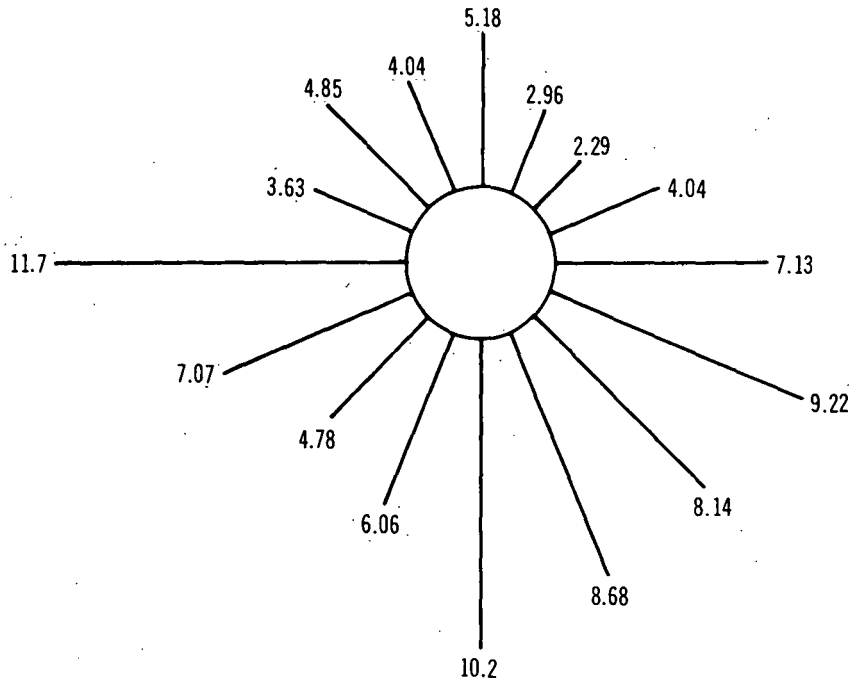
Data for the period 1958-1959 and 1963-1964 are being compiled on computer punch cards including the information described in Section III-7.2 for further summary and analysis. Wind persistence studies are in progress as well as wind direction range and distribution of the parameter $\sigma_\theta \bar{u}$ over periods of 2 hours, 4 hours, 8 hours, and 24 hours.



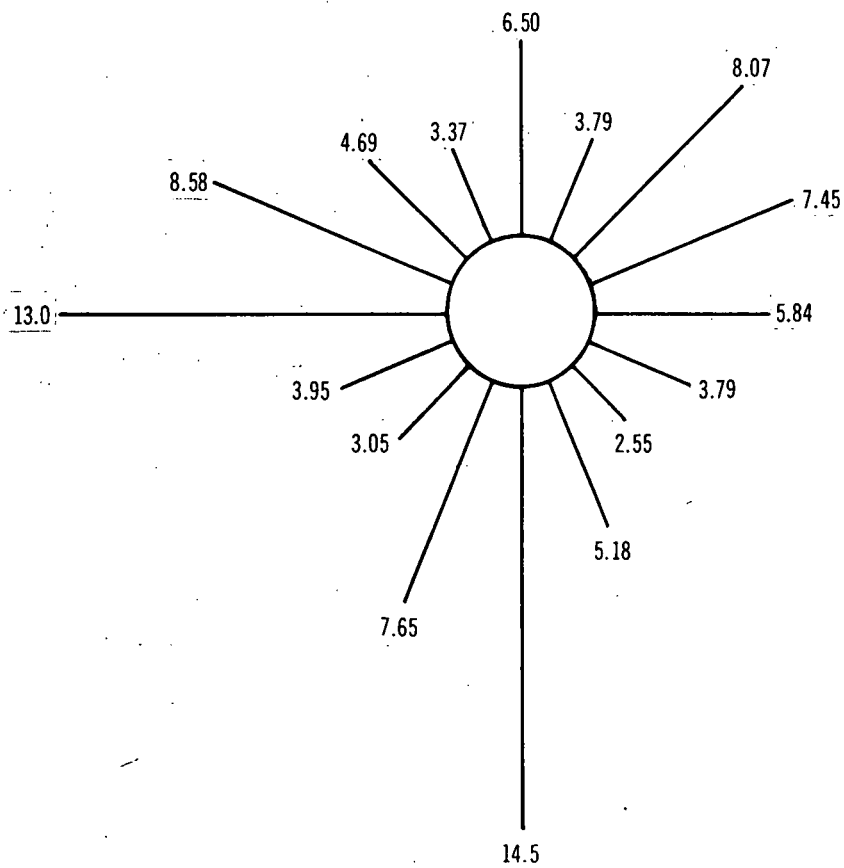
Annual Wind Rose (%) All Speeds



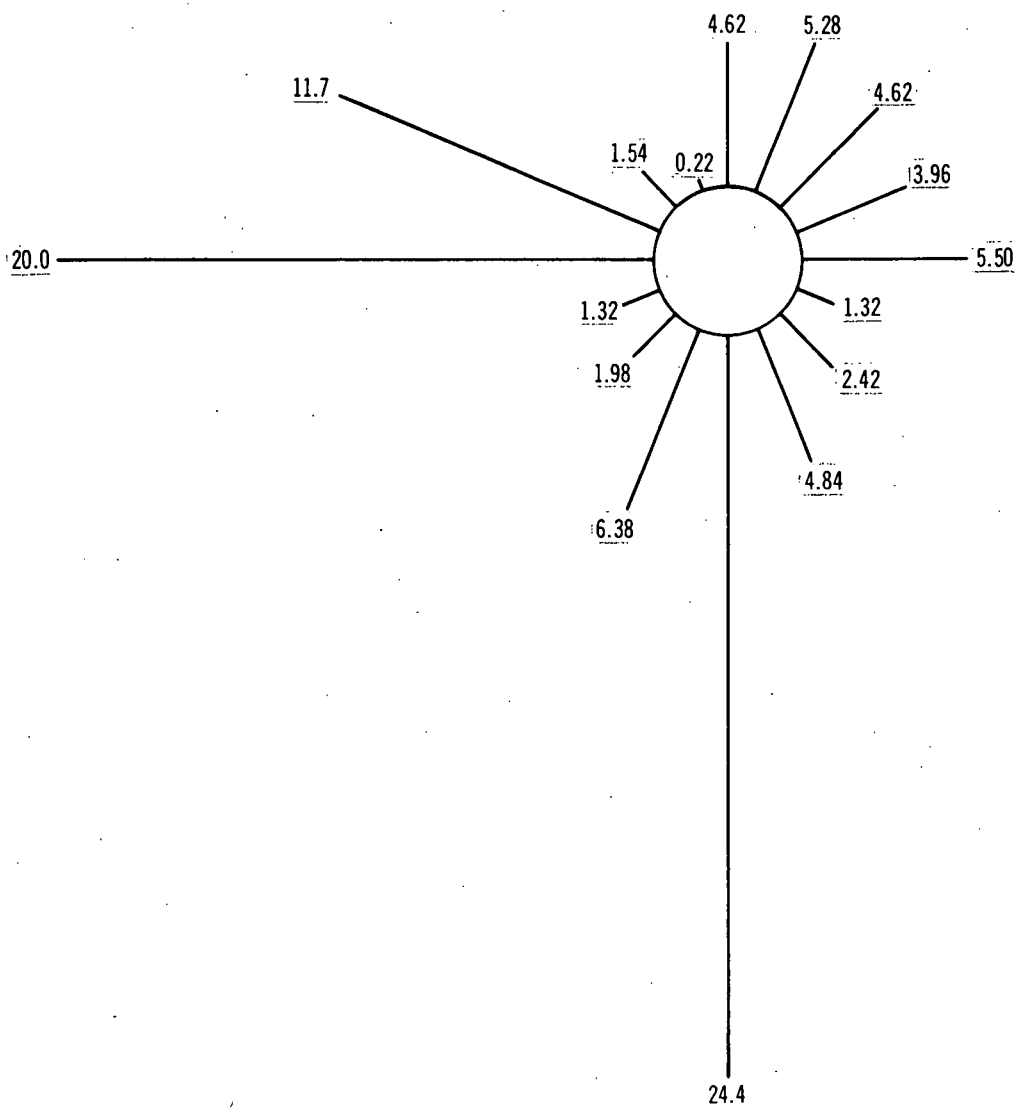
Annual Wind Rose (%) 0-3 mph



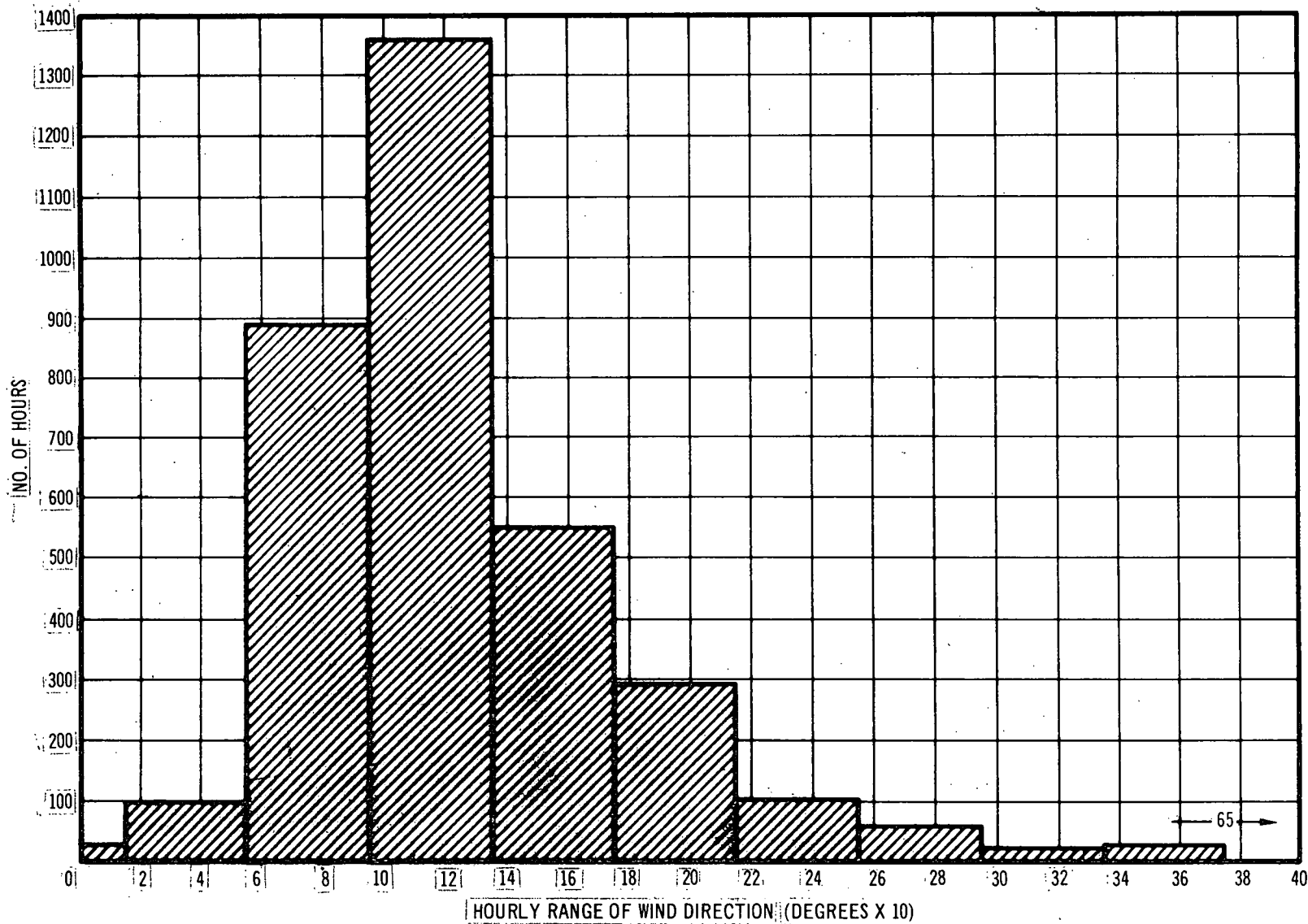
Annual Wind Rose (%) 4-7 mph



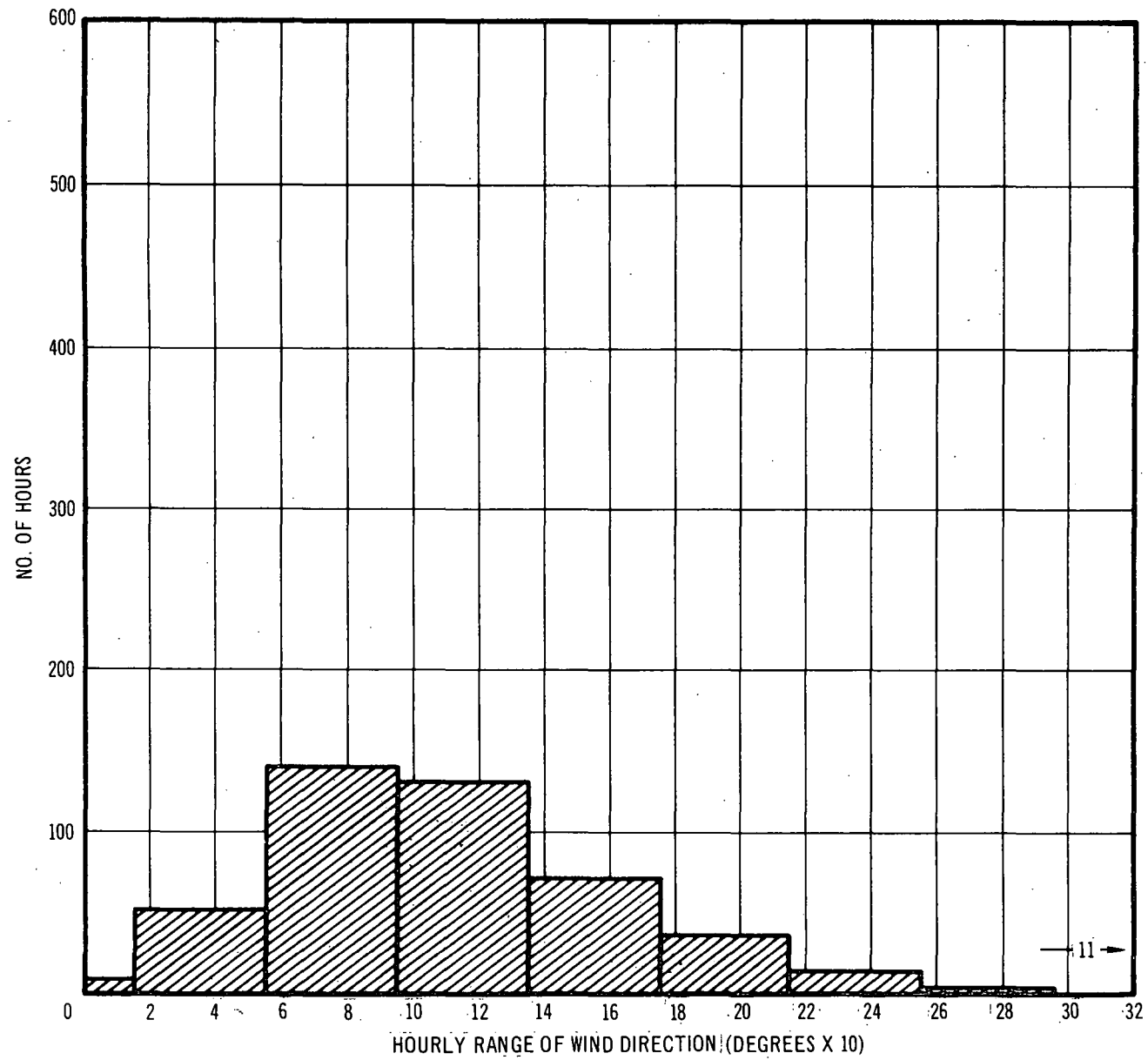
Annual Wind Rose (%) 8-12 mph



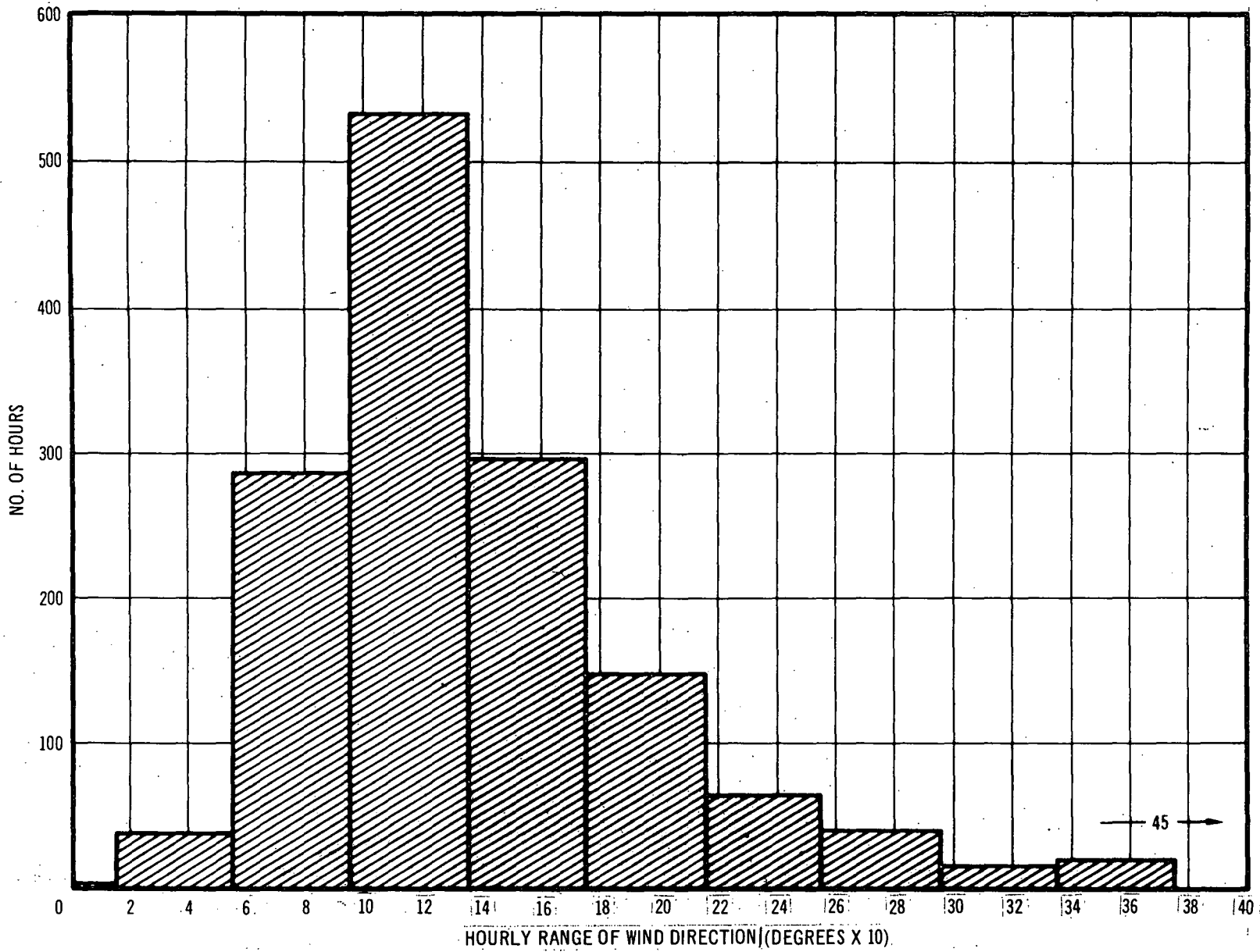
Annual Wind Rose (%) 13-25 mph



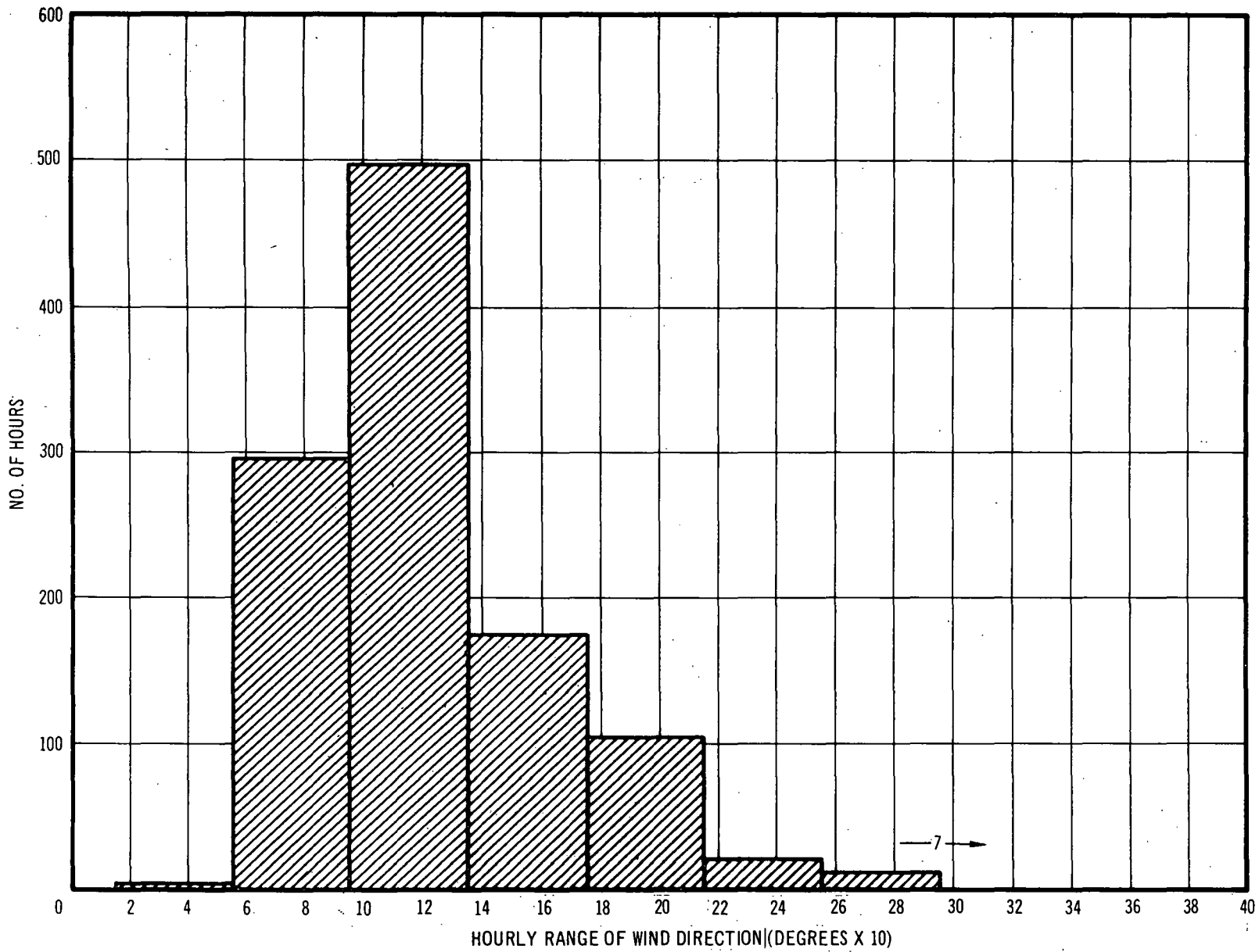
Hourly Wind Variability, 3658 Hours, All Speeds



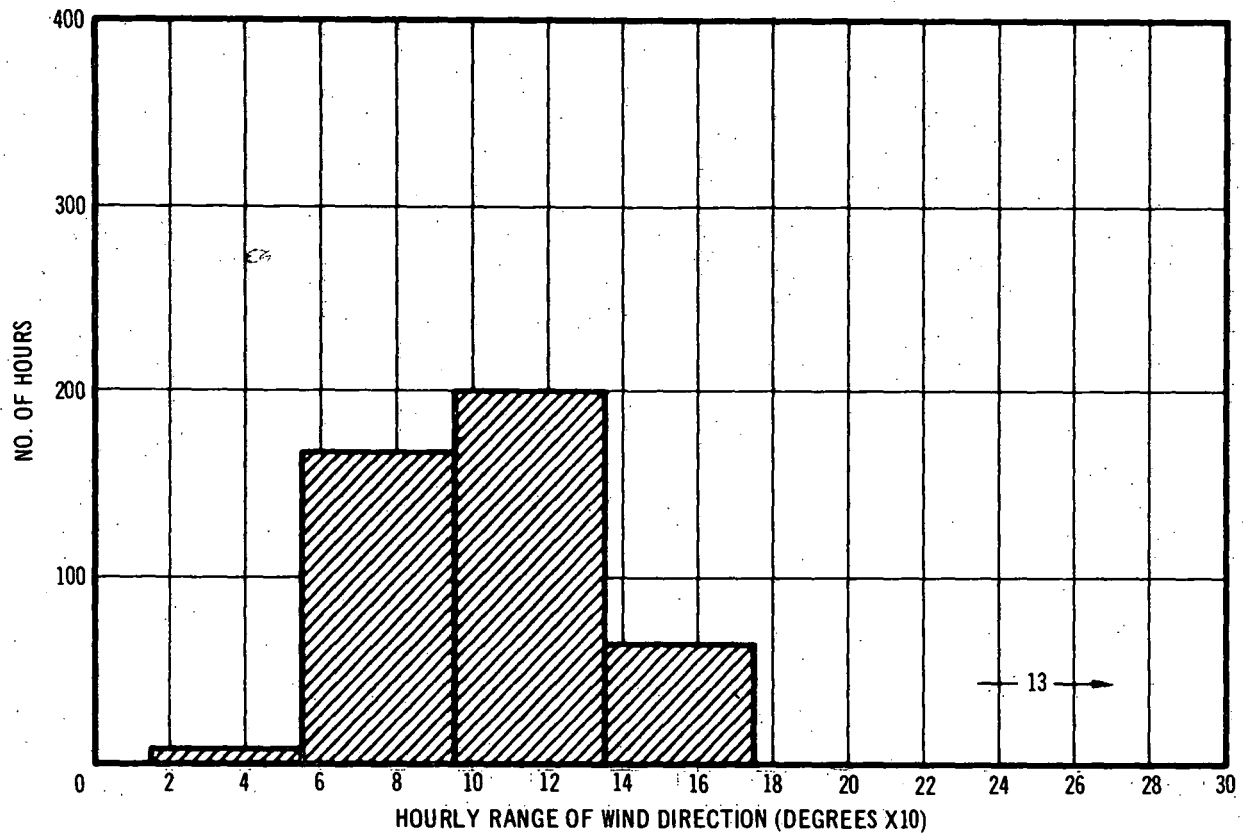
Hourly Wind Variability, 472 Hours, 0-3 mph



Hourly Wind Variability, 1510 Hours, 4-7 mph



Hourly Wind Variability, 1226 Hours, 8-12 mph



Hourly Wind Variability, 450 Hours, 10-25 mph